Tipton kangaroo rat
(*Dipodomys nitratoides nitratoides*)

5-Year Review:
Summary and Evaluation

Photo courtesy of the California State University, Stanislaus--Endangered Species Recovery Program.

U.S. Fish and Wildlife Service
Sacramento Fish and Wildlife Office
Sacramento, California

February 2010

5-YEAR REVIEW
Tipton kangaroo rat
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I. GENERAL INFORMATION

I.A. Methodology used to complete the review: This review was conducted by a staff biologist within the Sacramento Fish and Wildlife Office (SFWO) of the U.S. Fish and Wildlife Service (Service) using the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (Recovery Plan; Service 1998a), as well as published literature, agency reports, biological opinions, draft and completed habitat conservation plans, unpublished data, interviews with species experts, and maps of the current distribution of the species. No previous status reviews for this species have been conducted. The California Department of Fish and Game (CDFG) through the California Natural Diversity Database (CNDDB), however, has compiled and tracked changes to the known species locations since it was listed.[1]

I.B. Contacts

Lead Regional or Headquarters Office -- Contact name(s) and phone numbers: Diane Elam, Deputy Division Chief for Listing, Recovery, Habitat Conservation Planning, Region 8, Pacific Southwest Region; (916) 414-6464**.**

Lead Field Office -- Contact name(s) and phone numbers: Sacramento Fish and Wildlife Office; Kirsten Tarp, Recovery Branch, (916) 414-6600.

I.C. Background

I.C.1. FR Notice citation announcing initiation of this review:
72 FR 7064-7068, February 14, 2007 (Service 2007j)

I.C.2. Listing History

Original Listing
FR notice: 53 FR 25608 (Service 1988)
Date listed: July 8, 1988
Entity listed: Species – Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*)
Classification: Endangered

[1] CNDDB occurrence records and summary reports are based on forms submitted voluntarily by biologists. These forms document the presence or absence of plant and animal species and are based on field observations by knowledgeable individuals. The information reported includes: observation date, location, ecological characteristics of the site, and comments about relevant threats.

I.C.3. Associated Rulemakings: None (e.g., no critical habitat has been designated for this species).

I.C.4. Species' Recovery Priority Number at start of review: The Recovery Priority Number is 3c (based on a 1 to 18 ranking system where 1 is the highest recovery priority and 18 is the lowest) because a high degree of threat, a high recovery potential, a taxonomic rank of subspecies, and that the subspecies may be in conflict with construction or other development projects or other forms of economic activity (Service 1983a,b).

I.C.5. Recovery Plan or Outline

Name of plan: *Recovery Plan for Upland Species of the San Joaquin Valley, California*

Date issued: September 1998

II. REVIEW ANALYSIS

***Species overview*:**

Description: The Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*; Family Heteromyidae) is one of three subspecies of the San Joaquin kangaroo rat (*Dipodomys nitratoides* ssp.), morphologically distinguished by being larger than the Fresno kangaroo rat (*Dipodomys nitratoides exilis*) and smaller than the short-nosed kangaroo rat (*Dipodomys nitratoides brevinasus*; Best 1991). On average, adults weigh about 35-38 grams (1.2-1.3 ounces), have a head-body length of about 100-110 millimeter (3.9-4.3 inches), and a tail length of about 125-130 millimeter (4.9-5.1 inches; Williams 1985). Kangaroo rat adaptations for two-footed hopping include elongated hind limbs and a long, tufted tail for balance (Grinnell 1920, 1921; Merriam 1894). Tipton kangaroo rats eat mostly seeds. Burrow systems, normally less than about 250 millimeters (10 inches) deep, are usually in open areas (Germano and Rhodehamel 1995). Flat terrain not subject to flooding is essential for permanent occupancy by Tipton kangaroo rats.

Distribution: The historical geographic range of Tipton kangaroo rats was over 687,650 hectares (about 1.7 million acres; Williams 1985, 1986a,b; Figure 1[2]). Distribution was limited to arid-land communities occupying the valley floor of the Tulare Basin. By 1985, the inhabited area had been reduced, primarily by cultivation and urbanization, to only about 4 percent of the historical acreage. Current occurrences are limited to scattered, isolated areas (Kings, Tulare,

[2] There are problems in this figure with the geographic depiction of the historical and current distribution of the sub-species. Species experts have been consulted and the figure has been revised accordingly, however, some problems may remain. First, the presence of Tipton kangaroo rats at sites south of Buena Vista Lake is not certain and those sites are not included in figures widely used by species experts to indicate either the current or the historical distribution and should be investigated. Second, several sites actually occupied by Tipton kangaroo rats at present are not characterized as being within the current distribution. A thoroughly revised figure based on our present knowledge of the sub-species should be prepared by an appropriate species expert.

and Kern Counties) (Figures 2a, 2b). Densities typically are low, but populations are known to fluctuate greatly in response to climatic conditions (precipitation) and vary across habitat type (seasonal/short-lived invasion of vegetation, particularly by non-native grasses, can exacerbate Tipton kangaroo rat declines) (Morrison *et al*. 1996; Williams and Germano 1992).

Special Considerations: The construction of dams and canals, leading to a substantial increase in lands that could then be used for agriculture or development, was principally responsible for the decline and endangerment of the Tipton kangaroo rat. Current threats of habitat destruction or modifications are increasing (Bureau of Land Management 2007; DesertUSA 1996-2007; World Wildlife Fund [McGinley] 2007). Approximately 75 Tipton kangaroo rat occurrences have been reported to [California] Natural Diversity Database (2009c). Despite actions to conserve this species, its status continues to deteriorate (Best 1991; Goldingay *et al*. 1997; Peyton 1998; Uptain *et al*. 1999).

For additional information about the species, please see Appendix I.

II.A. Application of the 1996 Distinct Population Segment (DPS) policy

II.A.1. Is the species under review listed as a DPS?

____ ***Yes***
__X_ ***No***

The Federal Endangered Species Act of 1973, as amended (ESA), defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate wildlife. This definition limits listings as distinct population segments only to vertebrate species of fish and wildlife. No distinct populations have been identified for this subspecies.

II.B. Recovery Criteria

II.B.1. Does the species have a final, approved recovery plan containing objective, measurable criteria?

__X_ ***Yes***
____ ***No***

In the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (Service 1998a), the narrative discusses a recovery strategy and presents tables describing downlisting and delisting criteria with a step-down narrative.

II.B.2. Adequacy of recovery criteria.

II.B.2.a. Do the recovery criteria reflect the best available and most up-to-date information on the biology of the species and its habitat?

__X__ ***Yes***
____ ***No***

The recovery criteria focus on parcel ownership in the San Joaquin Valley (public ownership preferred), the development and implementation of management plans for the parcels of occupied habitats, and the creation of other factors or conditions that lead to stable or increasing Tipton kangaroo rat populations.

II.B.2.b. Are all of the 5 listing factors[3] that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)?

____ ***Yes***
__X__ ***No***

II.B.3. List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information. For threats-related recovery criteria, please note which of the 5 listing factors are addressed by that criterion. If any of the 5 listing factors are not relevant to this species, please note that here.

Downlisting Criteria (Addresses Listing Factor A)
Reclassification to threatened status will be evaluated when the species is protected in specified recovery areas from incompatible uses, management plans have been approved and implemented for recovery areas that include survival of the species as an objective, and population monitoring indicates that the species is stable. Downlisting criteria include:

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.

[3] Listing Factors:
A) Present or threatened destruction, modification or curtailment of its habitat or range;
B) Over-utilization for commercial, recreational, scientific, or educational purposes;
C) Disease or predation;
D) Inadequacy of existing regulatory mechanisms;
E) Other natural or manmade factors affecting its continued existence.

We define the phrase "precipitation cycle" as "…a period when annual rainfall includes average to 35 percent above-average through greater than 35 percent below-average and back to average or greater" (Service 1998a).

Protection of Occupied Habitat (Item 1)

The level of protection is evaluated for each of the recovery areas listed in the downlisting criteria, followed by a discussion of the adequacy of management plans and the mean density and stability of Tipton kangaroo rat populations. Figure 1 illustrates the location of known Tipton kangaroo rat occurrences reported in the [California] Natural Diversity Database (2009c). This section provides a brief description of the major threats known from each of the known populations, but a detailed threats analysis is provided in section II.C.2, below.

Three subcriteria must be met with respect to occupied habitat in order to meet the downlisting criteria:

The first of the three downlisting criteria for occupied habitat is that (i) three or more distinct areas with 2,000 hectares (4,940 acres) or more of contiguous, occupied habitat must be secured and protected, and that (ii) 30% each or more of the minimum acreage must be in public or conservation ownership.

Several public agencies and conservation organizations own or manage Tipton kangaroo rat habitat as a part of their overall conservation activities (Table 1; Figures 2a,b,c). In addition, several public agencies and conservation organizations have also developed habitat conservation plans with the Service that include conservation and recovery of the Tipton kangaroo rat (see section II.C.2.a and Table 4, below). Details of Tipton kangaroo rat recovery in specific recovery areas are presented in Appendix II.

[Note: Figures 2a and 2b are based on numerical data, as well as graphic representations of the range of the Tipton kangaroo rat. As depicted here, the historical range that is no longer occupied was approximately 1,081,779 acres (437,780 hectares); the current range is approximately 965,094 acres (390,559 hectares); total of 2,046,874 acres (828,340 hectares). These values, grossly overestimate the current range of the subspecies, as only a small portion of the available and appropriate habitat is occupied by the Tipton kangaroo rat and their range is severely fragmented. These figures may also overestimate the recovery potential of the sub-species because proposed conservation areas may contain only a small portion of appropriate habitat for the Tipton kangaroo rat.]

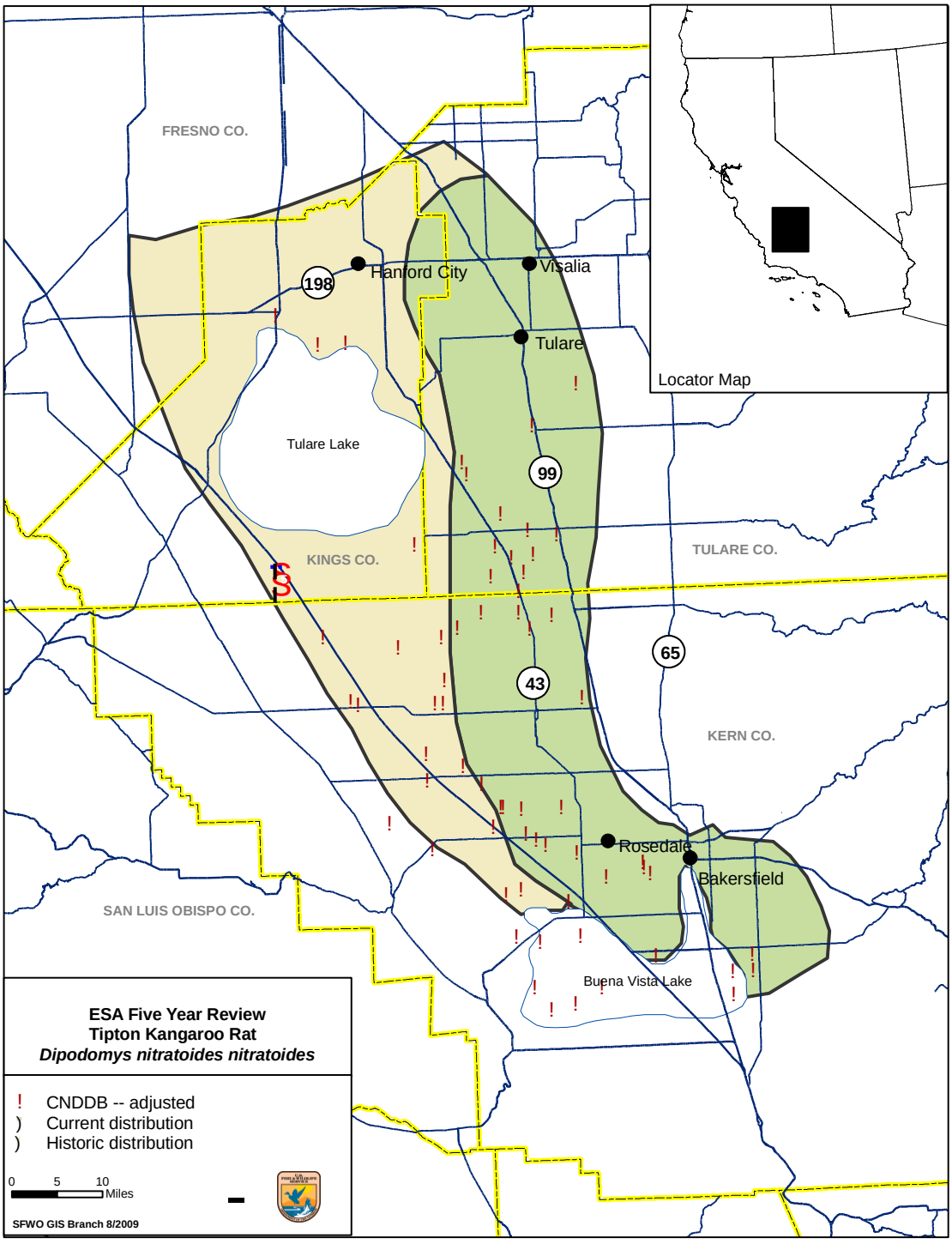

Figure 1. Geographic distribution of the Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*) in California. Extant known occurrences and populations are described in this review (red circles). Historical occurrences (black outline) and current distribution (green shading) are indicated, but may not be extant throughout the area. This region roughly falls within the southern portion of the San Joaquin Valley.

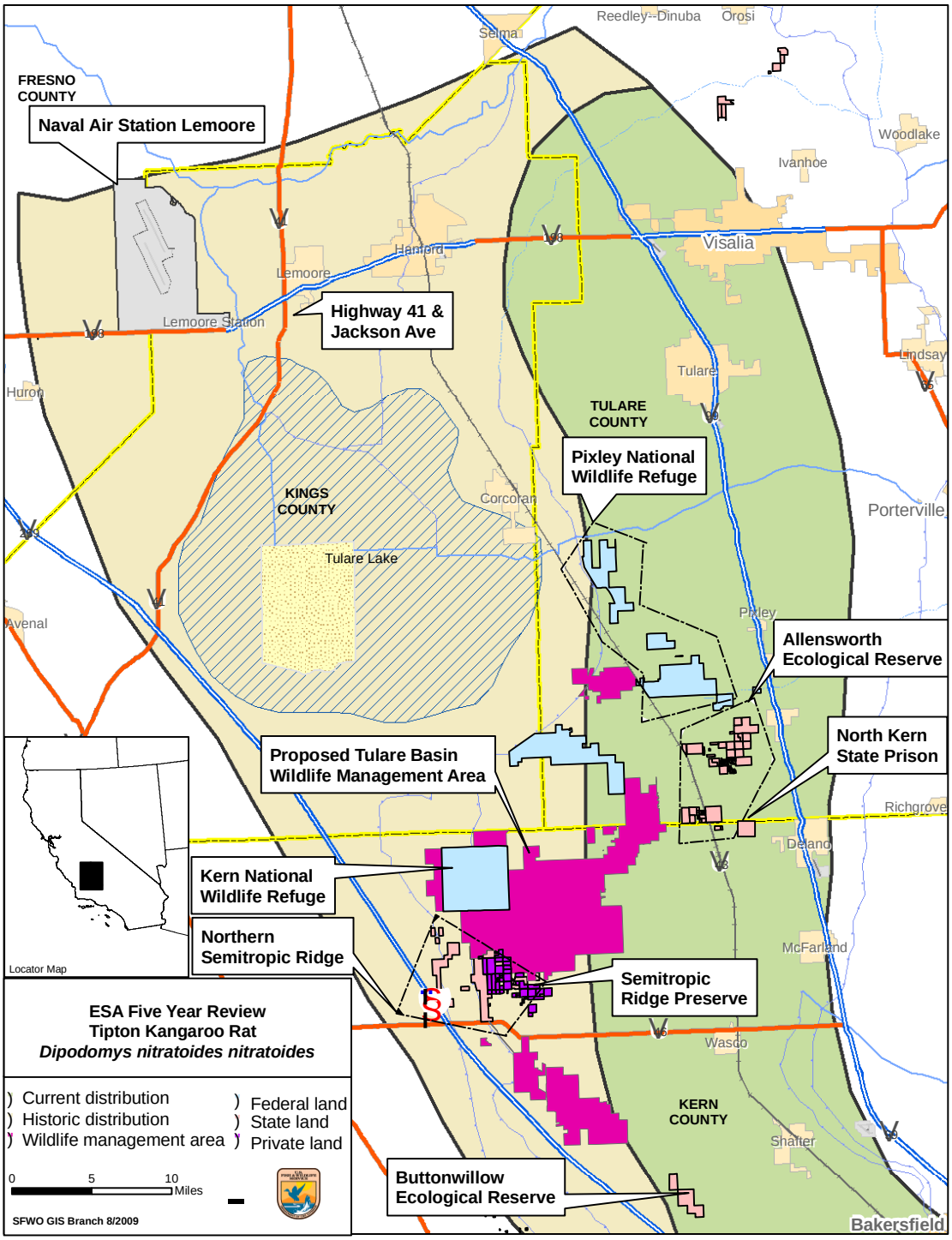

Figure 2a. Geographic distribution of proposed conservation and restoration areas for the Tipton kangaroo rat in California. [Note: Figures 2a and 2b overlap to a small extent.]

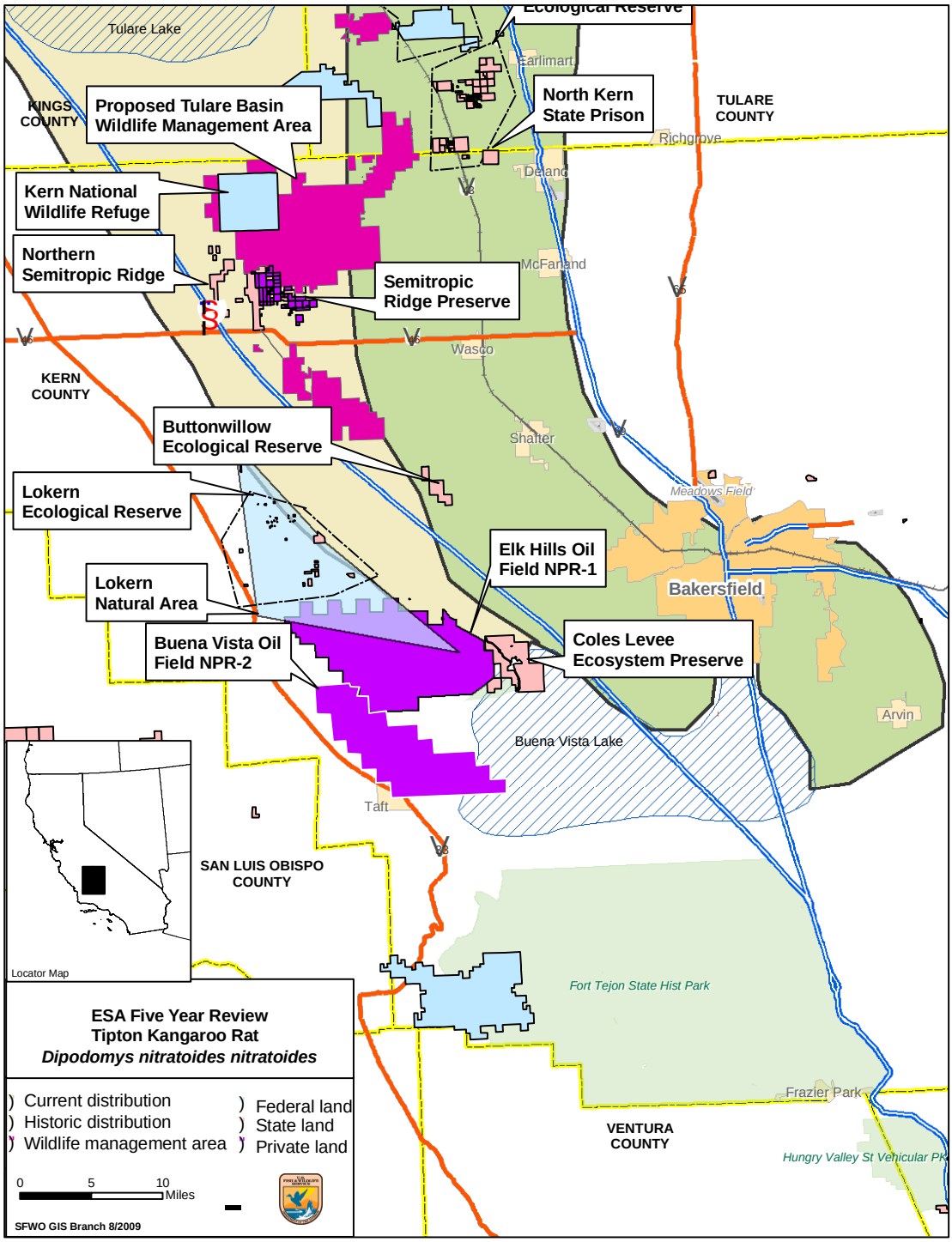

Figure 2b. Geographic distribution of proposed conservation and restoration areas for the Tipton kangaroo rat in California. [Note: Figures 2a and,2b overlap to a small extent.]

Despite the extent of this information, this assessment of occupied habitat, may be incomplete. Williams (1985:10-14) compiled a list of 54 sites known to be occupied by the Tipton kangaroo rat at that time. Since then, additional sites that generally are small and isolated have been reported to the [California] Natural Diversity Database (2009c), but no systematic effort has been made since 1985 to resurvey those sites or to compile additional relevant but unpublished information from species experts. While it is possible that some small populations of Tipton kangaroo rats have yet to be discovered, it is more likely that several sites that formerly supported Tipton kangaroo rat populations have been developed or used for agricultural purposes and no longer provide suitable habitat for this subspecies.

In summary, given the absence of range-wide surveys and the dynamic nature of Tipton kangaroo rat populations, the current geographic distribution of the subspecies is not clearly defined. Furthermore, we do not know what proportion of the occupied land is in public/conservation ownership *versus* private ownership. Currently, a majority of the known sites that are occupied by the Tipton kangaroo rat are under public/conservation ownership and are small, fragmented, and isolated from each other. While several parcels of habitat have been acquired or restored for conservation purposes, including those that have been conserved for the Tipton kangaroo rat, the criteria of having three or more distinct areas each with at least 2,000 hectares (4,940 acres) of contiguous habitat that is occupied by the Tipton kangaroo rat acquired or protected have not been met. Public or conservation ownership of occupied areas has not attained a level of at least 30 percent at each of the sites. Therefore, the protection for the Tipton kangaroo rat on public lands does not yet meet this criterion for downlisting.

Table 1.

Reported localities presently or formerly known to be occupied by the Tipton kangaroo rat, landowner or management agency, size, and protected status of lands (listed from north to south).

Locality	County	Landowner/ Management Agency	Approximate Total Area of Locality hectares (acres)	Year Acquired	Net Occupied Habitat hectares (acres)	Comments/Notes (sources)
Naval Air Station Lemoore[1]	Kings (small portion in Fresno)	Department of Defense	7,602 (18,784)	1972	40.5 (100)	The station also controls development easements on adjacent 4,460 hectares (11,020 acres). Tipton kangaroo rat occupies Resource Management Area 5 (known locally as Tumbleweed Park; 40.5 hectares [100 acres]). Management plan for 2001-2005 (plan for 2006-2010 pending). Small mammal surveys have occurred since 1982. Some question about the taxonomic status of subspecies at site (Tipton or Fresno kangaroo rat), however probably Tipton kangaroo rat.

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Locality	County	Landowner/ Management Agency	Approximate Total Area of Locality hectares (acres)	Year Acquired	Net Occupied Habitat hectares (acres)	Comments/Notes (sources)
Pixley National Wildlife Refuge[2]	Tulare	Service	2 765 (6,833)	1959 (created) 1960 (initiated)	Unknown	CDFG has an additional easement of 4 hectares (about 10 acres) nearby. Approved Master Plan since 1986. ESRP surveys since 1992; few Tipton kangaroo rats observed. About 2,584 hectares (6,385 acres) federally owned; about 1,583 hectares (3,911 acres) privately owned; about 2 hectares (4.5 acres) with conservation easement. About 2,973 hectares (7,347 acres) of annual grassland.
Allensworth Ecological Reserve[3]	Tulare	CDFG	1,998 (4,936)	1980 (initiated)	Unknown	A draft management plan was developed in 2005, but has yet to be approved. Surveys have been conducted by CDFG since about 1993. Trapping by CDFG since 1993 at least every 5 years. Germano and Saslaw translocated 144 Tipton kangaroo rats from Lamont area to this site in 2007.

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Atwell Island	Kings, Tulare	Bureau of Land Management	3,237 (8,000)	2000 (initial acquisition)	Unknown	In-house draft of activity level management for Atwell, but plan approval distant due to jurisdiction under the Bakersfield BLM, which is currently rewriting its management plan. Potential for 3,000-4,000 acres of suitable habitat for Tipton kangaroo rat once all land acquisition complete and all restoration in progress for 4-5 years[18].
North Kern State Prison[4]	Kern	Department of Corrections & Rehabilitation	259 (640)	1990	Unknown	Opened in 1993. Surveys by Uptain and colleagues during 1991-1995.
Kern National Wildlife Refuge[5]	Kern	Service	4,552 (11,249)	1958 (created) 1960	Unknown	Originally named Mariposa National Wildlife Refuge. Approved Master Plan since 1986. About 1,174 hectares (2,900 acres) of annual grassland. Flooded in 1980s and 1990s; few Tipton kangaroo rats observed on

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						or near refuge since then.
Northern Semitropic Ridge Ecological Reserve[6]	Kern	California Energy Commission & CDFG	2,720 (6,720)	1984 (initiated) 1993	Unknown	Surveys during 2003.
Semitropic Ridge Preserve[7]	Kern	CNLM	1,497 (3,709)	1968 (created) 1997 (acquired by CNLM)	Unknown	Management plan developed and implemented; Tipton kangaroo rat as a target species. Surveys by Warrick since 2001.
Buttonwillow Ecological Reserve[8]	Kern	CDFG	546 (1,350)	1991	Unknown	(Pacific Gas & Electric substation; small development project.) Surveys during 1998-1999.
Metropolitan Bakersfield HCP[9]	Kern	CDFG & CNLM	105,979 (262,000)	1992 (initiated)	Unknown	Management plan under the habitat conservation plan. Members of the steering committee include: City of Bakersfield, Kern County, Service, and California Department of Fish and Game.

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Kern Water Bank HCP (Kern Fan Element)[10]	Kern	Kern County Water Authority	8,054 (19,900)	1996	Unknown	Management plan under the habitat conservation plan. The water bank is administered under a joint powers authority.
DWR La Hacienda (Kern Fan Element) [11]	Kern	Kern County Water Authority		1997	Unknown	Acreage included with Kern Water Bank HCP. Management plan under the habitat conservation plan.
Lokern Natural Area (and Preserve)[12]	Kern	Bureau of Land Management, CDFG, Plains Exploration Company (PXP; Nuevo Torch), Occidental Petroleum (Chevron)	16,188 (40,000)	Unknown	Unknown	Multiple owners; several individual tracts. Chevron is the majority landowner (13,000 acres) and will implement management plans and surveys in the context of the habitat conservation plan. Plans in place for Plains Exploration portion. BLM is leading long-term study with detailed surveys over the last 5 years. Note: The name "Lokern" is used generically by several entities and

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Locality	County	Landowner/ Management Agency	Approximate Total Area of Locality hectares (acres)	Year Acquired	Net Occupied Habitat hectares (acres)	Comments/Notes (sources)
						refers to numerous sites in the same general area.
Lokern Preserve[13]	Kern	CDFG	57 (140)	1992 (initiated)	Unknown	Within 40,000 acres of Lokern Natural Area (and Preserve)
Lokern Preserve[14]	Kern	CNLM	1,578 (3,900)	Unknown	Unknown	Within 40,000 acres of Lokern Natural Area (and Preserve) Management plan developed and implemented; Tipton kangaroo rat as a target species. Surveys by Warrick since 2001.
Coles Levee Ecosystem Preserve[15]	Kern	Aera Energy Company	2,452 (6,059)	1992 (established) 1998 (acquired by Aera)	Unknown	Annual surveys have been conducted and reported to the Service since 1994.
Nuevo Torch HCP (now PXP)	Kern	Private	8,863 (21,900)	1999	Unknown	Habitat conservation plan completed. Management plan, including surveys, to be developed.
Champagne Shores HCP	Kern	Private (D.L. Griffen/	33 (82)	1990	Unknown	Development site. 14 Tipton kangaroo rats trapped on April 20,

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		Griffen Homes)				1990 (Germano 1991a,b); perhaps 50-100 Tipton kangaroo rats on entire parcel.
Lamont Public Utilities District HCP	Kern	Lamont Public Utilities District HCP	65 (160)	2005	Unknown	Development site. Tipton kangaroo rats trapped and relocated to Allensworth Ecological Reserve (Germano and Saslaw 2007).
California Aqueduct[16]	[several]	State of California	[ca. 121 linear miles] 4781 (11814)	Mid-1970s	306 (757)	Subspecies presence confirmed east of the aqueduct. Draft habitat conservation plan under review (January 2008); proposed management plan and surveys.
Other/ Various[17, 18]	Various (San Joaquin Valley)	California Department of Fish and Game	"large"	Various	Unknown	As a result of several consultations and mitigation arrangements over the years under sections 7 and 10 of the ESA, numerous parcels were donated to the California Department of Fish and Game by the project

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						proponents. The Service is in the process of incorporating parcel location and size data into our databases. Several thousand hectares (acres) are involved.

[1] Gorman and Rosenberg (2000); Kelly *et al*. (2000); Morrison *et al*. (1996); Smallwood and Morrison (2004); Uptain *et al*. 1999; US Navy Engineering Field Activity, West (2001)
[2] Newman *et al*. (2004); Newman *et al*. (2006); Service (2005a)
[3] Department of Fish and Game (Wildlife Conservation Board [2003 a,b,c]; Selmon *et al*. (2004a,b)
[4] California Department of Corrections and Rehabilitation (2007); Uptain *et al*. (1999)
[5] Newman *et al*. (2004); Newman *et al*. (2006); Service (2005a)
[6] Selmon *et al*. (2004b)
[7] Center for Natural Lands Management (2000-2004b); Warrick (2004, 2006, 2007)
[8] Selmon *et al*. (2004b)
[9] Service (2007h)
[10] Kern Water Bank Authority (2007); Service (1998b); Note: The phrase "Kern Fan Element" is a term used by the Service (1998a:197) to describe the area along the Kern River Parkway and western Kern County. Several federally-listed species occur in that area.
[11] Kern Water Bank Authority (2007); Service (1998b); Service (1998a:197)
[12] Center for Natural Lands Management (2000-2004a)
[13] Center for Natural Lands Management (2000-2004a)
[14] Center for Natural Lands Management (2000-2004a); Warrick 2004, 2006, 2007

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Locality	County	Landowner/ Management Agency	Approximate Total Area of Locality hectares (acres)	Year Acquired	Net Occupied Habitat hectares (acres)	Comments/Notes (sources)

[15] Quad Consultants(1997); Quad Knopf (1998, 2001, 2003a,b, 2004, 2005)
[16] California Department of Water Resources (2007); Toyon Environmental Consultants, Inc. (2007)
[17] Newell (2006); Penrod (2005); Penrod *et al*. (2001); Penrod *et al*. (2003); Stallup *et al*. (2003); White *et al*. (2003); White *et al*. (2006)
[18] Laymon, Bureau of Land Management (2009)

Management Plans

The second (Item 2) criterion for downlisting the Tipton kangaroo rat is that a management plan that includes the subspecies as an objective has been approved and implemented for all protected areas identified as important to the continued survival of the subspecies. Three large blocks or core areas of natural lands have been targeted by the Service for protection of the Tipton kangaroo rat: Kern Fan Element (see foot note #10 in Table 1), Pixley National Wildlife Refuge/Allensworth Natural Area, and Kern National Wildlife Refuge/Semitropic Ridge Natural Area (Service 1998a:197-199). In addition Atwell Island, which has an in-house management plan, and the Lemoore Naval Air Station which has a management plan pending, may also be important sites for Tipton kangaroo rat survival. However, in general (except for Pixley and Kern National Wildlife Refuges, see below), the sites that have been clearly identified as important to the continued survival of the subspecies do not have management plans. Therefore, the criterion has not yet been met.

Details on individual management plans are presented in Appendix III (including Federal, State, Conservation Organizations, County/Regional Organizations, and Private Organizations).

In summary, several sites are being managed for the benefit of the Tipton kangaroo rat. Perhaps the most effective management programs are those being implemented by Center for Natural Lands Management and Coles Levee Ecosystem Preserve. Active habitat management and vegetation monitoring, combined with systematic small mammal surveys at those sites, are helping managers to understand the dynamics of those Tipton kangaroo rat populations. Active habitat management and small mammal surveys are also being implemented at Pixley and Kern National Wildlife Refuges, but low Tipton kangaroo rat populations at the two sites make it difficult to interpret these results to determine the effectiveness of these actions. Management actions and small mammal surveys at lands administered by the California Department of Fish and Game are less well documented and need to be enhanced if they are to provide effective conservation benefits to the Tipton kangaroo rat. To conclude, only about half of the protected areas identified by the Service (1998a) as important to the continued survival of the subspecies have management plans (e.g., Pixley and Kern National Wildlife Refuges). With regard to additional sites that may be important to the survival of the subspecies, several have management plans (e.g., Naval Air Station Lemoore, Metropolitan Bakersfield [purchased lands are donated to and administered by California Department of Fish and Game], and Kern Water Bank Habitat Conservation Plans), but only a few of those can demonstrate a link between habitat management at the site and Tipton kangaroo rat population levels (e.g., Semitropic Ridge and Lokern Preserves and Coles Levee Ecosystem Preserve). The criterion has not yet been met.

Population Stability

The third (Item 3) criterion for downlisting the Tipton kangaroo rat is that several populations be stable or increasing through a precipitation cycle in the San Joaquin Valley. Over the years, surveys have been completed in an opportunistic manner (Tables 2a and 2b).

The populations of Tipton kangaroo rats in general are decreasing or unstable throughout their range. Furthermore, several sites that previously supported the Tipton kangaroo rat apparently either are no longer occupied by that subspecies or else have extremely small populations. Information for many sites suggests that Tipton kangaroo rat populations are not stable or increasing, and may be extirpated at some sites. For details, see Appendix IV.

The largest and most secure population of Tipton kangaroo rats is at Coles Levee Ecosystem Preserve (see Quad Knopf, Inc., 2005 and previous annual reports). A smaller population of Tipton kangaroo rats occurs at Resource Management Area 5 of Naval Air Station Lemoore. Relatively large numbers of Tipton kangaroo rats also occur at a location near the intersection of Highway 41 and Jackson Avenue, near Naval Air Station Lemoore, but that site is included within a proposed road improvement project (Uptain *et al*. 2000). A stable population has also been reported for Semitropic Ridge Preserve. While that preserve is relatively secure, the Tipton kangaroo rat population at Semitropic is extremely small. At this time, we are unable to categorize the population stability of the translocated Tipton kangaroo rats at Allensworth Ecological Reserve, but few if any kangaroo rats had been reported there since the early 1990s (Germano and Saslaw 2007; Selmon *et al*. 2004a,b; Uptain *et al*. 1999). In conclusion, the criterion for population stability has not been met.

Table 2a.

Survey results (number of individuals; multiple surveys reported separately with source) for the Tipton kangaroo rat at the several reported separate populations known in the San Joaquin Valley, California, 1982-2007 (listed from north to south).

Year	Naval Air Station Lemoore Wildlife Area 4	Naval Air Station Lemoore Resource Management Area 5 *grid trapping; burrow mapping*	Naval Air Station Lemoore Resource Management Area 5 *capture probability*	Highway 41 & Jackson Avenue	Pixley National Wildlife Refuge	Allensworth Ecological Reserve	North Kern State Prison
1982	Present[1]						
1988		Present[7]					
1991							(16)[21]
1992		Present[8]					
1993	Absent[2]	75-300[9]			125-290[16] (161)[17] [207-454][22]	(242)[18]	(112)[21]
1994					20-70[16] (51)[17]	(90)[18]	(64)[21]
1995		16[10]	4-35[12]		0-18[16] (14)[17] [3][22]	(2)[18]	(0)[21]
1996		2-39[10]	0-53[12] (71)[13]		0[16] (3)[17]	(1)[18]	
1997		1-12[10]	4-12[12] (17)[13]		(0)[17]	(0)[18]	
1998	Absent[3]	0-6[10]	0-8[12] (23)[13]		(0)[17]	(2)[18]	
1999	Absent[3]			7[14]	[0][22]		
2000		40[11]			[0, 1?][22]		
2001	Absent[4]	59-129[11]			[0][22]		
2002		69-122[11]		450[15]	[0][22]	2[19]	
2003	Absent[5]	55-173[11]		262[15]	[0][22]	2[20]	
2004	Absent[6]	95-202[11]		315[15]	[0][22]		
2005							
2006							
2007						+144[23]	

Table 2a.

Survey results (number of individuals; multiple surveys reported separately with source) for the Tipton kangaroo rat at the several reported separate populations known in the San Joaquin Valley, California, 1982-2007 (listed from north to south).

Year	Naval Air Station Lemoore Wildlife Area 4	Naval Air Station Lemoore Resource Management Area 5 *grid trapping; burrow mapping*	Naval Air Station Lemoore Resource Management Area 5 *capture probability*	Highway 41 & Jackson Avenue	Pixley National Wildlife Refuge	Allensworth Ecological Reserve	North Kern State Prison

Sources:
[1] O'Farrell and Sauls (1982; cited by Kelly *et al*. [2000])
[2] Morrison *et al*. (1996:1)
[3] Tetra Tech, Inc. (1999)
[4] Morrison (unpublished data; cited by Morrison and Smallwood [2004:3])
[5] Morrison and Smallwood (2003; cited by Smallwood and Morrison [2004:3])
[6] Morrison and Smallwood (2004; cited by Smallwood and Morrison [2004:3])
[7] Kelly *et al*. (2000)
[8] Kuenzi and Morrison (1992; cited by Smallwood and Morrison [2004:5])
[9] Morrison *et al*. (1996:604)
[10] Kelly *et al*. (2000:20; data extrapolated from text)
[11] Smallwood and Morrison (2004:15-18)
[12] Gorman and Rosenberg (2000:12)
[13] Uptain *et al*. (1999:7)
[14] Uptain *et al*. (2000:12)
[15] Smallwood and Morrison (2004:54-57)
[16] Kelly *et al*. (2000:36; data extrapolated from text)
[17] Uptain *et al*. (1999:5)
[18] Uptain *et al*. (1999:5)
[19] Selmon *et al*. (2004a:29)
[20] Selmon *et al*. (2004b:27)
[21] Uptain *et al*. (1999:6)
[22] Newman *et al*. (2004); Newman *et al*. (2006)
[23] Germano and Saslaw (2007); translocation of individuals from a proposed construction site near Lamont.

Table 2b.

Survey results (number of individuals; multiple surveys reported separately with source) for the Tipton kangaroo rat at the several reported separate populations known in the San Joaquin Valley, California, 1982-2007 (listed from north to south).

Year	Kern National Wildlife Refuge	Northern Semitropic Ecological Reserve	Semitropic Ridge Preserve	Buttonwillow Ecological Reserve	Coles Levee Ecosystem Preserve Trapped	Coles Levee Ecosystem Preserve Spotlighted North	Coles Levee Ecosystem Preserve Spotlighted South
1982							
1988							
1992							
1993	11[24]						
1994	4[24]				~172[31]		
1995	+33[25] (1)				0[32]	27[32]	
1996					3[33]	11[33]	
1997					2[34]	10[34]	
1998	1[24]			15[29]	3[35]	50 (68)[35]	63[35]
1999				25[30]	197[36]	194[36]	154[36]
2000					142[37]	197[37]	357[37]
2001			33[27]		104[38]	631[38]	105[38]
2002			41[27]		80[39]	328[39]	163[39]
2003			41[27]				
2004		75[26]	27[27]		75[40]	302[40]	164[40]
2005	0[22]		32[28]				
2006			15[28]				
2007			9[28]				

Sources:
[24] Williams (2005: Figure 3); translocated individuals.
[25] Germano (1995,2001)
[26] Selmon *et al*. (2004b:36)
[27] Warrick (2004:6)
[28] Warrick (2007:in litt.)
[29] Selmon *et al*. (2004a:31)
[30] Selmon *et al*. (2004a:32)
[31] M.H. Wolfe and Associates (1996:51)
[32] M.H. Wolfe and Associates (1996:33 & 51)
[33] Quad Consultants (1997:22, 24, & 32)
[34] Quad Knopf (1998:27, 28, & 33)
[35] Quad Knopf (1999:30-31 & 38-39)
[36] Quad Knopf, Inc. (2001:34, 36, 37, 39, 46, & 47)

Table 2b.

Survey results (number of individuals; multiple surveys reported separately with source) for the Tipton kangaroo rat at the several reported separate populations known in the San Joaquin Valley, California, 1982-2007 (listed from north to south).

Year	Kern National Wildlife Refuge	Northern Semitropic Ecological Reserve	Semitropic Ridge Preserve	Buttonwillow Ecological Reserve	Coles Levee Ecosystem Preserve Trapped	Coles Levee Ecosystem Preserve Spotlighted North	Coles Levee Ecosystem Preserve Spotlighted South

[37] Quad Knopf, Inc. (2001:34, 37-39, 48, & 49)
[38] Quad Knopf, Inc. (2003a:16, 18, 20, 26, & 27)
[39] Quad Knopf, Inc. (2003b:12, 14, 16, 22, & 23)
[40] Quad Knopf, Inc. (2005:12, 15, & Figure 12)

Delisting Criteria (Addresses Listing Factor A)
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.

Protection of Occupied Habitat

Current habitat protection efforts are discussed above. As a result of conservation actions, approximately 17 sites of currently or formerly occupied Tipton kangaroo rat habitat are in public or conservation ownership (Table 1). The combined surface area of these sites is approximately 150,000 hectares (about 370,500 acres). The quantity of habitat actually occupied by the Tipton kangaroo rat is unknown at this time, but likely is much smaller than that value. The delisting criterion is that 9,000 hectares (22,230 acres) of occupied habitat be protected in public or private ownership. In 1985, Williams (1985:19), based on his survey of occupied and likely occupied sites, determined that the quantity of occupied habitat was 25,665 hectares (about 63,449 acres). Since that time, many properties in the southern portion of the San Joaquin Valley – including several natural areas potentially occupied by the Tipton kangaroo rat -- have been developed or converted to agricultural uses. Over the past 100-150 years, reports suggest that as much as 64-95 percent of these natural areas have been converted or fragmented (Kelly *et al*. 2005a,b). Although conservation of relatively large parcels of occupied Tipton kangaroo habitat have been protected through the Metropolitan Bakersfield and Kern Water Bank Habitat Conservation Plans, as well as at Coles Levee Ecosystem Preserve the 9,000 hectare target has not been acheived. This delisting criterion has not yet been attained.

Population Stability and Densities

The delisting criterion is 10 individuals per hectare during a complete precipitation cycle. Tipton kangaroo rat population dynamics, however, still are poorly known, including densities. Population numbers apparently cycle over the years in response to precipitation and the secondary impacts of precipitation on vegetation, but the nature and extent of these variations are not well documented. Single *et al*. (1996), however, suggested that Tipton kangaroo rats may also be susceptible to disease as a consequence of exceptionally wet winters. Other species of small rodents in the San Joaquin Valley also exhibit substantial variations from year to year and from site to site (Cypher 2001).

Population studies of rodents usually require lengthy studies (upwards of 10-20 years) of large populations (hundred-thousands of individuals). Early studies suggested that Tipton kangaroo rats exhibited low densities (Clark *et al*. 1982

[1.5-2.6 per hectare at the former Paine Wildflower Preserve]; Hafner 1979 [1-2 per hectare in alkaline and terrace grasslands; 7-9 per hectare in saltbrush scrub; 13 localities]; Williams and Germano 1992 [3.0-3.8 per hectare at Pixley National Wildlife Refuge). The only current population of Tipton kangaroo rat that is relatively large, as well as stable and protected, is at Coles Levee Ecosystem Preserve. Those data, however, have not been analyzed quantitatively to provide density estimates. The next best set of population data that could be used to estimate population density is from Naval Air Station Lemoore, where Morrison *et al*. (1996:604) reported values of 3.5 animals per hectare (January; rainy season) and 5.5 animals per hectare (May; dry season). Also at Lemoore, Gorman and Rosenberg (2000:18-19) reported values of 1.5 ± 0.5 animals per hectare overall (15 grids considered) and 13.5 ± 4.4 animals per hectare on the focal grids (4 grids; 2 burned and 2 unburned). At the Highway 41 and Jackson Avenue site near Naval Air Station Lemoore, Smallwood and Morrison (2004:53-58) calculated densities for the year 2002 of 11.7 burrow systems per hectare (1 burrow system approximately equals 1 kangaroo rat), 14.5 for 2003, and 13.4 for 2004. Given the limited nature of these data, it is hard to generalize about densities or population sizes. An important consideration, however, is that these results are for small sites at locations known to be occupied more or less continuously over the years by the Tipton kangaroo rat. Thus, these densities likely are greater than at sites temporarily unoccupied or experiencing a temporary population decline. Population densities at all other sites (except perhaps for Coles Levee Ecosystem Preserve, Semitropic Ridge Preserve, and Allensworth Ecological Reserve) on average probably do not exceed 3.5-5.5 animals per hectare (*sensu* Morrison *et al*. 1996) and may be much less. The delisting criterion of ten individuals per hectare during a complete precipitation cycle has not yet been attained.

II.C. Updated Information and Current Species Status

During 1988-1998 (dates of original listing and publication of the Recovery Plan, respectively), several studies were conducted to update our knowledge of the Tipton kangaroo rat and to establish the baseline that will be used here to assess the current status of the species. One type of study was the generic biological assessment that documented the presence or absence of the subspecies at a proposed project site, characterized the habitat, and described conservation threats to the subspecies as a result of the proposed project. The other type of study was biological research that quantified and characterized the distribution and abundance of the Tipton kangaroo rat at specific sites (e.g., Best 1991; Peyton 1998; Rathbun *et al*. 1997; Single *et al*. 1996; Williams and Germano 1992; Williams *et al*. 1997).

Regarding the biology and habitat requirements of the subspecies, the best available information perhaps is for abundance and population trends. That information, however, is only available for a few limited sites. Our knowledge about abundance and population trends at other sites is extremely limited, as is

our knowledge about other aspects of the basic biology of the subspecies or its habitat requirements. In general, our knowledge about the behavior and ecology of the subspecies remains limited.

II.C.1. Biology and Habitat

II.C.1.a. Abundance, population trends

At the time of listing in 1988, little information was available about Tipton kangaroo rat abundances or population trends. Based on research by Williams (1985, 1986), we knew, for example, that the Tipton kangaroo rat occurred in at least 54 sites that varied greatly in size from small (4 hectares [10 acres]) to large (2,810 hectares [6,941 acres]). Historical records suggest that Tipton kangaroo rat populations usually were small and subject to great variation in total population size from year to year (Appendix IV). Current information, based on surveys at about 10 sites (Tables 2a and 2b), suggest that Tipton kangaroo rat abundance is low throughout the known range of the subspecies and that populations continue to decline. Surveys at Coles Levee Ecosystem Preserve, for example, suggest that the local population is well below 1,000 individuals; Naval Air Station Lemoore is a much smaller area (40.5 hectares, Table 1) and has even fewer Tipton kangaroo rats (estimates range from 0 to 300 individuals 1993, Table 2a). These two sites are relatively secure and well known with regard to the Tipton kangaroo rat. At the remaining sites, surveys suggest that several local Tipton kangaroo rat populations are well below 100 individuals per site, while others may no longer be extant. We have no current abundance data for the remaining 40 sites identified by Williams (1985).

Information about population trends is extremely limited and only a few sites have been surveyed (about 10 out of more than 50; Tables 2a and 2b). Of those, only five have been surveyed more than 5 years in a row, and only three are currently being surveyed in a systematic manner (Naval Air Station Lemoore, Semitropic Ridge Preserve, and Coles Levee Ecosystem Preserve). Although these data are highly variable from year to year, the overall population trends for these three sites appear to be declining. It is likely that populations at the remaining unsurveyed sites are also declining. Details on Tipton kangaroo rat numbers are presented in Appendix IV.

II.C.1.b. Genetics, genetic variation, or trends in genetic variation

At the time of listing in 1988, almost nothing was known about Tipton kangaroo rat genetics, genetic variation, or trends in genetic variation. Recent genetic research had focused on taxonomic and phylogenetic implications for the entire genus of *Dipodomys* (Stock 1974) and

systematic relationships of the *heermanni* group (Patton *et al*. 1976). Inbreeding was mentioned as a potential problem to the subspecies in the original listing (Service 1988:25610) due to the small sizes and highly isolated nature of the remaining sites where the Tipton kangaroo rat had been reported (Williams 1985:32-33), but no conservation actions were recommended.

Our current knowledge of Tipton kangaroo rat genetics has changed little over the years, but two items are relevant here. First, Uptain *et al*. (2000) suggested that genetic diversity had declined at Naval Air Station Lemoore during 1995-1999. It appears, however, that the specimens used for the analysis were mislabeled and that inappropriate methods were used (Gorman and Rosenberg 2000:22). Gorman and Rosenberg (2000:22) concluded that there was no evidence of inbreeding depression and that the results could support the notion of either high fitness within the Tipton kangaroo rat population at Naval Air Station Lemoore or a larger population at the site than had been estimated within the trapping grids. [Note: Smallwood and Morrison (2004:7) also commented on this issue and recommended additional research.] Second, Germano and Saslaw (2007) collected tissue samples from the 144 Tipton kangaroo rats that were translocated from Lamont to Allensworth Ecological Reserve in 2007. The genetic variation of these samples is being analyzed and potentially could provide valuable information about the subspecies.

The Recovery Plan (Service 1998a:251), recommends the completion of a metapopulation viability analysis for the Tipton kangaroo rat (Tipton and Fresno subspecies conducted together). Systematic surveys to collect information on abundance and population trends of Tipton kangaroo rats are already underway at three sites: Naval Air Station Lemoore, Semitropic Ridge Preserve, and Coles Levee Ecosystem Preserve. These studies could be expanded to include work on the genetics of those populations.

When available, the results by Germano and Saslaw (in prep) will provide extensive information about the translocated Lamont population of Tipton kangaroo rats. Results from other nearby studies potentially could provide comparative data for genetics, genetic variation, and trends in genetic variation on a regional basis.

II.C.1.c. Taxonomic classification or changes in nomenclature

No changes in taxonomic classification have occurred since listing (Service 1988) or the publication of the Recovery Plan (Service 1998a). According to ITIS Report (Integrated Taxonomic Information System; 2007), the current status of the subspecies is accepted. This determination

is also supported by species experts such as Best (1991), Hafner (1996), and Peyton (1998).

II.C.1.d. Spatial distribution, trends in spatial distribution

At the time of listing in 1988, we knew that the geographic distribution of the Tipton kangaroo rat historically encompassed about 695,174 hectares (1,716,480 acres; Williams 1985:19; Service 1988:25609). The spatial distribution extended from Lemoore and Hanford (Kings County) in the north; southeast along State Route 99 from Tipton to Pixley (Tulare County), Delano, Bakersfield, and Arvin (Kern County); westward to the southern, eastern, and northern shores of the former Buena Vista Lake (Kern County); and then northward through the Antelope Plain along a line marked by Buttonwillow, Lost Hills (Kern County), Kettleman City (Kings County), and Westhaven (Fresno County; Service 1988:25609). This area corresponds to the Southern San Joaquin Valley. As of July 1985, only about 25,665 hectares (63,367 acres), encompassing 3.7 percent of its historical range were still occupied by the subspecies (Williams 1985:19).

Given the lack of widespread and systematic surveys since Williams (1985, 1986a, 1986b), our current knowledge about the spatial distribution and trends in spatial distribution has not increased much over the years. Williams (1985:10-14) documented the presence of Tipton kangaroo rats at 54 sites. Current information suggests that the subspecies is now limited to about 10 major sites, as well as several smaller locations (CNDDB 2009c; Tables 1, 2a, and 2b):

- Naval Air Station Lemoore (Resource Management Area 5)
- Highway 41 & Jackson Avenue
- Pixley National Wildlife Refuge
- Allensworth Ecological Reserve
- North Kern State Prison
- Kern National Wildlife Refuge
- Northern Semitropic Ecological Reserve
- Semitropic Ridge Preserve
- Buttonwillow Ecological reserve
- Coles Levee Ecosystem Preserve
- Other smaller locations

Valley saltbrush scrub and valley sink scrub communities provide the habitat for the Tipton kangaroo rat (Service 1988:25609). They occupy alluvial fan and floodplain soils ranging from fine sands to clay-sized particles with high salinity (Service 1998a:110). Level- to nearly-level terrains are occupied. Although Tipton kangaroo rats occur in terrace grasslands devoid of woody shrubs, sparse-to-moderate shrub cover is associated with populations of high density.

The current range of the Tipton kangaroo rat is highly disjunct (Best 1991; California Department of Fish and Game 2006; Peyton 1998). Populations in the Tulare Lake area, for example, are 5-10 miles from each other, well beyond any reported dispersal distances. Based on Kelly *et al*. (2000), Gorman and Rosenberg (2000:14-15), for example, reported an average mean maximum distance moved of 15.9 ± 3.1 meters (52.2 ± 10.2 feet) at Naval Air Station Lemoore. Tipton kangaroo rat populations frequently are also separated by physical barriers such as roads and canals that can not be crossed by this subspecies.

Based on CNDDB occurrence records, the Tipton kangaroo rat occupies approximately 100 locations, but the surface area of these sites is not known ([California] Natural Diversity Database 2009c). Within this "occupied habitat," however, Tipton kangaroo rat distributions are not continuous. Instead, Tipton kangaroo rats occur in a mosaic pattern of small and isolated patches that are dynamic over time. As a result, the net occupied habitat is much less than either the gross size of the occupied habitat or the approximate size of the site (e.g., reserve size). To conclude, there is very little habitat remaining where this subspecies could possibly occur making future discoveries unlikely. At the same time, the potential for re-introduction becomes more limited as suitable habitat is lost as it is converted to other uses (Germano and Saslaw 2007).

II.C.1.e. Associated Conservation Actions

The Tipton kangaroo rat is known to occur in association with other sensitive species of plants and animals. According to the Recovery Plan (Service 1998a), at least six federally-listed species of plants and five federally-listed species of animals are characteristic of the San Joaquin Valley. Another 23 associated candidates and species of concern also occur in that area (Service 1998:1-3). Historical information suggests that the ranges of the Tipton kangaroo rat and the Western Burrowing Owl (*Athene cunicularia hypugaea*) – a species proposed for protection at the State level -- overlapped (Center for Biological Diversity 2003). All of these species share several biological requirements that can be used to guide the preparation of regional recovery plans that would address the conservation of many plants and animals species that depend on these habitats.

The status of the Tipton kangaroo rat has also been evaluated by several conservation organizations. According to IUCN (2007), the subspecies is categorized as critically endangered (CR). According to [California] Natural Diversity Database (2009b) and NatureServe (2007a,b,c), the Tipton kangaroo rat is ranked as: G3T1S1. [A Global Ranking of G3 means that the taxon is Vulnerable--At moderate risk of extinction due to a

restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors. An Infraspecific Taxon Conservation Status Ranking of T1 means that the taxon is Critically Imperiled--At high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors. A Subnational Conservation Status Ranking of S1 means that the taxon is Critically Imperiled--Critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.]

II.C.2. Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

II.C.2.a. Present or threatened destruction, modification or curtailment of its habitat or range

At the time of listing, habitat loss associated with agricultural development was identified as the main factor contributing to the decline of the Tipton kangaroo rat. In addition, the Tipton kangaroo rat was threatened by habitat loss and fragmentation from infrastructure development. These factors persist, but their overall impact on the Tipton kangaroo rat is exacerbated by additional factors.

Habitat destruction in the San Joaquin Valley was recognized as a general threat to wildlife in the early 20th century (Culbertson 1934). At the time of listing, habitat loss associated with agricultural development was explicitly identified as the main reason for the historical decline of the Tipton kangaroo rat (Service 1988:25609-25610), as well as for other taxa of small mammals (Williams *et al*. 1993; Williams *et al*. 1995). Agricultural development was specifically linked to the construction of roads, canals, railroads, and structures. This development was widespread and included substantial quantities of land. As indicated earlier, the original range of the Tipton kangaroo rat was about 695,174 hectares (1,716,480 acres; Williams 1985:19). By mid-1985, only about 30,549 hectares (75,430 acres) of undeveloped land remained in the Southern San Joaquin Valley, of which only about 25,665 hectares (63,367 acres) was still occupied by the subspecies (about 3.7 percent of the original range).

The Recovery Plan also cited habitat loss as the main reason for the decline for the Tipton kangaroo rat, and specifically mentioned the availability of water for agricultural uses from the construction of dams and canals under the Central Valley Project and the State Water Project (Service 1998a:110). While the Recovery Plan (Service 1998a) is not a formal review of the status of the species, it has provided relevant information that informed this analysis.

Habitat loss in the Southern San Joaquin Valley continues today (California Department of Fish and Game 2005 [2007]; Department of Fish and Game 2001). The Recovery Plan suggested that the primary mechanisms of habitat loss were industrial and agriculturally-related development, cultivation, the formation of heavy thatch by exotic grasses, and urbanization (Service 1998a:111). An additional factor in habitat loss in the Southern San Joaquin Valley was flooding. According to Kelly *et al*. (2005b:63), about 65 percent of grasslands, 64 percent of San Joaquin Valley shrub lands, 88 percent of water and wetlands, and 95 percent of riparian forest and oak woodland have been converted, mainly to agricultural use. The Tipton kangaroo rat is among the small mammals of the San Joaquin Valley that were negatively impacted (Uptain *et al*. 1999; Doyle *et al*. 2001).

In the Recovery Plan (Service 1998a:111), the Service also identified a growing concern about the buildup of salts in the soil of lands occupied by the Tipton kangaroo rat. Given that soils on the Tulare Basin floor lack natural drainage to the ocean and have a desert climate, the build up of salts in the soil and saline-saturated fields threaten agriculture over large areas. In response to this problem, many farmers/ranchers have created large evaporation ponds on their lands (about 81 hectares [200 acres]; up to 729 hectares [1,800 acres]). As a result, several natural lands occupied or potentially occupied by the Tipton kangaroo rat have been lost to evaporation ponds (Williams 1985). Land retirement (removing land from agricultural production) as an alternative to evaporation ponds has been proposed, but is not widely used in the Southern San Joaquin Valley.

Since 1988, about 50 projects impacting the Tipton kangaroo rat have been evaluated by the Service in the context of consultation under the ESA (Appendix V). A total of 6,001 hectares (14,823.63 acres) of permanent impacts and 2,387 hectares (5,896.37 acres) of temporary impacts have been identified and compensated through the consultation process under the ESA. While a few large projects were responsible for a large proportion of the impacted acreage, about 50 percent of these projects were small in scale and had impacts of 4 hectares (10 acres) or less.

While industrial- and agriculturally-related developments were the primary factors leading to habitat loss until the 1990s, urbanization is now becoming more of a factor leading to the destruction, modification, or curtailment of the habitat or range of the Tipton kangaroo rat. By 2050, for example, the current population of 1,165,000 people in Kern, Kings, and Tulare Counties is expected to increase to a population of approximately 3,485,000 people (State of California Department of Finance 2007). Growth is projected to continue, especially in the City of Bakersfield, along the Bakersfield-Fresno corridor (Highway 99), and

adjacent to Interstate 5 in several areas formerly or currently occupied by the Tipton kangaroo rat.

Urban sprawl and associated human activities have been identified as the leading cause of some species imperilment, including the Tipton kangaroo rat in California (Doyle *et al*. 2001). Sprawl (low density, automobile-dependent development into natural areas outside of cities and towns) results in habitat loss, habitat degradation (including the disruption of natural processes, increased wildfire suppression, increases in noise pollution, and high-impact outdoor recreation), habitat fragmentation (including blocking wildlife movement and edge effects), and loss of species diversity (including an increase in exotic species and changing ecosystem dynamics). All of these factors may adversely affect the Tipton kangaroo rat. Development in the vicinity of Bakersfield, for example, has been categorized as urban sprawl and is relevant here due to the destruction or modification of Tipton kangaroo rat habitat in that area. To a lesser extent, the growth of small towns in rural areas between Interstate 5 and Highway 99 will also result in the conversion of Tipton kangaroo rat habitat and a decrease in the subspecies' range.

The Tulare Basin Wildlife Management Area is a project that may benefit the Tipton kangaroo rat through habitat conservation (although its emphasis on waterfowl conservation may work to the detriment of the Tipton kangaroo rat, which requires dry land for its burrows). Atwell Island, as land continues to be acquired and restored to a saltbush habitat where appropriate, may also benefit Tipton kangaroo rats. However, the majority of projects in the species' range are unlikely to benefit the species. Several projects with relatively large environmental impacts are either slated for areas occupied by the Tipton kangaroo rat or are already underway. These projects can be categorized according to the nature of the activity (see Table 3):

- Transportation:
    - California High Speed Rail
    - 2030 Regional Transportation Plan
    - Goshen/Kingsburg 6-Lane Freeway
- Water exchange and associated development:
    - Consolidated and Conformed Place of Use
    - Friant-Kern Canal Section 1600
    - Acquisition of water from Santa Clara Valley Water District (Environmental Water Account)
    - Transfer, Banking, and Exchange of Friant Central Valley Project Water from Madera Irrigation District to Westlands Water District
- Aerial application of pesticides:
    - Curly Top Virus Control Program
    - Fruit Fly Cooperative Control Program

- Oil and gas production:
    - El Paso Line 1903 Pipeline Conversion Project
    - Competitive Oil and Gas Lease Sales
- Housing and industrial development:
    - Kern County Valley Floor Habitat Conservation Plan
    - Tejon Ranch

Table 3.
Proposed, pending, or recently implemented projects with known or anticipated large permanent or temporary impacts to habitats occupied by the Tipton kangaroo rat (listed alphabetically by county and project name).

Project Name (short/descriptive phrase; [citation])	County	Project Proponent [Nature of Project]	Project Extent
California High Speed Rail Program [California High Speed Rail 2004; California High Speed Rail Authority 2007a,b]	Several/ Statewide	California High Speed Rail Authority [Transportation]	Tulare-Bakersfield Corridor: 105 kilometers (65 miles); 30 hectares (74.407 acres) impacted
Consolidated and conformed place of use [Bureau of Reclamation 1999]	Several/ Region wide	Bureau of Reclamation [Water exchange and associated development]	13 hectares (33 acres) impacted in Arvin-Edison Water Storage District
Curly Top Virus Control Program [California Department of Food and Agriculture 2002]	Several/ Statewide	California Department of Food and Agriculture [Aerial application of pesticides]	Statewide
El Paso Line 1903 Pipeline Conversion Project [Entrix, Inc. 2004,2005; Federal Energy Regulatory Commission 2005]	Several/ Region wide	El Paso Natural Gas Company [Oil and gas production]	Total project = 142 kilometers (88 miles); 2.4 hectares (5.94 acres) impacted
Friant-Kern Canal Section 1600 Maintenance and Restoration Program [Friant Water Authority 2005]	Several/ Region wide	Friant Water Authority [Operation and maintenance]	Total length = 244 kilometers (151.8 miles)
Fruit fly cooperative control program [Animal and Plant Health Inspection Service 1999,2001,2002,2007a,b]	Several/ Statewide	U.S. Department of Agriculture (Animal and Plant Health Inspection Service) [Aerial application of pesticides]	Statewide

Table 3.
Proposed, pending, or recently implemented projects with known or anticipated large permanent or temporary impacts to habitats occupied by the Tipton kangaroo rat (listed alphabetically by county and project name).

Project Name (short/descriptive phrase; [citation])	County	Project Proponent [Nature of Project]	Project Extent
Competitive oil and gas lease sales [Bureau of Land Management 2005,2006b]	Kern	Bureau of Land Management [Oil and gas production]	2005 sale = 27 parcels; 7,649 hectares (18,900 acres) 2006 sale = 29 parcels; 7,652 hectares (19,000 acres) [years vary; usually only a small portion of the parcel is developed]
2030 Regional Transportation Plan [VRPA Technologies, Inc., 2007]	Kern	Kern Council of Governments [Transportation]	County wide; would affect four sites with habitat conservation plans
Tehachapi Connection [Penrod *et al*. 2001; Penrod *et al*. 2003; Stallcup *et al*. 2003	Kern	South Coast Wildlands Project [Habitat conservation]	Tehachapi = 268,411 hectares (663,257 acres)
Tejon Ranch [Penrod *et al*. 2003; Stallcup *et al*. 2003; White *et al*. 2003; White *et al*. 2003]	Kern	Conservation Biology Institute and others [Residential and commercial development; Habitat conservation]	Tejon = 109,312 hectares (270,000 acres)
Acquisition of water from Santa Clara Valley Water District (Environmental Water Account) [Bureau of Reclamation 2006a,b]	Santa Clara & Kern	Bureau of Reclamation [Water exchange and associated development]	50,000 acre feet per year for 2 years from Santa Clara Valley to Semitropic Water District

Table 3.
Proposed, pending, or recently implemented projects with known or anticipated large permanent or temporary impacts to habitats occupied by the Tipton kangaroo rat (listed alphabetically by county and project name).

Project Name (short/descriptive phrase; [citation])	County	Project Proponent [Nature of Project]	Project Extent
Transfer, banking, and exchange of Friant Central Valley Project water from Madera Irrigation District to Westlands Water District [Bureau of Reclamation 2006c]	Madera, Fresno, Kings, & Kern	Bureau of Reclamation ("no effects" determination) [Water exchange and associated development]	2006 water exchange: 25,000 acre feet from Madera Irrigation District to North Kern Water District (10,000 acre feet; Poso Creek/Friant-Kern Canal area) and Semitropic Water District (15,000 acre feet; Buttonwillow Ecological Reserve & CNLM lands)
Tulare Basin Wildlife Management Area [Service 2004b,c, 2007]	Kern & Tulare	Service [Habitat conservation]	Up to 6,478 hectares (16,000 acres); land protection plan; $22,000 per year; three proposed units
Goshen/Kingsburg 6-Lane Freeway Project [State of California Department of Transportation 2006]	Tulare & Fresno	State of California Department of Transportation [Transportation]	Widen 21.9 kilometers (13.6 miles) of road

Given that the final configuration for most of these projects has not been determined, the exact nature and extent of their potential effects to Tipton kangaroo rat populations can not yet be evaluated. These proposed projects, however, are potentially large/widespread as well as potentially destructive to Tipton kangaroo rat habitat, for example:

- Large/widespread:
    - Curly Top Virus Control Program (statewide aerial application of pesticides)
    - Friant-Kern Canal Section 1600 Maintenance and Restoration Program (244 kilometers [151.8 miles] of operation and maintenance; right of ways)
    - Fruit Fly Cooperative Control Program (statewide aerial application of pesticides)
- Destructive:
    - California High Speed Rail (105 kilometers along Tulare-Bakersfield corridor; 105 kilometers [65 miles] and 30 hectares [74.407 acres] impacted)
    - El Paso Line 1903 Pipeline Conversion Project (142 kilometers [88 miles] of pipeline; 2.4 hectares [5.94 acres] impacted)
    - Competitive Oil and Gas Lease Sales (about 7,600 hectares [19,000 acres] impacted annually, for example, in 2005 and 2006 [years vary; usually only a small portion of the parcel is developed])
    - 2030 Regional Transportation Plan (countywide)

Given the nature and extent of transportation projects, the environmental review process often is lengthy and complicated. In order to help streamline this process, Thorne *et al*. (2005) developed a regional assessment procedure based on a high-resolution vegetation map and potential occurrence data for 12 endangered or threatened species, including the Tipton kangaroo rat. For the projects along 315 kilometers of State Highway 99 in the San Joaquin Valley, the Tipton kangaroo rat could occur at 18 of the 44 projects that were studied (Thorne *et al*. 2005179 [Table 3]).

In an effort to reduce or eliminate habitat impacts , the Service has issued incidental take permits associated with several habitat conservation plans that include the Tipton kangaroo rat. Nine permits have been issued and three are pending that cover lands occupied by the Tipton kangaroo rat (Table 4). These permits primarily cover water storage, gas and oil production, and public and private development activities in Kern County, where many of the extant Tipton kangaroo rat populations occur. As these habitat conservation plans are implemented, they could potentially protect thousands of hectares/acres of lands occupied by this subspecies. In

addition to the habitat conservation plans, the Service has also established a Conservation Bank Program to facilitate mitigation and compensation obligations under the ESA, as well as to promote the conservation status of federally-listed species. Issues have been raised about the effectiveness of conservation banks to improve the conservation status of the Tipton kangaroo rat (Fox and Nino-Murcia 2005; Kareiva *et al*. 1999; Watchman *et al*. 2001). Currently, however, only one conservation bank (the Kern Water Bank) is approved for the Tipton kangaroo rat.

The Tulare Basin Wildlife Management Area, could potentially provide conservation benefits to the Tipton kangaroo rat depending on the its management and attention to species that require dry land (Table 4; Figures 2a and 2b): This project – if approved and implemented – would also provide important conservation benefits to several other endangered or threatened species of plants and animals. The Tulare Basin Wildlife Management Area, as proposed, has not yet been approved, but would encompass up to 6,478 hectares in the vicinity of Pixley National Wildlife Refuge, including lands currently or formerly occupied by the Tipton kangaroo rat (Service 2004b,c). Atwell Island may also provide conservation benefits, especially if areas that are restored to saltbush habitat are colonized by Tipton kangaroo rats from the currently occupied, more pristine areas of Atwell Island.

In conclusion, present or threatened destruction, as well as modification or curtailment of habitat or range, continue to impact this subspecies (California Department of Fish and Game [California Interagency Wildlife Task Force 2005]). While the Service is working with project proponents at the state, regional, and local levels to avoid or minimize loss of the Tipton kangaroo rat, declines continue where habitat is lost or converted. Habitat conservation plans, conservation banks, and private preserves, however, are providing opportunities to enhance the conservation status of the subspecies.

Table 4.
Issued and pending Incidental Take permits for HCP sites occupied by the Tipton kangaroo rat.

Title	Permits [Dates Noticed in Federal Register & Permit Issued]	Location (county)	Size of Project hectares (acres)	Applicant Type [Land Use]	Amount of Authorized Incidental Take	Other [citation]
ARCO Coles Levee (ARCO Western Energy; now Aera)	809228 [12/11/1995 & 03/01/1996]	Kern	48,713 (120,320)	Corporation [Gas and oil production]	180 acres with a 30 foot buffer	Expired; permittee surrendered the permit prior to the expiration date [Aera Energy LLC 2006; Harvard University Kennedy School of Government 2006; Landy *et al*. 1999; Lane *et al*. 2003; Service 2007a]
California Department of Corrections Delano Prison	744882 [12/05/1989 & 01/18/1990]	Kern (near City of Delano)	257 (635)	State agency [Other (prison)]	0 acres, 1 individual kill	[Service 2007b]
California Department of Corrections	TE 058060-0 [Not	26 sites throughout California	1,189 (2,937)	State agency [Other (prison)]	0 acres, 2 individual kills per 5 year period with 1 individual kill per	[Service 1999,2007c]

Table 4.
Issued and pending Incidental Take permits for HCP sites occupied by the Tipton kangaroo rat.

Title	Permits [Dates Noticed in Federal Register & Permit Issued]	Location (county)	Size of Project hectares (acres)	Applicant Type [Land Use]	Amount of Authorized Incidental Take	Other [citation]
Statewide Electrified Fence	available & 06/12/2002]				prison, per 5 year period	
California Department of Water Resources, California Aqueduct, San Joaquin Field Division	pending	Kern and Kings	121 linear miles	State Agency [utility/infrastructure]	pending	Service (in prep)
Champagne Shores	768386 [Not available & 06/01/1994]	Kern	33 (82)	Corporation [Residential and recreation]	25 acres of permanent habitat loss	[Germano 1991a,b; Rhodhamel and Vanherweg 1990; Service 2007d]
Chevron/Lokern Area	Pending [Pending & Pending]	Kern	108,089 (266,981)	Corporation [Gas and oil production; other]	pending	Only a small portion of this area is within the current range of

Table 4.
Issued and pending Incidental Take permits for HCP sites occupied by the Tipton kangaroo rat.

Title	Permits [Dates Noticed in Federal Register & Permit Issued]	Location (county)	Size of Project hectares (acres)	Applicant Type [Land Use]	Amount of Authorized Incidental Take	Other [citation]
						the Tipton kangaroo rat; environmental impact statement in preparation; several participants [Service in prep]
Kern County Waste Facilities	830963 [07/10/1997 & 10/24/1997]	Kern (near City of Bakersfield)	607 1,500	Local jurisdiction [Other (landfill)]	55 out of 114 acres of saltbush habitat	[Office of Administrative Law 2006; Service 2005c, 2007e]
Kern County Valley Floor	Pending [07/12/2007 & Pending]	Kern	805,830 (1,990,400)	Local jurisdiction [Public and private development]	pending	Environmental impact statement in preparation; potentially up to about 4,000 hectares (10,000 acres) of Tipton kangaroo rat

Table 4.
Issued and pending Incidental Take permits for HCP sites occupied by the Tipton kangaroo rat.

Title	Permits [Dates Noticed in Federal Register & Permit Issued]	Location (county)	Size of Project hectares (acres)	Applicant Type [Land Use]	Amount of Authorized Incidental Take	Other [citation]
						habitat could be conserved; several participants [Garcia and Associates 2006; Service 2002, 2007k]
Kern Water Bank	835054 828086 [05/16/1997 & 10/02/1997]	Portions of Kern, Tulare, and Kings	8,057 (19,900)	Local jurisdictions [Water activities]	All take authorization was grouped with the San Joaquin kit fox and the blunt-nosed leopard lizard as follows: 481 acres permanent habitat loss; 291 acres temporary habitat loss; 8,600 acres of intermittent, constant disturbance at any given time; 19,900 acres harassment; 4 individual	[Kern Water Bank Authority 2007; Service 1998b, 2007f]

Table 4. Issued and pending Incidental Take permits for HCP sites occupied by the Tipton kangaroo rat.						
Title	**Permits** **[Dates Noticed in Federal Register & Permit Issued]**	**Location (county)**	**Size of Project hectares (acres)**	**Applicant Type** **[Land Use]**	**Amount of Authorized Incidental Take**	**Other [citation]**
					kills per year (adjustable with a yearly review). Also, 3000 acres for loss of habitat and harassment within the 1.5 million acres of the Master Permit Credit Area over the life of the permit to be approved on an applicant by applicant basis. If the Kern Wateer Bank is expanded, take within the Master Permit Credit Area will increase as follows: for every 110 acres of increase in the size of the bank, 36 acres of permanent loss and 100 acres of temporary loss for	

Table 4.
Issued and pending Incidental Take permits for HCP sites occupied by the Tipton kangaroo rat.

Title	Permits [Dates Noticed in Federal Register & Permit Issued]	Location (county)	Size of Project hectares (acres)	Applicant Type [Land Use]	Amount of Authorized Incidental Take	Other [citation]
					harassment and disturbance will be authorized.	
Lamont Public Utilities District	TE 106826-0 [01/25/2005 & 07/06/2005]	Kern	65 (160)	Local jurisdiction [Utility/ Infrastructure]	65 acres (100%)	Sub-species extirpated from site; conservation credits were purchased from a bank; [Office of Administrative Law 2005; Service 2005b, 2007g]
Metropolitan Bakersfield	786634 [Not available & 08/24/1994]	Kern (near City of Bakersfield)	106,073 (262,000)	Local jurisdictions [Commercial, residential, utility]	6,000 acres	[Service 2007h]
Nuevo-Torch (now PXP)	TE 019489-0 [Not	Kern (near City of	8,826 (21,800)	Corporation [Gas and oil	All take authorization was grouped with the San Joaquin kit fox, the	[Service 2007i]

Table 4.
Issued and pending Incidental Take permits for HCP sites occupied by the Tipton kangaroo rat.

Title	Permits [Dates Noticed in Federal Register & Permit Issued]	Location (county)	Size of Project hectares (acres)	Applicant Type [Land Use]	Amount of Authorized Incidental Take	Other [citation]
	available & 11/18/1999]	Bakersfield)		production]	giant kangaroo rat, the blunt-nosed leopard lizard, and mountain plovers: 1700 acres	
Pacific Gas & Electric Company: San Joaquin Valley Operations and Maintenance	TE 168331-0 [Permit signed December 14, 2007]	Kern		Corporation [Utility]	4 acres per year over 30 years for a total of 120 acres of disturbance and temporary habitat loss; 0.01 acres per year over 30 years for a total of 3 acres of destruction and permanent habitat loss; 24 acres per year over 30 years for a total of 720 acres for off road travel and other disturbance	[Jones & Stokes 2006a,b; Service 2004a]

II.C.2.b. Overutilization for commercial, recreational, scientific, or educational purposes

Overutilization was not identified as a threat to survival when the species was listed (Service 1988:25610). This factor, likewise, does not appear to be a threat at this time.

II.C.2.c. Disease or predation

At the time of listing, neither disease nor predation was identified as a major factor (Service 1988:25610). Likewise, the Recovery Plan (Service 1998a) did not include any new information on such threats.

It now appears, however, that disease may be a factor in Tipton kangaroo rat population declines during wet winters. After biologists noted a decline in the abundance of Tipton kangaroo rats in the Southern San Joaquin Valley during the winter of 1994-1995, Single *et al*. (1996) analyzed several variables and concluded that disease, as well as thermal stress, reduced caloric value of seeds and mycotoxic factors could be responsible for a range wide reduction in kangaroo rat numbers. Additional data to test this hypothesis are not yet available.

II.C.2.d. Inadequacy of existing regulatory mechanisms

At the time of listing (Service 1988:25610), the Service indicated that existing regulatory mechanisms did not afford the Tipton kangaroo rat adequate protection. The regulatory mechanisms of agencies that permitted or funded agricultural development, as well as those that regulated the application of pesticides, were specifically cited as being inadequate. More recently, however, the adequacy of regulatory mechanisms has improved for the Tipton kangaroo rat (Service 1998a:111).

The following regulatory mechanisms pertain to this subspecies, but were not discussed at the time the Tipton kangaroo rat was federally listed (Service 1988):

- California Endangered Species Act (CESA).--The CESA (California Fish and Game Code, Section 2050 et seq.) prohibits the unauthorized take of state-listed threatened or endangered species (Department of Fish and Game 2007a). The Tipton kangaroo rat was listed in 1989 by the State of California as endangered (California Natural Diversity Database 2009a,b). Section 2080 of the Fish and Game Code prohibits "take" of any species that the commission determines to be an endangered species or a threatened species. Take is defined in Section 86 of the Fish and Game Code as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." CESA allows for take incidental to otherwise lawful development projects. The CESA emphasizes early consultation to avoid potential impacts to rare, endangered, and threatened species and to

develop appropriate mitigation planning to offset project caused losses of listed species populations and their essential habitats. Violations of this section are subject to "Uniform bail and penalty schedules" (State of California 2007). When properly implemented, the CESA should enhance the conservation status of the Tipton kangaroo rat, but by itself may not be sufficient to ensure the survival of the species.

The California Fish and Game Code Section 2087 includes exemptions from take prohibitions for accidental take that results from otherwise lawful routine and on-going agricultural activities. This Code Section, was amended in 2002 (SB 550) to remove a sunset clause and change the standard by which accidental take would be exempt from take prohibitions under the CESA by removing the terms "inadvertent" and "ordinary negligence." The effect of this change would, according to Garrison (2002), " … lower the threshold for accidental take from agricultural activities and make legal the intentional destruction of habitat for threatened, endangered, or candidate species." Under the amendment the conversion from grassland or dry farm agriculture to irrigated agriculture was not considered to be exempt (J. Vance, California Department of Fish and Game, personal communication, 2007). The amendment to this section will expire in 2011 (S. Juarez, California Department of Fish and Game, personal communication, 2007). It is unknown what effect this amendment has had on the rate of Tipton kangaroo rat habitat destruction or modification.

- California Environmental Quality Act of 1970 (CEQA).--The CEQA requires review of any project that is undertaken, funded, or permitted by the State or a local governmental agency (Department of Fish and Game 2007b). If significant effects are identified, the lead agency has the option of (a) requiring mitigation to offset project effects, (b) requiring changes in the project to reduce the impacts to a level of insignificance, or to (c) decide that overriding considerations make mitigation infeasible [CEQA Sec. 21081(b)]. In the latter case, a public agency must find that specific overriding economic, legal, social, technological, or other benefits of the project outweigh the significant effects on the environment. Destruction of listed species and their habitat would not be considered insignificant and a take permit would be required from CDFG; such a project would still be subject to CESA. A finding of overriding considerations, however, does not release the project proponent from the provisions of CESA. When properly implemented, the CEQA should enhance the conservation status of the Tipton kangaroo rat, but by itself may not be sufficient to ensure the survival of the subspecies.

  As a result of ESA implementation, approximately 3,300 hectares (8,200 acres) of habitat for the Tipton kangaroo rat have been protected since 1999. Data for mitigation actions and compensation funds under the

CESA are not available.

While current regulatory mechanisms, aside from the ESA, are tasked with various levels of environmental protection that are beneficial to threatened and endangered species, the ESA is the primary law providing protection for the Tipton kangaroo rat. However, despite what may be considered adequate protection for the species, ongoing habitat impacts continue to affect species survival.

II.C.2.e. Other natural or human-made factors affecting its continued existence

Inbreeding and the application of pesticides were specifically mentioned as other natural or human-made factors negatively affecting the Tipton kangaroo rat when it was listed (Service 1988:25610). Elsewhere in the listing notice, the Service indirectly suggested that flooding and excessive application of rodenticides could also negatively affect the subspecies. In the Recovery Plan (Service 1998a:110-111), the Service reaffirmed those threats without providing additional information. All of these factors are still viable threats today.

Additionally, while not directly exploited for sport, Germano (1995) reported finding 17 dead Tipton kangaroo rats -- during a single outing -- trapped in waterfowl blinds used legally for recreational purposes at the Semitropic Ridge Natural Area, Kern County. While waterfowl blinds are not a major threat to the Tipton kangaroo rat, they are still widely used today. The loss of these animals was unnecessary and can be prevented easily (Germano 1995:35).

The Service (1998a:111-112) also cited competition with Heermann's kangaroo rat (*D. heermanni*) as a factor affecting the continued existence of the subspecies. The competitively dominant Heermann's kangaroo rat is larger than the Tipton kangaroo rat, more general in habitat requirements, and more successful in maintaining populations in a fragmented landscape (Service 1998a:112). While Heermann's and Tipton kangaroo rats rarely occupy the same area, competition between these taxa may become an important factor if the Tipton kangaroo rat is translocated to an area unknowingly occupied by Heermann's kangaroo rat (Germano and Saslaw 2007). The competitive dominance of Heermann's kangaroo rat may prevent establishment or survival of Tipton kangaroo rats in areas of range overlap.

Inadequate habitat management leading to the build up of thatch was also cited by the Service in the Recovery Plan (Service 1998a). Thatch buildup, a common problem in poorly managed areas, apparently makes it more difficult for the Tipton kangaroo rat to escape predators by jumping out of harms way. At Kern and Pixley National Wildlife Refuges, for example, the removal of the invasive plant species, saltcedar (*Tamarix ramosissima*), is the focus of an integrated management program, using the herbicide triclopyr, to benefit native species

including the Tipton kangaroo rat (California Interagency Noxious Weed Coordinating Committee (2001:12). Livestock grazing has been identified as a potential habitat management tool to reduce thatch (Rathbun *et al*. 1997; Saslaw 2002; Germano *et al*. 2000, 2001, 2002, 2006). Research is currently underway in the Lokern area to measure the effects of livestock grazing on species of plants and animals at risk of extinction in the San Joaquin Valley (Germano *et al*. 2006; Germano *et al*. 2007). The Lokern area, however, is occupied by the giant kangaroo rat (*D. ingens*) rather than the Tipton kangaroo rat, but those results may still be relevant to the Tipton kangaroo rat.[4] If grazing is not possible, prescribed burning has been shown to be an effective management tool to benefit small mammals (Poopatanapong and Kelt 1999).

New threats to the Tipton kangaroo rat have not been specifically identified since it was listed (Service 1988) or the Recovery Plan (Service 1998a) was published. Two threats not yet fully articulated, however, potentially could be relevant to the Tipton kangaroo rat: illegal application of rodenticides and climate change.

Rodenticides.—The excessive application of rodenticides was identified as a potential threat to the Tipton kangaroo rat, but specific evidence documenting the magnitude of this threat has not yet been presented (Service 1988:25610; Service 1998a:111). Rodenticides are widely used throughout the range of the Tipton kangaroo rat (Bell Laboratories 2005a,b,c; Critter Control 2005-2007; Howard 1994; Whisson 1999). Recent analyses suggest that the illegal application of rodenticides in neighboring agricultural fields is a potential hazard to a similar species, the giant kangaroo rat. The Service has identified the following vertebrate control agents as detrimental to the existence of giant kangaroo rats: aluminum phosphide, magnesium phosphide, chlorophacinone, potassium nitrate, sodium nitrate, and zinc phosphide (Service 1993). There are large areas in the Sunflower Valley (western corners of Kings and Kern Counties), Kettleman and Tent Hills in Kings County, and the eastern foothills of the Panoche Hills, Fresno County, for example, that show characteristic features of giant kangaroo rat habitat, but these areas apparently are unoccupied by any species of kangaroo rat (Service 1998a:92). Williams (1992) believes that populations in these areas may have been eliminated by use of rodenticides. Given the similarities between Tipton and giant kangaroo rats, as well as the fact that large expanses of the original range are no longer occupied (Figure 1), illegal application of rodenticides may be an increasingly important threat to the conservation status of the Tipton kangaroo rat.

[4] Rathbun and Barnum (1997) indicated that the Tipton kangaroo rat occurred in the western portion of the San Joaquin Valley, generally in the vicinity of the Lokern Natural Area. Rathbun *et al*. (1997:10) reported the capture of two kangaroo rats at Lokern, but did not determine the sub-species. Subsequent annual reports for the Lokern Grazing Study have not reported any captures of the Tipton kangaroo rat (Germano *et al*. 2007). It is not clear whether the Tipton kangaroo rat formerly or currently occurs in the Lokern area. For purposes of completeness, the Lokern Natural Area is included here, including the several associated preserves. In the specific case of the Chevron/Lokern Habitat Conservation Plan, the Service has determined that most of that area is habitat for the giant kangaroo rat, while only that portion east of the California Aqueduct is Tipton kangaroo habitat.

Climate Change.--Another potential threat to the Tipton kangaroo rat is climatic change. This threat was previously identified for the giant kangaroo rat (Terry, in litt., 2007). Population trends of Tipton and giant kangaroo rats are highly correlated with inter-annual variations in precipitation. Populations of giant kangaroo rat have been monitored more closely than Tipton kangaroo rats, so we can look to these data as a surrogate. Years of successive drought lead to dramatic declines in the numbers of giant kangaroo rats as observed on the Elkhorn Plain in 1991 (Williams and Germano 1994) and in the Panoche-Ciervo area in the late 1980s (Williams 1992). In addition, it has been suggested that years of above normal precipitation can also result in significant declines in giant kangaroo rat populations, particularly in areas that are not grazed (Germano *et al*. 2001; Germano *et al*. 2005; Kelly *et al*. 2004). Little information is available for Tipton kangaroo rats; Single *et al*. (1996) reported substantial population declines for the Tipton kangaroo rat following heaving rains during 1994-1995.

Climate models predict for California an overall warming of 1.7 degrees Celsius – 5.8 degrees Celsius (3.0 degrees Farhenheit – 10.4 degrees F) by 2100 (Cayan *et al*. 2006) but vary in their predictions for precipitation. VanRheenen *et al*. (2004), however, predicts a decrease in precipitation in the southern San Joaquin. Climate change will likely result in changes in the structure and composition of vegetative communities of Tipton kangaroo rat habitat and potentially could increase exotic species and toxic molds. There are insufficient data available at this time, however, to predict with a high level of confidence the effect of climate change on the Tipton kangaroo rat.

Although the threats to the species persist, there are also new conservation opportunities to help improve the status of the Tipton kangaroo rat. One action with potential benefits is to capture and move imperiled individuals either to a new area where development will not occur or to release individuals back to a site after activities have ceased (Germano 2001:71). Individuals may be translocated (moved to a different site), or reintroduced (moved back to a site that previously was occupied). In an assessment of four reintroductions of Tipton kangaroo rats during 1994-1999, Germano (2001:72) concluded that one had been successful and that the outcome of three had been uncertain. Regarding five translocations during 1990-2000, Germano (2001:72) concluded that one possibly had been successful, one was uncertain, two were not successful, and one was aborted. If reintroductions and translocations are to be successful, Germano (2001:75) suggested several criteria for site selection: use public lands (to eliminate private-property conflicts), pick sites that have friable soils, few predators, and few or no Tipton kangaroo rats. In addition, if possible pick sites that have low numbers of competitors. Regarding the release itself, it may be beneficial to use an artificial burrow stocked with food, surround the burrow with a fence buried into the soil to prevent competitors and predators easy access to released individuals, and cover the fenced area with wire to exclude avian predators (Germano 2001:76). In 2006, Germano and Saslaw (2007) captured and translocated 144 Tipton kangaroo rats from a site near Lamont to Allensworth Ecological Reserve, north

of Bakersfield. Since the study is ongoing, final results are not yet available. Preliminary results, however, are available, including: survival through August 2007 was 8.3 percent and there is evidence of reproduction. Additional trapping is proposed for late 2007 to compile new information about the translocation. In conclusion, the translocation of Tipton kangaroo rats, despite being highly labor intensive, potentially may be a very successful means of mitigating the impact that development has on this subspecies in the Southern San Joaquin Valley (Moore 2007).

In conclusion, many natural and human-made factors continue to affect the Tipton kangaroo rat. Inbreeding, application of pesticides, buildup of salts in the soil, waterfowl hunting, and competition with Heermann's kangaroo rat – previously identified threats -- all potentially could have negative effects on the Tipton kangaroo rat, but systematic studies to characterize and quantify these impacts still have not been undertaken. Inadequate habitat management was also identified, but studies at Lokern are underway and ultimately may provide information about appropriate habitat management techniques.

II.D. Synthesis

When *Dipodomys nitratoides nitratoides* was originally listed as endangered in 1988 (Service 1988), the primary threat to its survival and recovery was habitat loss. Since then, industrial- and agriculturally-related developments, thatch accumulation, urbanization, and flooding have been identified as the specific mechanisms that drive habitat loss (Service 2007n,o). Climate change and the illegal application of rodenticides have been identified as potential new threats to the conservation status of the subspecies. Restricted to arid-land communities in the Southern San Joaquin Valley, the Tipton kangaroo rat currently occurs only in a few of the remaining small and isolated parcels of grassland and saltbrush scrub communities. About 96 percent of the original range is no longer suitable for the Tipton kangaroo rat. Despite the development of habitat conservation plans and the creation of protected areas, in part for the benefit of this subspecies, Tipton kangaroo rat populations continue to decline. While the Tipton kangaroo rat has recently been reported to occur in at least 10 sites, not a single one of those sites could be categorized as having large tracts of occupied habitat, an effective management plan for the subspecies, or a stable or increasing population of kangaroo rats. While some population monitoring and habitat management activities are underway at Naval Air Station Lemoore, Semitropic Ridge Preserve, and Coles Levee Ecosystem Preserve, as well as a translocation project (Allensworth Ecological Reserve) and a livestock grazing study (Lokern Grazing Study [the Tipton kangaroo rat is not a study species]), the biology of the subspecies and keys to effective habitat management essentially remain poorly known. In summary, based on the highly restricted range of the Tipton kangaroo rat, the continuation of habitat loss/conversion, the continuation of threats and the identification of new threats, the current protection of only a small portion of Tipton kangaroo rat habitat, and the distribution of small populations in highly isolated fragments, we conclude that the Tipton kangaroo rat continues to meet the definition of endangered.

III. RESULTS

III.A. Recommended Classification: Given your responses to previous sections, particularly Section II.D. Synthesis, make a recommendation with regard to the listing classification of the species (briefly summarize the reasons for this recommendation). Also refer to 50 CFR 424.11 Factors for listing, delisting, or reclassifying species:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist (*Indicate reasons for delisting per 50 CFR 424.11):*
____ Extinction
____ Recovery
____ Original data for classification in error
__X__ No change is needed

III.B. New Recovery Priority Number: __3c__

No change in the Recovery Priority Number is necessary. The degree of threat remains high, as does the recovery potential, a taxonomic rank of subspecies is retained, and the subspecies is, or may be, in conflict with construction or other development projects or other forms of economic activity" [Service 1983a:43104]).

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

Within the context of the broad habitat conservation and ecological research recommendations mentioned generally throughout this review, we propose several specific tasks or activities for future action. While some of these tasks or activities have already been specified in the Recovery Plan [Service 1998a], others are new. In addition, several newly-developed research techniques and insights suggest new ways to accomplish or undertake these tasks or activities:

- **Determine population Status through Surveys**.—Determine the current distribution and abundance of the Tipton kangaroo rat. All 54 sites identified by Williams (1985:10-14) should be resurveyed. All of the locations identified by the [California] Natural Diversity Database (2009c) should also be surveyed. Survey results should be compiled into an analysis that identifies and characterizes currently occupied sites, as well as the Tipton kangaroo rat populations encountered. 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 (see below), and to develop an adaptive management program that will achieve the recovery of the Tipton kangaroo rat.

- **Population Monitoring at Selected Sites**.—Based on the results of the status survey (see above), as well as a review/analysis by species experts of all available survey information. Develop a monitoring plan for the subspecies to monitor abundance and population trends at a few selected sites. Sites should be selected taking into account the current size of the Tipton kangaroo rat population; the size and condition of the habitat at the site; the ability of the site to withstand conservation threats from adjacent lands; and the potential of the site to support translocation projects, habitat restoration efforts, and habitat management studies. Monitoring should either continue for at least 10-20 years or until population dynamics are well understood.

- **Habitat Acquisition/Management/Restoration**.—Based on the status survey (see above), as well as the group consensus of the several species experts about the subspecies' habitat needs, key priority tracts should be protected though acquisition or easement High priority should be given to large unprotected sites that are currently occupied by the subspecies, as well as to large, formerly-occupied sites that are unprotected but have a high restoration potential. Protected lands must also be adequately managed or restored. In the absence of documented management or restoration guidelines, appropriate pilot studies must be undertaken to determine effective actions. The Lokern Grazing Study (see Germano *et al*. 2007), underway since 1999, already has generated useful information for federally-listed species of plants and animals in that area and perhaps could serve as a model in areas occupied by the Tipton kangaroo rat.

  Given the existing configuration of natural lands in the 1990s, the Recovery Plan (Service 1998a:112) suggested a recovery strategy based on the protection of additional natural lands and restoration of contiguous agricultural lands with drainage problems that would focus on three sites: Kern Fan area, Pixley National Wildlife Refuge-Allensworth Natural Area, and the Kern National Wildlife Refuge-Semitropic Ridge Area (Figures 2a, 2b). Given that circumstances may have changed over the past 10 years, that suggestion may no longer be valid; the Service, in partnership with species experts, may wish to re-evaluate this suggestion.

- **Genetic Research**.—Given the confusion over the taxonomic identity of the kangaroo rat at Naval Air Station Lemoore (Tipton or Fresno), as well as the similarity of the three *D. nitratoides* subspecies with each other, and the similarity of the approximately 22 species of the genus *Dipodomys* with each other, the development of a genetic profile to differentiate the several taxa is indicated. Germano and Saslaw (*in prep*) already have initiated such a study for Tipton kangaroo rats recently translocated to Allensworth Ecological Reserve. Given the ongoing trapping efforts at Semitropic Ridge Preserve and Coles Levee Ecosystem Preserve, perhaps those studies should be expanded to include genetic research as well.

To accomplish these tasks, the development of a conservation action plan comparable to plans compiled by IUCN/SSC specialist groups (see: http://www.iucn.org/themes/ssc/) would be helpful. Building on the listing information (Service 1988), as well as the Recovery Plan (Service 1998a), the Service – in partnership with the several species experts -- should continue to facilitate the compilation of the information indicated above by the San Joaquin Valley Recovery Team in order to help guide conservation and research activities by scientists and natural resource managers.

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APPENDIX I

Species overview (expanded)

Description: The Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*; Family Heteromyidae) is one of three subspecies of the San Joaquin kangaroo rat (*Dipodomys nitratoides* ssp.), morphologically distinguished by being larger than the Fresno kangaroo rat (*Dipodomys nitratoides exilis*) and smaller than the short-nosed kangaroo rat (*Dipodomys nitratoides brevinasus*; Best 1991; Boolootian 1954; DJ Hafner 1996; MS Hafner 1979; Tappe 1941). Sexually dimorphic, the male is larger than the female (Eisenberg 1963). On average, adults weigh about 35-38 grams (1.2-1.3 ounces), have a head-body length of about 100-110 millimeter (3.9-4.3 inches), and a tail length of about 125-130 millimeter (4.9-5.1 inches; Williams 1985:3). Kangaroo rat adaptations for two-footed hopping include elongated hind limbs, a long, tufted tail for balance, a shortened neck, and a large, flattened head (Grinnell 1920,1921; Merriam 1894). Tipton kangaroo rats eat mostly seeds, with small amounts of green, herbaceous vegetation and insects supplementing their diet when available. Kangaroo rats have developed the ability to survive in the wild indefinitely without drinking water (Stoudemire 2005). Burrow systems, normally less than about 250 millimeters (10 inches) deep, are usually in open areas, but may also occur in areas of thick scrub (Germano and Rhodehamel 1995). Flat terrain not subject to flooding is essential for permanent occupancy by Tipton kangaroo rats. Little is known about Tipton kangaroo rat reproduction in the wild, but females in captivity have one or two litters per year (1-2 offspring per litter; Eisenberg 1963).

Distribution: The historical geographic range of Tipton kangaroo rats was over 687,650 hectares (about 1.7 million acres; Williams 1985,1986a,b: Figure 1). Distribution was limited to arid-land communities occupying the valley floor of the Tulare Basin in level or nearly level terrain. By 1985, the inhabited area had been reduced, primarily by cultivation and urbanization, to about 24,270 hectares (about 60,000 acres), only about 4 percent of the historical acreage. Current occurrences are limited to scattered, isolated areas in the Southern San Joaquin Valley (Kings, Tulare, and Kern Counties). Densities typically are low (Naval Air Station Lemoore: 1-5.5 individuals per hectare during periods with low population levels and 3.5-25 individuals per hectare with high population levels; Pixley: 3.0-3.89 individuals per hectare), but populations are known to fluctuate greatly in response to habitat type and climatic conditions (Morrison *et al*. 1996; Williams and Germano 1992). Individual home ranges for the Tipton kangaroo rat have not been reported, but ranges for a similar species, Merriam's kangaroo rat (*Dipodomys merriami*), are about 1.57-1.65 hectares each (Penrod *et al*. 2003:27).

Special Considerations: The construction of dams and canals, by providing water to agricultural lands in normally arid areas, was principally responsible for the decline and endangerment of the Tipton kangaroo rat. Petroleum extraction, as well as urban and industrial development, has also contributed to the destruction of Tipton kangaroo rat habitat. Current threats of habitat destruction or modifications are increasing throughout the Central Valley and come primarily from industrial and agriculturally-related developments, cultivation and urbanization, and secondarily from flooding (Bureau of Land Management 2007; DesertUSA

1996-2007; World Wildlife Fund [McGinley] 2007). Pesticide application and road maintenance (including the grading of berms and off-road driving) can severely impact the species (Department of Pesticide Regulation 2002; Southern California Edison 2006). Approximately 75 Tipton kangaroo rat occurrences have been reported to [California] Natural Diversity Database (2009c). Taking into account estimated kangaroo rat densities and the quantity of actually or likely occupied habitat, the California Department of Fish and Game (2000) estimates a total population of approximately 190,020 Tipton kangaroo rats. Despite actions to conserve this species, its status continues to deteriorate (Best 1991; Goldingay *et al*. 1997; Peyton 1998; Uptain *et al*. 1999).

APPENDIX II

Protection of Occupied Habitat (expanded)

Service.— The Service administers Pixley and Kern National Wildlife Refuges which presently or formerly were occupied by the Tipton kangaroo rat (Figures 2a, 2b). Pixley National Wildlife Refuge (this site comprises about 4,168 hectares [10,300 acres]) has several small patches of arid, alkaline plains sparsely covered with annual grasses and saltbush (*Atriplex* spp.) – high quality Tipton kangaroo habitat -- and formerly was occupied by this subspecies (Table 1; discussed in Section II.C.1, Biology and Habitat). Kern National Wildlife Refuge (about 4,552 hectares [11,249 acres]) also has several smaller patches of Tipton kangaroo rat habitat and was occupied by this subspecies until about 1998 (Williams 2005). The subspecies has not been seen recently at the refuge despite recent trapping efforts (Newman *et al*. 2006). These two sites are secured and protected by Service personnel in the context of normal refuge activities, but the Tipton kangaroo rat habitat patches are vulnerable to natural and human threats (discussed in Section II.C.2; Five Factor Analysis).

Department of Defense.—The Department of Defense (U.S. Navy) administers Naval Air Station Lemoore which presently is occupied by an undetermined subspecies of kangaroo rat (Figures 2a, 2b). Some researchers consider the subspecies to be the Tipton kangaroo rat, while others suggest that the species is the Fresno kangaroo rat (Morrison *et al*. 1996; Gorman and Rosenberg 2000; Kelly *et al*. 2000; Smallwood and Morrison 2004). The naval air station occupies a surface area of about 7,602 hectares (18,784 acres), of which about 40.5 hectares (100 acres; Resource Management Area 5; known locally as Tumbleweed Park) are occupied by the kangaroo rat. Tumbleweed Park is located in a peripheral area to the east of the main runways and is used for agricultural purposes (including grazing and burning; U.S. Navy Engineering Field Activity, West 2001; Kelly *et al*. 2000:6). Given the military nature of this site, these lands are highly secure from outside intervention. Small and isolated, this Tipton kangaroo rat habitat patch, however, is still highly vulnerable to natural and human threats (e.g., flooding, road maintenance, and vehicle traffic; discussed below in Section II.C.2). Water resources in this area are managed by the Westlands Water District (2002).

Department of Energy.—The U.S. Department of Energy has ties to two large tracts which overlap just slightly into Tipton kangaroo rat habitat. These two sites were originally created to enhance national security (GlobalSecurity.org 2007; U.S. Department of Energy and U.S. Department of the Interior 1996). Naval Petroleum Reserve 1 was established in 1912 (19,194 hectares [47,409 acres]; U.S. Department of Energy and U.S. Department of the Interior 1996). This reserve was sold to private parties in 1998 and now is known as Elk Hills Oil Field (U.S. Department of Energy 1998,2007a,b). While the site is large and includes appropriate habitat, the Tipton kangaroo rat is known from only a single locality (Section 23S, east of the California Aqueduct), and is not likely to be affected by gas and oil production activities at the oil field (Medlin 1995:18). The second site, Naval Petroleum Reserve 2 (12,178 hectares [30,080 acres]), was also established in 1912 and is located immediately to the SW of Naval Petroleum Reserve 1. This site was transferred to the Bureau of Land Management in 2005 and

now is known as the Buena Vista Oil Field (Bureau of Land Management 2006a). As in Elk Hills, the site is large and includes a small amount of appropriate habitat; the Tipton kangaroo rat is known from only a single locality (Section 18, east of the California Aqueduct). While the Tipton kangaroo rat is reported from the vicinity (EG and G Energy Measurements, Inc., 1995), there is no indication that the subspecies is affected by activities at the reserve itself.

California Department of Fish and Game.—The California Department of Fish and Game administers several sites presently or formerly occupied by the Tipton kangaroo rat (Figures 2a, 2b): (1) Allensworth Ecological Reserve (about 1,998 hectares [4,936 acres]; California Department of Fish Game 2007a; Department of Fish and Game [Wildlife Conservation Board] 2003a,b,c; Fish and Game Commission 2007a,b), (2) Northern Semitropic Ridge Ecological Reserve (about 2,720 hectares [6,720 acres]; administered jointly with California Energy Commission; California Fish and Game Commission 2006), (3) Buttonwillow Ecological Reserve (about 546 hectares [1,350 acres]; California Department of Fish and Game 2007b), and (4) Lokern Preserve about 57 hectares [140 acres]). As is the case with Federal lands managed by the Service, these sites are secured and protected by CDFG personnel in the context of normal preserve activities (e.g., law enforcement and waterfowl management), but these Tipton kangaroo rat habitat patches are vulnerable to natural and human threats (e.g., flooding, road maintenance, and vehicle traffic; discussed below in Section II.C.2).

Other State of California Agencies.—Two State of California agencies manage lands with this subspecies range (Figures 2a, 2b). First, the Department of Corrections and Rehabilitation administers North Kern State Prison (259 hectares [640 acres]). The buffer of scrublands surrounding the prison is occupied by the Tipton kangaroo rat. These lands are secure and not subject to disturbance other than routine operation and maintenance activities. Second, the California Aqueduct, formerly known as the State Water Project, is administered by the Department of Water Resources. Initiated in 1957, the aqueduct is about 714 kilometers (444 miles long; California Department of Water Resources 2007). The aqueduct passes along the western edge of the Central Valley and essentially is the western boundary of the geographic range of the Tipton kangaroo rat in the Bakersfield area. Aqueduct lands have impacted about 101 hectares (250 acres) of Tipton kangaroo habitat and are routinely subject to maintenance and vehicle traffic, but access to the general public is restricted. The California Department of Water Resources has now applied for an incidental take permit pursuant to section 10(a)(1)(B) of the ESA for routine operations and maintenance (245 hectares of impacts [permanent impacts + temporary impacts + mowed areas] on 730 hectares of suitable [occupied and potential] habitat; Service 2007p; Toyon Environmental Consultants, Inc., 2007).

County/Regional Organizations.—Three sites reportedly occupied by the Tipton kangaroo rat are owned or administered under cooperative agreements that include a combination of Federal, State, County, and private organizations (Figures 2a, 2b): (1) Metropolitan Bakersfield Habitat Conservation Plan (initiated in 1992; about 109,979 hectares [262,000 acres]; W Kern County; lands owned and managed by California Department of Fish and Game and Center for Natural Lands Management); (2) Kern Water Bank (created in 1996; about 8,054 hectares [19,900 acres]; SW of the City of Bakersfield; owned by four water agencies and California Department of Water Resources (Lane *et al*. 2003); and (3) Lokern Natural Area (about 16,188 hectares [40,000 acres]; W of the City of Bakersfield; a mixture of

public and private lands). While access to the sites owned by the petroleum companies usually is restricted to the general public, the remaining Tipton kangaroo rat habitat patches are vulnerable to natural and human threats (e.g., flooding, road maintenance, and vehicle traffic).

Conservation Organizations.—The Center for Natural Lands Management administers two sites in the Southern San Joaquin Valley, one of which is occupied by the Tipton kangaroo rat (Figures 2a, 2b): Semitropic Ridge Reserve (about 1,255 hectares [3,100 acres]) and Lokern Preserve (about 1,618 hectares [4,000 acres]; Center for Natural Lands Management 2000-2004a,b). Both are managed – in part – to benefit the Tipton kangaroo rat, but this subspecies has only been reported at the Semitropic Ridge Reserve site

Private Organizations.--Coles Levee Ecosystem Preserve (about 2,452 hectares [6,059 acres] was created in 1992 and was originally administered by ARCO Western Energy in collaboration with the California Department of Fish and Game. In 1998, Aera Energy LLC purchased the site (Aera Energy LLC 2006). Since its creation, the preserve has had an active biological monitoring program and habitat management program for the Tipton kangaroo rat, as well as several other federally-listed species of plants and animals (Harvard University Kennedy School of Government 2006; Landy *et al*. 1999; Lane *et al*. 2003). The site is also visited by hundreds of elementary and high school students annually within the context of environmental education programs.

APPENDIX III

Management Plans (expanded)

Individual management plans for important sites occupied by the Tipton kangaroo rat, however, are being prepared or implemented for the following sites (grouped by landowner/management agency and listed from north to south):

Naval Air Station Lemoore.—Kelly *et al*. 2000 proposed a management plan of the Tipton kangaroo rat following their assessment of this site. Gorman and Rosenberg 2000 questioned many aspects of this plan based on their re-analysis of the field data. In June 2001, the Final Integrated Natural Resources Management Plan and Environmental Assessment Naval Air Station Lemoore (2001-2005) was adopted (U.S. Navy Engineering Field Activity, West 2001). Under this plan, habitat at Tumbleweed Park is managed by grazing and burning for the benefit of the Tipton kangaroo rat. There is a disagreement, however, between the Service and Naval Air Station Lemoore representatives about what constitutes a viable management plan with regard to the Tipton kangaroo rat. Small mammal surveys have been conducted at this site by Endangered Species Recovery Plan (frequently identified as ESRP) and others

Pixley and Kern National Wildlife Refuges.—An approved Master Plan was adopted for each refuge in 1986 (Service 1985). In February 2005, a Final Comprehensive Conservation Plan was adopted for each refuge (Service 2005a). Under these plans, each refuge is managed, in part, for the benefit of the Tipton kangaroo rat. Specific management actions include burning, grazing, water level management, and small mammal population surveys (Service 2005a:75-103, F-3).

Elk Hills and Buena Vista Oil Fields.—The Tipton kangaroo rat is mentioned in annual reports management plans for each site in the overall context of habitat management and small mammal monitoring (EG and G Measurements 1988, 1989, 1990a,b, 1992a,b,c, 1995; Otten and Cypher 1997; Bureau of Land Management 2006a). Given that only a small portion of these oil field may support the Tipton kangaroo rat, no specific conservation actions for the benefit of this subspecies are proposed for the two sites other than the inclusion of lease stipulations that allow for pre-construction and mitigation measures (Bureau of Land Management 2006a:41).

Ecological Reserves and Preserves.--The State of California (California Department of Fish and Game) manages several protected areas where the Tipton kangaroo rat occurs, including: (1) Allensworth Ecological Reserve, (2) Northern Semitropic Ridge Ecological Reserve (managed jointly with California Energy Commission), (3) Buttonwillow Ecological Reserve, and (4) Lokern Preserve. The State of California also manages California Aqueduct lands. The degree to which management plans that include the Tipton kangaroo rat have been developed and implemented is unclear. Allensworth reportedly has a draft plan developed in 2005 but yet unapproved

(Année Ferranti, CDFG 2009). The habitat at many other sites apparently used by the Tipton kangaroo rat has reportedly deteriorated over the years due to insufficient habitat management. While Allensworth, Northern Semitropic, and Buttonwillow have been intermittently surveyed over the years, there is no systematic monitoring or management specifically for the benefit of the Tipton kangaroo rat (Selmon *et al*. 2004a,b). Allensworth may receive additional attention by the department in the context of habitat management, however, given the translocation of 144 Tipton kangaroo rats to the site in 2007 (see Germano and Saslaw 2007). At California Aqueduct (Toyon Environmental Consultants, Inc. (2007:S4), maintenance activities since 1992 have been conducted in ways that eliminated take of the sub-species and were consistent with the recently proposed habitat conservation plan (Service 2007p). The draft habitat conservation plan provides for surveys and management plans.

Other State Lands.--The State of California (California Department of Corrections) also manages North Kern State Prison, near Delano. Lands around the prison itself are managed, in part, for the benefit of the Tipton kangaroo rat (California Department of Corrections and Rehabilitation 2007). Small mammal surveys were conducted by Uptain during 1991-1995 (Uptain 1995).

Conservation Organizations.--The Center for Natural Lands Management manages two sites for the benefit of the Tipton kangaroo rat: Semitropic Ridge Preserve and Lokern Preserve (Center for Natural Lands Management 2000-2004a,b). Habitat at each site is actively managed in accordance with a formal management plan to maintain residual dry matter at a minimum. Small mammal surveys have been conducted – in part -- at each site since 2001 (Warrick 2007).

County/Regional Organizations.—(1) The site encompassed by the Metropolitan Bakersfield Habitat Conservation Plan is administered by California Department of Fish and Game and Center for Natural Lands Management. Under this plan, about 105,979 hectares (262,000 acres) are managed for conservation purposes. (2) The Kern Water Bank Authority manages two parcels – in part -- for the benefit of the Tipton kangaroo rat: (a) Kern Water Bank Habitat Conservation Plan and (b) Department of Water Resources La Hacienda site. Encompassing about 8,054 hectares (19,900 acres), some lands at the water bank have been managed since 1996 through a program that emphasizes wetland restoration and water quality that does not benefit the Tipton kangaroo rat (Kern Water Bank Authority 2007). Most of the actual conservation lands that are a part of the mitigation bank part of the area, however, are managed for upland species and do benefit the Tipton kangaroo rat.

Private Organizations.--Coles Levee Ecosystem Preserve has been actively managed -- first by ARCO Western Energy and later by Aera Energy LLC -- for a broad suite of federally-listed species, including the Tipton kangaroo rat. This management program includes biological surveys, habitat management, and the preparation of annual reports (see Quad 1997; Quad Knopf 1998, 2001, 2003a,b, 2004, 2005). This site initially was operated under an ESA section 10 permit (habitat conservation plan) for oil

field activities, as well as conservation activities, but the permit was surrendered to the Service prior to its expiration date (permit 809228; Service 2007a).

APPENDIX IV

Population Stability (expanded)

The following summarizes the results on Tipton kangaroo rat numbers and population cycles that have been reported to the Service (Tables 2a and 2b):

- At Naval Air Station Lemoore, kangaroo rats were initially reported at Wildlife Area 4 in 1982 (O'Farrell and Sauls 1982). Despite surveys in 1993, 1998, 1999, 2001, 2003, and 2004, kangaroo rats have not been reported again at that location (Morrison *et al*. 1996; Morrison and Smallwood 2004; Smallwood and Morrison 2004; Tetra Tech, Inc., 1999). Tipton/Fresno kangaroo rats were reported nearby at Resource Management Area 5 (Tumbleweed Park) beginning in 1988 and again in 1992 (Kelly *et al*. 2000; Kuenzi and Morrison 1992). During 1995-1998, Kelly *et al*. (2000) reported about 0-39 individuals per year. Gorman and Rosenberg (2000) re-analyzed those data and determined that 0-53 individuals per year were present. Uptain *et al*. (1999) reported 17-21 individuals at Resource Management Area 5 during 1996-1998. Most recently at Resource Management Area 5, Smallwood and Morrison (2004) reported 55-202 burrow systems per year during 2001-2004 (1 burrow system approximately equals 1 kangaroo rat).
- At a nearby site, the intersection of Highway 41 and Jackson Avenue (about 40 hectares; 100 acres), Smallwood and Morrison (2004) also reported 262-450 burrow systems per year during 2002-2004. To conclude, these results suggest that only a few hundred kangaroo rats occur at Naval Air Station Lemoore, most recently only at Resource Management Area 5, and that population numbers vary greatly from year to year. While these values may suggest that the population is stable or increasing, Tipton kangaroo rats at these two isolated sites are still highly vulnerable to natural and human threats (e.g., flooding, road maintenance, and vehicle traffic; discussed in Section II.C.2).
- At Pixley National Wildlife Refuge, about 125-290 Tipton kangaroo rats were reported for 1993 (Kelly *et al*. 2000). No Tipton kangaroo rats were reported during surveys in 1997 and 1998 (Kelly *et al*. 2000; Uptain *et al*. 1999). Recent unpublished information suggests that few if any Tipton kangaroo rats occur at the refuge today.
- At Allensworth Ecological Reserve, 242 Tipton kangaroo rats were reported in 1993 (Uptain *et al*. 1999), but information suggests that few if any Tipton kangaroo rats occurred recently at the site (Selmon *et al*. 2004a,b) until early 2007, however, when 144 Tipton kangaroo rats were translocated from a proposed public utility construction site near Lamont to this reserve (Germano and Saslaw 2007). Follow-up surveys will be undertaken during late-2007 and early 2008 to determine the status of those individuals. It remains to be seen if this translocation is sufficient to reestablish a Tipton kangaroo population at Allensworth.
- At North Kern State Prison, 0-112 individuals per year were reported during 1991-1995 (Uptain *et al*. 1999), but no recent survey results are available. If extant, this population likely is small and isolated from other Tipton kangaroo rat populations.
- At Kern National Wildlife Refuge, fewer than 11 individuals per year were reported during 1993-1999 (Newman *et al*. 2006; Williams 2005). In 1995, 33 Tipton kangaroo rats were translocated to the refuge, but a subsequent survey only reported 1 individual,

while a more recent survey in 2006 did not locate any Tipton kangaroo rats at the site (Newman *et al*. 2006). This population may not be extant.

- At Northern Semitropic (75 individuals; surveyed in 2004) and Buttonwillow Ecological Reserves (15-25 individuals; surveyed in 1998 and 1999), Tipton kangaroo rats were reported during three opportunistic surveys (Selmon *et al*. 2004a,b). The current status of these populations, however, is unknown.
- At Semitropic Ridge Preserve, 9-41 individuals per year have been reported since 2001 (Warrick 2007 in litt). Despite active habitat management at the preserve, the small size of this population suggests that Tipton kangaroo rats at his site are still highly vulnerable to natural and human threats (e.g., flooding, road maintenance, and vehicle traffic; discussed in Section II.C.2).
- At Coles Levee Ecosystem Preserve, several hundred Tipton kangaroo rats have been captured or observed at the sample trapping grids and along the spotlight transects annually since 1998 (M.H. Wolfe and Associates 1996; Quad Consultants 1997; Quad Knopf 1998, 1999; and Quad Knopf, Inc., 2001, 2003a,b, 2005). While these numbers are not comparable with each other due to different sampling regimes (unequal numbers of traps, grids, transects, and night surveys from year to year), they suggest that a small, but stable population may be present at the preserve.

As indicated earlier in this review, this assessment of occupied habitat and population status, however, may be incomplete. Williams (1985:10-14) compiled a list of 54 sites known to be occupied by the Tipton kangaroo rat. Since that time, additional sites have been reported to the [California] Natural Diversity Database (2009c), but no systematic effort has been made since 1985 to resurvey those sites or to compile unpublished information from species experts. Most likely, several sites that formerly supported Tipton kangaroo rat populations have been developed or used for agricultural purposes and no longer provide suitable habitat for this subspecies.

Appendix V.
Subset of approved projects (incidental take permit issued under the ESA) with relatively large permanent or temporary impacts to habitats occupied by the Tipton kangaroo rat (sorted according to magnitude of permanent impacts). [1]

Service Reference	Date (mm/dd/yy)	Project Name (county)	Permanent Impacts hectares (acres)	Temporary Impacts hectares (acres)
1-1-97-F-0108	9/30/1997	Biological Opinion for Kern Water Bank Authority Habitat Conservation Plan (Kern)	4,891 (12,081)	118 (291)
1-1-96-F-0034	2/23/1996	Settlement Agreement Between Office of the Solicitor and Valley Communities, Inc. (Kern)	267 (660)	0 (0)
1-1-01-F-0003	9/30/2002	Programmatic Biological Opinion on Effects of Minor Transportation Projects (10 counties)	255 (630)	0 (0)
1-1-03-F-0367	9/22/2003	Biological Opinion on the Proposed State Route 46 4-Lane Widening Project (Kern)	138 (341.7)	85 (210.24)
1-1-96-F-0030	2/7/1996	Biological Opinion for Arco Western Energy Habitat Conservation Plan (Kern)	73 (180)	0 (0)
1-1-02-F-0178	9/9/2002	Programmatic Biological Opinion on NRCS Compatible Use Permits, Tulare Basin Wetlands Reserve Program (Tulare)	0 (0)	2,024 (5,000)
1-1-02-F-0188	8/12/2002	Programmatic Biological Opinion on Ongoing and Proposed Maintenance, Naval Air Station Lemoore (Kings) ***[not finalized; draft was rejected by applicant]***	0 (0)	40 (100)

[1] The total number of projects with impacts to the Tipton kangaroo rat was 49. The total of permanent impacts was 6,001 hectares (14,823.63 acres). The total of temporary impacts was 2,387 hectares (5,896.37 acres). The total of lands protected under compensation agreements was about 16,500 hectares (40,700 acres).

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Dipodomys nitratoides nitratoides*

Current Classification Endangered

Recommendation resulting from the 5-Year Review

____ **Downlist to Threatened**
____ **Uplist to Endangered**
____ **Delist**
__X__ **No change is needed**

Review Conducted By Sacramento Fish and Wildlife Office staff

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve _____ Date 2·16·10