CALIFORNIA DEPARTMENT OF FISH AND GAME
WILDLIFE MANAGEMENT DIVISION
NONGAME-BIRD AND MAMMAL SECTION

FIVE-YEAR STATUS REPORT*

I. *COMMON* NAME: Fresno Kangaroo Rat
SCIENTIFIC NAME: *Dipodomys nitratoides exilis*
CURRENT CLASSIFICATION: Endangered

II. RECOMMENDED ACTION:
Retain endangered classification

III. SUMMARY OF REASONS FOR RECOMMENDED ACTION:

Population surveys in 1988 and 1989 failed to locate Fresno Kangaroo Rats (FKR) on existing Ecological Reserves acquired to protect the species. Populations located in Merced and Kings counties are mere remnants and may not be representative genetically of *D. n. exilis.* Remaining populations of FKRs continue to be jeopardized by loss of habitat, use of rodenticides for control of California Ground Squirrels *(Spermophilus beecheyi),* flooding of habitat, and lack of management actions to enhance habitat and monitor populations on existing reserves. The proposed water delivery system to western Madera and central Merced County would provide additional irrigation to the largest remaining uncultivated blocks of historic habitat for FKR. These may represent the only habitats for FKRs with sufficient size and protection from flooding to maintain viable populations of FKRs. None of this land is currently protected from agricultural or other developments.

IV. NATURE AND DEGREE OF THREAT:

The principal threat to FKRs is loss of habitat by conversion to cultivated agriculture: urbanization and related developments of transportation and water delivery systems. Except for about 1106 ha (2732 ac) in publicly owned reserves, remaining potential habitat for FKRs is privately owned and subjected to heavy livestock use (Rado 1986). Threats to extant populations are primarily from continuing conversion of native habitats to cultivated agriculture and other land developments. In addition, too little or too much livestock grazing also is detrimental to this Endangered species. The fragmentation and isolation of extant habitat resulting from these developments pose additional threats in the form of loss of genetic diversity and excessive inbreeding in remaining small and isolated populations. Other potential threats include use of rodenticides on public and private property, competition with Heermann's Kangaroo Rats *(D. heermanni),* disease and predation. Any of these factors has the potential to extirpate the remaining small and isolated populations.

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V. HISTORIC AND CURRENT DISTRIBUTION:

Historic:

The region of the State historically occupied by FKR was comprised of alkaline sink shrublands and arid, alkaline grasslands of the San Joaquin Valley, from the vicinity of the Merced River, Merced County, on the north, to the Kings River, Kings County, on the south, and extending from the edge of the valley floor near Livingston, Fresno, and Selma, westward to the wetlands of Fresno Slough and the San Joaquin River (Merriam 1894, Grinnell 1920, Hoffman 1975, Williams 1985).

Documentation of historic distribution outside the area in Fresno County west of Fresno is limited. However, Boolootian (1954), Culbertson (1946), Hoffmann (1975), and Williams (1985) collectively provided a composite picture of the historic distribution and documentation of the loss and fragmentation of habitat. In addition to published localities, there are unpublished records of specimens from Livingston, Merced County, and three sites in Madera County that provide additional evidence for the occurrence of D. n. exilis north of the San Joaquin River (Culbertson 1946). An estimate of the area comprising the historic range is approximately 359,700 ha (888,459 ac).

Nine separate areas in west-central Fresno County that were inhabited historically and uncultivated in 1981 (Grinnell 1922) included: a) about 202 ha (500 ac) in portions of section 13, 14 and 24, T15S, R17E, and section 19, T15S, R18E (most of this land has been developed since 1981); b) about 122 ha (300 ac) in sections 9 and 17, T14S, R17E (developed since 1981); c) about 4405 ha (1000 ac) in sections 1 and 2, T14S, R16E (acquired as an Ecological Reserve since 1981); d) about 324 ha (800 ac) in sections 11 and 2, Tl4S, R16E (acquired as an Ecological Reserve since 1981); e) 32 ha (80 ac) in SW ¼ of section 24, T13S, R16E; f) 65 ha (160 ac) in the NW ¼ of section 31, T13S, R17E; g) ,49 ha (120 ac) in section 10, T14S, R16E (cultivated since 1981); h) 907 ha (2240 ac) in sections 1, 2, 35 and 36, T13S, R15E; and h) 365 ha (900 ac) in sections 8 and 9, T14S, R16E. Occupancy by FKR was not verified on any of these parcels during surveys in 1980-81 and 1988-89.

Additional historic habitat in areas included in the 1988-1989 surveys consisted of: a) approximately 73 ha (180 ac) immediately south of Kerman in the SW ¼ of section 19, 14S, R18E (site of a radio-transmitter facility; b) about 4 ha (10 ac) in the NE ¼ of NE ¼ of NE ¼ of section 18, T15S, R18E (site of population studies of FKRs by W. Hoffmann in 1970s property owned by the Federal Aviation Administration).

Current:

Extant populations were last verified in November 1981 on the Alkali Sink Ecological Reserve (Calif., Dept. Fish and Game Administered), section 12, T14S, R15E, Fresno County, and on adjacent privately owned land (section 11, T14S, R15E; 01). Surveys in 1988 and 1989 failed to locate populations at either locality or on the newly acquired Ecological Reserve in sections 1 and 2, T14S, R16E and sections 11 and

12, T14S, R16E. Extensive flooding of the area since the 1980-81 surveys may have extirpated FKRs at these sites.

Specimens of *Dipodomys nitratoides* taken under a contract to the Department recently (1985 to November, 1989) in seasonally flooded iodine bush shrublands in the South Grasslands Water District, Merced County, in sections 10, 16, 21 were somewhat intermediate to *brevinasus* and *exilis,* but were found in the same habitat as *exilis* and have been tentatively assigned to *exilis.* These areas are privately owned lands included in the wetland waterfowl easements of the U.S. Fish and Wildlife Service. It is possible that *D. n. exilis* also still inhabits some areas in the East Grasslands District, near Merced National Wildlife Refuge, Merced County, parts of which are also maintained for wintering waterfowl through easements with the U.S. Fish and Wildlife Service. An extant population of *D. nitratoides* at Lemoore Naval Air Station in Kings County (parts of 45 ha (112 ac) in SW ¼) section 17, T18S, R19E) may be referable to *D. n. exilis* or *D. n. nitratoides.* Daniel F. Williams, contractor to the Department, collected specimens from here and from areas south and east of Lemoore Naval Air Status (i.e., NW ¼ section 6, T20S, R21E, 5.5 mi S, 2 mi E Lemoore, Kings County) in June 1989.

Other areas with possibly extant FKR populations include uncultivated grassland, alkali sink shrubland, and seasonally flooded wetlands within the historic range of the species, in Fresno, Kings, Madera, and Merced counties (Grinnell 1921). Populations of *Dipodomys nitratoides* occurred on the Mendota Wildlife Area, Fresno County, both east and west of the Fresno Slough, but these populations were regarded by some (Hoffman 1975) as representing *D. n. brevinasus* rather than *exilis,* although they were intermediate to the two subspecies, structurally (Merriam 1894, Williams 1985).

VI. HISTORIC AND CURRENT ABUNDANCE:

Historic and current population sizes of FKRs are not known. Over the entire historic range, densities probably averaged less than 1 or 2 animals per ha. Because much of the area flooded periodically, population densities varied. Due to drought and other natural events, not all of the area within the historic range was inhabited.

In one study (Hoffman 1974), population density was estimated to vary from about 16.7 to 24.8 FKRs per ha (6.8 to 10.1 per ac) during a period from February through December. Another study provided estimates of from 4.9 to 17.1 per ha (1.7 to 6.9 per ac) at different sites and in different seasons.

VII. SPECIES. DESCRIPTION AND BIOLOGY:

Except for its smaller size, *Dipodomys nitratoides exilis* does not differ substantially from the other subspecies of *D. nitratoides* or the general form and appearance of other species of kangaroo rats. As with other kangaroo rats it is adapted for bipedal locomotion, having greatly enlarged hind limbs, a long tail, and a short neck. The head is large and dorsal-ventrally flattened and with dorsal-laterally placed ears and eyes. Dorsal and lateral surfaces are colored dark yellowish-buff; the underparts are white. Dark whisker patches are

connected by a dark band of fur across the nose. The tail has a crest of longer hairs distally, terminating in a tuft. FKRs are the smallest kangaroo rats in the genus *Dipodomys* and have snuff-brown pelage and darker facial markings. *D. n. exilis* is distinguished from *D. n. nitratoides* and *D. n. brevinasus* by its smaller size; the length of hind foot in males and females, respectively, averages 33.9 mm and 33.4 mm, verses greater than 34.7 mm and 34.3 mm for males and females of the other subspecies (Grinnell 1922). The skull is shorter, with relatively less inflated mastoid bullae and shorter rostrum and nasal bones than other populations (Grinnell 1922, Hoffman 1975). *D. n. exilis* is darker in color than typical *D. n. brevinasus,* but is about the same shade as some *D. n. nitratoides.*

Little detailed information on the food habits of Fresno Kangaroo Rats is available. Seeds are the staple in the diet of *Dipodomys nitratoides* ,(Culbertson 1946, Eisenberg 1963, Williams 1985). A wide variety of seeds are probably consumed, including seeds of annual and perennial grasses, particularly wild oats, brome grasses, soft chess, and wild barley and fesque. Seeds of annual forbs such as filaree, peppergrass, and shepard's purse are also important foods. Seeds of woody shrubs, especially *Atriplex,spp;* are diligently sought out by Tipton and Short-nosed Kangaroo Rats and are also probably important for Fresno Kangaroo Rats (Williams, pers. obs.).

Most kangaroo rats gather seeds when they are available and cache them for consumption later. Typically, caches are made in small pits that hold the contents of the two seed pouches. Caches are located on the surface of the soil, and are typically scattered over the home range of the individuals. The only types of caches that have been found for Fresno Kangaroo Rats are small caches in the sides of burrows. Culbertson (1946) speculated that Fresno Kangaroo Rats did not cache seeds in their burrows to the same extent as other kangaroo rats because the soil where they lived was damp much of the year. Seeds would spoil rapidly under such conditions. He further speculated that Fresno Kangaroo Rats therefore were obligated to forage on the surface year round to a greater extent than kangaroo rats which cached more food.

No specific information is available on home range size or territoriality in Fresno Kangaroo Rats or other populations of *Dipodomys nitratoides.* Kangaroo rats in general are at least territorial for part of the year, with females being more strictly territorial than males. Home range size varies by habitat quality and species of kangaroo rat. In the closely related species, *D. merriami,* size of home range averaged about 1.65 ha (4.06 ac) for males and 1.57 ha (3.9 ac) for females in a study in New Mexico (Blair 1943). In contrast, the Giant Kangaroo Rat *(D. ingens),* living in association with *D. n. brevinasus* on the Carrizo Plains, has a home range of about 0.04 ha (about 0.1 ac) (Braun 1965). The home ranges of Fresno Kangaroo Rats probably are larger than *D. ingens,* a species with extensive food caching and management behaviors, but smaller than *D. merriami* reported by Blair (1943).

The burrow system is the apparent focus of territoriality in all kangaroo rats. Except for nursing young associated with females, each burrow system is typically occupied by a single individual.

Fresno Kangaroo Rats are nocturnal and active year round. Tape (1941) reported seeing Tipton Kangaroo *Rats (D. n. nitratoides)* emerge from their burrows and begin above-ground activities as early as 7 minutes before sunset in early spring. Other kangaroo rats in the San Joaquin Valley are sometimes seen above ground by day in March and April (Williams, pers. obs.), but this is considered to be rare and isolated deviations from the typical nocturnal activity.

The Fresno Kangaroo Rat is not a cover-dependent species. Dense, herbaceous vegetation is generally avoided, and areas of high shrub density usually have few individuals of *D. nitratoides* (Williams 1985). Plants associated with Fresno Kangaroo Rats seem important only as a source of seeds for food, and perhaps to provide nesting material.

Individuals shelter in ground burrows that are dug by them or their predecessors. Burrows are virtually always found in relatively light, friable soils in raised areas. Historically, colonies were densest in areas with sandy loam soils. The surface area covered by the burrow system of individual Fresno Kangaroo Rats generally varies from about 2.1 to 3.7 m (7 to 12 ft) on a side. There are usually two or three burrow entrances that slant gently underground, and one hole that opens from a vertical shaft. Tunnels are about 51 mm (2 in) in diameter and extend about 30.5 to 38.1 cm (12 to 15 in) below ground.

Nothing is known about mating behavior of *Fresno* Kangaroo Rats in the wild. However, mating probably takes place on the surface within the territory of the female.

Eisenberg and Issac (1963) found that sexual maturity in FKRs was attained in as little as 82 days. Pregnant female Fresno Kangaroo Rats have been taken in all months except August and December (Culbertson 1946, Hoffman 1974). Females are probably capable of breeding two or more times per year, but few individuals probably live long enough to breed more than once or twice. Breeding behavior is probably initiated in late fall or early winter after onset of the rainy season. Nothing is known about pair bonds in wild populations, but there are probably no lasting male/female pair bonds formed. Females may breed with more than one male during estrus. Most females born the previous season probably do not give birth until mid-February or early March. Gestation was 32 days and young were weaned at 21 to 24 days in a captive colony of Short-nosed Kangaroo Rats (Eisenberg and Isaac 1963). Average litter size in captive Fresno Kangaroo Rats reported by Culbertson (1946) was about 2 (range, 1 to 3); Eisenberg and Issac (Eisenberg and Isaac 1963) found an average of 2.3 young per litter (range 1 to 3) in captive *D. n. brevinasus* populations.

VIII. HABITAT REQUIREMENTS:

The historic geographic range of the FKR encompassed an area of grassland and alkali sink plant communities on the San Joaquin valley floor. Here, mean annual temperature is about 17°C (63°F) with a mean monthly low of 7.1°C (46°F) in January and a mean monthly high of 27.2°C (81°F) in July. Average annual precipitation varies from about 17.8 cm (7 in) in the western part of the range to 27.9 cm (11 in) in the east, at Fresno. The mean frost-free period ranges from about 225 to 250 days. The climate is hot and dry between about May and October,

with little or no rainfall, and cool and moist from November to April. In the winter months, from mid- or late November through January, ground or tule fogs frequently obscure the sun and result in lower daytime temperatures at the ground. Freezing temperatures are relatively rare.

Today, soils in which FKRs burrow typically remain moist most of the Year, except for a dry crust on the surface. Water tables are usually within a few feet of the surface. Alkaline vernal pools and temporary play as are typical features of the terrain inhabited by FKRs.

Extant habitat of FKRs consists of arid, alkaline, annual grassland and shrubland associations between about 60 and 90 m (200 to 300 ft) above sea level. Populations of *D. nitratoides,* considered to belong to the *exilis* subspecies, have also been located in iodine bush *(Allenrolfea)* associations that are typically flooded yearly between about October and March. The only refuges not inundated are on the dikes between flooded cells (Williams 1985). Most extant habitat consists of level terrain, a sparse cover of plants and alkaline soils with a high clay content. Most of this ground is subjected to seasonal flooding. FKRs prefer to locate burrows in natural areas above the flood levels such as the mounds around the bases of shrubs where wind-deposited soil has accumulated, and in raised structures such as berms of roads and banks of railroads and canals. FKRs are driven out of areas by flooding. Although soils in most extant habitat are relatively high in silts and clay, prime habitat, supporting dense population, typically have more friable soils with a greater percentage of sand. Historically, FKRs may have been most numerous on fine sandy soils of aluvial deposits along the eastern edge of the valley floor. However, virtually all these areas are under agricultural cultivation today (Culbertson 1946).

Areas of dense herbaceous vegetation and plant litter are not favored by kangaroo rats in general, nor by FKRs (Knapp 1975). Periodic fires or light-to-moderate grazing probably enhances habitat for FKRs by reducing density of vegetation and accumulated litter and by promoting the growth of annual forbs. Insufficient data exist, however, to determine the best method of maintaining optimum conditions for FKRs.

Dominant plant species typically associated with FKRs include brome grass *(Bromus mollis, B. rubens),* filaree *(Erodium* spp.), foxtail fesque *(Vulpia myuras),* grasses such as *Vulpia megalura* and *Hordeum* spp., iodine bush *(Allenrolfea occidentalis),* peppergrass *(Lepidium nitidum),* saltbush *(Atriplex* spp.), seepweed *(Suaeda fruticosa),* shepard's purse *(Capsella bursa-pastoris),* and wild oats (Avena fatus; Grinnell 1922, Boolootian 1954, Knapp 1975, Hoffman and Chesmore 1982).

IX. CURRENT AND RECOMMENDED MANAGEMENT:

Because the FKR has Endangered status at both the State and federal levels, State and federal lead agencies must consider its needs in authorizing activities that might adversely affect the species or its habitat. This is part of the project review process undertaken by both agencies.

There is a pressing need to conduct studies on the existing parcels of the Alkali Sink Ecological Reserve and any other State and federal

lands that may be inhabited by FKRs in an attempt to determine if there are extant populations. when populations are located, long-term studies to determine the necessary habitat manipulation and management actions must be undertaken. Studies should be designed to determine the nature and extent of competitive interactions between *D. n. exilis* and *D. heermanni,* and efficacious ways to manage natural communities to minimize competition.

Acquisition of additional reserve lands that have natural protection from periodic flooding should be given a high priority. Historic FKR habitat in western Madera County east of the town of Madera and northwest of Firebaugh should be given high priority for acquisition.

Regulations on the acquisition and the use of all rodenticides by governmental agencies and the public need to ensure that a clear record of purchases, in quantities greater than expected for household use. They must also provide maximum protection from accidental poisoning of FKRs where rodenticides are used to control California Ground Squirrels. Included in these regulations should be instructions telling the user to set bait stations only within the cultivated field being protected rather than at the edge of uncultivated fields. These uncultivated fields could potentially be inhabited by FKRs. Baits acceptable to ground squirrels, but not kangaroo rats should be the only baits registered for use within the range of Threatened and Endangered small mammals. This restriction would exclude rodenticide-treated grains. Some experimentation might be necessary before "kangaroo rat-safe" bait is developed.

X. SOURCES OF INFORMATION

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