

LITERATURE CITED

DISTRIBUTION AND ABUNDANCE OF THE SAN JOAQUIN KIT FOX

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Abstract. The current range of the San Joaquin kit fox (*Vulpes macrotis mutica*) had been delimited. It extends north almost of Los Banos along the foothills of the western San Joaquin Valley and to about 20 miles south of Porterville on the eastern edge of the valley. The only extensive occurrence on the valley floor proper is in the southwestern portion wherever native vegetation remains. This kit fox is also found on the Carrizo Plain. The total range contains approximately 3,000 square miles of appropriate habitat. Population density estimates vary from 1 fox per square mile to 1 fox per 2.8 square miles. The total population is thought to number between 1000 and 3000 foxes. The major influence upon this kit fox's population decline has been the conversion of native habitat to agricultural and industrial development. Within the past 10 years there has been an estimated 34% reduction in the amount of native habitat and it is assumed that this has resulted in a somewhat comparable reduction in the kit fox population.

INTRODUCTION

The recent decline of the kit fox populations within California resulted in this species being given the status of protected furbearer by the California Fish and Game Commission in 1965. One year later, 1966, the Secretary of the Interior, under the Endangered Species Preservation Act, listed the San Joaquin kit fox as an endangered species.

The decline of the San Joaquin kit fox appears to be primarily a result of man's activities in this geographical region. The human population expansion has necessitated an increase in agricultural and industrial development with a resulting loss of native habitat. Much of the rich San Joaquin Valley has been converted to cropland and this trend is unlikely to cease in the near future.

This paper reports the results of a preliminary study of the distribution and abundance of the San Joaquin kit fox undertaken by the Special Wildlife Investigations branch of the California Department of Fish and Game during the summer

of 1969.

The kit fox inhabits sparsely vegetated arid areas, generally being considered an animal of the North American deserts. Within these areas it seems to prefer sandy or loam substrates. Egoscue (1962) has suggested a strong correlation between kit fox distribution and the location of Pleistocene lake beds where the required substrate predominates. Kit fox dependence upon this substrate has been attributed to its weak digging ability and need for places where dens may be easily excavated. This fox's apparently heavy reliance upon burrowing mice for food may indicate that kit fox distribution is related to prey distribution.

There are eight recognized subspecies of kit fox (*Vulpes macrotis*). All occur in North America and their geographical distribution is shown in Figure 1. This figure also gives the distribution of the ecologically similar swift fox (*Vulpes velox*).

Three kit fox subspecies have occurred in California: the San Joaquin kit fox (*V. m. mutica*); the desert kit fox (*V. m. arsipus*); and the long-eared kit fox (*V. m. macrotis*) (Hall and Kelson, 1959:859; Grinnell et al., 1937). Their distribution is shown in Figure 2.

The long-eared kit fox inhabited the San Jacinto, Alessandro, Perris, and San Fernando valleys of southern California. It is now extinct, the last sighting being in 1903 (Grinnell et al. 1937).

The desert kit fox occupies the greatest area within California - the Mojave and Colorado deserts. This fox also ranges into Nevada, Arizona, and Mexico. Its present range is thought to be about the same as its former range.

The San Joaquin kit fox, at one time, inhabited most of the arid southern part of the great central valley of California. This population was probably established from the desert kit fox population sometime during the Pleistocene by moving into the valley through one of the lower passes at the Southern end, such as Walker, Tehachapi, or Tejon passes.

METHODS

The current range of the San Joaquin kit fox was established using a general survey technique. Whenever possible direct evidence such as actual sightings or the presence of recently active dens was noted. Wherever it was not possible to actually search an area indirect evidence had be used. It was assumed that kit foxes could inhabit an area if it contained the appropriate vegetation cover type and burrowing rodents. For the most part the upper elevational limits were based on this assumption.

Population estimates were arrived at in several ways. Riley D. Patterson, District Supervisor, U. S. Fish and Wildlife Service, Division of Wildlife Services, Bakersfield, California provided data from a breeding den survey done in April

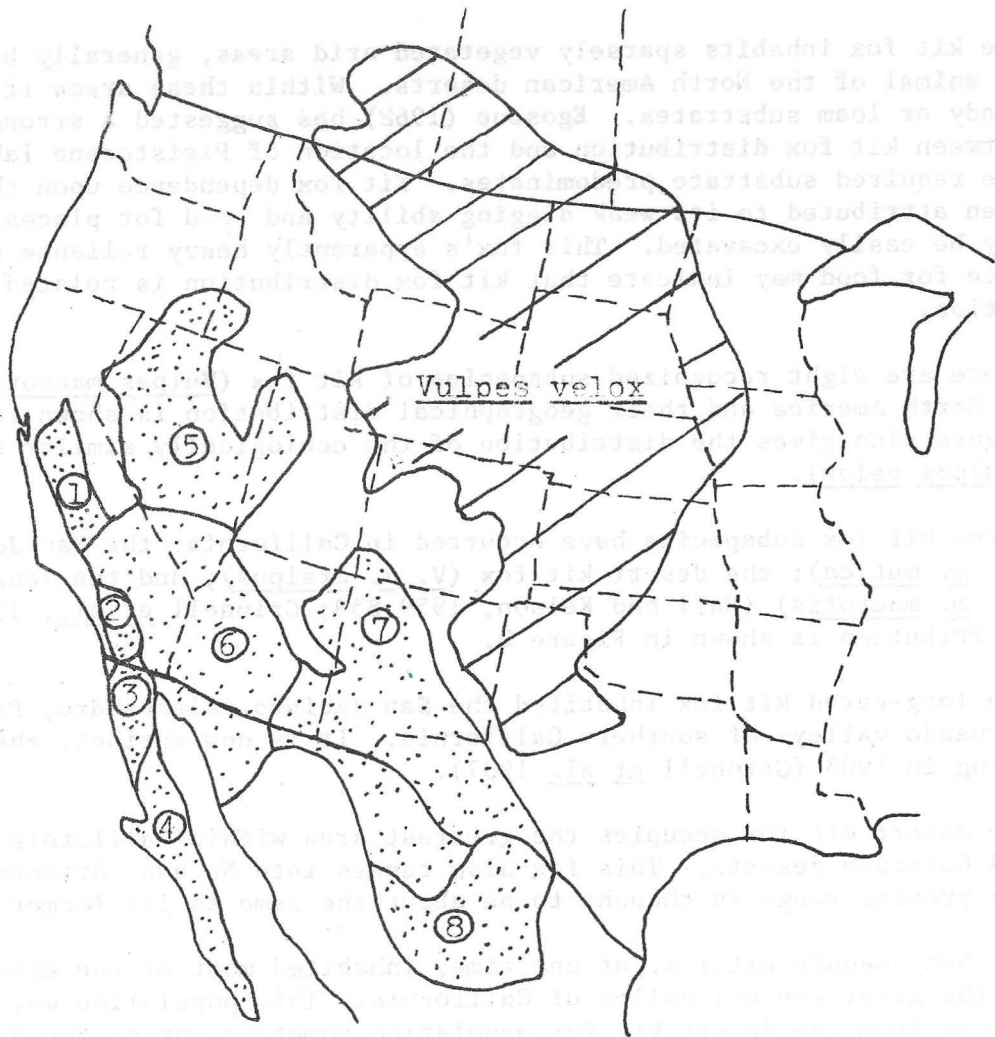


Figure 1. Geographical distribution of the subspecies of kit fox, Vulpes macrotis, and the swift fox, V. velox (Hall and Kelson, 1959:859).

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|------------------------------|-----------------------------|
| 1. <u>V. m. nutica</u> | 5. <u>V. m. nevadensis</u> |
| 2. <u>V. m. macrotis</u> | 6. <u>V. m. arsinus</u> |
| 3. <u>V. m. tenuirostris</u> | 7. <u>V. m. neomexicana</u> |
| 4. <u>V. m. devia</u> | 8. <u>V. m. zinseri</u> |

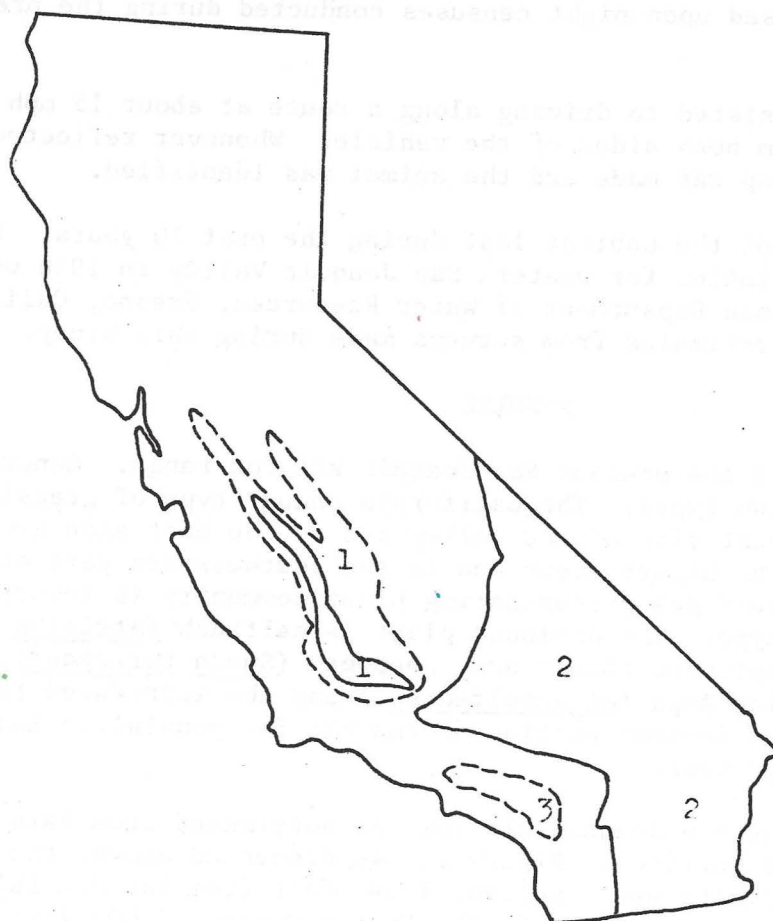


Figure 2. General distribution of kit foxes in California. San Joaquin kit fox (1), desert kit fox (2), long-eared kit fox (3). Known extent of distribution indicated by broken line; distribution as of 1930 by solid line. (Grinnell et al., 1937:403).

of 1969. This was conducted on approximately 140,000 acres of brush and range land in western Kern County. Another population density figure was obtained from work done on the desert kit fox, V. m. nevadensis, (Egoscue, 1956). The other index used was based upon night censuses conducted during the present study.

The night censusing consisted to driving along a route at about 15 mph and shining a spotlight from both sides of the vehicle. Whenever reflected eye-shine was observed a stop was made and the animal was identified.

An evaluation was made of the habitat lost during the past 10 years. Data on acreages on native vegetation for western San Joaquin Valley in 1958 were provided by the California Department of Water Resources, Fresno, California. Acreages for 1969 were estimates from surveys made during this study.

RESULTS

Vegetation varies within the present San Joaquin kit fox range. Generally it can be divided into two types. The California annual type of grassland is found along the upper west side of the valley and on the east side around to the southern end. On the higher areas and in the southwestern part of the valley on the floor itself the predominating plant community is referred to as the Atriplex cover type. The dominant plant is saltbush (Atriplex polycarpa). Other conspicuous plants are: seepweed (Suada torreyana); pickleweed (Salicornia spp.); iodine bush (Allenrolfea sp.) and the introduced tumbleweed (Amaranthus albus). The densest portion of the kit fox population inhabits this Atriplex vegetation type.

The present range of the San Joaquin kit fox, as determined from this study, is shown in generalized outline in Figure 3. As discussed above, the following upper elevational limits were applied: 1,500 feet from the San Luis Reservoir, Merced County, to Panoche Creek, Fresno County; 2,000 feet from Panoche Creek to Highway 46 near Blackwells Corner, Kern County; 2,500 feet from Highway 46 to Highway 99 at the Grapevine, Kern County. On the east side of the valley the limit was placed at 1,500 feet. Limit of distribution on the valley floor was determined by presence of native vegetation and was quite discontinuous in many places.

Currently the northernmost range limit is west of Los Banos, Merced County, on the west side of the valley and White River, south of Porterville, Tulare County on the east side.

The total range contains about 3,000 square miles of native vegetation.

The following are the population density estimates which were used to determine the overall population size. The Fish and Wildlife Service data showed a mean of 1 den per two square miles. Egoscue (1956) reported one pair of adults per 3.6 square miles. The night census work of this study yielded a density of 1 fox per 2.8 square miles. Applying these figures to the amount of native

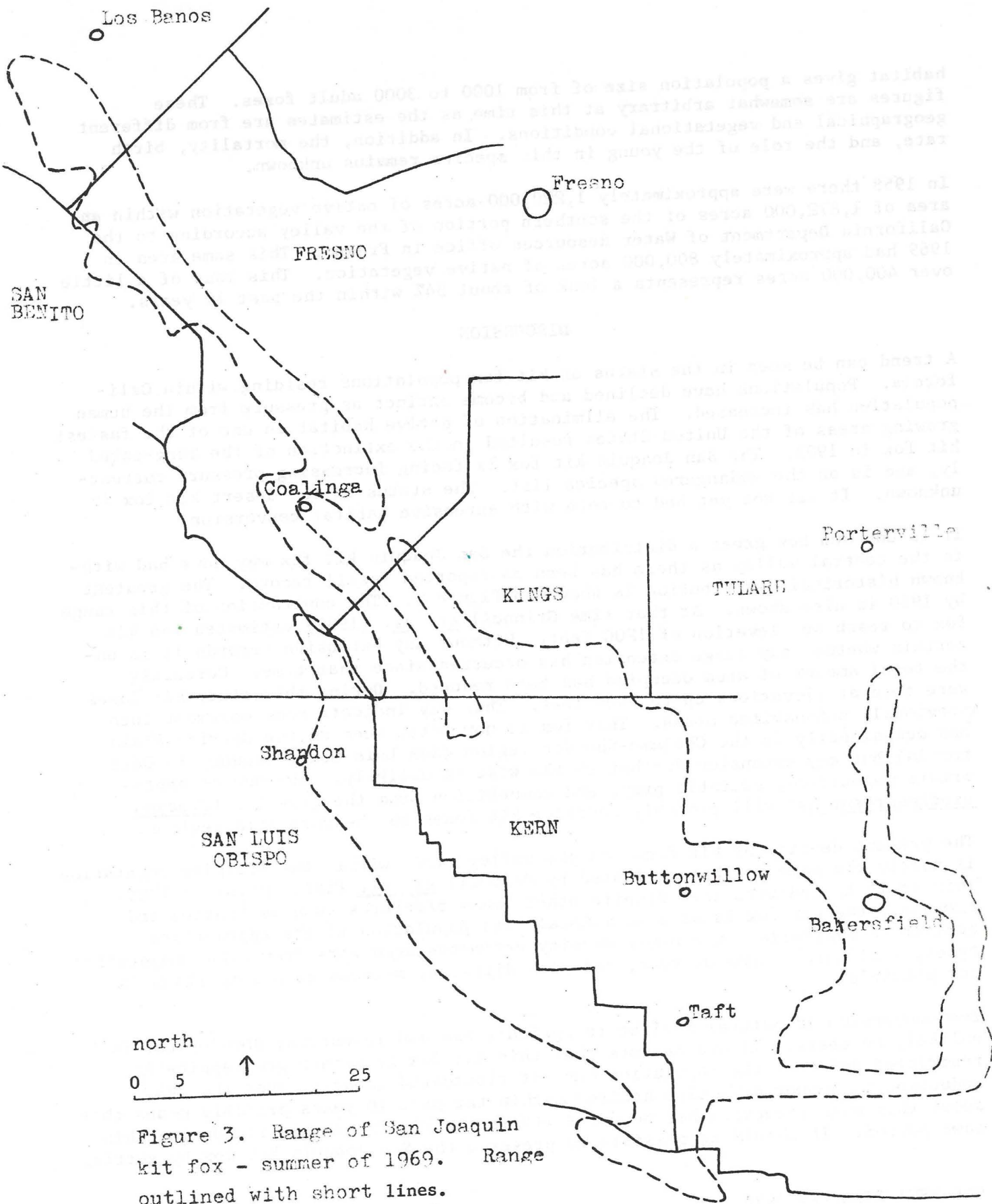


Figure 3. Range of San Joaquin kit fox - summer of 1969. Range outlined with short lines.

habitat gives a population size of from 1000 to 3000 adult foxes. These figures are somewhat arbitrary at this time as the estimates are from different geographical and vegetational conditions. In addition, the mortality, birth rate, and the role of the young in this species remains unknown.

In 1958 there were approximately 1,220,000 acres of native vegetation within an area of 1,872,000 acres of the southern portion of the valley according to the California Department of Water Resources office in Fresno. This same area in 1969 had approximately 800,000 acres of native vegetation. This loss of a little over 400,000 acres represents a loss of about 34% within the past 10 years.

DISCUSSION

A trend can be seen in the status of kit fox populations residing within California. Populations have declined and become extinct as pressure from the human population has increased. The elimination of native habitat in one of the fastest growing areas of the United States resulted in the extinction of the long-eared kit fox in 1903. The San Joaquin kit fox is facing increasing pressure currently, and is on the endangered species list. The status of the desert kit fox is unknown. It has not yet had to cope with extensive habitat conversion.

It is unknown how great a distribution the San Joaquin kit fox may have had within the central valley as there has been no reported fossil record. The greatest known historical distribution is shown on Figure 2. The contraction of this range by 1930 is also shown. At that time Grinnell *et. al.* (1937) estimated the kit fox to reach an elevation of 1200 feet. Without any extensive records it is uncertain whether any range extension has occurred since that time. Certainly the total amount of area occupied has been reduced. During this study kit foxes were seen at elevations up to 2400 feet. This may indicate some movement into previously uninhabited areas. This fox is now often seen on the Carrizo Plain and occasionally in the Cholame-Shandon region (San Luis Obispo county in California) but any extension further to the west is unlikely. Absence of appropriate vegetation, suitable prey, and competition from the gray fox (*Urocyon cinereoargenteus*) will probably restrict kit foxes to the more arid regions.

The present density of kit foxes on the valley floor within the Atriplex vegetation is nearly the same as that estimated by Grinnell *et. al.* (*ibid*) prior to 1925. This seems to indicate that despite other human pressures such as hunting and trapping, the kit fox is able to maintain its population if the appropriate habitat is available. The other density estimates used were from other vegetation types, a different time of year, and with different methods so a comparison is not possible.

The conversion of natural habitat to agricultural and industrial development is unlikely to cease. If one assumes that this kit fox is rather geographically restricted and that the population has not fluctuated greatly, then the 34% reduction in amount of native habitat within the past 10 years probably means that about this much reduction has occurred within the kit fox population during this same period. It should be possible to preserve the San Joaquin kit fox by setting

aside some of this native vegetation in some form of a reserve.

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