STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF FISH AND GAME

MAMMALIAN SPECIES OF SPECIAL CONCERN IN CALIFORNIA

by

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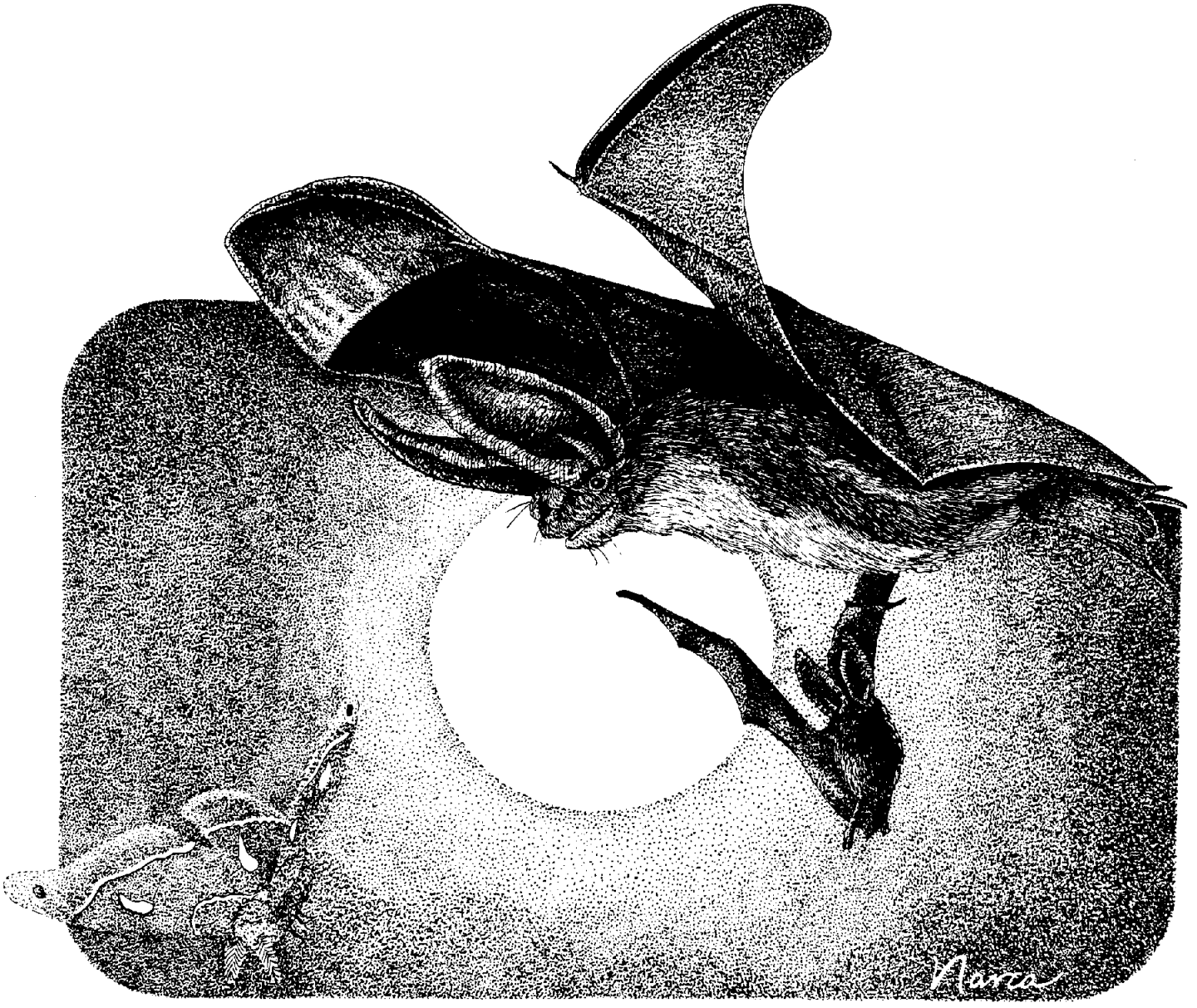

Cover: Townsend's Big-eared Bat (*Plecotus townsendii*)

Page 11: Suisun Shrew (*Sorex ornatus sinuosus*)

Page 49: White-eared Pocket Mouse (*Perognathus alticola*)

Page 72: Mountain Beaver (*Aplodontia rufa*)
Fisher (*Martes pennanti*)

Artwork by Narca Moore-Craig

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ABSTRACT

The native species of land mammals of California which currently do not have state or federal Threatened or Endangered Species status were investigated in order to identify those potentially threatened with extinction. Investigations concentrated on determining historic and current distributions, habitat associations, population status, and the nature and proximity of threats of extinction. Information was developed primarily from the literature, museum records, and field notes, and from contacts with biologists with knowledge of current developments in the field. Detailed studies were conducted in some areas, but only cursory field work was undertaken in other areas of concern. Populations of 36 species and subspecies were considered to be potentially jeopardized. These are placed in three priority categories. The 13 taxa in the Highest Priority face a high probability of extinction if current trends continue; the 11 taxa in the Second Priority are definitely declining in population size and appear jeopardized, but the threats are less immediate; the 12 taxa in the Third Priority appear not to face extinction soon, but their populations are declining seriously or they are otherwise highly vulnerable to human developments. Information on distribution, population status, habitat, and taxonomy, and recommendations for management actions are presented for each species on the List of Concern. Brief remarks are included for 56 other taxa considered in developing the final List of Concern.

Species limited to or primarily dependent upon riparian and wetland communities have been affected most severely by human developments. Five geographic areas of critical concern are: the Colorado River riparian corridor; the San Joaquin Valley lowlands, including grassland, riparian and wetland communities; the tidal marshes of the Los Angeles Basin; the tidal marshes of San Francisco and San Pablo bays; and the grasslands of the southern California coastal basins. Loss and fragmentation of mature and old-growth forests, lack of data on population structure of some game and fur-bearing species, and human disturbances of sensitive species are other important factors generating concerns for several species.

1/ Wildlife Management Division Administrative Report 86-1 (June 1986). Supported by federal Endangered Species Act grant-in-aid funds for Nongame Bird and Mammal Section project E-W-4, IV-14.1; and by internal Nongame Bird and Mammal Section research funds.

RECOMMENDATIONS

In addition to recommendations contained in the species accounts for the preservation of California's mammals, the California Department of Fish and Game and I recommend the following:

1. Give high priority to the preservation and/or restoration of plant communities essential to wildlife:

    a. Restore and protect riparian forests and wetlands in California, with special attention to those of the Colorado River and the San Joaquin Valley.

    b. Restore and protect tidal wetlands, especially those in San Francisco, San Pablo, and Suisun bays and those along the southern California coast in Ventura, Los Angeles, and Orange counties.

    c. Preserve and protect native grasslands and desert shrub communities in the San Joaquin Valley, Salinas Valley, and the southern California coastal basins in Los Angeles, Orange, Riverside, and San Diego counties.

    d. Preserve and protect mature and old-growth conifer forests in blocks large enough to support species such as Fishers.

2. Propose species on the List of Special Concern that meet the criteria of Threatened or Endangered Species to the California Fish and Game Commission and the U.S. Fish and Wildlife Service for addition to the lists of Threatened and Endangered Wildlife.

3. Initiate programs to determine the effects of hunting and trapping on game and furbearing species on the List of Special Concern and modify regulations as appropriate.

4. Encourage the protection of all species of bats in California and initiate an educational program to inform the public of the role of bats in control of insects and the sensitivity of bats to disturbance in maternity roosts and hibernacula. Support and assist the development of regulations prohibiting the poisoning or killing of bats as control measures in human structures.

5. Encourage governmental, educational, and conservation agencies and institutions involved in wildlife, land, and resource management to give high priority to Species of Special Concern in research programs and land and resource management decisions.

6. Encourage persons with information on Species of Special Concern or other species that may be threatened to bring the information to the attention of the Department of Fish and Game. Revise the List of Special concern every two years to reflect current information on distribution, population status, and management recommendations.

PREFACE

The primary objectives in preparing this document were to identify taxa of mammals in California that had no status as Endangered, Threatened, or Fully-protected, but which appeared to be vulnerable to extinction, and to develop a set of priorities for determining their status and ensuring their survival. As originally conceived and implemented, the project provided no resources for field investigations, although most areas of the state were visited and limited field work was conducted. In the ensuing five years, however, opportunities to conduct more extensive field work in several areas have arisen and the investigations have resulted in removing several species from the draft List of Concern, moving others to lower categories, and elevating others to higher categories. Three species included on the final list were not investigated in the same detail as others, because in the early stages of the project I had decided there were no indications that they were in jeopardy. Subsequent to preparation of the draft final report, however, reconsideration of their status has resulted in their inclusion. I thought it better to include them with only partial data available rather than to delay the preparation of the final report.

A rough draft of the accounts of 52 species and subspecies to be included in this report was prepared and submitted for comment to the California Department of Fish and Game in 1981. A completed draft of the report was submitted later in 1981. The Department of Fish and Game finished its review and returned the draft to me for final revisions in June, 1984. By the time it was returned, considerable new information had been gathered for several species, and substantial revisions were envisioned; in addition, I had incurred a number of commitments that precluded work on the document until fall of 1985. In the interest of making the information that was gathered for the original report available, I have decided reluctantly to forego major revisions. Most sections of the report have been reorganized, 18 species have been deleted from the List of Concern (they are discussed in the section entitled "other candidate species"), three species have been added to the list of concern, and some new information, gathered during subsequent field work by me and others, has been incorporated.

23 February 1986
Turlock, California

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INTRODUCTION

During the past 150 years, 515 species and subspecies of native land mammals have been recorded as occurring in California (Hall, 1981; Williams, 1984), a number much greater than in any comparable political unit north of the American tropics. Seven species, including the Mexican Jaguar (Felis onca arizonensis), Plains Bison (Bison bison bison), Gray Wolf (Canis lupus fuscus and C. l. youngi), California Grizzly Bear (Ursus arctos californicus; taxonomy of Hall, 1984), and the Western White-tailed Deer (Odocoileus virginianus ochrourus), are now extinct or extirpated within California. Coues' White-tailed Deer (O. v. cousei) probably also occurred within California, occupying the riparian forests of the Colorado River floodplain. Specimens are unknown from California, although Hall (1981) listed a record from Ehrenburg, Arizona, on the Colorado River opposite California. This species was probably already rare along the Colorado River by the time rapid immigration triggered by the the gold rush, and has been extinct long since. The Long-eared Kit Fox (Vulpes macrotis macrotis) was driven to extinction by humans in the southern coastal basins of California. Pronghorns (Antilocapra americana americana) have been extirpated from most of their historic range in California, in west-central and southern parts of the state; and Tule Elk (Cervus elaphus nannodes), while no longer threatened with extinction, exist only under full protection. The decline or extinction of most of these species was primarily due to persecution and/or overharvesting by humans.

Twenty-three mammalian species (29 subspecies) in California were designated as Threatened or Endangered species in 1985, including nine marine mammals. The terrestrial species are listed in Table 1, together with those known to be extinct or extirpated from the state. The principal factor jeopardizing the rodents and Kit Fox (Table 1) has been loss of habitat. Human disturbance and intrusion into their habitats have been significant factors in the decline of the Sierra Nevada Red Fox, Southern Wolverine, and the California and Peninsular Bighorn Sheep.

Twenty native game and fur-bearing species of mammals are partially protected by hunting and trapping regulations established by the California Fish and Game Commission and administered by the California Department of Fish and Game. Additionally, the Ringtail (Bassariscus astutus), Fisher (Martes pennanti), and Northern Flying Squirrel (Glaucomys sabrinus) are protected through legislative action or by the California Fish and Game Commission. The White-eared Pocket Mouse (Perognathus alticola), Point Arena Mountain Beaver (Aplodontia rufa nigra), Point Reyes Mountain Beaver (A. r. phaea), and all species of bats are partly protected from taking through restrictions on scientific collection by the California Department of Fish and Game. The Mountain Lion (Felis concolor) is designated as a game species but presently there is no open hunting season.

All other terrestrial species of mammals in California have little or no protection, and for those and many game, fur-bearing, fully-protected, and state Endangered and Threatened species, no management plans are in operation to ensure the preservation of unique populations. Yet, the

California Endangered Species Act of 1970 and subsequent amendments mandate the preservation of all species of native mammals. Rapid agricultural development and urbanization of vast areas in California have profoundly diminished the extent of several biotic communities and jeopardized their unique biotas. For example, the floor of the San Joaquin Valley measures approximately 3.44 million hectares (8.5 million acres). Major plant communities once included valley grassland (dominated by perennial species such as Stipa pulchra and S. cernua), San Joaquin saltbush (dominated by several xeric-adapted and halophytic shrubs, including Atriplex spp., Suaeda fruticosa, Allenrolfea occidentalis, and Ephedra californica), tule marsh (dominated by species of Scirpus and Typha), and riparian forests and savannas (Kuchler, 1977). By 1979, nearly all of this land was developed, either as large urban areas or as cultivated crop land. Less than 60,700 hectares (150,000 acres) were uncultivated, and significant portions of this latter amount were developed for petroleum extraction, strip-mined for gypsum and clay, or occupied by roads, canals, air strips, cities, oil-storage facilities, pipelines, and evaporation and percolation basins. The vast tule marshes were nearly gone; most of those that remained were degraded by seasonal flooding with waters laden with metallic salts drained from irrigated fields. The grassland communities were reduced to small remnants, mostly fringing the valley floor, and their perennial species were largely replaced by exotic species of weedy annuals such as Bromus spp., Avena spp., and Erodium spp. Of the original 404,700 hectares (about 1 million acres) or more of riparian communities in the Central Valley, less than 10% existed in 1979 (Warner, 1979); much of that was significantly degraded in quality.

Populations of mammals native to the arid coastal basins of southern California have been reduced drastically in size as a result of habitat loss. Today, nearly all of the populations of species native to the plant communities on the floor of the southern coastal basins face proximate threats of extinction. The Long-eared Kit Fox succumbed to the pressure of increasing numbers of people in southern California several decades ago (Waithman and Roest, 1977). Other species extirpated there and/or throughout southern California include the Mexican Jaguar (Merriam, 1919; Strong, 1926), Great Basin Gray Wolf (Grinnell et al., 1937), Pronghorn (McLean, 1944), and Coues' White-tailed Deer.

Populations of mammalian species dependent upon freshwater and tidewater riparian and wetland communities have declined markedly in nearly every region within California as a result of loss and degradation of their habitats. White-tailed Deer, dependent upon riparian communities in California, have already been extirpated (see section on Other Candidates in Results section) and several other species are seriously jeopardized.

The rapid, widespread loss of old-growth forests by logging activities raises concerns that cannot be resolved with existing information. Although no mammalian species in California is known to be limited to old-growth forests, a few require extensive tracts of relatively undisturbed forest. Fragmentation and isolation of relatively small blocks of mature and old-growth stands of Yellow Pine, Douglas Fir, Mixed Conifer, and Red Fir by recent forest-management practices has been extensive and could prove to be disastrous for wide-ranging species such as the Fisher and Marten, and for species with limited vagility such as

Table 1. Extinct, Threatened, and Endangered species of land mammals in California as of January, 1986. CE - California Endangered; CT - California Threatened; FE - Federal Endangered; FT - Federal Threatened.

Species	Status
San Joaquin Antelope Squirrel (*Ammospermophilus nelsoni*)	CT
Mohave Ground Squirrel (*Spermophilus mohavensis*)	CT
Morro Bay Kangaroo rat (*Dipodomys heermanni morroensis*)	CE, FE
Giant Kangaroo Rat (*Dipodomys ingens*)	CE
Fresno Kangaroo Rat (*Dipodomys nitratoides exilis*)	CE, FE
Stephens' Kangaroo Rat (*Dipodomys stephensi*)	CT
Salt Marsh Harvest Mouse (*Reithrodontomys raviventris raviventris* and *R. r. halicoetes*)	CE, FE
Amargosa Vole (*Microtus californicus scirpensis*)	CE, FE
Cascades Gray Wolf (*Canis lupus fuscus*)	Extinct
Great Basin Gray Wolf (*Canis lupus youngi*)	Extinct
Island Fox (*Vulpes littoralis catalinae*, *V. l. clementae*, *V. l. dickeyi*, *V. l. littoralis*, *V. l. santacruzae*, and *V. l. santarosae*)	CT
Long-eared Kit Fox (*Vulpes macrotis macrotis*)	Extinct
San Joaquin Kit Fox (*Vulpes macrotis mutica*)	CT, FE
Sierra Nevada Red Fox (*Vulpes vulpes necator*)	CT
California Grizzly Bear (*Ursus arctos californicus*)	Extinct
Southern Wolverine (*Gulo gulo luteus*)	CT
Mexican Jaguar (*Felis onca arizonensis*)	Extirpated
Western White-tailed deer (*Odocoileus virginianus ochrourus*)	Extirpated
California Bighorn Sheep (*Ovis canadensis californiana*	CT
Peninsular Bighorn Sheep (*Ovis canadensis cremnobates*)	CT
Bison (*Bison bison bison*)	Extirpated

Red Tree Mice. Likewise, some species of bats may depend on roosting sites under loose bark and in hollow cavities of standing trees and foraging sites within the forest, and their populations may be significantly impacted by loss of old-growth forests and current forest-management activities

Concern over the rapid loss of major biotic communities within California and the increasing threats to several species of mammals prompted the Nongame Bird and Mammal Section of the California Department of Fish and Game to initiate this study of potentially threatened species of mammals. The principal objectives were to identify potentially jeopardized populations of mammals within California, and to group them into priority categories for management actions, including proposals for protected status, expenditure of research funds, and preservation of essential habitat.

METHODS

Investigations of potentially threatened mammals were limited to taxa without Threatened or Endangered status at the state or federal level. Taxa concurrently being investigated through other projects of the Department of Fish and Game also were excluded from detailed studies (i.e., some subspecies of the Bobcat, Felis [Lynx] rufus, and the River Otter, Lutra canadensis).

Priorities for the investigations were:

1. species endemic to California;
2. subspecies endemic to California;
3. species and subspecies whose geographic ranges extend beyond California and which appear to be jeopardized throughout their geographic range;
4. populations of taxa threatened within California but which also occur elsewhere and appear not to be threatened throughout their geographic range (e.g., Myotis velifer velifer, the Cave Myotis).

These priorities had some influence on which taxa received greatest consideration for inclusion in detailed investigations. Priority rankings, however, were based solely on the apparent proximity and nature of threats to populations. Locally depleted populations of wider-ranging taxa within California were not studied in detail, with the exception of the American Badger (Taxidea taxus).

A working list of 86 candidate species was assembled first and then information for each candidate was gathered. Blair Csuti (The Nature Conservancy) nominated some of the candidates. Data on life histories, habitat associations, historic and current distributions, systematic status, population status, and nature of potential threats were sought for each candidate. Initially, information was gathered without benefit of field work, being derived instead from published sources, other biologists, and previous field experiences in California. The intent was to develop information needed to direct limited funds for field investigations to studies of biotic communities and taxa with the greatest perceived threats to their existence. During the course of the original investigation, however, most areas in the state where loss of habitat posed a threat to one or more species of mammals were visited. Only cursory field studies were carried out, however, as time and funding did not permit detailed field work. Subsequently, more detailed studies have been conducted in the San Joaquin Valley (Williams, 1985; Glenn Basey, unpubl. ms.; Cheryl Johnson, unpubl. ms.); San Bernardino Mountains (Sulentich, 1983; Williams, 1983);) San Gabriel mountains (Williams, 1983); Tehachapi Mountains (Sulentich, 1983); east-central slope of the Sierra Nevada (Williams, 1984); western slope of the central Sierra Nevada (unpubl. data); San Pablo and Suisun bay marshes (K. Ford, unpubl. data; Williams, 1983); Point Arena area, Mendocino Co. (Dale Steele, unpubl. data); San Francisco Bay (Ford, 1986); San Pablo Creek Marsh (by Foreman; T. Rado, pers. comm.); and on Santa Catalina Island (Collins and Martin, 1985; Williams, 1983). For the majority of the species included here, however, there have been no recent, detailed, field studies undertaken.

Letters and questionnaires seeking information on potentially threatened taxa of mammals were sent to all members of the American Society of

Mammalogists with mailing addresses in California, and to other, selected persons in state and federal agencies, colleges and universities, and natural history museums. Approximately 500 persons were contacted in this manner. Sixteen persons responded to the request for information, and collectively listed 16 species they believed should be investigated. Of the 16, two were species of marine mammals which were not included in this project, and four were species already with state Rare or Endangered status. All of the remainder were already on the working list. Subsequent to development of the draft report, questions regarding the status of 11 other taxa were raised by Ronald Nowak (Endangered Species Office, U.S. Fish and Wildlife Service). Little additional research was conducted on most of the latter species; reasons for excluding them and other candidate species are given in brief accounts (see section on Other Candidate Species).

Information on the distributions of species on the working lists was developed from the literature and from museum records. No attempt was made to locate all records, although literature and museum surveys were as complete as time and resources permitted. Data on historic distributions were assembled from these sources, but for most taxa no detailed field surveys had been conducted prior to wide spread human developments; thus, the historical distribution records of most species are scanty. Because the investigations included a large number of taxa, and because many museums do not catalog specimens by subspecies, it would have been unreasonable to ask personnel at most museums to furnish the required information. Instead, I visited and obtained distributional data from 13 major natural history museums and acquired information from nine others through correspondence (listed in the Appendix). Additional data from other mammal collections were obtained from the card files at the National Museum of Natural History, where for several decades early in the century the staff recorded specimens known to be housed in other museums. I also contacted several persons directly to inquire about specific taxa and human developments affecting plant communities in selected areas of California. This approach was more productive than broadcasting appeals for input. Unfortunately, however, identifying persons with the information needed was often impractical.

The species accounts in the Results section are arranged in groups by priority category and, within groups, systematically by genera, following Hall (1981). Species and subspecies are arranged alphabetically within genera. Records of distribution are listed alphabetically by county and, within counties, by locality with respect to reference point (e.g., city or physiographic feature). Localities using the same reference point are arranged by compass direction, starting with north and proceeding clockwise. Localities are listed as recorded on specimen tags and in museum catalogs or in the literature. The number of specimens, when known, and the museum of deposition or literature citation conclude each locality record. Cases where localities or identification of specimens seemed erroneous are discussed in the Remarks section.

Statements about habitat associations and population status are necessarily brief for most taxa because of lack of detailed information. Whenever possible, statements were developed primarily from information based on studies of the populations of concern rather than from studies conducted elsewhere. To extrapolate extensively from studies based on

populations outside the area of concern carries a high risk of incorrectly characterizing habitat use and population biology. Comments in the Recommendation sections are suggestions for priority actions and are neither detailed nor complete. Remarks on systematic status are intended to flag potential problems which should be considered in designing studies to elucidate the status of populations. Although neither state nor federal regulations require that a jeopardized population have unique taxonomic identity to be designated Rare, Threatened, or Endangered, the political conflict resulting from unresolved taxonomic controversies involving endangered species is best avoided whenever possible.

In interpreting and compiling the information in this report, and in assigning taxa to priority categories, my philosophy has been to give the benefit of doubt to the species under consideration. I have attempted to convey the essence of available information, but time and resources did not permit detailed field investigations or development of lengthy species accounts. A principal purpose of this report is to stimulate others with information to come forward. I have not cited all of the relevant literature for most taxa, especially reports that added no new information on the limited set of topics included in the accounts.

Scientific names for species are those listed by Jones et al. (1982) unless noted otherwise in the species accounts. Common names are from Grinnell (1933) and Williams (1979), or are ones commonly used by the Department of Fish and Game. Common names for subspecies are generally unnecessary, but, because subspecies can be accorded Threatened or Endangered status under both state and federal regulations, use of common names for subspecies is necessary in this report. Names for subspecies are from the list of Grinnell (1933), but often amended to reflect current taxonomy or to shorten needlessly long names. I coined common names or adopted those of other authors for subspecies not listed by Grinnell (1933). Scientific names for subspecies are from Hall (1981) except in cases where I disagree with his taxonomy or when more recent publications have altered his taxonomic arrangements. Departures from Hall's (1981) subspecies taxonomy are noted in the species accounts.

RESULTS

Of the species and subspecies investigated for this report, 36 warrant greatest concerns. These are listed in Table 2 in three categories: Highest, Second, and Third priorities. The definitions for these categories are based on the perceived proximity of threats of extinction. Species listed in the Highest Priority category appear to face a high probability of extinction or extirpation from their entire geographic range in California if current trends continue. Populations of species in the Second Priority category are definitely jeopardized and declining, but the threats of extinction or extirpation appear less imminent. Populations of species listed in the Third Priority category appear not to face extinction in the near future, but they are declining seriously or are otherwise highly vulnerable to extirpation because of human developments, and require special attention in land- and resource-management decisions. Some species listed in the Second and Third Priority categories are relatively rare and virtually no current data on their distributions and population status are available; when investigated in detail, some of these may be found to face greater or lesser threats. Accounts of species included in the three priority categories are presented in the following section.

Other species investigated, but considered to warrant lesser concerns are listed in the fourth group, entitled Other Candidates, beginning on page 73. Brief remarks on the probable status of these species, deleted from the final List of Concern, are included. Lack of information for some species listed is cause for concern about their status; their deletion from the final List of Concern here should not be construed as a definitive indication of their population status.

Major contributing factors in jeopardizing most species on the List of Concern are the diminishment and degradation of natural communities (Table 3 and Species Accounts). Loss of native plant communities in four regions of California present the most acute problems threatening unique (i.e., taxonomically recognized) populations of mammals: the Colorado River riparian communities; the southern California coastal basins from the San Fernando Valley southward to the Mexican boundary, including lowland grassland and desert communities and tidal marshes along the south coast; the San Joaquin Valley desert, grassland, and riparian and wetland communities; and the tidal marsh communities of San Francisco and San Pablo bays. Loss of riparian and wetland communities is no less serious elsewhere, but fewer unique taxa of mammals are threatened. In addition to loss of habitat, disturbances by humans, especially in hibernacula and maternity roosts is perceived as a serious threat to most of the species of bats. Habitat degradation and lack of information on hunter take and population dynamics for use in management are viewed as potential threats to the five species of rabbits and hares, currently designated as game species, on the List of Concern. Cutting and fragmentation and isolation of blocks of mature and old-growth conifer forests pose potential threats to two species on the List of Concern.

Potential occurrences of Species of Special Concern on lands administered by several state and federal agencies are listed in Table 4. Information in Table 4 was developed from a "Federal Public Lands Responsibility Map" of California (1:7500,000 scale; 1978) and from other sources. There is

Table 2. Mammalian species of special concern in California, listed by priority categories. See text for definitions of priority categories. Page refers to starting page of species accounts.

Table 3. Distribution, habitat, and major causes for concern for mammalian species of special concern in California. Refer to species accounts for details. CA - California; CI - Santa Cruz and Santa Rosa islands; CR - Colorado River; des. - desert; disturb. - human disturbances; GB - Great Basin steppes; Mtn. - mountains; N - north; NW - Northwest; Pt. A. - Point Arena area; Pt. R. - Point Reyes area; SB - San Bernardino; SCB - southern California coastal basins; SCM - southern California coastal marshes; SCI - Santa Catalina Island; SFB - San Francisco Bay; SJV - San Joaquin Valley; SN - Sierra Nevada; So - southern; SPB - San Pablo Bay; SV - Salinas Valley; Tr. R.- Transverse Ranges; W - west.

Species	Range	Habitat	Cause for Concern
	HIGHEST PRIORITY		
Buena Vista Lake Shrew	SJV	Wetland	Habitat loss
Suisun Shrew	SPB	Salt marsh	Habitat loss
Santa Catalina Shrew	SCI	Riparian	Habitat loss?
Salt-marsh Wandering Shrew	SFB	Salt marsh	Habitat loss
Arizona Myotis	CR	Riparian	Habitat loss, disturb.
Arizona Cave Myotis	CR	Riparian	Habitat loss, disturb.
Riparian Brush Rabbit	SJV	Riparian	Habitat loss
Point Arena Mountain Beaver	Pt. A.	Wetland	Habitat loss
Los Angeles Pocket Mouse	SCB	Grass/Des.	Habitat loss
Pacific Pocket Mouse	SCB	Grass/Des.	Habitat loss
Tipton Kangaroo Rat	SJV	Grass/Des.	Habitat loss
Colorado River Cotton Rat	CR	Riparian	Habitat loss
Yuma Mountain Lion	CR	Riparian	Habitat loss
	SECOND PRIORITY		
So. California Salt-marsh Shrew	SCM	Salt Marsh	Habitat loss
California Leaf-nosed Bat	So CA	Grass/Des.	Habitat loss, disturb.
Townsend's Big-eared Bat	CA	Various	Disturb.
Pocketed Free-tailed Bat	So CA	?	Disturb.?
California Mastiff Bat	W CA	Widespread	Disturb., pesticides?
Salinas Pocket Mouse	SV	Grassland	Habitat loss
White-eared Pocket Mouse	SB Mtn.	?	Habitat loss?
So. Marsh Harvest Mouse	SCM	Salt marsh	Habitat loss
Riparian Woodrat	SJV	Riparian	Habitat loss
White-footed Vole	NW CA	Riparian?	Habitat loss?
Point Reyes Jumping Mouse	Pt. R.	Wetland	Habitat loss
	THIRD PRIORITY		
Big Free-tailed Bat	So. CA	?	Disturb.?
Pygmy Rabbit	GB	Sagebrush	Habitat loss
Oregon Snowshoe Hare	NE CA	Thickets	Habitat loss
Sierra Nevada Snowshoe Hare	SN	Thickets	Habitat loss
Western White-tailed Hare	GB SN	Grassland	Habitat loss
Point Reyes Mountain Beaver	Pt. R.	Wetland	Habitat loss
Tehachapi Pocket Mouse	Tr. Mt.	Grass/Des.	Habitat loss
Short-nosed Kangaroo Rat	SJV	Grass/Des.	Habitat loss
Red Tree Vole	NW CA	Fir	Habitat loss
Pacific Fisher	N CA	Conifer	Habitat loss, disturb.
American Badger	W CA	All	Habitat loss, taking
Channel Islands Spotted Skunk	CI	?	?

no similar, pictorial summary of state-managed lands nor a central source of information on state-owned lands. Thus, only lands managed by the California Departments of Fish and Game and Parks and Recreation are included. Information displayed in Table 4 should not be construed as indicating non-occurrence on lands administered by other governmental agencies or that other Species of Concern do not occur on lands administered by these agencies.

Table 4. Occurrence of Mammalian Species of Special Concern in California on lands administered by selected state and federal agencies. BLM - U.S. Bureau of Land Management (Dept. of Interior); CPR - Calif. Dept. of Parks and Recreation; DFG - Calif. Dept. of Fish and Game; DD - U.S. Department of Defense; DE - U.S. Department of Energy; FS - U.S. Forest Service (Dept. of Agriculture); FWS - U.S. Fish and Wildlife Service (Dept. of Interior); NPS - U.S. National Park Service (Dept. of Interior). See Table 2 for scientific names.

Species	CPR	DFG	BLM	DD	DE	FS	FWS	NPS
			HIGHEST PRIORITY					
Buena Vista Lake Shrew	X		X		X		X	
Suisun Shrew	X	X		X			X	
Santa Catalina Shrew								
Salt-marsh Wandering Shrew	X	X					X	
Arizona Myotis	X		X				X	
Arizona Cave Myotis	X		X				X	
Riparian Brush Rabbit	X			X				
Point Arena Mountain Beaver	X		X	X				
Los Angeles Pocket Mouse		X	X	X				
Pacific Pocket Mouse	X			X				
Tipton Kangaroo Rat	X	X	X	X			X	
Colorado River Cotton Rat	?		X				X	
Yuma Mountain Lion	X		X	X		X	X	X
			SECOND PRIORITY					
So. California Salt-marsh Shrew	X	X		X			X	
California Leaf-nosed Bat	X	X	X	X			X	X
Townsend's Big-eared Bat		X	X	X	X	X	X	X X
Pocketed Free-tailed Bat	X	X	X			X	X	X
California Mastiff Bat	X	X	X	X	X	X	X	X
Salinas Pocket Mouse	?		X	X				
White-eared Pocket Mouse			X			X		
So. Marsh Harvest Mouse	X	X		X			X	
Riparian Woodrat	X			X				
White-footed Vole	X	X				X		X
Point Reyes Jumping Mouse	X							X
			THIRD PRIORITY					
Big Free-tailed Bat	X	X	X	X		X		
Pygmy Rabbit	X	X	X	X		X		
Oregon Snowshoe Hare	X		X			X	X	
Sierra Nevada Snowshoe Hare	X					X		X
Western White-tailed Hare	X	X	X	X		X	X	X
Pt. Reyes Mountain Beaver	X							X
Tehachapi Pocket Mouse	X		X			X		
Short-nosed Kangaroo Rat		X	X		X			
Red Tree Vole	X	?	X			X		X
Pacific Fisher	X	?	X			X		X
American Badger	X	X	X	X	X	X	X	X
Channel Islands Spotted Skunk								X

HIGHEST PRIORITY LIST

Buena Vista Lake Shrew
Sorex ornatus relictus

1932. *Sorex ornatus relictus* Grinnell, Univ. California Publ. Zool., 38:389. Type Locality: evacuated slough just outside of east side levee, Buena Vista Lake, 290 ft, Kern Co., California.

Distribution: Grinnell (1933) speculated that Buena Vista Lake Shrews once occupied the marshlands of the San Joaquin Valley floor throughout most of the Tulare Basin. He noted that by 1933, their range was much restricted because of the disappearance of lakes and sloughs.

Populations Status: Nothing is known about the current population status of the Buena Vista Lake Shrew. Nearly all of the valley floor in the Tulare Basin is now cultivated. Most of the lakes and marshes have been drained and are also cultivated. All of the Buena Vista Lake bed is cultivated, and most of the canals in the area are steep-sided and kept free of vegetation by use of herbicides. Ornate shrews (*Sorex ornatus*) may be extant in places such as the Kern National Wildlife Refuge, in wetlands of the Kern River percolation area, and along sloughs and canals on the valley floor leading into Goose Lake, although there are no records of shrews from any of these areas. Any extant populations found within the Tulare Basin may or may not be representative of *S. o. relictus*. Clark et al. (1982) used pitfall traps in an unsuccessful attempt to capture Buena Vista Lake Shrews on The Nature Conservancy Paine Wildflower Preserve and the Voice of America transmitter site west of Delano.

Habitat: Buena Vista Lake Shrews occupied marshes on the perimeter of Lake Buena Vista (Grinnell, 1932). Farther north, in the San Joaquin Basin, Ornate Shrews live in dense vegetation along streams and sloughs and around the perimeter of tule marshes (unpub. data). Presumably, Buena Vista Lake Shrews occurred in similar wetlands in the Tulare Basin.

Recommendations: A survey for Buena Vista Lake Shrews should be undertaken to establish its distribution and population status and to identify potential threats to remaining populations. Initial efforts should be concentrated around the Buena Vista Lake Aquatic Recreation Area (Lake Webb and Lake Evans), on the Kern National Wildlife Refuge, the Tule Elk Reserve, and along Buena Vista and Goose Lake sloughs. Pitfall traps are most effective for shrews (Williams and Braun, 1983), and can be left in place for extended times offsetting the extra effort required to set them.

Remarks: Nothing has been recorded on this taxon since the original description. The more upland subspecies, *S. o. ornatus*, occupies the area surrounding the range of *S. o. relictus*. Intergradation probably occurred along the lower courses of the streams entering the floor of the Tulare Basin.

Distribution Records: KERN CO.: N side Buena Vista Lake, 1 (USNM); east side levee, 298 ft, Buena Vista Lake, 290 ft, 3 (MVZ); Buttonwillow, 1 (CAS).

Suisun Shrew
Sorex ornatus sinuosus

1913. *Sorex sinuosus* Grinnell, Univ. California Publ. Zool., 10:181.
Type Locality: Grizzly Island, Suisun Bay, Solano Co., California.
1979. *Sorex ornatus sinuosus* , Williams, Ann. Carnegie Mus., 48:426.

Distribution: According to Rudd (1955a), Suisun Shrews occur in the tidal marshes of the northern shores of San Pablo and Suisun bays, as far east as Grizzly Island and as far west as the mouth of Petaluma Creek. Brown and Rudd (1981), however, redefined the western boundary of the range as Sonoma Creek and Tubbs Island. Shrews living in the marshes as far east as Collinsville represent *S. o. californicus* (Williams, 1983).

Populations Status: At one time, San Pablo and Suisun bays were lined with salt and brackish water marshes, but today marshes are broken into several small, isolated units. The marshes of Suisun Bay are the most extensive, but Suisun Shrew populations there may be threatened in part by management of the marshes to favor growth of *Scirpus*. Present habitat is much less extensive in San Pablo Bay. Very few of the extant tidal marshes have a full profile of marshland vegetation, and few border on significant upland areas where marshland species can seek refuge from flooding. Suisun Shrews inhabit a smaller area and are more restricted in the habitats they occupy than are Salt Marsh Harvest Mice, an Endangered Species.

The population status of *S. o. sinuosus* was investigated during spring and summer, 1983, following a winter of record flooding in the marshes of San Pablo and Suisun bays (Williams, 1983). No live Suisun Shrews were captured on any of 34 transects in marshes throughout the geographic range of *S. o. sinuosus*. One dead shrew was found, however. Subsequent surveys with Sherman live traps found one Suisun shrew in a marsh on the northern perimeter of Suisun Bay in 1985 (K. Ford, pers. comm.). The principal problem in both areas, but most acute in San Pablo Bay, is the lack of upland areas continuous with the marshes where Suisun Shrews and other terrestrial animals can refuge during times of flooding (Williams, 1983). Management of the marshes has not included refuges from flooding as a required element.

Habitat: Suisun Shrews typically inhabit tidal marshes characterized in order of decreasing tolerance to inundation, by *Spartina foliosa*, *Salicornia ambigua*, and *Grindelia cuneifolia*, and brackish marshes dominated by *Scirpus californicus* and *Typha latifolia* (Rudd, 1955a). They appear to require dense, low-lying cover where invertebrates are abundant. Rudd stated that structure ("growth form") of the plant community, not species composition, was the determining factor in shrew occupancy. Driftwood and other litter above the mean high-tide line is probably essential for nesting and foraging sites. Upland habitats, continuous with the marshlands, offering sufficient cover and sources of food to sustain shrews during prolonged flooding of marshes and dikes, such as occurred during the winter of 1982-83, are also probably essential (Williams, 1983).

Recommendations: When the results of additional population surveys for Suisun Shrews are completed (U.S. Fish and Wildlife Service, in litt.),

marshland management practices and plans should be reviewed to determine their impact on populations of Suisun Shrews. Acquisition of upland areas for refuge from flooding, or creation of refuge sites on dikes above flood level will probably be required to provide suitable habitat for Suisun Shrews and other small mammals inhabiting the tidal marshes.

Remarks: Rudd (1955a) analyzed structural characters of Sorex ornatus-group shrews from the San Pablo and Suisun bays area and determined that shrews of the sinuosus type were recognizably distinct from S. o. californicus, but that spatially intermediate populations exhibited some intermediate characteristics. He thought that because the character gradients were rather abrupt, recognition of sinuosus as a species was justified. Brown (1971, and unpubl. dissert., 1970) found that S. ornatus and S. sinuosus had identical karyotypes, which differed from S. vagrans of the San Francisco Bay area. Karyotypes of shrews from populations previously thought to be S. v. vagrans or hybrids of vagrans, ornatus and sinuosus were shown to be identical to the ornatus-sinuosus karyotype. Brown and Rudd (1981) investigated the relationships of these shrews further, determining that sinuosus was best treated as a subspecies of S. ornatus, and restricting the distribution of sinuosus to an area approximately east of Sonoma Creek, but including Tubbs Island within the range of sinuosus.

The disposition of specimens referred to by Rudd (1955a) is not clear. Some of these are in the Museum of Vertebrate Zoology and others are in the collections at the University of California Davis. Differences in the locality descriptions on the specimen labels and in Rudd's (1955a) paper and differences in total numbers of specimens made it difficult to decide if these referred to the same specimens. Several specimens in museums, collected in marshes in San Pablo Bay in Sonoma County are designated as S. sinuosus, but are now considered to be S. o. californicus. Two specimens in the Museum of Vertebrate Zoology from "Solano County; Lake Chabot (seepage area below dam)" were assigned to the subspecies S. o. sinuosus. Lake Chabot is located on a golf course, west of the Solano Co. Fairgrounds. These specmiens may be S. o. californicus or S. o. sinuosus; they are not listed below.

Distribution Records: SOLANO CO.: 0.5 mi NE Cordelia Salt Marsh, 5 (MVZ); Gray Goose Duck Club, 1.5 mi SW Suisun, 1 (CAS); Grizzly Island, Suisun Bay, 1 (LACM), 20 (MVZ), 5 (UDAV), 2 (USNM), 19 (Rudd, 1955a); Grizzly Island, State Dept. of Fish and Game headquarters, 1 (CSCS); Honker Gun Club, near Dutton, Van Sickle Island, 1 (CAS); 3 mi E Mare Island Bridge, adjacent to White Slough and Hwy. 37, 1 (MVZ); 2.7 mi W jct. Napa Road and Hwy. 37 (on 37), 1 (MVZ); 8 mi N Rio Vista, 80 ft, 1 (CSUF); Sears Point Road, 6 mi NW Vallejo, 65 (MVZ); Sears Point Road, 8 mi NW Vallejo, 7 (MVZ); Sears Point Road, San Pablo Bay, 47 (Rudd, 1955a); South Hampton Bay, near Solano Co. public dump, 15 (MVZ); South Hampton Bay, 13 (Rudd, 1955a); Suisun City, salt marsh adjacent to Cordelia St., 4 (MVZ); Suisun marshes, periphery of Grizzly Island, 13 (Rudd, 1955a); 3 mi NW Vallejo, 1 (UDAV); Van Sickle Island, 1 mi S Dutton, 1 (CAS); Van Sickle Island, 1 (CAS), 3 (UDAV).

Santa Catalina Shrew
Sorex ornatus willetti

1941. Sorex willetti von Bloeker, Bull. So. California Acad. Sci., 40:163. Type Locality: Avalon Canyon, Santa Catalina Island, Los Angeles Co., California.
1967. Sorex ornatus willetti, von Bloeker, Proc. Symposium Biol. California Islands, p. 246.

Distribution: Santa Catalina Shrews are known only from Santa Catalina Island, Los Angeles California (Williams, 1983). The localities for the specimens and three sight records collectively span the length of the island (Collins and Martin, 1985; Williams, 1983).

Population Status: Only a single Santa Catalina Shrew was captured in a survey during January, 1983 employing pitfalls on 22 10-trap transects distributed in all major plant communities on the island (Williams, 1983). A subsequent survey, during summer, 1985, employing pitfalls on 25 10-trap transects failed to capture any additional shrews (Collins and Martin, 1985). Williams believed that the Santa Catalina Shrew might have been on the verge of extinction. Degradation of woodland, riparian, and wetland communities by introduced ungulates, especially sheep, cattle, feral goats, and wild pigs, and further degradation of these communities by diversion of water from springs and streams to the urbanized areas on the island probably were factors contributing to the scarcity of shrews. Another important factor was probably the marginal suitability of the island communities for shrews. Santa Catalina Island contains only a few small, degraded riparian communities and wetlands. Another important element threatening shrews was the high density of feral cats on the island.

Although most of the island is being managed by the Santa Catalina Island Conservancy with the objective of preserving the native biota, the Conservancy presently derives significant income from commercial hunting of wild pigs, goats, and deer, and sale of some bison. Free roaming ungulates on the island are the major threat to its native biota and a potential source of irreconcilable conflict of management objectives. These ungulates and introduced blackbuck (Antilope cervicapra) are noticeably degrading some natural plant communities and preventing others from recovering from damage caused when densities of domestic and feral ungulates were greater. Wild pigs are causing the most apparent damage in wetlands and streamside communities and on wooded slopes with deep layers of leaf litter: areas likely to be of major importance to shrews. Additional serious threats stem from the growing human resident and transient populations on the island where potable water supplies are already overtaxed. Diversion of increasing amounts of fresh water for human use will probably result in additional degradation of the already damaged riparian systems on the island.

Habitat: Although on the mainland, Ornate Shrews are often captured in upland plant associations such as coastal sagebrush and chaparral, their precise habitat requirements are unknown, and it has not been shown that communities such as these are important to breeding populations. Over most of their range in California, Ornate Shrews are most abundant in riparian and wetland communities (Collins and Martin, 1985; Owen and

Hoffmann, 1983; Williams, 1983). The only specimen of S. o. willetti trapped was taken in a tangle of driftwood and woody roots a few feet above a creek bed; riparian vegetation was poorly developed along that portion of the creek (Williams, 1983).

Recommendations: Two recent surveys for Santa Catalina Shrews have shown the extreme rarity of this insular population, but have failed to delineate critical elements of the biotic communities that must be protected in order to ensure survival of Santa Catalina Shrews. Thus, any activities taken to help protect the population possibly could have the opposite effect. Specific actions to enhance habitat for shrews on the island should only be made after obtaining results from detailed studies of Ornate Shrews on the mainland in similar communities with a similar climate. Studies should be designed to provide information needed in determining the best course of action to enhance the chances of survival of Santa Catalina Shrews. Regardless of these studies, however, preserving wetland and riparian systems should be given high priority in management of the island. Elimination of all ungulates, starting with wild pigs, feral goats, and bison would remove the greatest sources of damage to plant communities on the island. An intensive campaign to reduce the size of the population of feral cats would alleviate some pressure on shrews, but both the practicality of such a campaign and its importance in protecting shrews is in doubt.

The possibility that insular populations of Ornate Shrews occur on Santa Cruz, Santa Rosa, San Miguel, and/or San Clemente islands should not be overlooked (von Bloeker, 1967; Walker, 1980).

Remarks: The Santa Catalina Shrew was described as a species, but later was relegated to subspecific status under Sorex ornatus (von Bloeker, 1967). It differs from mainland shrews of the ornatus group in being larger and somewhat darker in color dorsally, with lighter-colored underparts. Present data are insufficient to determine the degree of relationship between Ornate and Santa Catalina Shrews, although available evidence supports treating it as a subspecies of S. ornatus (unpubl. data). A single, subfossil cranium of Sorex was found among midden remains in a rock fissure on the coast of San Miguel Island, Santa Barbara Co. (Walker, 1980). This specimen appeared to be structurally similar to S. o. willetti, according to Walker (1980).

Anecdotal accounts of sight records of Santa Catalina Shrews by residents of the island are: Middle Canyon W of Thompson Dam (Williams, 1983); Bunk House at Middle Ranch, Middle Canyon; and Road to west end, 0.2 mi W Isthmus Dump (Collins and Martin, 1985).

Distribution Records: LOS ANGELES CO.: Avalon Canyon, Santa Catalina Island, 1 (LACM); 0.1 mi W Cottonwood Reservoir, Cottonwood Canyon, 76 m, 1 (CM).

Salt Marsh Wandering Shrew
Sorex vagrans halicoetes

1913. Sorex halicoetes Grinnell, Univ. California Publ. Zool., 10:183. Type Locality: salt marsh near Palo Alto, Santa Clara Co., California.

1928. Sorex vagrans halicoetes , Jackson, N. Amer. Fauna, 51:108.

Distribution: Sorex v. halicoetes is limited to the salt marshes of the south arm of San Francisco Bay (Findley, 1955).

Populations Status: Johnston and Rudd (1957) reported fluctuations in relative numbers between 1951 and 1955, based upon numbers of active nests found. They determined that Salt Marsh Wandering Shrews represented about 10% of the small mammal community of the marshes and were less abundant than Mus musculus, Reithrodontomys raviventris, Rattus norvegicus, and Microtus californicus.

Most of the once-extensive salt marshes of San Francisco Bay have been lost by human developments. The extent of remaining habitat for these shrews is small. Because they use only a limited area within the marshes, there is less habitat for them than for Salt Marsh Harvest Mice. Therefore, S. v. halicoetes may be under greater threats of extinction than the Endangered Salt Marsh Harvest Mice. Ford (1986) found 16 live Salt Marsh Wandering Shrews in a popualtion survey of marshes in San Francisco Bay during 1985. He recommended federal Endangered Species status for S. v. halicoetes.

Habitat: Johnston and Rudd (1957) provided a detailed sketch of the habitat of Salt Marsh Wandering Shrews. The shrews frequented areas in tidal marshes that provide dense cover, abundant food (primarily invertebrates), suitable nesting sites, and fairly continuous ground moisture. Their center of activity was in the "medium high marsh," about 6 to 8 ft above sea level, and in lower-lying marsh not regularly inundated. Suitable sites were characterized by abundant driftwood and other debris scattered among Salicornia. The Salicornia was usually 1 to 2 ft tall. The detritus preserved moisture and offered refuge in dry periods to amphipods, isopods, and other invertebrates, and resting sites for shrews. Nesting material consisted of plant parts, primarily Spartina duff. The higher-lying marsh, 8 to 9 ft in elevation, was too dry and offered only minimal cover — few or no shrews occupied this zone. The lower zone, dominated by Spartina, was subjected to daily tidal floods and had cover too sparse for shrews.

Recommendations: Any planned developments or activities that would modify marsh vegetation and degree of inundation with the range of the Salt Marsh Wandering Shrew should be reviewed to determine impact on this species. The feasibility of modification of extant marshes to enhance suitability for Salt Marsh Wandering Shrews, Salt Marsh Harvest Mice, and other jeopardized species should be investigated.

Remarks: The taxonomy of the Sorex vagrans species group has had a complex and confusing history and additional changes in scientific names will probably be required when relationships among populations are finally resolved (Findley, 1955; Hennings and Hoffmann, 1977; Rudd, 1955a). There appears to be no controversy about the taxonomic status of the halicoetes population, however. Brown (1974) found that the karyotype of one Salt Marsh Wandering Shrew was similar to those of three specimens of S. v. vagrans from the northern part of the San Francisco Bay region. These karyotypes were most similar to S. vagrans from areas farther north in California and Oregon. Eight specimens identified as S. v. halicoetes in

the collection of the California Academy of Sciences, captured from Inverness, Marin Co., are, in my opinion, S. v. sonomae.

Rudd (1955b) compared ages, sexes, and weights of S. v. vagrans, S. v. paludivagus, S. ornatus californicus, and S. o. sinuosus. Methods of distinguishing Salt Marsh Wandering Shrews from Ornate Shrews were given in Hennings and Hoffmann (1977) and Junge and Hoffmann (1981). The report by Ford (1986) was completed too late to include details here, but is the most complete account of the distribution and current population status of S. v. halicoetes.

Distribution Records: ALAMEDA CO.: 1 mi N bay Farm Island, Melrose Marsh, 1 (MVZ); Berkeley, 1 (USNM); Dumbarton Point, 1 (KU); Elmhurst, 4 (MVZ); Hayward, 1 (MVZ); Hayward Landing, end of Russell City Road, 6 (MVZ); Melrose, 1 ((MVZ); 1 mi NW Newark, 1 (MVZ); Oakland airport, 1 (MVZ); S side Oakland Airport, 12 (MVZ); West Berkeley, 1 (USNM). CONTRA COSTA CO.: Giant (Atlas Powder Co. salt marsh), 1 (MVZ); 3 mi NE Oakley, E side Grizzly Island, 1 (MVZ); mouth San Pablo Creek, 1 (MVZ); San Pablo Creek Salt Marsh, 29 (MVZ); San Pablo Marsh, Richmond (Johnston and Rudd, 1957); salt marsh, 3 mi N Richmond, 1 (CM); salt marsh, 4 mi N Richmond, 1 (CM). SAN FRANCISCO CO.: Lake Merced, 1 (CAS); San Francisco, 4 (CAS), 1 (MVZ), Presidio, San Francisco, 1 (CAS). SAN MATEO CO.: no specific locality, 1 (MVZ); Belmont, 1 (MVZ), 2 (USNM); 0.9 mi NE Coloma, 17 (CAS); 0.5 mi S Chinese Cemetery, Coloma, 1 (CAS); Coloma, 1 (CAS); W approach Dumbarton Bridge, 3 (MVZ); Juncitas, 1 (SDSNH); Menlo Park, 1 (SDSNH); Pacifica, 0.25 mi E Westview, 1 (CAS); Palo Alto, 2 (LACM); adjacent to Palo alto Yacht Harbor, 1 (UDAV); San Mateo, 2 (USNM); Redwood City, 1 (LACM), 3 (MVZ), 23 (SDSNH); Woodside, 1 (SDSNH). SANTA CLARA CO.: 1.75 mi NE Alviso, 79 (MVZ); Los Esteros Road, 0.5 mi NE Alviso (salt marsh), 20 (MVZ); 1 mi SSW Alviso (salt marsh), 3 (MVZ); county line between Santa Clara and San Mateo counties, on bay between Palo Alto and Redwood City, 2 (CM); Palo Alto, 7 (MVZ), 3 (USNM).

Arizona Myotis
Myotis lucifugus occultus

1909. Myotis occultus Hollister, Proc. Biol. Soc. Washington, 22:43. Type Locality: west side Colorado River, 10 mi above Needles, San Bernardino Co., California.
1967. Myotis lucifugus occultus, Findley and Jones, J. Mamm., 48:443.

Distribution: Arizona Myotis occur from southeastern California and Sonora, Mexico, to western Chihuahua, Mexico, and northward in Arizona and western New Mexico (Fenton and Barclay, 1980; Hall, 1981). In California, the Arizona Myotis occurs only along the Colorado River lowlands and in the adjacent desert mountain ranges.

Populations Status: Populations of M. lucifugus have drastically declined in numbers in many parts of its range. Fenton and Barclay (1980) attributed declines, in part, to the use of pesticides, control measures in nursery colonies, collecting of bats by researchers, and disturbance of hibernating individuals. They underscored the importance in disturbances of hibernating bats, noting that it causes bats to lose weight, thus decreasing their chances of survival. Judging from incidental accounts,

Arizona Myotis were formerly common along the Colorado River. More recent observations suggest that this population has declined drastically (K. Stager, P. Leitner, pers. comm.). Arizona Myotis, like many other bats, may be sensitive to disturbances in their maternity roosts too. Many females fail to return to maternity colonies in years subsequent to disturbances by humans. They may abandon a colony prematurely, just after the young have learned to fly, but before than have learned to capture insects. This could lower recruitment into the population. Stream channelization and loss of the riparian vegetation may also be factors in the decline of M. l. occultus in California. Pesticide use in agricultural areas along the lower Colorado River and elsewhere could be a contributing factor in the decline (Fenton and Barclay, 1980; Geluso et al., 1976).

Habitat: Both Hollister (1909) and Grinnell (1914) shot Arizona Myotis flying among Cottonwood trees on the floodplain of the Colorado River. Others were collected by Grinnell "over water in a back eddy of the river." Stager (1943) found one Arizona Myotis about 100 ft in from the entrance of a large copper mine in the Riverside Mountains, in the northeastern corner of Riverside County. He also collected individuals from a maternity colony of about 800 bats, located on the underside of a bridge near Blythe. Although M. l. occultus is known only from the low desert along the Colorado River in California, it is most commonly associated with pine forests at elevations from 6000 to 9000 ft in other parts of its range (Barbour and Davis, 1969).

In most areas, roosts of Arizona Myotis have been found beneath bridges and in attics of buildings (Barbour and Davis, 1969). Arizona Myotis probably also use hollows in trees and protected crevices in rocks for roosts. Stager's (1943) record is the only known occurrence in a mine or cave.

Arizona Myotis may migrate out of California to spend the autumn and winter elsewhere, or they may make more local migrations to suitable hibernacula. The earliest and latest records of occurrence in California are 30 April and 16 August, respectively (Stager, 1943).

Recommendations: Highest priority should be given to locating populations, especially maternity colonies, and obtaining estimates of colony size. The most critical need is to establish a data base on population size so that future trends can be more reliably monitored. Where Arizona Myotis may pose a public health problem or a nuisance, exclusion or non-lethal aversion devices should be the only control methods allowed (Barclay et al., 1980; Constantine, 1979).

Remarks: Earlier, I (Williams, 1979) recognized occultus as a species despite evidence presented by Findley and Jones (1967) and Barbour and Davis (1970) indicating interbreeding in an area in New Mexico and southern Colorado between M. lucifugus and occultus. My decision was based on the results of a phenetic analysis of the genus Myotis (Findley, 1972) that suggested that occultus and M. l. carissima (the taxon with which occultus was thought to interbreed) were best place in different species groups. Clearly, genetic studies are needed to resolve these conflicting findings. In the meantime, however, it seems best to follow

Findley and Jones (1967) in treating occultus as a subspecies of M. lucifugus.

Distribution Records: IMPERIAL CO.: Potholes, 1 (SDSNH); 4 mi S Potholes, Colorado River, 1 (MVZ); 5 mi NE Yuma, 1 (KU), 4 (MVZ). RIVERSIDE CO.: Blythe, 6 (CM), 59 (LACM), 1 (MVZ); Ft. Yuma, 3 (CAS); Ripley, 5 mi S Blythe, 3 (LACM); Riverside Mountains, 1 (LACM). SAN BERNARDINO CO.: 10 mi N Needles, 2 (USNM).

Arizona Cave Myotis
Myotis velifer velifer

1890. Vespertilio velifer J. A. Allen, Bull. Amer. Mus. Nat. Hist., 3:177. Type Locality: Santa Cruz del Valle, Guadalajara, Jalisco, Mexico.
1897. Myotis velifer, Miller, N. Amer. Fauna, 13:56.

Distribution: M. velifer velifer is found from extreme southeastern California eastward to western New Mexico and southward to Guatemala. In California, it is known only from the lowlands of the Colorado River and adjacent desert mountain ranges (Vaughan, 1959).

Population Status: Vaughan (1959) found large colonies, each containing approximately 1000 individuals, in several mine tunnels in the Riverside Mountains of Riverside and San Bernardino counties. More recent observations in the area (P. Brown, in litt.), suggest a significant decline in population size. Mines previously occupied now have few bats. The extent of decline and its causes are speculative. Loss of riparian habitat for foraging could be a principal factor, together with human disturbances of colonies. Renewed mining activities and casual exploration of caves and mines by rock collectors and sight-seers may be major sources of disturbances. Use of pesticides might have contributed to the decline by reducing abundance of insects and by poisoning bats.

Habitat: Cave Myotis are habitual cave dwellers and are highly colonial. They inhabit arid zones in the southwestern United States. During the season of reproduction, in spring and summer, they form large colonies in warm caves and mines and less often in buildings and other structures (Barbour and Davis, 1969). In California, they have been found in an old storehouse (Grinnell, 1914) and in mine tunnels (Stager, 1939; Vaughan, 1959). In large portions of their range they are typically associated with Brazilian Free-tailed Bats (Tadarida brasiliensis). Vaughan (1959) noted that Cave Myotis used a variety of temporary roosts: buildings, caves, and mine tunnels.

Vaughan (1959) found that in the vicinity of the Riverside Mountains, Cave Myotis foraged primarily over the floodplain of the Colorado River. He found that they maintained regular foraging paths "over low vegetation, along the files of dense vegetation that line the oxbows and main channel of the river, between the scattered thick patches of vegetation that dot the floodplain, or above bodies of water." He noted that the dense, linear stands of Mesquite, Tamarisk, and Catclaw Acacia bordering still water of oxbow ponds seemed to constitute optimal foraging habitat. Most foraging bats were observed between about 6 and 15 ft above the ground,

primarily close to vegetation. Kunz (1974) found that most individuals from large colonies in south-central Kansas dispersed nightly for considerable distances to feed. Insects of a variety of orders were consumed; beetles (Coleoptera) comprised the single largest class (Kunz, 1974).

In parts of their geographic range, especially in Kansas, Oklahoma, and Texas, Cave Myotis hibernate in winter (Twente, 1955). M. v. incautus may be quite different in its life history from M. v. velifer, however (Hayward, 1970). Stager (1939) did not find Cave Myotis in California during winter and early spring. He believed that they were only in California from May to October. They probably migrate into Mexico, but this has not been established.

Recommendations: Information pertaining to location and size of extant colonies is needed. Most colonies will probably be located in caves and mines, but buildings may contain some colonies. Data on population size are essential for assessing future trends and making management decisions. Colonies of Cave Myotis located in mines that are to be reactivated will likely abandon the sites as disturbances increase in frequency. Because the bats will most likely leave a roost in autumn, the best time to bat-proof structures is during the winter months, November to March (Constantine, 1979).

Agency biologists working in the southeastern California desert area must be able to identify Myotis velifer. They should be familiar with the situation outlined here, and be aware of the sensitivity of colonies to disturbances. They should be instructed in methods of estimating population size and techniques of non-lethal control of bats in human-made structures (Barclay et al., 1980; Constantine, 1979). Public health, law enforcement, and agricultural officials should refer all reports of bats and all requests for information on eradication of bats to the Department of Health Services, Veterinary Unit in Berkeley.

Remarks: Dr. Patricia Brown (in litt.) has monitored a population of M. velifer in a mine in the Whipple Mountains since 1968. This population declined in size by over 50% between about 1960 and 1980. The decline was at least partly the result of vandals entering the mine and killing several bats. A gradual decrease in numbers has continued since that incident, however.

Hayward (1970) determined that M. v. brevis Vaughan, 1954, was not recognizably distinct from M. v. velifer. Hall (1981) did not cite Hayward's (1970) paper.

Distribution Records: IMPERIAL CO.: 4 mi S Potholes, 1 (MVZ); 5 mi NE Yuma, 5 (MVZ). RIVERSIDE CO.: Alice Mine, Riverside Mountains, 56 (LACM); Dollar Mine, 5.5 mi S, 0.6 mi E Vidal, 1 (CSLB); Mountaineer Mine, 5.5 mi S, 0.6 mi E Vidal, 750 ft, 1 (MVZ); Mule Mountains (P. Brown, in litt.); Riverside Mountains, 35 mi N Blythe, 81 (Vaughan, 1959); Riverside Mountains, NE corner of county, 1 (MVZ); Riverside Mountains, 6 mi S Vidal, 8 (MVZ); Riverside Mountains, 7 mi S Vidal, 10 (MVZ). SAN BERNARDINO CO.: Needles, 3 (MVZ); W side river, above Needles, 2 (USNM); Whipple Mountains (P. Brown, in litt.).

Riparian Brush Rabbit
Sylvilagus bachmani riparius

1935. Sylvilagus bachmani riparius Orr, Proc. Biol Soc. Washington, 48:29.
Type Locality: 2 mi NE Vernalis, Stanislaus Co., California.

Distribution: Orr (1940) collected specimens from a single locality along the west side of the San Joaquin River in northern Stanislaus County. He also observed, but did not collect, Riparian Brush Rabbits in adjacent San Joaquin County. Orr (1940) believed that the range of S. b. riparius extended along the San Joaquin River from Stanislaus County to the Delta region. The only presently known population is found on the lower Stanislaus River in Caswell State Park; there are probably other, tiny colonies between Caswell State Park and the confluence of the Stanislaus and San Joaquin rivers (Glenn Basey, in litt.).

Population Status: Only one moderate-sized population is known to be extant within Caswell State Park, San Joaquin County (G. Basey, in litt.). This population, which numbers perhaps less than 100 individuals at the start of the breeding season, was adversely affected by clearing and burning of brush in the Park in winter of 1984-85. Further development of recreation facilities in the Park and continuing brush clearing for fuel control pose significant threats to this population. Elsewhere between Caswell State Park and the San Joaquin River, Basey (in litt.) found only inconclusive evidence of tiny, scattered populations. Use of most of the property in the floodplain of the lower Stanislaus River is restricted by wildlife easements obtained as mitigation for loss of wildlife habitat as a result of construction of New Melones Dam. The Army Corps of Engineers is the administering agency for the easements. In his surveys, Basey (in litt.) found these wildlife areas were being used for rifle ranges, livestock grazing, off-road vehicle recreation, and other activities. Although Basey's studies are still in progress, activities such as these probably compound the threats to remaining populations of Riparian Brush Rabbits.

The Army Corps of Engineers is preparing to clear much of the brush and trees from within the lower San Joaquin River floodplain, between an area below Friant Dam, Fresno Co., and the delta in San Joaquin Co. (U.S. Fish and Wildlife Service, in litt.). Although no extant populations of Riparian Brush Rabbits have been found yet along the San Joaquin River, these activities pose a substantial threat to any remaining populations there and will virtually preclude reestablishment of populations in the future.

The major threat to remaining populations may stem from annual flooding. All land bordering the diked floodplains of the lower San Joaquin and Stanislaus rivers is cultivated or otherwise developed. In most areas, much or all of the woody vegetation has been removed for control of stream flow and to enhance growth of herbaceous plants for livestock grazing. In times of severe flooding, such as in the winters of 1979-80, 1982-83, and 1985-86, nearly all habitat available to Riparian Brush Rabbits is inundated. Animals living in the floodplain are forced to shelter on dikes or in areas lacking adequate cover, exposing them to increased predation and cold, wet weather. A single, severe episode of flooding, only slightly worse than was witnessed during March, 1986, could possibly

cause the extinction of remaining populations.

The Riparian Brush Rabbit is currently designated a Resident Small Game species and may be hunted. Although the effect of hunting on populations of Brush Rabbits, in general, are probably insignificant, hunting might easily extirpate most of the small, scattered populations of Riparian Brush Rabbits outside of Caswell State Park.

Habitat: In general, brush rabbits are associated with chaparral or other types of dense brush (Chapman, 1974). Riparian Brush Rabbits occupy dense thickets of Wild Rose (Rosa sp.), Willows (Salix spp.), and Blackberries (Rubus sp.) growing along the banks of the river. Orr (1940) never observed Riparian Brush Rabbits in loose brush or in open fields. Studies by Glenn Basey (in litt.) indicated that, in summer when herbaceous plants were largest and provided densest cover, Riparian Brush Rabbits used weedy fields and clearings adjacent to patches of shrubs. These areas of herbaceous vegetation were not entered in autumn and winter when the plants were dead and cover was minimal or absent. Basey (in litt.) found that patches of herbaceous growth at the immediate edge (within less than a meter) of shrubs were important sources of food.

Distribution Records: SAN JOAQUIN CO.: Caswell State Park, 2 (CSCS); San Joaquin River, extreme southern part of county (Orr, 1935). STANISLAUS CO.: Kincaid's Ranch, 2 mi NE Vernalis, W side San Joaquin River, 2 (CAS), 3 (MVZ).

Point Arena Mountain Beaver
Aplodontia rufa nigra

1914. Aplodontia nigra Taylor, Univ. California Publ. Zool., 12:297.
Type Locality: Point Arena, Mendocino Co., California.
1918. Aplodontia rufa nigra, Taylor, Univ. California Publ. Zool., 17:479.

Distribution: Aplodontia rufa nigra is known only from the vicinity of Point Arena, Mendocino County. According to Taylor (1918), it originally occupied a total area of about 24 square miles. Camp (1918) stated that known colonies extended from the town of Point Arena to Alder Creek, 7.5 miles north of town.

Population Status: An investigation of the status of the Point Arena Mountain Beaver by Dale Steele is presently in progress (U.S. Fish and Wildlife Serv., in litt.). Some populations are threatened by housing developments and others are small and apparently vulnerable to any event that would alter the character of their habitat. The restricted distribution of this population and the fact that Mountain Beavers are often heavily persecuted by humans gives additional cause for concern. Logging may benefit Mountain Beavers in that logging opens up the forest and stimulates growth of deciduous trees and herbaceous plants. Urbanization generally results in the decline or local extirpation of Mountain Beavers. Home developments are likely in the range of the Point Arena Mountain Beaver.

Habitat: Specific information on the Point Arena Mountain Beaver was given by Camp (1918). Only north-facing slopes of ridges and gullies were found to be inhabited. In general, Mountain Beavers inhabit wooded regions along the Pacific Coast with abundant moisture and herbaceous plants for food. Soils must be sufficiently soft for burrowing. Mountain Beavers are generally most numerous on the slopes of ridges and gullies. They are usually associated with deciduous thickets with a tangle of undergrowth of both herbaceous and woody vegetation (Scheffer, 1929). The brushy successional stages of most coniferous communities (excepting the more arid, pine forests) provide the best habitat. Often, Mountain Beavers locate their burrows in areas of seepage springs. Some running water within their burrow systems may be required. Point Arena Mountain Beavers mostly occupy thickets of thimbleberries on north-facing slopes.

Mountain Beavers eat a great variety of herbaceous and woody plants (Scheffer, 1929). Although Mountain Beavers prefer succulent stems of herbaceous plants, little vegetation within their reach seems unacceptable for food or use in construction of nests. Generally, only the bark of woody plants is eaten, and most woody material is consumed in winter when herbaceous plants are unavailable. Mountain beavers cut a great deal of herbaceous material and leave it scattered around to dry. Much of this material spoils and is never eaten.

Recommendations: When available, the results of the field survey by Dale Steele, for the U.S. Fish and Wildlife Service, should be reviewed to determine if additional protection for this population is needed.

Remarks: This nearly black population of Mountain Beavers is apparently isolated from all others by unsuitable terrain (Hall, 1981; Taylor, 1918).

Distribution Records: MENDOCINO CO.: Point Arena, 3 (CM), 6 (MVZ); Point Arena, Christensen Ranch, 2 (MVZ); 5 mi N Point Arena, 1 (UDAV).

Los Angeles Pocket Mouse
Perognathus longimembris brevinasus

1900. *Perognathus panamintinus brevinasus* Osgood, N. Amer. Fauna, 18:30.
Type Locality: San Bernardino, San Bernardino Co., California.
1928. *Perognathus longimembris brevinasus*, Huey, Trans. San Diego Soc. Nat. Hist., 5:88.

Distribution: The geographic range of Los Angeles Pocket Mice is restricted to lower elevation grasslands and Coastal Sage associations in the Los Angeles Basin, from approximately Burbank and San Fernando on the northwest to San Bernardino on the northeast, and Cabazon, Hemet, and Aguanga on the east and southeast. Their geographic limits on the southwest are not clear, but probably lie somewhere near the Hollywood Hills.

Population Status: Data on the population status of *P. l. brevinasus* are not available. Urbanization and cultivation of the majority of the land within the interior valleys of the Los Angeles Basin have made a large percentage of its historic range uninhabitable. Stephens (1906) noted that Los Angeles Pocket Mice were usually rare, but were infrequently

abundant, probably following years of much greater than average precipitation.

Small populations probably still exist in isolated parts of the historic range of P. l. brevinasus. The extent of available habitat cannot be estimated without a better understanding of its habitat requirements.

Habitat: Nothing specific has been recorded about the habitat requirements of P. l. brevinasus. Grinnell (1933) stated that it inhabited open ground with soils composed of fine sands. Stephens (1906) remarked that he thought that Los Angeles Pocket Mice did not often dig burrows. He said that they hid under weeds and dead leaves instead. This would be unusual for any species of Perognathus should it prove to be true.

Recommendations: Field notes of persons who surveyed the available habitat of Stephens' Kangaroo Rat may include some data on recent occurrence and abundance of P. l. brevinasus; information should be sought from them. Efforts should be made to determine the habitat associations and current distribution of this subspecies.

Remarks: Huey (1939) stated that specimens from Cabazon were not typical of P. l. brevinasus. The specimens from White Water Ranch may represent P. l. bangsi. I believe that specimens from near Ranchita (2 mi E, Culp Valley) and Warner Pass, San Diego Co., stated to be P. l. brevinasus by Bond (1977), are P. l. internationalis. Huey (1939) assigned the specimens from "Warner's Pass" to P. l. internationalis, but did not mention those from near Ranchita.

The Perognathus longimembris species group is in need of taxonomic revision. The characteristics diagnostic of P. l. brevinasus, especially the short rostrum, are nearly unique among the subspecies of P. longimembris. Osgood (1900) remarked that this taxon possibly represented a distinct species. If this is the case, P. l. brevinasus is probably conspecific with P. longimembris pacificus, which has a contiguous range along the coast and which also has a short rostrum.

Distribution Records: LOS ANGELES CO.: Burbank, 1 (USNM); Garney, San Fernando Valley, 1 (MVZ; see also Grinnell and Swarth, 1913); Hyperion [= El Segundo], 1 (LACM); San Fernando, 1 (MVZ). SAN BERNARDINO CO.: Cajon Wash, 9 (LACM); N of Etiwanda, 1 (LACM); Ferndale (Osgood, 1900); Reche Canyon, 1250 ft, 4 mi SE Colton, 1 (MVZ); mouth Reche Canyon, near Colton, 1 (MVZ), 44 (USNM); 4.75 mi N San Bernardino, 1600 ft, 3 (MVZ); 5 mi NW San Bernardino, 32 (SDSNH); Slover Mountain, near Colton, 1 (MVZ). SAN DIEGO CO. : 2.5 mi N Oak Grove, 7 (SDSNH). RIVERSIDE CO. : Aguanga, 3 (SDSNH); 0.25 mi ENE Aguanga, 2050 ft, 1 (MVZ); 1 mi SE Aguanga, 2150 ft, 3 (MVZ); Banning, base San Jacinto Mountains, 2 (MVZ), 2 (USNM); 2 mi E, 0.5 mi S Banning, 2100 ft, 1 (MVZ); 2 mi E, 3 mi N Beaumont, 3000 ft, 1 (MVZ); Cabazon, 70 (SDSNH); near Cabazon, base San Jacinto Mountains, 19 (MVZ); 2 mi NE Cabazon, 2 (CSLB); 0.25 mi E Cabazon, 1800 ft, 2 (MVZ); 1 mi S Cabazon, 3 (LACM); 2 mi S Cabazon, 7 (LACM); 3 mi S Cabazon, 2 (SDSNH); 1 mi N, 2 mi W Cabazon, 2200 ft (MVZ); Dos Palmas Spring, Santa Rosa Mountains, 3500 ft, 4 (MVZ); Eden Hot Springs, 1500 ft, 1 (MVZ); Hemet, 1 (USNM); Menifie, 27 (LACM); Vallevista, San Jacinto Valley, 1800 ft, 8 (MVZ); White Water Ranch, 2 (SDSNH); Winchester, 3 (SDSNH).

Pacific Pocket Mouse
Perognathus longimembris pacificus

1898. *Perognathus pacificus* Mearns, Bull. Amer. Mus. Nat. Hist., 10:299. *Type Locality*: Mexican boundary monument No. 258, shore of Pacific Ocean, San Diego Co., California.
1932. *Perognathus longimembris pacificus*, von Bloeker, Proc. Biol. Soc. Washington, 45:128.

Distribution: *P. l. pacificus* inhabits the narrow coastal plains from the vicinity of the Mexican border, northward to El Segundo, Los Angeles Co., California.

Population Status: The present status of *P. l. pacificus* is unknown. Field work on the Irvine Ranch, San Joaquin Hills, Orange County (M'Closkey, 1972; Meserve, 1976) showed these mice to be scarce. This area is now urbanized. This subspecies may not be endangered, but habitat loss due to highways, urbanization, and off-road vehicle activities has likely been extensive. Probably all populations north of the San Joaquin Hills are extinct. This may also be the case from San Diego south, although some small areas near the Tiajuana River may still be inhabited.

Habitat: The types of soil and plant communities required by Pacific Pocket Mice are not known. Several authors noted that these Pocket Mice were found only on soils of fine, alluvial sands near the ocean (Bailey, 1939; Grinnell, 1933; Mearns, 1898; von Bloeker, 1931). M'Closkey (1972) and Meserve (1976) found Pacific Pocket Mice to be rare in a Coastal Sage-scrub community in a dry, rocky and gravelly site in the San Joaquin Hills of Orange Co. M'Closkey (1972) remarked that *P. l. pacificus* had an unpredictable pattern of residence there. Only open spaces in an otherwise dense, weedy area were occupied near San Diego (von Bloeker, 1931).

Principal plant species at several sites inhabited by *P. l. pacificus* were Telephone Weed, Foxtail, Saltgrass, Ice Plant, Star Thistle, and Arrow Weed (von Bloeker, 1930). Pacific Pocket Mice apparently eat mostly seeds of grasses and forbs (Meserve, 1976; von Bloeker, 1931), although other plant materials are consumed in smaller quantities (Meserve, 1976).

Recommendations: Information on areas of present occurrence and estimates of population densities are needed. Sites with favorable habitat may be rare, and these may serve as the only reservoirs from which individuals disperse to areas of lower quality habitat. A live-trapping program designed to provide data on distribution and abundance should be carried out. All persons undertaking field work on small mammals in the area should be encouraged to gather needed information on Pacific Pocket Mice. Public agencies administering land within the range of *P. l. pacificus* should be informed of the need for information and of the sensitivity of Pacific Pocket Mice to further loss of habitat. The Camp Pendleton Marine Corps Base may be the only area where habitat for *P. l. pacificus* can be protected relatively easily.

Remarks: Some of the localities, listed below, in San Diego County probably refer to the same place (e.g., 4 mi N Oceanside; sand dunes near Oceanside; mouth of Santa Margarita River). Specimens listed from

Tiajuana Valley by Huey (1939) are probably the same ones that von Bloeker reported on from "near the type locality."

The systematic relationships of the P. longimembris group needs to be reviewed, especially the relationships among P. l. pacificus, brevinasus, bangsi, internationalis and bombycinus of southern California. These taxa, and others in Baja California, possibly represent a species distinct from P. longimembris from the Mojave Desert and the Great Basin. P. l. cantwelli is a synonym of P. l. pacificus (Huey, 1939).

Distribution Records: LOS ANGELES CO.: Cliffton, 100 ft, 1 (MVZ); Del Rey, 6 (LACM); Del Rey Hills, near Loyola, 2 (LACM); El Segundo, 8 (SDSNH); 1 mi N El Segundo, 8 (SDSNH); 0.5 mi NW El Segundo, 1 (MVZ); Hyperion [= El Segundo], 50 ft, 6 (MVZ); Palisades del Rey (von Bloeker, 1932); Paya Del Rey, 6 (LACM); Wilmington, 3 (MVZ). ORANGE CO.: Dana Point, 5 mi W Capistrano Beach, 10 (LACM); Irvine Ranch, between Buck Gully and San Joaquin Reservoir, San Joaquin Hills (M'Closkey, 1972; Meserve, 1976); near San Juan Capistrano Point (Grinnell, 1933); Star Ranch, N of San Juan Capistrano Beach (V. Bleich, pers. comm.). SAN DIEGO CO.: Oceanside, 3 (LACM), 6 (MVZ), 38 (SDSNH); 4 mi N Oceanside, 8 (LACM), 7 (SDSNH); sand dunes near Oceanside (Bailey, 1939); shore of Pacific Ocean, near U.S.-Mexican boundary monument #258, 11 (MVZ), 3 (USNM); San Onofre, 1 (SDSNH); 2 mi E San Onofre (von Bloeker, 1930); mouth of Santa Margarita River, near Oceanside, 1 (USNM); near mouth Tia Juana River, 4 (SDSNH); Tia Juana Valley, 79 (SDSNH); 2 mi N U.S.-Mexican boundary monument #258, 17 (LACM).

Tipton Kangaroo Rat
Dipodomys nitratoides nitratoides

1894. Dipodomys merriami nitratoides Merriam, Proc. Biol. Soc. Washington, 9:113. Type Locality: Tipton, San Joaquin Valley, Tulare Co., California.
1921. Dipodomys nitratoides nitratoides, Grinnell, J. Mamm., 2:96.

Distribution: The historic distribution of Tipton Kangaroo Rats included most of the San Joaquin Valley floor in the Tulare Basin, from approximately Lemoore and Hanford in Kings Co. on the north, to Visalia, Tipton, Delano and Bakersfield on the east, and to the edge of the alkaline-sink plant communities on the west. Present distribution is limited to a few remaining areas of uncultivated ground, mostly with alkaline soils (Williams, 1985). The western boundary was defined by Williams (1985) as being approximately coincident with the route of the California Aqueduct. D. n. nitratoides apparently interbred with the Short-nosed Kangaroo Rat (D. n. brevinasus) along the southern and western edges of the valley floor, but the geographic ranges of the two subspecies are no longer in contact (Hafner, 1979; Williams, 1985).

Population Status: Hafner (1979) determined that populations of Tipton Kangaroo Rats were extant on parts of the Kern and Pixley National Wildlife Refuges and in several small areas still uncultivated in 1978. The only large block of habitat was located in the area east and north of Buttonwillow, Kern County. Williams (1985) did not find Tipton Kangaroo Rats on the Kern National Wildlife Refuge in 1985, and speculated that

they may have been extirpated by floods that inundated even the dikes on the refuge during Winter 1982-83. Williams (1985) estimated that the historical geographic range of the Tipton Kangaroo Rat encompassed approximately 695,174 hectares (1,716,480 ac.). By July, 1985, the area inhabited had been reduced, primarily by cultivation, to about 25,665 ha. (63,367 ac.), only about 3.7% of the historical acreage. The loss of habitat was expected to continue until there is none privately owned, perhaps within the next four or five years. Only 2486 ha. (6137 ac.) of federally administered land was found to have historically supported populations; Tipton kangaroo rats may have been extirpated from 1053 ha. of this total between 1982 and 1985. Of all local, state and federal government-administered lands, only about 2606 ha. (6434), divided among five separate parcels, had populations of low- to moderate-densities of Tipton kangaroo rats that were relatively secure from loss of habitat to cultivation or extirpation due to flooding. These areas probably were not large enough to support populations sufficient in numbers to prevent continuing loss of genetic diversity and subsequent extinction. Other potential threats to small, isolated, remnant populations included diseases, predation and poisoning by rodenticides (Williams, 1985).

Habitat: Tipton Kangaroo Rats are limited to arid-land communities occupying the valley floor of the Tulare Basin in level or nearly level terrain. They occupy alluvial fan and floodplain soils ranging from fine sands to clay-sized particles (because of the high alkalinity of these soils, some of the finer-textured soils tend to be powdery when dry rather than hard-packed). Generally, woody shrubs of one or more species are sparsely scattered over occupied terrain with scant-to-moderate ground cover of grasses and forbs. Woody shrubs commonly associated with Tipton Kangaroo Rats are: Atriplex spinifera, A. polycarpa, A. phyllostegia, A.lentiformis, Allenrolfea occidentalis, Haplopappus acradenius, and Prosopis juliflora. A conspicuous semiwoody species is Suaeda fruticosa (Williams, 1985).

In areas with vernal pools and alkaline playas, Tipton Kangaroo Rats place their burrows in any elevated terrain available, such as where wind-blown soil particles have accumulated around some obstruction or on slight ridges, usually no more than 0.5 to 1.0 meter above the playa beds. Tipton Kangaroo Rats sometimes colonize areas that are flooded in winter and spring. Favored areas include iodine bush shrublands which are flooded seasonally and where alkaline water lies close to the surface of the soil, year around. Presumably, these individuals are either drowned or escape to higher ground when the floods return (Williams, 1985).

Recommendations: The most important need is for preservation of relatively large blocks of habitat on the valley floor in the Tulare Basin where this species still lives. Most remaining uncultivated parcels of habitat may be to small to support populations of Tipton Kangaroo Rats indefinitely (Williams, 1985). Williams (1985) recommended that federal Endangered Species status be sought for D. n. nitratoides. Review of the status of the Tipton Kangaroo Rat for state Endangered Species designation is called for.

Remarks: Records of distribution from along the western edge of the San Joaquin Valley listed by Hafner (1979) and in the draft version of this report have been excluded below. These specimens came from areas with

habitat typical of D. n. brevinasus; it was not clear from Hafner's report if the specimens were D. n. nitratoides or D. n. brevinasus. Williams (1985) reviewed the status of these specimens and determined they were best assigned to brevinasus. The specimens listed below from Tulare Lake (USNM) had no precise locality information. They could have come from either Kings or Tulare counties. They are listed under Kings County because others in the U.S. National Museum were collected in that county. Williams (1985) reported that extant populations of Tipton Kangaroo Rats probably occurred on at least 154 separate parcels in 54 separate blocks of uncultivated land in June, 1985; these localities are not listed below.

The taxonomy of the subspecies of D. nitratoides was reviewed by Hoffmann (1975) and Hafner (1979).

Distribution Records: KERN CO.: Adobe Station, 4 (USNM); Bakersfield, 1 (MVZ); 8 mi NE Bakersfield, 15 (MVZ); 12 mi SW Bakersfield, 1 (MVZ); 5 mi W Bakersfield, 1 (MVZ); 19 mi SE Bakersfield, 4 (CSUF); 20 mi S, 8 mi W Bakersfield, 1 (MVZ); 3 mi N Buena Vista Lake, 5 (MVZ); Buena Vista dry Lake bottom, 15 mi NE Taft, 4 (CSLB); east side levee, 298 ft, Buena Vista Lake, 4 (MVZ); S of Buena Vista Lake Reservoir, near Taft, 1 (USNM); Buttonwillow, 15 (USNM); 4.6 mi E Buttonwillow (M. Hafner); 9.6 mi E Buttonwillow (M. Hafner); 15 mi S Corcoran, 19 (MVZ); 0.5 mi N, 1 mi E Corners [Conners ?], 6 (LACM); Delano, 16 (USNM); 1 mi S, 5.4 mi W Delano (M. S. Hafner); 1.4 mi S, 8.3 mi E Edison (M. S. Hafner); Famoso, 1 (USNM); 2.5 mi S, 6.3 mi E Famoso (M. S. Hafner); Kern National Wildlife Refuge, 18 mi W Delano, 2 (LACM); 2.5 mi N, 6.2 mi E Lost Hills (M. S. Hafner); 7 mi N, 5.3 mi E Lost Hills (M. S. Hafner); 7 mi N, 6.3 mi E Lost Hills (M. S. Hafner); 5.2 mi N, 1.5 mi W Mettler (M. S. Hafner); 7 mi W Old River (M. S. Hafner); 1 mi N Pond, 1 (MVZ); 4. mi S, 0.5 mi E Shafter (M. S. Hafner); 1.5 mi W Tupman, 2 (LACM); 1.2 mi S, 1.5 mi E Tupman (M. S. Hafner). KINGS CO.: 15 mi S Corcoran (Grinnell, 1933); 3.5 mi S, 2 mi W Lemoore (M. S. Hafner); Tulare Lake, 13 (USNM); W side Tulare Lake, 1 (USNM); Lemoore Naval Air Station (T. O'Farrell, pers. comm.). TULARE CO.: Alila [= Earlimart], 16 (USNM); 1.5 mi NE Angiola, 3 (CSUF); 2 mi NE Angiola, 39 (CSUF); 1.3 mi N, 5 mi W Delano (M. S. Hafner); Earlimart, 7 (LACM); 1 mi N Earlimart, 2 (MVZ); 2 mi W Earlimart, 5 (MVZ); 3.5 mi S, 5 mi W Pixley (M. S. Hafner); Tipton, 266 ft, 43 (MVZ); 2 mi NE Tipton, 1 (CSUF); 7 mi NE Tipton, 1 (MVZ); 3.5 mi S, 8 mi W Tipton (M. S. Hafner); 10 mi SW Tipton, 3 (CSUF); 12 mi SW Tipton, 2 (CSUF).

Colorado River Cotton Rat
Sigmodon arizonae plenus

1928. Sigmodon hispidus plenus Goldman, Proc. Biol. Soc. Washington, 41:205. Type Locality: Parker, 3500 ft, Yuma Co., Arizona.
1970. Sigmodon arizonae plenus, Zimmerman, Publ. Mus., Michigan State Univ., Biol. Ser., 4:435.

Distribution: Sigmodon arizonae plenus is found in California in marshy and dense, grassy areas along the Colorado River floodplain from the Nevada border to about the level of Bard. Goldman (1928) listed only three localities for S. arizonae in California: Needles; Colorado River opposite Parker, Arizona; and 15 mi SW of Ehrenberg, Arizona. The distribution was apparently spotty, rather than continuous.

Population Status: This population is known to be extant only in one area in California (Brad Blood, in litt.). In 1965, Bradley (1966) collected along the Colorado River in Nevada, but caught no Cotton Rats. The marsh where he and Hall (1946) had caught Cotton Rats had dried up and was largely devoid of Cattails. Bradley (1966) surmised that changes in vegetation resulted from absence of flooding due to channeling of the river and restriction of river flow while filling Lake Powell. He suggested that S. arizonae was extinct in Nevada.

Habitat: Goldman (1928) noted that this subspecies appeared to be restricted to "isolated sections of alluvial bottom along the Colorado River." The climate is too hot and arid to support Cotton Rats anywhere except immediately adjacent to the river. Within this habitat, Cotton Rats inhabit areas supporting Sedges, Rushes, Cane, and other grass-like plants. Hall (1946) collected Cotton Rats from a small marsh in Nevada supporting Cattails and Bermuda Grass and ringed by Mesquite. The marsh was 0.5 mi N of the California border, along the Colorado River. Bradley (1966) collected in the same area in 1961 and found no Cotton Rats, and none were found in nearby areas with "riparian vegetation."

Recommendations: Extant populations in California should be investigated further to determine their status. Efforts to preserve existing habitat for this species should be initiated. The feasibility of securing additional habitat along the Colorado River should be investigated.

Remarks: Brad Blood and David Huckaby of California State University, Long Beach, investigated the status of S. arizonae in California. Localities listed below without numbers of specimens refer to specimens that Brad Blood (in litt.) identified as S. arizonae.

Zimmerman (1970) showed that Sigmodon hispidus and Sigmodon arizonae differed greatly in chromosome number and structure, and were distinguishable in skeletal structure. S. arizonae plenus has two more chromosomes than S. a. arizonae. Severinghaus and Hoffmeister (1978) reconfirmed the structural distinctness of the two species and discussed methods for identification of skulls.

Distribution Records: IMPERIAL CO.: near Bard, 7 mi NE Ft. Yuma, 1 (MVZ); 2 mi above Laguna Dam, 3 (MVZ); Palo Verde, 3 (MVZ); 0.5 mi S Palo Verde (B. Blood - CSLB). RIVERSIDE CO.: Blythe, 1.5 mi W Colorado River, 8 (MVZ); 3 mi NE Blythe (B. Blood - CSLB); 15 mi SW Ehrenberg, 3 (USNM); Neighbors Road (B. Blood - LACM); opposite Riverside Mountains, Colorado River (B. Blood - LACM). SAN BERNARDINO CO.: 2 mi E Earp, 4 (CSLB); Colorado River, opposite Parker, Arizona, 25 (MVZ), 1 (USNM); Colorado River, 33 mi N Blythe, off Highway 62, via Earp, 2 (CSLB); Needles, 1 (USNM); 4 mi NE Parker, Arizona, on Colorado River, 2 (CSLB).

Yuma Mountain Lion
Felis concolor browni

1903. Felis aztecus browni Merriam, Proc. Biol. Soc. Washington, 16:73.
Type Locality: Colorado River, 12 mi below Yuma, Arizona.
1929. Felis concolor browni, Nelson and Goldman, J. Mamm., 10:347.

Distribution: Yuma Mountain Lions have been recorded as occurring at low elevations in the Colorado River Valley of southeastern California, southwestern Arizona, and adjacent areas in Sonora and Baja California (Currier, 1983; Young and Goldman, 1946). Halloran (1946) reported on a specimen which was trapped on the Kofa Game Range, 50 mi NE Yuma, Yuma Co., Arizona. The area was described as rough, desert terrain with an elevation of about 1000 ft. F. c. browni probably occupies the desert areas of southeastern California, perhaps ranging as far north as the Amargosa Mountains of California and the McCullough Range of southern Nevada. Its range extended westward into the Imperial Valley. Grinnell (1933) listed an occurrence at Calexico. Weaver noted occurrence of Mountain Lions from a few areas of the desert ranges of southeastern California: New York Mountains (Weaver et al., 1969); Little San Bernardino Mountains (Weaver and Hall, 1971); near Picacho State Recreation Area (Weaver and Mensch, 1969). Leslie and Douglas (1979) reported sight records of Mountain Lions on the east side of the River Mountains, near Lake Mead, Nevada. Halloran (1946) mentioned a few reports of sightings from the Imperial National Wildlife Refuge during the 1940's.

Population Status: No current information is available. Bounties on only two Mountain Lions from Imperial County were collected between 1907 and 1950 (McClean, 1954), suggesting that at least in that county, mountain lions were very rare. Because these bounty records did not specify area within counties, it is not known if the animals from Riverside and San Bernardino counties were Yuma Mountain Lions. Most of the riparian floodplain forest of the lower Colorado River and the woody growth along desert washes have diminished or disappeared in this century.

Habitat: Grinnell (1933) stated that Yuma Mountain Lions lived mostly in the dense vegetation of the bottomland along the Colorado River, and also noted their presence in adjacent, rocky uplands. The habitat requirements of F. c. browni are essentially unknown. Mountain Lions in adjacent regions prefer brush and timber in rocky terrain (McLean, 1954). Most of the desert ranges of southeastern California are too arid to support more than sparse brushlands or Juniper woodlands. Adequate numbers of deer for food are another usual requirement (Currier, 1983). Weaver (in litt.) thought that Burro Deer (Odocoileus hemionus eremicus), principally inhabitants of bottomlands and arroyos vegetated with Willows, Mesquite, Acacia, Ironwood, and Palo Verde, were the staple food of Yuma Mountain Lions. Merriam (1903) remarked that the unusually small teeth and "weak" rostrum of F. c. browni indicated smaller species of prey than the deer typically preyed upon by adjacent populations of Mountain Lions. Burrow Deer are larger in size than adjacent populations of Mule Deer (Cowan, 1936). The tiny-sized Coue's White-tailed Deer, which was perhaps the most abundant deer species along the Colorado River in prehistoric times, may have been the major prey species for F. c. browni. Yuma Mountain Lions probably occasionally prey upon Mountain Sheep, Burros, rabbits and hares, various rodents, and calves, in addition to Burro Deer.

Recommendations: Field surveys for Mountain Lions in the eastern halves of Imperial, San Bernardino, and Riverside counties should be conducted to determine their current status. Information on the principal food of Yuma Mountain Lions is needed to determine current and future prospects for survival and to develop a plan to ensure the recovery of F. c. browni.

The geographic range of F. c. browni in California should be more clearly defined. The racial characters of this subspecies are apparent externally (Young and Goldman, 1946; Grinnell, 1914; Merriam, 1903); thus, examination of live-captured individuals should be sufficient to confirm racial identity. Systematic review of extant specimens from the California desert area should be carried out.

Mountain Lions in the California desert area should continue to be completely protected. Any individuals preying on livestock should be captured alive, if possible, and relocated, rather than killed.

Protection of riparian communities along the Colorado River should be undertaken as soon as possible. The Bureau of Land Management, U.S. Fish and Wildlife Service, and U.S. Department of Defense should be informed of the need for information about Yuma Mountain Lions on lands they administer within the potential range of F. c. browni.

Remarks: According to Goldman (Young and Goldman, 1946), F. concolor browni is medium-sized, very pale-colored, and has short, sparse pelage. Goldman noted that this population intergraded "along the mountain barrier west of the California desert area."

See the Distribution section for circumstantial records of occurrence.

Distribution Records: IMPERIAL CO.: Colorado River, 20 mi N Picacho, 1 (MVZ); Calexico (Grinnell et al., 1937).

SECOND PRIORITY LIST

Southern California Salt Marsh Shrew
Sorex ornatus salicornicus

1932. *Sorex ornatus salicornicus* von Bloeker, Proc. Biol. Soc. Washington, 45:131. *Type Locality*: Playa del Rey, Los Angeles County, California.

Distribution: Southern California Salt Marsh Shrews are confined to the coastal marshes in Los Angeles, Orange, and Ventura counties. Known occurrence extends from Point Mugo, Ventura County on the north to the salt marshes around Anaheim Bay and Newport Beach in Orange County, on the south.

Population Status: Nothing is known about the status of the Southern California Salt Marsh Shrew. Loss of habitat to human developments along the coast has been significant, and populations probably have declined as a result. Lack of refuge sites above the marshes to escape from flooding during seasonal high tides and periodic storms may be the most crucial factor threatening extant populations.

Habitat: Nothing has been recorded concerning habitat requirements of the Southern California Salt Marsh Shrew, other than that individuals were captured in coastal marshes (von Bloeker, 1932). In general, Ornate Shrews are insectivorous; the populations living in salt marshes probably subsist primarily on amphipods, isopods, insects, and other invertebrates. They probably require fairly dense ground cover, nesting sites above mean high tide and free from inundation, and fairly moist surroundings, based on studies of other shrews in similar habitats elsewhere (Johnston and Rudd, 1957).

Recommendations: Information is needed on the current status, habitat requirements, and extent of available habitat. Threats to these populations need to be identified and steps taken to ensure the survival of Southern California Salt Marsh Shrews. Pitfalls used as livetraps are effective for capturing shrews, but pitfalls are nearly impossible to keep in the ground in tidelands. Other effective methods of surveying populations are searching for nests (Johnston and Rudd, 1957) and shrews sheltering under debris (Ford, 1986), and, to a lesser extent, use of Sherman live traps. Surveys could be carried out in conjunction with studies of *Reithrodontomys megalotis limicola*, another Species of Special Concern sharing these saltmarsh communities.

Remarks: These communities are also used by the Light-footed Clapper Rail (*Rallus longirostris levipes*) and some potential habitat for Southern California Salt Marsh Shrews is currently in Department of Fish and Game "ecological reserves" (Upper Newport Bay and Bolsa Chica). Shrews have not been reported from marshes in Bolsa Bay, but they should be expected to occur there. Specimens in the San Diego Society of Natural History collection from Big Bear Lake and Lytle Creek, San Bernardino Co., identified as *Sorex ornatus salicornicus*, are *S. o. ornatus*.

Distirbution Records: LOS ANGELES CO.: Nigger Slough, 1 (von Bloeker, 1932); Playa del Rey, 2 (LACM), 1 (UCLA), 1 (SDSNH), 5 (von Bloeker, 1932). ORANGE CO.: S side Newport Bay, 1 mi above Coast Highway, 2 (MVZ). VENTURA CO.: Point Mugu, 1 (LACM).

California Leaf-nosed Bat
Macrotus californicus

1859. Macrotus californicus Baird, Proc. Acad. Nat. Sci.. Philadelphia, 10:116. Type Locality: Old Fort Yuma, Imperial Co., California.

Distribution: California Leaf-nosed Bats occur from southern Nevada, southern California and Western Arizona southward through Baja California Sur and Sonora, Mexico (Hall, 1981). In California, they occupy the low-lying desert areas of southern California, including the coastal basins.

Population Status: Macrotus californicus has disappeared from most areas of the coastal basins from Los Angeles to San Diego. Elsewhere in southern California, populations have declined, but appear to have stabilized (P. Brown, in litt.).

Loss of foraging habitat in the coastal basins is probably a principal factor in the decline of populations. Elsewhere, disturbances of roosts may be the primary cause of decline. Grinnell (1918) discussed an episode which suggests that maternity colonies are sensitive to disturbance; one colony apparently abandoned a cave after biologists had visited and collected bats. Judging from the description of depth of guano, the cave had been used for a long time. Wintering bats are probably even more sensitive to disturbances, as sites suitable for overwintering colonies are probably few. Disturbances cause extra activity and elevated metabolism, resulting in extra expenditure of energy at a time when energy economy may be critical to successful overwintering.

Habitat: In California, Leaf-nosed Bats are found in lowland desert associations. They appear to be limited to areas with suitable day-roosts, which must provide shelter from excessive heat and aridity. Howell (1920a) stated that California Leaf-nosed Bats were common in the desert only in caves and old mines, especially along the old shore line of the Salton Sea bed, near sea level. He remarked that the sexes roosted together only during the mating season. Barbour and Davis (1969) indicated that copulation occurred from September to November.

Vaughan (1959) studied M. californicus in the Riverside Mountains near the Colorado River. There, Leaf-nosed Bats occupied day-roosts only in caves and deserted mine tunnels. He found a day-roost in a cabin near the Colorado River, however. Leaf-nosed Bats roosted in groups of several to 100 or more. Most groups were encountered within 30 to 80 ft from the entrances of tunnels, and seemed not to require darkness. Vaughan believed that day-roosts of M. californicus must be enclosed and have overhead protection from the weather. Favored sites were large enough for bats to enter by flying because these bats cannot crawl. They also provided considerable ceiling surface and flying space (individuals are not in contact while hanging).

Temperatures in day-roosts are warm, but considerably cooler than ambient day-time temperatures outside the roost (84 vs 110 deg. F, respectively, Vaughan, 1959). California Leaf-nosed Bats occupy a great variety of night roosts, where they rest and consume captured prey. The only common feature Vaughan (1959) could detect of night-time roosts was adequate overhead protection -- old adobes, deserted wooden buildings, cellars, porches and a wide variety of caves and mine tunnels were used.

Leaf-nosed Bats apparently are entirely insectivorous in California. Food includes a diversity of flightless and flying arthropods (Barbour and Davis, 1969; Vaughan, 1959). Vaughan noted that Leaf-nosed Bats hovered frequently and flew low and slowly over the ground while foraging. Generally, they flew within 3 feet of the ground over dry washes and nearby flats. They also foraged close to vegetation. Vaughan surmised that they picked insects off of the vegetation and the substrate while hovering. California Leaf-nosed Bats may travel up to a mile from their day-roosts while foraging, but Vaughan suggested that their foraging range was small, perhaps within a few hundred yards of the roost on frequent occasions.

Some California Leaf-nosed Bats may migrate out of the state (probably to Mexico) during winter; P. Brown (in litt.) stated that many are resident. They do not hibernate. Stephens (1906) failed to find bats of this species in winter, but could always locate them in spring and summer. Grinnell (1918) reported that March and September were the earliest and latest dates, respectively, for M. californicus in California. She noted, however, that one specimen in the Museum of Vertebrate Zoology was collected on 31 December in a mine near Palo Verde, and recounted information on presence of Leaf-nosed Bats on 20 February.

Recommendations: Reliable quantitative data are greatly needed on population size, distribution, and currently used maternity and overwintering roosts, if the latter are found in California. Trends cannot be unequivocally established until these baseline data are gathered. United States Geological Survey maps are a good source of information for locating abandoned mines. The old shore line of the Gulf of California around the perimeter of the Salton Sink contains many shallow grottos and caves, as does that along the Colorado River lowlands. Careful search, while avoiding excessive disturbances, should reveal colonies. Colony size can be estimated by counting emerging bats (usually, Leaf-nosed Bats emerge about 1 to 1.5 hours after sunset).

Protection of nursery colonies from disturbances by humans is extremely important. The means of accomplishment would depend upon the situation. The entrances to tunnels could probably be sealed off to prevent access by humans but permit entry by bats (Leaf-nosed Bats must be able to enter by flying). Some important roosting areas might more simply be closed to access by vehicles. This method, however, is unlikely to reduce sufficiently the level of disturbances in many areas, and is impractical in many others.

A carefully designed campaign to inform the public of the usefulness of bats and their sensitivity to disturbances may be helpful. Department of Fish and Game personnel in Southern California should be informed about the need for preservation of this and other species of bats. Agency

personnel in field positions should be trained to recognize M. californicus, as well as all other species, and should receive instructions on methods of estimating colony size and control of bats in man-made structures (see Barclay et al., 1980; Constantine, 1979). They should be informed of the sensitivity of colonies to disturbances, and use only approved methods of observation and control, when necessary. Persons in agencies such as public health, law enforcement, and agriculture should be similarly informed.

Remarks: Grinnell (1918) listed the localities, Santa Margarita Ranch and River, as being in San Diego County, whereas Riverside County was listed on the specimen tags. She also listed the localities, Indian Wells and Mecca, as being in Imperial County, but they are actually located in Riverside County.

The systematic status of Macrotus californicus has been a subject of disagreement among researchers. Anderson and Nelson (1965) believed that the evidence they examined demonstrated that californicus was a subspecies of M. waterhousii. Davis and Baker (1974) interpreted additional morphometric and karyotypic evidence as showing specific distinctness of these taxa. Hall (1981) treated californicus as a subspecies of waterhousii because of "inconsistencies" in the literature. I believe the evidence favors specific recognition.

Distribution Records: IMPERIAL CO.: Clapp Mine, 15 mi NE Yuma, 5 (MVZ); Ft. Yuma, 18 (CAS), 28 (KU), 14 (MVZ), 2 (PM), 1 (UDAV), 1 (USNM), 1 (TCWC); 6 mi SW Ft. Yuma, 10 (KU); Palo Verde, 4 (MVZ), 1 (SDSNH); 24 mi S Palo Verde, 1 (MVZ); Picacho Mine, 16.5 mi N Ft. Yuma, 1 (MVZ); Potholes, 25 (CM), 3 (SDSNH); 1 mi N Potholes, 1 (SDSNH); 2 mi N Potholes, 200 ft, 34 (MVZ); 3 mi N Potholes, 4 (KU); Senator Mine, 10 mi N Potholes, 11 (SDSNH); Tumco Mine, 5 mi N, 2 mi E Ogilby, 9 (UDAV), 6 (MVZ). LOS ANGELES CO.: Iverson Ranch, Santa Susanna Pass, Chatsworth, 1 (MVZ); 2 mi N Owensmouth (Howell, 1920). RIVERSIDE CO.: Alice Mine, 7 mi S Vidal, 2 (MVZ); Indian Wells, 2 (MVZ), 4 (USNM); Mecca, 2 (MVZ); Mountaineer Mine, 5.5 mi S, 0.6 mi E Vidal, 2 (CSLB); Mountaineer Mine, 5.6 mi S, 0.3 mi E Vidal, 14 (MVZ); Mountaineer Mine, T2S, R24E, 5 (MVZ); Neighbors, 11 (LACM); Riverside Mountains, 35 mi N Blythe, 22 (KU); Riverside Mountains, 7 mi S Vidal, 86 (MVZ); Santa Margarita River, 17 (CAS); W of State Highway 95, 9 (UDAV); Torres [Toro], 61 (MVZ); cave near Torres [Toro], 2 (KU); 5 mi E Vidal, 1 (UDAV); 5.3 mi S Vidal, 7 (CAS). SAN BERNARDINO CO.: 2 mi N Colorado River, 0.2 mi W Nevada boundary, 1000 ft, 2 (MVZ). SAN DIEGO CO.: Anza Borrego State Park, 2 (SDSNH); Artery Mine, Dulzura, 1 (SDSNH); De Luz, 8 (CAS); 2 (USNM); Donahue Mines, near Dulzura, 2 (LACM); Pauma Valley, 2 (SDSNH); 10 mi NW Ripley, 2 (KU); Vallecito, 38 (MVZ), 4 (SDSNH), 20 (USNM).

Townsend's Big-eared Bat
Plecotus townsendii

1837. Plecotus townsendii Cooper, Ann. Llyc. Nat. Hist. New York, 4:73. Type Locality: Columbia River [Fort Vancouver, Clark Co., Washington].

Distribution: Townsend's Big-eared Bats occur throughout California,

although details of their distribution are scanty. There are two subspecies within California: P. t. townsendii occupies the humid, coastal regions of northern and central California and P. t. pallescens occurs in the remainder of the state (Hall, 1981).

Populations Status: Little specific information is available on populations trends, although a marked decline in numbers appears to have occurred over the last 40 years. Pearson et al. (1952) postulated that there was an increase in numbers prior to the 1950's due to increased roosting sites available in human-made structures. In recent years, populations of Townsend's Big-eared Bats seem to have declined in numbers in most areas of the United States (Barbour and Davis, 1969; Humphrey and Kunz, 1976). Partricia Brown (in litt.) noted that populations of P. t. pallescens in the desert area of southeastern California were declining. She stated that they no longer occupied any of the roosts used 30 years previously (about 1950). Graham (1966) found no extant colonies in California's limestone caves, and speculated that all had been abandoned due to human activities. My impression, based on numbers found and turned in to the Biology Department at California State University, Stanislaus, by local residents, is that P. t. pallescens was common in central California into the 1960's, but by the early 1970's was rarely seen. I have captured only one individual during 14 years of netting bats in central California, and none have been turned in to me by others.

Habitat: Townsend's Big-eared Bats live in a variety of communities, including coastal conifer and broad-leaf forests, oak and conifer woodlands, arid grasslands and deserts, and high-elevation forests and meadows. Throughout most of its geographic range, it is most common in mesic sites (Kunz and Martin, 1982). Known roosting sites in California include limestone caves, lava tubes, mine tunnels, buildings, and other human-made structures (Dalquest, 1947; Graham, 1966; Pearson et al., 1952). Habitat for Townsend's Big-eared Bats must include appropriate roosting, maternity, and hibernacula sites free from disturbances by humans. A single visit by humans can cause the bats to abandon a roost. Females typically roost in large maternity colonies which are highly susceptible to disturbances by humans (Barbour and Davis, 1969). Males usually roost singly or in small groups and are probably not affected as much as females by disturbances. Both sexes hibernate in buildings, caves, and mine tunnels, either singly (males) or in small groups (P. Brown, in litt.; Pearson et al., 1952).

Recommendations: Data documenting population status and size and location of maternity colonies and hibernacula are needed most. Great care must be observed in gathering such information; roosts should not be entered. Public land-administering agencies should give special consideration to protecting roosts located on public lands from human disturbances.

Remarks: Early in the investigations, I decided information was insufficient to determine a priority listing for Plecotus townsendii, but that it was probably jeopardized to some degree. Unfortunately, this decision also meant that I quit collecting detailed information on distribution records. Since development of the draft List of Concern, I have decided that this species warranted higher priority than the "sensitive" category to which it was assigned. Thus, no documentation of distribution records are included.

Pocketed Free-tailed Bat
Tadarida femorosacca

1889. *Nyctinomus femorosaccus* Merriam, N. Amer. Fauna, 2:23. *Type Locality*: Agua Caliente [Palm Springs], Riverside Co., California.
1924. *Tadarida femorosacca*, Miller, Bull. U.S. Natl. Mus., 128:86.

Distribution: Pocketed Free-tailed Bats have a spotty distribution, ranging from southern California through the Baja California Penninsula, and southward through southwestern Arizona to at least Michoacon and Tamaulipas, Mexico (Hall and Kelson, 1959). In California, they are known only from a few records in the arid lowland of the southern part of the state. Pocketed Free-tailed Bats are probably resident within the state.

Population Status: There is little current information on the status of *T. femorosacca* in California. According to P. Brown (in litt.), the roost described by Krutzsch (1944a) is no longer occupied. The paucity of records suggests that *T. femorosacca* has always been rare, or at least rarely encountered, in California. Because *T. femorosacca* can easily be confused with the widespread and common *T. brasiliensis*, it may be more common than records suggest. I listed it here in an attempt to stimulate gathering of information about its status in California.

Habitat: Pocketed Free-tailed Bats are characteristically associated with rocky, desert areas with relatively high cliffs. They generally use crevices in rocks as day-roosts, although they sometimes are found in man-made structures. Krutzsch (1944a) found a colony of 50 to 60 individuals in a crevice in the side of a cliff on a southwestern-facing slope in San Diego Co. *T. femorosacca* drops from the roost in order to gain speed for flight.

Recommendations: The principal need at this time is for reliable data on the distribution and population status of *T. femorosacca*. Biologists and public health personnel who routinely work with bats should be alerted to the need for information on *T. femorosacca* and briefed about methods of distinguishing species of *Tadarida*.

Remarks: There is no controversy about the status of this species. It is similar only to *T. brasiliensis* in the United States (see Barbour and Davis, 1969).

Distribution Records: IMPERIAL CO: Mouth of Colorado River (Grinnell, 1933). RIVERSIDE CO.: Agua Caliente [Palm Springs], 1 (USNM); Barker Dam Reservoir, Joshua Tree National Monument (P. Brown, in litt.); Palm Canyon, near Palm Springs, 1 (FMNH), 1 (MVZ). SAN DIEGO CO.: Palm Canyon, Borrego Valley, 1 (MVZ); 2 mi SE Suncrest store, Suncrest (Krutzsch, 1944b).

California Mastiff Bat
Eumops perotis californicus

1890. *Molossus californicus* Merriam N. Amer. Fauna, 4:31. *Type Locality*: Alhambra, Los Angeles County, California.
1932. *Eumops perotis californicus*, Sanborn, J. Mamm., 13:351.

Distribution: Mastiff Bats occur from central California, southward to central Mexico. In California, they have been recorded from Butte County southward in the western lowlands through the southern California coastal basins and the western portions of the southeastern desert region (Sanborn, 1932). Vaughan (1959) observed mastiff bats at Hetch Hetchy Reservoir in the central Sierra Nevada and there are also records of this species from Yosemite Valley. All others are from lower-lying regions. E. perotis is resident within the state, although some bats probably migrate from the colder areas to winter in the southern lowlands (Krutzsch, 1955).

Population Status: Available records indicate that Mastiff Bats were widespread in the San Joaquin Valley, Salinas Valley, and Coastal lowlands from the San Francisco Bay area southward to San Diego. Incidental information suggests that populations of E. perotis have undergone significant declines in recent years (P. Brown, in litt.; P. Leitner, pers. comm.). Historically known roosts in central California are no longer occupied (unpubl. data). Reasons for their decline are only conjecture. Extensive loss of habitat due to urbanization of coastal basins, marsh drainage, and cultivation of major foraging areas are likely factors in the decline. Widespread use of insecticides may have also reduced insect abundance and also poisoned some bats.

Habitat: Mastiff Bats are resident at low elevations in the coastal basins of southern California. They appear to favor rugged, rocky areas where suitable crevices are available for day-roosts. Characteristically, day-roosts are located in large cracks in exfoliating slabs of granite or sandstone. The crevices must open downward, be at least 5 cm wide and 30 cm deep, and narrow to at least 2.5 cm at their upper end (Vaughan, 1959). The crevices typically open high on a cliff and are at least 2 m above the substrate (Krutzsch, 1955; Vaughan, 1959). Mastiff Bats have great difficulty taking flight, and must drop at least 2 to 3 m for launching. Mastiff Bats also frequently roost in buildings, provided these have sheltering spaces with conditions similar to those described above. Howell (1920b) speculated that prior to construction of buildings, Mastiff Bats roosted in cracks in rocks and in hollow trees.

Vaughan (1959) observed Mastiff Bats and estimated that they foraged as much as 2000 ft above the ground. He noted that in some places they regularly foraged at 100 to 200 ft over the substrate. They probably forage for considerable distances from their roosting sites. For example, colonies roosting in suitable sites in the Diablo and Temblor ranges, flanking the San Joaquin Valley, likely foraged over the valley floor where insects were more abundant.

Mastiff Bats become torpid on a circadian cycle during the winter months (Leitner, 1966).

Recommendations: Data on the nature and extent of changes in population densities are needed. Historic roosting sites, especially those in areas unlikely to be disturbed by humans, should be surveyed to determine current numbers. Efforts to locate occupied roosts and to estimate numbers should be undertaken. Pesticide loads in captured bats, those found dead, and layered accumulations of guano should be determined.

Colonies which must be controlled because of health hazards or for other reasons should not be poisoned. Efforts to exclude such colonies from structures should be made only at times least likely to result in increased mortality (i.e., not in winter or when young, non-volant bats are present; Constantine, 1979).

Persons in public agencies who handle questions or problems dealing with bats should be informed of the need for information on E. perotis and of its sensitivity to disturbances. Sources of information on methods of non-lethal control of bats should be brought to the attention of such agencies (e.g., Barclay et al., 1980; Constantine, 1979).

Remarks: Eumops perotis is structurally distinct from all other species of Eumops. Eumops perotis californicus is the only subspecies occurring in North America. A second, disjunct population, E. p. perotis, is found in South America, as far south as Argentina (Eger, 1977).

Distribution Records: California (no specific locality), 1 (USNM). ALAMEDA CO.: Hayward, 1 (USNM). BUTTE CO.: Oroville (Eger, 1977). FRESNO CO.: Fresno, 2 (CAS), 1(MVZ); Little Table Mountain, 1 (CSUF); Mendota (von Bloeker, 1943); Trimmer, 1 (MVZ). IMPERIAL CO.: 24 mi S Palo Verde, 1 (MVZ). KERN CO.: near Bakersfield (Krutzsch, 1955); Buena Vista Lake, 5 mi NE Taft, 1 (CSLB); Buttonwillow, 1 (CAS); 1 mi SW Democrat Springs, 1950 ft, Kern River, 19 (MVZ); 10 mi N McKittrick, 1 (CAS); Summer, 1 (MVZ); 10 mi NW Taft, 1 (CSLB), 1 (LSU), 1 (ROM); 10 mi W Taft, 4 (CSLB); Twisselman Ranch, near McKittrick (Krutzsch, 1955). LAKE CO.; Arabella Lake (Storer, 1926); Middleton (Storer, 1926). LOS ANGELES CO.: Alhambra, 1 (AMNH), 1 (LACM), 1 (UI), 2 (USNM); Azusa, 1 (AMNH), 2 (CAS), 17 (LACM), 2 (LSU), 1 (MCZ), 1 (MVZ), 1 (SDSNH), 4 (USNM); Citrus College, Azusa, 1 (CSLB); Claremont (Vaughan, 1959); Covina, 1 (AMNH), 5 (CSLB), 4 (FMNH), 6 (LACM), 5 (MVZ), 4 (UI), 12 (USNM); Gardena (von Bloeker, 1932b); Glendora, 2 (CSLB); Los Angeles, 1 (AMNH), 16 (LACM), 1 (LSU), 1 (MVZ), 16 (USNM); Palms, 2 (SDSNH); Pasadena, 6 (MVZ); Pomona, 1 (KU), 1 (SDSNH), 7 (USNM); Santa Monica, 3 (SDSNH); Santa Monica Mountains, crest at east end (Vaughan, 1959); Sierra Madra, 9 (MVZ). MARIPOSA CO: Mariposa, 1 (ANSP); Yosemite Valley (Vaughan, 1959). MONTEREY CO: Camphora, 2 mi N Soledad, 1 (MVZ). ORANGE CO.: Santa Ana, 1 (ROM). RIVERSIDE CO.: 4 mi SW Lakeview, 2 (KU); Mecca, Colorado Desert, 1 (MVZ); near Perris (Vaughan, 1959); 6 mi W Riverside (Vaughan, 1959). SAN BENITO CO.: Silver Creek, 7 mi ESE Panoche, 900 ft, 18 (MVZ; Dalquest, 1946). SAN BERNARDINO CO.: Colton, 1 (KU), 7 (MVZ), 1 (PM), 1 (TCWC), 2 (UDAV), 1 (UI); Slover Mountain, Colton, 1 (MVZ); 1 mi N, 6 mi W Lucerne Valley (Vaughan, 1959). SAN DIEGO CO.: 1.5 mi N Barrett Junction, 7 (MVZ); Barrett Dam (Krutzsch, 1943); Bow Willow Ranger Station, Anza Borrego Desert, 1 (SDSNH); Dos Cabasas, 1 (USNM); Dulzura, 4 (FMNH), 19 (SDSNH); El Cajon (Vaughan, 1959); Lake Hodges, near Escondido, 1 (MVZ); Otay, 1 (CAS); San Diego, 2 (SDSNH); southeast of Suncrest (Krutzsch, 1945); Yaqui Well, 1 (SDSNH). TULARE CO.: Porterville (Constantine and Humphrey, 1979); Traver, 1 (CAS). TUOLUMNE CO.: Hetch Hetchy Reservoir (Vaughan, 1959).

Salinas Pocket Mouse
Perognathus inornatus psammophilus

1937. *Perognathus longimembris psammophilus* von Bloeker, Proc. Biol. Soc. Washington, 50:153. *Type Locality*: west side Arroyo Seco Wash, 150 ft, 4 mi S Soledad, Monterey Co., California.

Distribution: As defined herein (see Remarks), the known distribution of *P. i. psammophilus* extends from near Soledad southward to Hog Canyon in the Salinas Valley, Monterey Co. The relationships of populations on the Carrizo Plains (von Bloeker, 1937), Cuyama Valley, and upper Salinas River watershed are uncertain (see Remarks).

Populations Status: Most natural communities in the Salinas Valley have been cultivated or otherwise developed. Extant populations of Salinas Pocket Mice have not been located in that area in recent years. Areas where they may still be found are privately owned and access to search for Salinas Pocket Mice is difficult to acquire.

Habitat: According to von Bloeker (1937), Salinas Pocket Mice occur on fine-textured, sandy soils. They may also occur on a variety of other substrates in annual grassland and desert shrub communities, especially where plant cover is not dense and soils are friable.

Recommendations: The most pressing need is for information on the location and status of extant populations. Efforts to locate populations and to preserve suitable habitat in the Salinas Valley should be given relatively high priority. The systematic relationships of *P. i. psammophilus*, *P. i. inornatus*, and *P. i. neglectus* should be resolved prior to any proposals for protecting the Salinas Pocket Mouse.

Remarks: All of the specimens available to von Bloeker (1937) when he described *P. longimembris psammophilus* were subadults. He also described *P. inornatus sillimani* from the same locality (Arroyo Seco) at the same time (1937). All of the specimens of *P. i. sillimani* that von Bloeker (1937) reported on and used in his diagnosis were adults. Although von Bloeker (1937) compared both subspecies with other subspecies of their respective species, he did not compare the two new subspecies with each other. I examined all of the extant specimens of both taxa and found no evidence suggesting that there was more than one species represented. The two subspecies are based upon different age groups drawn from the same population. Neither group of specimens closely resembles *P. longimembris*, which, in my opinion, does not occur anywhere in the central California lowlands, despite indications to the contrary in Hall (1981) and other publications (see below). I consider *psammophilus* to be a subspecies of *P. inornatus*, and *P. i. sillimani* to be a junior synonym of *P. i. psammophilus*. The latter decision is based upon the superior page position of the description of *psammophilus* (von Bloeker, 1937).

Available data show that populations of *P. inornatus* living on the Carrizo Plain, San Luis Obispo Co., are closely similar in structure and karyotype to those of *P. i. neglectus* from along the western margin of the San Joaquin Valley (Williams, 1978, and unpubl. data). On the bases of different karyotypes (50 vs 56 chromosomes) and body proportions, *P. i. neglectus* and *P. i. inornatus* are probably different species. *P.*

longimembris does not occur in central California. Mice from within the San Joaquin, Sacramento, and Salinas valleys, identified by others as P. longimembris, are all referable to one or the other group of P. inornatus (unpubl. data).

Specimens listed here are from within the geographic range of P. i. sillimani as defined by von Bloeker (1937), but which I consider to be indistinguishable from P. i. neglectus. Their relationship with P. i. psammophilus is unresolved; it is possible that psammophilus will be found to be a synonym of neglectus. SAN LUIS OBISPO CO.: 5.5 mi SW Caneros Spring, 1 (CAS); Carrizo Plains, W end Salt Lake, 1 (USNM); Carrizo Plains, 8 mi E [SE] Simmler, 3 (USNM); 8.75 mi SE Cholame, 2200 ft, 1 (CAS); Cuyama Valley, 3 mi E Cuyama Ranch, 3 (USNM); Elk Horn Plain, 1 (CM); Indian Creek, 1500 ft, 13 mi S Shandon, 1 (MVZ); Salinas Valley, 2 mi S San Miguel, 7 (MVZ); San Diego Joe's, 2700 ft, 6 (MVZ); San Diego Joe's, 1 mi S, 7 mi E Simmler, 2700 ft, 7 (MVZ); Santiago Springs, 1 (MVZ), 4 (USNM); Santiago Springs, 1.5 mi S, 8 mi E Simmler, 10 (MVZ); 4 mi S, 5 mi E Shandon, 1175 ft, 4 (MVZ); 7 mi SE Simmler, 5 (MVZ); Soda Lake, 1 (CSLB). VENTURA CO.: Quatal Canyon, 6 mi E Venucopa, 1 ((MVZ).

Localities (above) listed as San Diego Joe's and Santiago Springs refer to the same place. This has led to considerable confusion because Santiago Creek is in Kern County on the San Joaquin Valley side of the Temblor Range and San Diego Joe's was located along San Diego Creek on the western slope of the Temblor Range. Also, the locality referred to as San Diego Joe's or Santiago Springs is around 2500 ft.

Distribution Records: MONTEREY CO.: Arroyo Seco, W side, 4 mi S Soledad, 150 ft, 8 (LACM), 30 (MVZ); Arroyo Seco River, 10 mi S Paraiso Springs, 1 (USNM); Hog Canyon, 1 (LACM); Metz, Salinas Valley, 200 ft, 1 (MVZ); mouth Wild Horse Canyon, 500 ft (von Bloeker, 1937).

White-eared Pocket Mouse
Perognathus alticola alticola

1894. Perognathus alticolus Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 45:412. Type Locality: Squirrel Inn, 5500 ft near Little Bear Valley, San Bernardino Mountains, San Bernardino Co., California.
1900. Perognathus alticola, Osgood, N. Amer. Fauna, 18:39.

Distribution: Perognathus alticola alticola is known only from the western portion of the San Bernardino Mountains in the vicinity of Strawberry Peak, at altitudes extending from about 5400 ft to 5800 ft. Grinnell (1908) reported that an immature Perognathus, partly eaten, was found in a trap set in Sagebrush at the north base of Sugarloaf Peak, at 7500 ft. This was likely a White-eared Pocket Mouse.

Population Status: Stephens (1906) remarked that White-eared Pocket Mice were uncommon, and that considerable trapping had yielded only six specimens. A few additional specimens were collected in the years prior to the 1940's. I am not aware of any specimens collected later than 1934. Jim Sulentich (1983) searched extensively for White-eared Pocket Mice, starting in June of 1979 and using pitfalls and livetraps. To date, no White-eared Pocket Mice have been taken.

Habitat: Only scant information has been recorded. Grinnell (1933) stated that members of this population inhabited the Transition life-zone, living on the "dry floor of open Pine forest where Bracken Fern grows." White-eared Pocket Mice are likely to be found among Sagebrush and other shrubs in open, Ponderosa Pine forests and Pinyon-Juniper woodlands and in Sagebrush covered areas on the northern slopes and Big Bear Basin of the San Bernardino Mountains.

Recommendations: The U.S. Forest Service should be informed of the need for information on White-eared Pocket Mice, as it is the principal land-administering agency within the area. Efforts to locate extant populations should be intensified, including searches in the San Gabriel Mountains. If and when such populations are located, action designed to ensure their security should be taken.

Remarks: Jim Sulentich and David Huckaby at California State University, Long Beach are principal authorities on the current population status of this taxon. White-eared Pocket Mice will probably be found to be most common on the northern slopes of the San Bernardino and San Gabriel Mountains.

Rhoad's (1894) specific epithet, alticolus, apparently referred to the mountain home of this species (altus, high; cola, inhabiting). However, the root, col, is a prefix to be used before r and meaning with or together. Osgood (1900) amended the spelling without comment. As Rhoads (1894) made no reference to what the name was supposed to mean or how it was derived, one can only guess about his intent. I suspect, therefore, that Osgood's amendment was inappropriate, but as this spelling (alticola) is well-entrenched in the literature, its continued use will best preserve nomenclatural stability. I raise this issue here because two prominent works on California's mammals (Grinnell, 1933; Ingles, 1965) used Rhoads' spelling. Rhoads' paper was dated 1893, but was published in 1894. The White-eared Pocket Mouse is an apparently isolated allospecies of the Perognathus parvus group (Williams, 1978).

Distribution Records: SAN BERNARDINO CO.: San Bernardino Mountains, 3 (USNM), 1 (ANSP), 1 (SDSNH); Squirrel Inn, San Bernardino Mountains, 5500 ft, 2 (LACM), 3 (MVZ), 6 (SDSNH); 0.5 mi E Strawberry Peak, San Bernardino Mountains, 2 (SDSNH); 1 mi E Strawberry Peak, San Bernardino Mountains, 5750 ft, 5 (MVZ), 3 (SDSNH); 2 mi E Strawberry Peak, 5750, ft, 13 (MVZ); Strawberry Peak, 5000 to 5700 ft, 21 (LACM).

Southern Marsh Harvest Mouse
Reithrodontomys megalotis limicola

1932. Reithrodontomys megalotis limicola von Bloeker, Proc. Biol. Soc. Washington, 45:133.

Distribution: Southern Marsh Harvest Mice are known to occur only in coastal salt marshes in Ventura, Los Angeles, Orange, and Santa Barbara counties, California.

Population Status: No current data are available. The urbanization of the areas within this mouse's range has been extensive. Stream

channelization and development of coastal areas have resulted in habitat loss. These developments and urbanization could have fragmented remaining habitat and isolated populations too small to endure. Some of the marshes are currently protected as ecological reserves, however.

Habitat: Southern Marsh Harvest Mice are strictly confined to marshy areas, generally coastal salt marshes dominated by Salicornia. Adjacent weedy areas and marshes in brackish sites may also be inhabited (von Bloeker, 1932a).

Recommendations: The immediate need is for data on distribution and population status. A live-trapping program should be undertaken.

Remarks: Specimens identified as R. m. limicola from Dominguez Hills and Palo Verde Hills, Los Angeles County (CSLB), are probably referable to R. megalotis longicaudus. According to von Bloeker's (1932a) description, R. m. limicola is easily distinguished from adjacent subspecies of Harvest Mice.

Distribution Records: LOS ANGELES CO.: Del Rey Marsh, 3 (LACM), 1 (USNM); 0.5 mi NW El Segundo, 1 (MVZ); Hyperion, 2 (LACM); Marina Del Rey, salt marsh N of Culver Blvd., 1 (CSLB); Nigger Slough, Gardena, 5 (LACM); Playa del Rey, salt marsh, 46 (LACM); 1 mi N Playa del Rey, salt marsh, 1 (LACM); Torrence, Avalon Blvd. and Dominquez Channel, 1 (CSLB). ORANGE CO.: Anaheim Bay, 8 (LACM); Los Altos, E of Ammo. Dump, 1 (CSLB); Newport Beach, 2 mi NE Highway 101, 2 (CSLB); San Gabriel River Blvd., 1 (CSLB). SANTA BARBARA CO.: Carpinteria, salt marsh, 5 (LACM). VENTURA CO.: Point Mugu, 16 (LACM).

Riparian Woodrat
Neotoma fuscipes riparia

1938. Neotoma fuscipes riparia Hooper, Univ. California Publ. Zool., 42:223. Type Locality: Kincaid's Ranch, 2 mi NE Vernalis, Stanislaus Co., California.

Distribution: Riparian Woodrats are known only from an area along the San Joaquin, Stanislaus, and Tuolumne rivers in Stanislaus and San Joaquin counties (Hooper, 1938; unpubl. data). Hall and Kelson (1959) assigned a specimen from El Nido, Merced Co., to this subspecies on geographical grounds (see Remarks).

Population Status: Trapping programs along the Tuolumne (C. Johnson, unpubl. ms.) and Stanislaus (G. Basey, unpubl. ms.) rivers have resulted in a few captures only in Caswell State Park. The current status of this population is unknown. Regulation of stream flow, stream channelization, cultivation of the floodplains, and brush and tree removal have diminished available riparian habitat. Removal of undergrowth and large trees with dead and hollow limbs in parks has reduced habitat further. If current trends continue, additional habitat loss can be expected. During floods, there are few or no refuges for Woodrats, as nearly all land bordering the rivers is cultivated. A population is still extant in the general area of the type locality (unpubl. data), but its demographic features are unknown.

Habitat: Dusky-footed Woodrats are found only in areas supporting brush. Generally, they occur in areas with mixtures of trees and brush. They require suitable nesting sites such as cavities in trees, snags, or logs; spaces in talus; or lodges built of downed woody material. These houses or lodges are usually a conspicuous feature of areas inhabited by N. fuscipes.

Nothing specific has been recorded about the habitat of Riparian Woodrats. Basey (unpubl. ms.) captured a few Riparian Woodrats in traps set in runways of Riparian Brush Rabbits. Students at California State Univ., Stanislaus, have noted that these Woodrats occasionally use nest boxes placed in trees for Wood Ducks along the lower San Joaquin and Tuolumne rivers. Apparently, Woodrats also eat the eggs of the Wood Ducks. The San Joaquin Valley is generally devoid of suitable habitat for Woodrats, except along rivers where trees and brush were found. Thus, this population is confined to riparian habitat.

Recommendations: A survey of riparian areas along all of the principal tributaries of the San Joaquin River should be undertaken to determine distribution and abundance of N. f. riparia. The status and relationships of the Woodrats in Corral Hollow should be clarified. Appropriate wildlife organizations and county fish and wildlife committees involved in placing and monitoring Wood Duck nesting boxes should be alerted to the need for information about Riparian Woodrats.

Remarks: There is no habitat for N. fuscipes in the area around El Nido today, because of agricultural developments. The specimen probably came from somewhere along the San Joaquin River west or south of El Nido. A specimen from 10 mi SW Los Banos (Merced Co.; CSUF) is either N. f. perplexa or N. lepida (I do not recall looking at the specimen when the data were obtained from the museum records).

Distribution Records: MERCED CO.: El Nido (Hall and Kelson, 1959). SAN JOAQUIN CO.: Corral Hollow, 1 (MVZ); Corral Hollow Creek, 4 mi E Alameda Co. line, 1 (MVZ); San Joaquin River, 3 mi NE Vernalis, 3 (MVZ). STANISLAUS CO.: Kincaid's Ranch, 2 mi NE Vernalis, 2 (MVZ).

White-footed Vole
Arborimus albipes

1901. Phenacomys albipes Merriam, Proc. Biol. Soc. Washington, 14:125. Type Locality: Redwoods, near Arcata, Humboldt Bay, Humboldt Co., California.

1979. Arborimus albipes, Williams, Ann. Carnegie Mus., 48:426.

Distribution: White-footed Voles occur in the humid coastal forest region from the Columbia River, Oregon, southward to Humboldt County, California. They are known from near sea level to as high as 3500 ft (Maser and Johnson, 1967). The localities in California are all from low-lying areas.

Population Status: No data are available to allow determination of the population status of A. albipes. White-footed Voles have been captured infrequently, and must be considered rare. Because nearly all known

localities of capture have been associated with small streams in forested areas, White-Footed Voles may be sensitive to logging and other alterations of riparian habitats.

Habitat: Maser and Johnson (1967) reviewed habitat notes associated with each specimen known to them. White-footed Voles have been taken in a variety of situations, but generally seemed to be associated with small streams in forested areas. Available evidence indicates that these voles are terrestrial, unlike A. longicaudus. Their structural features, however, suggest that they are more scansorial than typical voles (Johnson and Maser, 1982). They probably climb shrubs and downed woody material in the understory, and perhaps even trees.

All records of capture are from areas in the humid coastal forest region. Captures were mostly in forested sites, but one was taken in a logged area (two years after logging), and one was captured in a grassy spot on a partly logged ridge top (Maser and Johnson, 1967). Very small clearings, created by fallen timber and supporting herbaceous growth, may be important habitat for this species. Thickets of Alders and other riparian communities along small streams (Maser et al., 1980) may also be essential habitat.

Howell (1928) found only roots of herbaceous plants in three stomachs of White-footed Voles, whereas Maser and Johnson (1967) found green plant material in several stomachs.

Recommendations: Arborimus albipes should be given special consideration in forest management plans within its range. There is little public land within its known range in California. White-footed Voles occur in the Redwood National Park's northern section in Del Norte and Humboldt counties; special effort should be made to determine their distribution and habitat needs there.

White-footed Voles will probably be found farther inland at higher elevations on State and U.S. National Forest lands. Intensive searches should be conducted to determine the limits of their distribution in California, habitat needs, and population status. Pitfall trapping may prove more successful for capture of White-footed Voles than conventional snap-traps.

Remarks: Taylor (1915) described Arborimus as a subgenus of Phenacomys. Johnson (1973) presented and discussed evidence which indicated that Tree Voles (Arborimus) were divergent from Heather Voles (Phenacomys); he elevated Arborimus to generic rank. Unfortunately, Johnson (1973) did not state whether albipes was an Arborimus or a Phenacomys. Based upon the obviously close similarity of albipes to A. longicaudus (Howell, 1920c, 1926; Taylor, 1915), Williams (1979) treated albipes as a member of the genus Arborimus. Johnson and Maser (1982) discussed characteristics diagnostic for Arborimus and Phenacomys and formally transfered albipes to the genus Arborimus.

Distribution Records: DEL NORTE CO.: Wilson Creek, N of Klamath [city], 1 (CM). HUMBOLDT CO.: Arcata, Humboldt Bay, 1 (USNM); 5.5 mi E Bayside, 1 (MVZ); 3 mi N Orick, 1 (UCLA); Trinidad, 1 (HSU), 1 (MVZ), 2 (SDSNH); N of Trinidad, 1 (MVZ), 3 (USNM).

Point Reyes Jumping Mouse
Zapus trinotatus orarius

1899. *Zapus orarius* Preble, N. Amer. Fauna, 15:29. Type Locality: Point Reyes, Marin County, California.
1944. *Zapus trinotatus orarius*, Hooper, Misc. Publ. Mus. Zool., Univ. Michigan, 59:67.

Distribution: *Zapus trinotatus orarius* is apparently confined to a small area on the Point Reyes Peninsula, Marin County, California (Krutzsch, 1954).

Population Status: No data are available on the current status of Point Reyes Jumping Mice. The habitat for this population is not extensive. Post-Pleistocene changes in climate may continue to modify habitat unfavorably for this species in the Point Reyes area. Grazing by Cattle may have been a factor contributing to adverse conditions for Jumping Mice at Point Reyes, but this problem has been resolved. The impact of introduced Axis and Fallow deer is unknown. The principal causes for concern are the small range and relictual nature of the population, and the fact that these mice are seemingly scarce.

Habitat: Howell (1920d) listed the habitat of this population as bunch grass marshes on the uplands of Point Reyes. Krutzsch (1954) stated that Point Reyes Jumping Mice occur in moist areas that are safe from continuous inundation. Farther north, Pacific Jumping Mice are characteristic of the Pacific coastal coniferous forests. They seem to prefer riparian Alder communities and treeless openings with tall, dense herbaceous growth of grasses and forbs (Maser et al., 1981). Wet, marshy sites are often said to be preferred, although Pacific Jumping Mice also occur occasionally in closed forests with little understory, in dry meadows, and more often in thickets of deciduous, woody vegetation along streams and seepage areas.

Zapus trinotatus eats seeds of herbaceous plants, especially grasses and grass-like monocots. Stems of plants are frequently cut to obtain ripening seed-heads. Fruits and insects are also eaten (Krutzsch, 1954; Jones, et al., 1978).

Recommendations: A live-trapping program employing pitfalls is the best method of sampling for Jumping Mice. Conventional livetraps rarely capture Jumping Mice in comparison to pitfalls (Williams and Braun, 1983). The Point Reyes area should be thoroughly inventoried for Jumping Mice, and their habitat associations, specific requirements, and population status established.

Remarks: Point Reyes Jumping Mice are the southernmost population of Pacific Jumping Mice. The structural characters of this population are distinctive, and no evidence exists of intergradation with Jumping Mouse populations farther north along the California coast (Howell, 1920d). Hooper (1944) arranged *orarius* as a subspecies of *trinotatus*, suggesting that intergrades could be expected from geographically intermediate areas. Krutzsch (1954) concurred with Hooper's (1944) arrangement, but noted that "Interbreeding in the wild between *Z. t. orarius* and *Z. t. eureka* probably does not take place, because these subspecies are

separated by terrain not suited to Jumping Mice."

Distribution Records: MARIN CO.: Elk, Tennessee Valley (barn on Lewis Dairy — from owl pellet), 1 (USNM); W end Elk Valley, 10 ft, 1 (MVZ); Fort Berry, 1 (CAS); Fort Cronkhite, 1 (CAS); 3 mi W Inverness, 300 ft, 16 (MVZ); Point Reyes, 1 (USNM); 5 mi NNE point Reyes Lighthouse, 12 (MVZ); 6 mi NE Point Reyes, 1 (MVZ); West Portal, Fort Barry, 2 (MVZ); 6 mi SSE Tomales Bay, 1 (CAS).

THIRD PRIORITY LIST

Big Free-tailed Bat
Tadarida macrotis

1839. *Nyctinomus macrotis* Gray, Ann. Mag. Nat. Hist., 4:5. Type Locality: Cuba.
1962. *Tadarida macrotis*, Miller, Bull. U.S. Natl. Mus., 28:86.

Distribution: Big Free-tailed Bats are found from northern South America and the Caribbean Islands northward to the western United States. Populations in the southwestern U.S. appear to be widely scattered. Known breeding localities in the U.S. are found in parts of Arizona, New Mexico, and Texas. In California, *T. macrotis* is known only from a few low-lying arid areas of southern California and a single specimen from Berkeley, Alameda Co. (see Remarks). According to Barbour and Davis (1969), records of accidental occurrence (stray, migratory individuals) are known from widely scattered localities in western North America, including British Columbia and Iowa.

Population Status: Very little is known of *Tadarida macrotis* in California. Possibly it does not occur regularly within the state. The nature of the records, however, suggests that Big Free-tailed Bats breed somewhere within the state -- most likely in the rugged, wooded, mountainous areas of southern California. At least one of the specimens from California was a young bat (Hall, 1946), collected on 11 August. Huey (1932, 1954a) reported on two Big Free-tailed Bats from San Diego, one collected on 1 February; the second, when found, was mummified. The specimen from Berkeley was taken on 18 December (unpubl. data).

Tadarida macrotis may not be under any threats within California. Its rarity, however, gives cause for concern about its present status. Listing it here may stimulate efforts by others to clarify its status.

Habitat: Big Free-tailed Bats inhabit relatively rocky areas in the arid southwestern U.S. They apparently roost primarily in crevices in cliffs (Barbour and Davis, 1969). Findley et al. (1975) described maternity colonies situated in a crevice in the roof of a large sandstone rock shelter and under slabs of lava on a perpendicular cliff. They found Big Free-tailed Bats up to 8000 ft, but they were most common in communities below 6000 ft in New Mexico. In New Mexico, at least, females apparently inhabit forested areas during the reproductive season in the summer. Big Free-tailed Bats appear to be migratory in most of the U.S. Winter records, however, include specimens from San Diego, California, and Yuma, Arizona (Barbour and Davis, 1969).

Recommendations: An attempt to gather current information on the distribution and populations status of the Big Free-tailed Bat should be undertaken. Biologists and public health personnel who routinely receive information from the public about bats or who conduct research on bats should be alerted to the need for information on this species. They should be provided with a description to aid identification of this species. Students and faculty members at colleges and universities in southern California should be encouraged to undertake studies of the

occurrence and habitat associations of bats in various parts of southern California.

Remarks: Tadarida macrotis has been listed as T. molossa in much of the literature. A note in the card catalog of the Museum of Vertebrate Zoology, Univ. California, Berkeley, questioned the specimen from Berkeley on the basis that the tag was attached to the jar rather than the specimen. Everything else appeared to be in order and the jar seemed not to have been opened or otherwise disturbed, according to the notation. All things considered, the record should be accepted as accurate.

Distribution Records: California (no precise locality, but presumably along the Colorado River near Nevada), 1 (USNM). ALAMEDA CO.: Berkeley, Univ. California Campus, 1 (MVZ). SAN DIEGO CO.: San Diego, 2 (SDSNH); Mission Beach, San Diego (August and Dingman, 1973).

Pygmy Rabbit
Brachylagus idahoensis

1891. Lepus idahoensis Merriam, N. Amer. Fauna, 5:76. Type Locality: Pahsimeroi Valley, near Goldburg, Custer Co., Idaho.
1904. Brachylagus idahoensis, Lyon, Smithsonian Misc. Coll., 45:411.

Distribution: Pygmy rabbits are found only in the Great Basin and contiguous areas in Sagebrush-dominated communities. They occur from southeastern Washington southward to about Inyo Co., California, and eastward to western Utah and southeastern Idaho. In California, they occur in eastern Modoc, Lassen, and Mono counties and probably in northern Inyo County. Their occurrence is very spotty throughout their geographic range (Green and Flinders, 1980).

Population Status: Pygmy Rabbits have a limited and spotty distribution, being strictly confined to suitable stands of Sagebrush (primarily Artemisia tridentata) and Rabbitbrush (Chrysothamnus spp.). Although Pygmy Rabbits may seem common where found, they are not numerous over their geographic range.

The current population status of Pygmy Rabbits in California is unknown, but their numbers have probably declined in the past several years. Loss of habitat to cultivation is less of a factor than loss of habitat by overgrazing. Even though overgrazing favors growth of woody shrubs such as Sagebrush over perennial grasses, cattle often congregate in tall stands of Sagebrush, seeking shade in summer, protection from wind, and relief from insects. Frequently, cattle trample and otherwise open up the understory from ground level up to 1 to 1.5 m, reducing food and shelter for Pygmy Rabbits. Brush clearing on rangelands and range fires also reduce available habitat for Pygmy Rabbits. In Oregon, Weiss and Verts (1984) found evidence of a marked decrease in occupancy of sites between 1981 and 1983. They suggested that Pygmy Rabbit populations are susceptible to rapid declines and local extirpations. The fragmentation of Sagebrush communities poses a potential threat to extant populations because of this susceptibility.

Habitat: Pygmy Rabbits are associated only with dense stands of tall Sagebrush and rabbitbrush. Soils must be friable for burrowing. Weiss and Verts (1984) found that Pygmy Rabbits were associated with areas with greater shrub cover, shrub height, soil strength, and soil depth in comparison to adjacent, unoccupied sites. There was no significant association with percent basal area of perennial grasses, density of annual grasses, density of forbs, or cryptogam cover. Burrows of Pygmy Rabbits are usually placed on slopes (Green and Flinders, 1980). Food consists principally of Big Sagebrush (A. tridentata) in winter (up to 99% of the diet), whereas grasses form a significant portion of the diet in summer. White et al. (1982) found differential use of populations of Big Sagebrush, but were unable to associate this with known variations in the chemical composition of A. tridentata populations. Captives, however, showed no significant preference as food for one type of Sagebrush subspecies over others. Weiss and Verts (1984) determined that occupancy of sites by Pygmy Rabbits in Oregon was not dependent upon the presence of particular subspecies of Sagebrush.

Recommendations: Detailed information on distribution, habitat associations, abundance, and numbers of Pygmy Rabbits killed by hunters in California are needed. Management of habitat for Pygmy Rabbits is probably the most important element in ensuring their survival. Land and resource management agencies in California should be encouraged to develop needed information on Pygmy Rabbit populations and to consider habitat for Pygmy Rabbits in land and resource management

Remarks: The Pygmy Rabbit is designated as a Resident Small Game species in California. There is an open season for hunting from 1 July through January, with a daily bag limit of five. Although the effect of hunting on Pygmy Rabbit populations is not known, hunters probably do not kill many because Pygmy Rabbits are quite secretive and rarely venture from dense brush; they usually retreat to their burrows when threatened.

Brachylagus is structurally and behaviorally distinct from all species of Sylvilagus and apparently of an ancient lineage separate from that of Sylvilagus. It was first treated as a species of Sylvilagus by Grinnell et al. (1930) for reasons that have little or no bearing on its phyletic relationships. Since then, most authors have treated it as a species of Sylvilagus (e.g., Hall, 1981). Green and Flinders (1980) reviewed the taxonomic history of B. idahoensis.

Distribution Records: LASSEN CO.: 7 mi E Ravendale, 5000 ft, 19 (MVZ); 3 mi S Ravendale, 5300 ft, 1 (MVZ); vicinity of Red Rock Post Office, 5300 ft (Grinnell et al., 1930. MODOC CO.: Goose Lake, 2 (USNM). MONO CO.: Bodie, 8374 ft, 2 (CAS), 8 (MVZ); north of Crowley Lake (Jones, 1957); Mono Dunes (Harris, 1982); Mono Flats, 7000 ft, 3 (CAS); Mono Lake, near Mono Mills, 4 (CSUF); Mono Lake, Black Point (Harris, 1982); Mono Lake County Park (Harris, 1982).

Oregon Snowshoe Hare
Lepus americanus klamathensis

1899. Lepus klamathensis Merriam, N. Amer. Fauna, 16:100. Type Locality: head of Wood River, near Fort Klamath, Klamath County,

Oregon.
1936. Lepus americanus klamathensis, Bailey, N. Amer. Fauna, 55:95.

Distribution: Lepus americanus klamathensis is found in the Cascade Mountains from Mt. Hood, Oregon, southward to Mt. Shasta and the Trinity Mountains of California (Bailey, 1936; Orr, 1940). In California, it is known from the vicinity of Mt. Shasta, the Trinity Mountains, and from the Warner Mountains. The Warner Mountain population is probably isolated from all others by expanses of unsuitable habitat.

Population Status: Apparently, Oregon Snowshoe Hares never have been common in California within historic times, judging from early accounts (e.g., Merriam, 1899) and from the small number of specimens in museums (Orr, 1940). Mossman (1979) considered determination of their present abundance within California to be important. Mailliard (1927) failed to find L. americanus in the Warner Mountains; the species is apparently known from a single specimen from that mountain range. I saw no evidence of L. americanus in the Warner Mountains during 3 days of field work in 1983.

Populations of Snowshoe Hares undergo periodic fluctuations in numbers, so field researchers may have simply searched when populations were low. The evidence, however, favors an interpretation of rarity.

The Snowshoe Hare is a game species in California (Resident Small Game), and may be hunted from 1 July through January, with a bag limit of five per day. Many hunters probably fail, however, to distinguish Snowshoe Hares from other hares (Black-Tailed and White-Tailed) which have no season or bag limits in California. The effect of hunting on populations of L. americanus in California is unknown.

No definite decline in numbers has been established. The apparent rarity of these hares and the potential for habitat loss due to logging and usurpation of riparian habitat by humans require that the population status of L. a. klamathensis be determined.

Habitat: Snowshoe Hares are primarily found in riparian areas with thickets of deciduous trees such as Alders and Willows, and in dense thickets of young conifers, particularly firs. Dense patches of Ceanothus and Arctostaphylos are sometimes inhabited. In California, Snowshoe Hares are found mainly above the Yellow Pine zone, in Canadian and Hudsonian associations (Orr, 1940). Merriam (1899) reported that Snowshoe Hares formerly were common in marshy places along streams near Fort Klamath, Oregon. He did not obtain specimens, however, during field work at Mt. Shasta. Mossman (1979) indicated that Snowshoe Hares only inhabit areas in northern California which have snow in the winter.

Recommendations: The highest priority should be given to determining the status of the Warner Mountain population, an apparently isolated and unique population. Detailed assessments of population numbers in all areas of the range of L. a. klamathensis should be made. Habitat needs of L. americanus klamathensis should be considered in managing State and U.S. National Forest lands within its range.

Remarks: Orr (1940) regarded the Washington Snowshoe Hare as specifically

distinct from L. americanus, and treated klamathensis as a subspecies of L. washingtoni (but see Dalquest, 1942).

Distribution Records: MODOC CO.: vicinity of Fort Bidwell, 6000 ft, 1 (MVZ). SHASTA CO.: McCloud River, 12 mi E McCloud Post Office, 1 (MVZ); south fork Salmon River (Grinnell, 1933). SISKIYOU CO: T. H. Benson Estate, Butte Creek, 5000 ft, 1 (MVZ); Gottville, 1 (USNM); McCloud, 1 (MVZ); N of Mt. Shasta (city), 1 (UDAV). TRINITY CO.: head of Bear Creek, 2 (MVZ); Rush Creek, 12 mi from Weaverville, about 3000 ft, 1 (MVZ).

Sierra Nevada Snowshoe Hare
Lepus americanus tahoensis

1933. Lepus washingtoni tahoensis Orr, J. Mamm., 14:45. Type Locality: 0.5 mi S Tahoe Tavern, Placer Co., California.
1942. [Lepus americanus] tahoensis, Dalquest, J. Mamm., 23:176.

Distribution: Sierra Nevada Snowshoe Hares range along the mid-elevations of the Sierra Nevada from the vicinity of Mt. Lassen southward to Mono and Tulare counties (unpubl.). They are known from Nevada only in the vicinity of Lake Tahoe (Hall and Kelson, 1959). They occupy altitudes above 4800 ft in the north of their range and 5000 ft in the south. Upper elevational limits are unknown; these hares generally occur below 8000 ft.

Population Status: Judging from circumstantial evidence, Sierra Nevada Snowshoe Hares are more abundant than Oregon Snowshoe Hares, but still are relatively uncommon. There is no evidence of a population decline, but L. americanus is vulnerable to widespread habitat alterations due to some logging activities and use of meadows for agriculture, grazing, and other activities. Furthermore, this is a Resident Small Game species which is hunted from 1 July through January. Many hunters likely fail to distinguish L. americanus from white-tailed hares (Lepus townsendii), which have no season or bag limits in California. The effect of hunting on L. a. tahoensis populations is unknown, but is unlikely to be much of a factor.

Habitat: The habitat of Sierra Nevada Snowshoe Hares is similar to that of L. a. klamathensis. They live only in boreal zones, typically inhabiting riparian communities with thickets of deciduous trees and shrubs such as Willows and Alders. They also frequent dense thickets of young conifers and chaparral composed of Ceanothus and Arctostaphylos (Orr, 1940). In the Lake Tahoe region in summer, Orr, (1940) noted signs of Snowshoe Hares only near brush adjacent to both meadows and riparian deciduous vegetation. He found no evidence of Snowshoe Hares on ridgetops or brush-covered upper slopes. In the Mt. Lassen region, Grinnell et al. (1930) found that Snowshoe Hares were uncommon, being infrequently encountered among thickets of Snow-brush and young Firs, and in or near thickets of Alders and Willows situated in meadows. In winter, Grinnell et al. (1930) found tracks of Snowshoe Hares to be more numerous in and near thickets of Snow-brush, Willows and small conifers than on more open ridges.

Recommendations: The principal need is for reliable data on distribution

and abundance of L. a. tahoensis. Special consideration of habitat needs of L. americanus in managing public lands in California is needed.

Remarks: Lepus americanus tahoensis differs from L. a. klamathensis in its darker coloration, other, minor details of coloration, and in skull proportions. There is no controversy about its status.

Distribution Records: ALPINE CO.: Pacific Valley, half way between Woodfords and Big Trees, 1 (MVZ). EL DORADO CO: no precise locality, 1 (MCV); Echo Lake, 1 (MVZ). LASSEN CO.: Warner Creek (Grinnell, 1933). MONO CO.: 4 mi N, 1 mi E Mammoth, 1 (HSU). NEVADA CO.: Sagehen Creek, 4 mi NW Hobart Mine, 1 (MVZ); Spruce, 1 (MVZ); 10 mi W Truckee, 1 (MVZ); Truckee, 1 (MVZ). PLACER CO.: Cisco, 1 (MVZ); Donner, 1 (USNM); near S shore Donner Lake, 6000 ft, 1 (MVZ); Donner Summit, 7000 ft, 1 (MVZ); Lake Tahoe, Rubicon subdivision between Emerald Bay and Meeks Bay, 3 (CAS); near Tahoe City, 19 (MVZ); 0.5 mi S Tahoe Tavern, 1 (MVZ). PLUMAS CO.: Willow Lake, 5600 ft, 1 (MVZ). SIERRA CO.: east side Yuba Pass, 6000 ft, 1 (MVZ). TEHEMA CO.: 7 mi E junction highways 32 and 36, 1 (CSUC); Mineral, 4800 ft, 1 (MVZ); Summit Creek, 5200 ft, 2 mi E Mineral, 2 (MVZ). TUOLUMNE CO.: Niagra Creek, 5600 ft (Orr, 1940); between Pine Crest and Belle Meadows, 1 (MVZ); 1 mi NW Strawberry, 6000 ft, 1 (CAS).

Western White-tailed Hare
Lepus townsendii townsendii

1839. Lepus townsendii Bachman, J. Acad. Nat. Sci. Philadelphia, 8(1):90. Type Locality: Fort Walla Walla, Walla Walla Co., Washington.

Distribution: Western White-tailed Hares are found from the Okanogan Valley of southern British Columbia southward east of the Cascade Crest to the southern Sierra Nevada of California, and eastward to extreme western Montana and western Colorado (Hall, 1981). In California, White-tailed Hares principally occupy open forests and sagebrush-grassland associations in the Great Basin Province. They occur also at high elevations along the main crest of the Sierra Nevada and rarely to as low as 6000 ft on the western slope. I observed white-tailed hares near Markwood Meadow at about 6000 ft, and on Tamarack Ridge at about 7500 ft in Fresno Co., approximately 30 mi west of the Sierra Nevada crest. The southernmost published locality known is Mt. Silliman, Tulare County in Sequoia National Park (Fry, 1924).

Population Status: Little current information is available for California. Airola (1980) stated that this species had not been seen in Lassen County in the last 20 years. Evidence suggests that populations of L. townsendii have declined drastically, especially at lower elevations in the sagebrush-grassland associations of the Great Basin province (Grayson, 1977). Competition with domestic livestock is probably a principal factor in the drastic population declines throughout its range, including California (Dalquest, 1948; Mossman, 1979). Loss of habitat to cultivation and other developments are probably also important factors in the decline. Hunting could be a factor, but is probably less important than habitat loss.

Dalquest (1948) noted that early explorers and settlers found White-tailed

Hares in abundance in eastern Washington. At the same time, Black-tailed Hares apparently were absent from the state prior to 1870 (Couch, 1927). With grazing by livestock the bunchgrass habitat was rapidly reduced, the Black-tailed Hares expanded their range explosively northward, and the White-tailed Hares survived only at the upper elevational limits of their habitat in the yellow pine/sagebrush-grassland ecotone. Today, White-tailed Hares are extinct over the greater part of their historic range on the Columbia Plateau. In California, they are nowhere common. Grinnell et al. (1930) found scant evidence of White-tailed Hares in the area from east of Lassen Peak to the Nevada border. Grinnell and Storer (1924) remarked that even in the center of their range in the Yosemite region they were much less common than the Black-tailed Hares of lower country. Howell (1924) failed to find White-tailed Hares in the Mammoth region, although he saw evidence of their presence. Orr (1940) declared that White-tailed Hares were one of the rarer members of the genus Lepus in California, noting that they were by no means abundant anywhere.

Currently, this is a Resident Small Game species in California with no closed season or daily bag limits.

Habitat: White-tailed Hares occupy a variety of habitats, including Sagebrush-covered slopes on the eastern Sierra Nevada, grasslands and meadows to timberline or above, and forests of Lodgepole Pine, Yellow Pine, Western Juniper, Dwarf Juniper, Red Fir, and mixed conifers. In the Sierra Nevada, White-tailed Hares apparently migrate to higher areas in summer and descend to lower regions in winter, particularly the Sagebrush-covered eastern slopes of the Sierra Nevada (Merriam, 1904; Orr, 1940).

Orr (1940) found signs of White-tailed Hares to be most abundant on exposed, flat-topped ridges above 8500 ft in El Dorado Co. Farther north in Oregon and Washington, White-tailed Hares were formerly most numerous on the bunchgrass prairies and the Sagebrush-bunchgrass associations near the Yellow-Pine zone (Bailey, 1936; Dalquest, 1948). Grinnell and Storer (1924) stated that in the Yosemite region, White-tailed Hares "generally keep to open places where they can see unobstructedly for long distances. Around Tuolumne Meadows, flat-topped hills bearing moderately open stands of trees together with some brush were often occupied."

Lepus townsendii apparently requires thickets of young or stunted conifers, or deciduous, woody plants for day-time cover. It feeds primarily at night in meadows during summer. Winter staples probably include bark of Willows, Alders and other woody plants

Recommendations: Population surveys throughout the range of L. townsendii in California should be carried out. Habitat needs of White-tailed Hares should be considered in management decisions on state and federal lands within their geographic range.

Remarks: Orr (1940) regarded the population in California formerly known as L. t. sierrae, as inseparable from L. t. townsendii.

Distribution Records: ALPINE CO.: Carson Valley, 5270 ft, 1 (MVZ); Hope Valley, 7800 ft, 1 (SDSNH), 1 (USNM); Woodfords, 1 (MVZ). EL DORADO CO.: 1 mi NW Dick's Peak, 9000 ft (Orr, 1940); Velma Lakes region (Orr, 1940).

FRESNO CO.: Badger Flat, E of Huntington Lake, 1 (CSUF); near Dinky Creek Ranger Station, about 6000 ft (DFW); Markwood Meadow, 1 (CSUF); Tamarack Ridge at Highway 168, about 7500 ft (DFW). INYO CO.: above Bishop, 1 (LACM); W slope Mt. Langley, 13800 ft (Grinnell). LASSEN CO.: Red Rock, 3 (MVZ), 2 (SDSNH); 7 mi W Termo (Grinnell, 1933). MARIPOSA CO.: E base Half Dome, 7500 ft (Grinnell and Storer, 1924). MODOC CO.: Eagleville, 1 (CAS); Goose Lake (Mailliard, 1927); Parker Creek, Warner Mountains, 6300 ft, 1 (MVZ); 3 mi S Pine Creek, 1 (MVZ); 2 mi E Pitt River Ranger Station, 1 (CAS); Steele Meadows, 4700 ft, 1 (MVZ); Warner Mountains, 2 (CAS). MONO CO.: 9 mi W Benton, 8300 ft, 1 (MVZ); Bodie, 8374 ft, 1 (MVZ); Bridgeport, 6473 ft, on U.S. Highway 395, 1 (MVZ); 8 mi SW Bridgeport, 7000 ft, 1 (CSLB); Cabin Creek, 10500 ft, White Mountains, 1 (MVZ); 10 mi N Crowley Lake, 7000 ft on U. S. Highway 395, 1 (MVZ); Farrington, 1 (MVZ); Glass Mtn., 11000 ft, 1 (MVZ); Lake Mary, 9000 ft, 1 (CAS); Log Cabin Rd. (Harris, 1982); Long Valley, Mammoth region (Howell, 1924); slopes of Mono Craters (Grinnell and Storer, 1924); Mono Lake, 1 (MVZ), 8 (USNM); Mono Mills (Grinnell and Storer, 1924); Mono Pass (Harris, 1982); Mt. Dana (Harris, 1982); 2.5 mi N Mt. Patterson, Sweetwater Mountains, 10000 ft, 1 (MVZ); 1.75 mi W Mt. Patterson, Sweetwater Mountains, 10500 ft, 1 (MVZ); 1 mi WNW Mt. Patterson, Sweetwater Mountains, 10800 ft, 1 (MVZ); Saddlebag Lake (Harris, 1982); Slate Creek Valley (Harris, 1982; 2 mi W mouth Sweetwater Canyon, Sweetwater Mountains, 10000 ft, 1 (MVZ); 4 mi SE Lower Twin Lake, 8000 ft (Summer Meadows, A. Farrington's Ranch), 2 (MVZ); Walker Lake (Harris 1982); Mt. Warren (Harris, 1982); near Williams Butte, 1 (MVZ); White Mountains, 12700 ft, 1 (CAS); White Mountain Research Station, White Mountains, 12000 ft, 1 (MVZ). PLACER CO.: Tahoe City, Lake Tahoe, 1 (MVZ). PLUMAS CO.: Willow Lake, 5600 ft (Grinnell, 1933). SHASTA CO.: vicinity of Fort Cook, near Burgettville, 1 (USNM). TULARE CO.: Big Cottonweel Meadows, Mt. Whitney, 1 (FMNH); SW end Lake South America, 11900 ft (Orr, 1940); Mineral King (Fry, 1924; Monache Meadows (Grinnell, 1933); N spur Mt. Silliman, 10400 ft (Fry, 1924). TUOLUMNE CO.: near Dana Creek, 2 mi W Mono Pass (Merriam, 1904); east base Half Dome, 7500 ft (Grinnell and Storer, 1924); Tuolumne Meadows, 8600 ft, Yosemite National Park, 1 (MVZ).

Point Reyes Mountain Beaver
Aplodontia rufa phaea

1899. *Aplodontia phaea* Merriam, Proc. Biol. Soc. Washington, 13:19.
1918. *Aplodontia rufa phaea*, Taylor, Univ. California Publ. Zool., 17:480.

Distribution: According to Taylor (1918), *A. r. phaea* inhabited an area of approximately 110 square miles in the Point Reyes area of Marin County. Apparently, most colonies were located on north facing slopes of hills and gullies (Camp, 1918).

Population Status: The status of *A. r. phaea* is unknown. Much of the region within its general range is unsuited to Mountain Beavers. The actual inhabited area was only a fraction of the 110 square miles encompassed by the margins of its range (Camp, 1918). The restricted distribution of *A. R. phaea* gives cause for concern. Much of the area within its range, however, is included in the National Park system, giving cause for optimism about the fate of this population.

Habitat: The general remarks about the habitat of Aplodontia rufa in the account of A. r. nigra applies also to this subspecies. Grinnell (1933) noted that A. r. phaea was found on hillsides in seepage areas overgrown with Sword Ferns and Thimbleberries, and that all localities of known occurrence were below 1000 ft in elevation. Camp (1918) found colonies on a north facing bluff among treeless hills west of Inverness.

Recommendations: Surveys of the distribution and habitat associations of Point Reyes Mountain Beavers should be undertaken. The National Park Service and other public agencies responsible for land management within the range of Point Reyes Mountain Beavers should be informed of the need for information on this species. The impact on its population of all potential developments within its range should be determined. Also, the effects of introduced cervids (Axis and Fallow deer) on habitat for Mountain Beavers should be assessed.

Remarks: Aplodontia rufa phaea is isolated from all other populations of Mountain Beavers by uninhabited terrain (Hall and Kelson, 1959). They are smaller in body sizes than all other populations, and are the lightest colored of those found along the Pacific Coast.

Distribution Records: MARIN CO.: Bear Valley Ranch, 2 (MVZ); Heim's Ranch, 5 mi W Inverness, 48 (MVZ); 3 mi W Inverness, 1 (MVZ); near highway, 4 mi W Inverness, 2 (UDAV); 6 mi W Inverness, 7 (MVZ); Lagunitas, 1 (CAS), 2 (MVZ); Limantour Bay, 1 (CAS); Marshall Ranch, 8 (MVZ); Murphy Ranch, about 4 mi WSW Inverness, 10 (MVZ); 4 mi S Olema, 4 (MVZ); 2 mi W Olema, 1000 ft, Mt. Wittenberg, 1 (MVZ); Point Reyes, 1 (CM), 15 (USNM); Point Reyes, 4 mi W Inverness, 2 (CM); 3 mi NE Point Reyes (city), 1 (CM); Wildcat Canyon, Tevis Ranch, 9 mi W Olema, 2 (MVZ).

Tehachapi Pocket Mouse
Perognathus alticola inexpectatus

1926. Perognathus alticola inexpectatus Huey, Proc. Biol. Soc. Washington, 39:121. Type Locality: 14 mi W Lebec, 6000 ft, Kern Co., California.

Distribution: Tehachapi Pocket Mice are known from a few scattered localities from Tehachapi Pass on the northeast to the area of Mt. Pinos on the southwest, and around Elizabeth, Hughes, and Quail Lakes on the southeast. Known localities are between about 3500 and 6000 ft in elevation.

Populations Status: Trapping for the Tehachapi Pocket Mouse by Sulentich (1983) produced 11 specimens from two localities on the eastern side of Tehachapi Pass in an area where a single specimens was caught in 1975 (Williams, 1978). In view of the scarcity of specimens and the general inability to find Tehachapi Pocket Mice, their populations must be small, scattered, and vulnerable to changes in habitat quality.

Habitat: The habitat of the Tehachapi Pocket Mouse is not well defined. Four specimens were captured in a fallow grain field at about 4000 ft, several years after it had been planted to grain (Sulentich, 1983; Williams, 1978). The predominate plant in the area when I collected there

was Russian Thistle (Salsola sp.). Desert shrubs and grasses dominated nearby hills. Cantwell (in Huey, 1926) collected Tehachapi Pocket Mice on a grassy flat among scattered Yellow Pine trees. Other areas where Tehachapi Pocket Mice have been collected support arid annual grassland and desert shrub communities.

Recommendations: Additional studies of habitat requirements and distribution are needed. Areas likely to support populations are the mountain slopes of the Tehachapi and San Gabriel ranges that front on the Mojave Desert.

Remarks: Perognathus alticola inexpectatus appears to be allied with P. a. alticola structurally. Sulentich (1983) believed that the Tehachapi Pocket Mouse was a distinct species from the White-eared Pocket Mouse. Populations of P. a. inexpectatus may be in contact with and intergrade with populations of P. parvus xanthonotus, which is known from an area of the Tehachapi Mountainsl in the vicinity of Walker Pass and adjacent canyons. Habitat for Pocket Mice of this species group appears to be nearly continuous along the desert slopes of the southern Sierra Nevada, Tehachapi Mountains, San Gabriel Mountains, and San Bernardino Mountains. The allopatric distributions of these taxa (Hall, 1981) probably is more apparent than real. Eight Tehachapi Pocket Mice, in addition to the specimens listed below, were captured in the area of Tehachapi Pass by Sulentich (1983, and unpubl.).

Distribution Records: LOS ANGELES CO.: Elizabeth Lake, 4 (LACM); Gorman, 1 (LACM); 2 mi E Gorman, 3500 ft, 3 (MVZ); 2.5 mi SE Gorman, 1 (MVZ); Lake Hughes, 1 (LACM); 2 mi W Quail Lake, 3500 ft, 1 (LACM). KERN CO.: 0.5 mi SW Cameron, 3900 ft, 4 (MVZ); 14 mi W Lebec, 6000 ft, 3 (SDSNH); Cuddy Valley, Mt. Pinos, 1 (LACM); Sand Canyon, about 8 mi E (by rd.) Tehachapi, sec. 28, T32S, R34E, 4080 ft, 3 (CSLB), 1 (MSB); Tehachapi, 2 (USNM); Tehachapi Peak, 2 (USNM).

Short-nosed Kangaroo Rat
Dipodomys nitratoides brevinasus

1920. Dipodomys merriami brevinasus Grinnell, J. Mamm., 1:179. Type Locality: Hays Station, 19 mi SW Mendota, Fresno Co., California.
1921. Dipodomys nitratoides brevinasus, Grinnell, J. Mamm., 2:96.

Distribution: Short-nosed kangaroo Rats are found on the western side of the San Joaquin Valley, from near Los Banos, Merced Co., southward west of the San Joaquin River and a line approximately coincident with the Kettleman Hills, Lost Hills, and Elk Hills to the southern end of the valley. They also occur in the Panoche Valley, San Benito Co., the Sunflower Valley, Kings Co., the Antelope Plain in Kern Co., the Carrizo Plain in San Luis Obispo Co., the Cuyama Valley in San Luis Obispo and Santa Barbara counties, and at the edge of the valley floor around the south end of the San Joaquin Valley from the vicinity of Maricopa on the West to east of Bakersfield on the east (Hall, 1981; Williams, 1985, and unpubl. data). Within this area, they are found mostly on flat and gently sloping terrain and on hill tops in desert-shrub associations, primarily Atriplex.

Population Status: Loss of habitat has been extensive throughout the range of the Short-nosed Kangaroo Rat, particularly on flatter lands in the Cuyama, San Joaquin and Panoche valleys, and on the Antelope and Carrizo plains. Cultivation of native communities has been the principal reason for loss of habitat. Relatively small, isolated populations are found on the southern Antelope Plain west of Buttonwillow and in the vicinity of Taft and Maricopa, Kern Co.; on uncultivated sites in the Kettleman Hills, and in and around oil fields near Coalinga, Fresno Co.; west of Interstate Highway 5 on unirrigated lands at the edge of the valley in Fresno Co.; and around Soda Lake on the Carrizo Plain, San Luis Obispo Co. Where they are found, they are typically common. A major cause for concern is that virtually all of the areas where Short-nosed Kangaroo Rats still are found are privately owned and have moderate to good potentials for cultivation. Only the lack of irrigation water has prevented cultivation of most areas until now. Of greater concern is the lack of lands dedicated to preserving natural communities within its range, except for the area immediately around Soda Lake on the Carrizo Plain (few Short-nosed Kangaroo Rats occur within the confines of the present preserve). Public-owned lands within the geographic range of Short-nosed Kangaroo Rats, such as those on the Carrizo and Elk Horn plains, recently have been subject to intense grazing pressures with virtually no plant litter remaining (some areas are being grazed year around), and providing little opportunity for herbaceous plants to fruit (unpubl. observ.). Preliminary field work in some of these areas during the past year found no Short-nosed Kangaroo Rats in areas where they were fairly common as recently as 1982 (Kerry Kilburn, pers. comm.; unpubl. data).

The Short-nosed Kangaroo Rat was not included on the priority List of Concern when the draft copy was assembled, primarily because it appeared to warrant lesser concern than many other species. In the ensuing five years, however, additional field work within its geographic range, focused mostly on Giant Kangaroo Rats, found that some populations once considered secure were declining or had disappeared. Some other areas where Short-nosed Kangaroo Rats were presumed to occur, based on the type of plant communities, proved not to have extant colonies. Thus, in reassessing its status, it seemed best to elevate it to the Third Priority Category to emphasize potential threats to remaining populations and to expedite the gathering of information needed to determine its status.

Habitat: Dipodomys nitratoides brevinasus occupies grassland and desert-shrub associations on friable soils. They inhabit highly alkaline soils around Soda Lake, on the Carrizo Plains, and less saline soils elsewhere. On the valley floor, around Los Banos, Merced Co., small populations live on dikes secure from winter flooding, then move into seasonally flooded iodine bush shrublands during the summer months, where at least some individuals reproduce (unpubl. data). Hawbecker (1951) reported that, in the Panoche Valley, San Benito Co., Short-nosed Kangaroo Rats were found on gentle slope and rolling, low hill-tops where some shrubs were present. He suggested that they did not "venture far out of this habitat." Light to moderate grazing by livestock probably enhances habitat for Short-nosed Kangaroo Rats.

Recommendations: The primary needs are for detailed information on distribution and populations status of Dipodomys nitratoides brevinasus,

and land use projections within areas still inhabited. The U.S. Bureau of Land Management should pay particular attention to this species in its management plans for lands in western Kern Co., and on the Carrizo and Elk Horn plains in San Luis Obispo Co. The impact on Short-nosed Kangaroo Rats and other native species by the present pattern of livestock grazing should be determined and grazing leases reviewed accordingly. The California Department of Fish and Game should review its opportunities to purchase and develop lands as a preserve for this and other jeopardized species of the San Joaquin Valley lowlands, especially in northwestern Fresno and eastern San Benito counties in the Panoche Valley area.

Remarks: Because the Short-nosed Kangaroo Rat was not on the draft List of Concern, distribution records were not obtained from most museums visited. The basic distributional area is documented in Grinnell (1922) and Hoffmann (1975). Williams (1985) discussed, in detail, the boundary between the subspecies D. n. nitratoides and brevinasus. Ten specimens identified as D. nitratoides from 3 mi E Cuyama Ranch, 2200 ft, Cuyama Valley (probably San Luis Obispo Co.) collected in 1916 (USNM collection) were not mentioned by Grinnell (1922) or Hall (1981). Hoffmann (1975) examined specimens from the Cuyama Valley, but did not identify the number or museum where those specimens were housed (I presume that they were the specimens in the U.S. National Museum). He compared them with samples of nitratoides from other localities and determined that they exhibited characteristics more diagnostic of Dipodomys merriami (fide Lidicker, 1960), but equivocated as to their identity. Any surveys for Dipodomys nitratoides brevinasus should include the Cuyama Valley and should be designed to obtain information useful in resolving the specific identity of that population, presuming it is extant.

Red Tree Vole
Arborimus longicaudus

1890. Phenacomys longicaudus True, Proc. U.S. Natl. Mus., 13:303. Type Locality: Marshfield, Coos Co., Oregon.
1973. Arborimus longicaudus, Johnson, J. Mamm., 54:239.

Distribution: Red Tree Voles are found along the Pacific coastal lowlands in Oregon and Northern California (Howell, 1926; Hall, 1981; but see Remarks). In California, they range from the Oregon border southward to Sonoma County along the coast, and in the coastal mountain ranges southward to about Mt. Sanhedrin, Mendocino Co. Marginal records on the east are Bridgeville, Humboldt Co.; South Fork Mountain, Trinity Co.; Mt. Sanhedrin, Mendocino Co.; and Occidental, Sonoma Co. (Hall, 1981; Howell, 1926). Records of elevation extend from near sea level to about 3100 ft in California (Grinnell, 1933; unpubl. data).

Population Status: Red Tree Voles have always been considered rare, although they are common locally (Taylor, 1915). Records of distribution within California suggest a spotty pattern of dispersion. Their reproductive potential is lower than typical voles (Hamilton, 1962), and presumably, populations could be jeopardized by greatly increased mortality associated with extensive logging. Clearing trees for agriculture and homesites, and logging, especially clear-cutting, within the range of Red Tree Voles have significantly reduced available habitat

and fragmented populations (Maser et al., 1981). Construction of roads and powerlines also have contributed to loss of habitat and fragmentation and isolation of populations.

The Red Tree Vole was not listed in any of the three priority categories on the draft List of Concern, but was considered a sensitive species. Information on its population status was unavailable, but it did not seem to be jeopardized. Since development of the draft list, I have reconsidered its status in light of a trip through portions of its geographic range in search of populations, made in April, 1984. Although Red Tree Voles are still locally common in the foothills of mountains on the east edge of the coastal plain in Humboldt Co., loss and fragmentation of habitat has been extensive everywhere within its range. Furthermore, these trends are likely to continue at an accelerated pace in the future. The Red Tree Vole has been elevated to the Third Priority Category to emphasize that current trends in logging may jeopardize the species and to emphasize the need for definitive information on distribution and population status.

Habitat: Red Tree Voles live only in coastal coniferous forests consisting of Douglas Fir, Grand Fir, Western Hemlock, and/or Sitka Spruce. Taylor (1915) remarked that most Red Tree Voles were found in Douglas Fir and Grand Fir trees, and that only Todd (1891) found these voles in Sitka Spruce. Maser and Storm (1970) stated that Red Tree Voles also inhabit Western Hemlock trees. They live, nest, and feed within the forest canopy. Males are partly terrestrial, but females rarely are found on the ground. Red Tree Voles feed on the needles, buds, and tender bark of twigs of Douglas Fir, Western Hemlock, and Grand Fir (Howell, 1926; Maser and Storm, 1970; Maser et al., 1981; and Taylor, 1915). They do not eat Redwood needles; hence pure stands of Redwood are not occupied (Taylor, 1915). Redwood is the principal forest type in preserves within the range of the Red Tree Vole. Generally, large trees are preferred as homes, although small trees are also inhabited, especially where larger ones are unavailable (Benson and Borrell, 1931; Howell, 1926). Condensation of water on leaves from dew and fog or frequent rains may be required as a source of drinking water (Taylor, 1915). Although many of the factors determining the occurrence of Red Tree Voles are not known, these animals probably require fairly dense, mature stands of conifer forest composed of at least some Douglas Fir or Grand Fir. Clear-cuts, forest fires, and other factors that create openings in the forest and isolate blocks of trees are detrimental to Red Tree Voles.

Large nests are constructed in trees, generally around the trunk, typically from 20 to 60 ft above ground (Benson and Borrell, 1931). Nests have been found as low as 4 ft to as high as 100 ft or more. The nests consist primarily of the resin ducts of fir needles, the only part not eaten by the voles, and fecal material. The bulk of the nest increases over the years as a series of residents occupy the site and add material.

Recommendations: The most pressing need is for detailed information on the present distribution and population status of Red Tree Voles. Known and projected developments within its present range should be assessed to determine their impact on the species. State agencies, the U.S. Forest Service, U.S. Bureau of Land Management, and the U.S. National Park Service should conduct detailed surveys for Red Tree Voles on lands they

manage. Clear-cutting in areas inhabited by Arborimus longicaudus should be avoided in preference to selective logging whenever possible.

Remarks: Until recently, the Red Tree Vole was considered to be a member of the genus Phenacomys. Johnson (1973) reviewed the structural, ecological, and behavioral characters of Arborimus and Phenacomys. Additional studies of the generic differences of Arborimus and Phenacomys were presented by Johnson and Maser (1982). According to Maser et al. (1981) and Sara George (pers. comm.), the Red Tree Vole in California is a different species than that found in most of Oregon; Murray Johnson is currently investigating the relationships of these sibling populations and their geographic distributions.

During the research for this report, I decided Arborimus longicaudus was not to be included in a priority category on the List of Concern; thus, I stopped recording distributional records during visits to museums. Therefore, the following list does not include records of specimens from all of the museums visited. Noteworthy are the collections at the California Academy of Sciences and Humboldt State University.

Distribution Records: HUMBOLDT CO.: 5 mi E Arcata, 1 (CSLB); Big Bend, Mad River, 2 (MVZ); Bridgeville, 1 ((MVZ); 4.3 mi N Bridgeville, 1 ((MVZ); 4.6 mi N Bridgeville, 2 ((MVZ); 2 mi E Bridgeville (Benson and Borrell, 1931), 1 (MVZ), 1 (PM); 4.6 mi by rd. (Hwy 36) E Bridgeville, 1 (MVZ); 1 mi W Bridgeville (Benson and Borrell, 1931); 1.5 mi W Bridgeville, 1 (MVZ); 2 mi W Bridgeville, 2 (UCLA); 3 mi N Capetown, Oil Creek, 2 (MVZ); 5.3 mi NE Capetown, Morrow Ranch, 1450 ft, 5 (MVZ); Carlotta, 5 (MCZ), 13 (MVZ), 2 (ROM), 4 (SDSNH), 3 (UCLA), 18 (USNM); Chaparral Mt., 2 (MVZ); Coyote Peak, 1 (MVZ); Cuddeback, 1 (MVZ); French Camp, 3100 ft, 1 (MVZ); 2 mi along Johnson Rd., off Bald Hill Rd., 1 (CSLB); 8.2 mi (by rd.) E Korbel, 1 (MVZ); Maple Creek, 1 mi N jct. Mad River, 4 (MVZ); 0.5 mi S (by rd.) Maple Creek, 1 (MVZ); 3.2 mi NW Petrolia, 1 (MVZ); 5.2 mi SE Petrolia, 1 (MVZ). MENDOCINO CO.: Anchor Bay, 3 (CM); 10 mi E Point Arena, Garcia River, 3 (CM); 8 mi SW Laytonville, Clark Ranch, 1 (MVZ); Mendocino City, 16 (MVZ); Mt. Sanhedrin, 1 (ANSP); 4 mi S Mt. Sanhedrin, Leerly's Ranch, 2340 ft, 1 (MVZ); 0.8 mi S Slick Rock Creek on State Hwy #1, 2 (MVZ); 3 mi W Whiskey Spring, Graveyard Rd., 800 ft, 1 (MVZ). SONOMA CO.: 1 mi N, 0.2 mi E Bridgehaven, 50 ft, 1 (MVZ); 1 mi N Camp Meeker, 1 (MVZ); 3.5 mi N Camp Meeker, 1 (MVZ); Duncan Mills, 1 (LACM); 3 mi E Duncan Mills, 1 (MVZ); 2 mi W Duncan Mills, 4 (MVZ); 3 mi W Duncan Mills, 1 (MVZ); 3.5 mi W Duncan Mills, 1 (MVZ); 7 mi N (by rd.) Fort Ross, 1 (MVZ); 1 mi E Jenner, 3 (MVZ); near Monte Rio, Bohemian Grove on Russian River, 2 (MVZ); 2 mi SE Monte Rio, 1 (CM); 2 mi S Monte Rio, 1 (MVZ); 2.3 mi S Monte Rio, 11 (MVZ); 3 mi S Monte Rio, 4 (MVZ); 4 mi S Monte Rio, 1 (MVZ); 1 mi W Monte Rio, 1 (CM); Occidental, 2 (LACM); 2 mi N Occidental, 3 (MVZ); 0.5 mi S Occidental, 2 (MVZ); 1 mi S Occidental, 1 (MVZ); 0.25 1 mi W jct. Sheephouse Creek and Russian River, 1 (MVZ); 0.5 mi E Stewart's Point, 1 (MVZ); 10 mi SSE Stewart's Point, 1 (MVZ). TRINITY CO.: Mad River, 2500 ft, South Fork Mtn., 1 (MVZ); Reilley's Ranch, 3000 ft, South Fork Mtn., 4 (MVZ).

Pacific Fisher
Martes pennanti pacifica

1898. *Mustela canadensis pacifica* Rhoads, Trans. Amer. Philos. Soc., new ser., 19:435. *Type Locality*: Lake Keechelus, Kittitas Co., Washington.
1912. *Martes pennanti pacifica*, Miller, Bull. U.S. Mus., 79:94.

Distribution: *Martes pennanti* was formerly widely distributed in boreal forests across Canada and the northern United States, extending south in the mountains to California and Utah in the west and Tennesee and North Carolina in the east (Powell, 1981; Strickland et al., 1982*a*).

Pacific Fishers are found along the Pacific Coast from north-central coastal British Columbia to northern California, in the Cascade Mountains, and the Sierra Nevada of California. They range eastward to the Blue Mountains of northeastern Oregon (Hall, 1981). In California, they occur from the Oregon Border in the northwestern part of the state south to about Clear Lake, Lake County, in the Coastal Mountains and to Sonoma County along the coast. They range eastward in northern California to around Eagle Lake, Lassen County, and southward in the Sierra Nevada to at least Greenhorn Mountain, Kern County (Schempf and White, 1977). Altitude of occurrence varies from near sea level to over 11000 ft.

Population Status: Schempf and White (1977) reviewed historic and recent records of Fishers in California, including sightings on file in U.S. Forest Service offices and from California Department of Fish and Game records. Data they gathered suggested that Fishers were relatively common in the North Coast region, but were rare or uncommon in the Sierra Nevada and appeared to be decreasing. These data were unsupported by field surveys, so recent trends were unknown. Particular attention was drawn to the apparent decline of populations in the southern Sierra Nevada and possible declines in the northern Sierra Nevada. Buck et al. (1983) studied a population of Fishers in Trinity Co. to determine habitat use and possible effects of timber harvest on Fishers. They found that clearcutting and the general trend toward reduction in size and isolation of mature stands were probably detrimental to Fisher populations. They also determined that selective cutting of trees decreased the quality of habitat for Fishers.

Habitat: Fishers prefer heavy stands of mixed species of mature timber, but they range widely in forested regions (Buck et al., 1983). They are frequently encountered in second-growth forests, and sometimes in forest openings. A few records of Fishers have been found in communities such as scrub woodlands at lower elevations (Schempf and White, 1977). This does not mean, however, that Fishers can live in these habitats permanently. In California, Fishers primarily inhabit mixed conifer forests composed of Douglas Fir and associated conifers, although they also are encountered frequently in higher elevation, fir and pine forests such as Red Fir and Lodgepole Pine, and mixed evergreen/broad leaf forest.

Fishers prey on a variety of small- and medium-sized mammals, especially Chipmunks, Squirrels, Marmots, Woodrats, Porcupines, Rabbits, Hares, Martens, Foxes and other small carnivores (Powell, 1981; Strickland et al., 1982*a*; Yocum and McCollum, 1973). Grinnell et al. (1937) speculated

that Fishers also feed on birds such as Grouse.

Fishers are known to den in cavities near the tops of large trees, in hollow logs on the ground, in talus, and crevices in rock outcrops (Grinnell et al., 1937).

Recommendations: Field surveys are needed to establish a data base against which future trends can be assessed, and to define more accurately current status. Attention should focus on the Sierra Nevada, as evidence suggests declining populations there (Schempf and White, 1977).

Effects of various forest harvesting practices on Fisher populations should be determined over a broader area (Buck et al., 1983); and specific habitat needs such as stand density and tree size, food sources, and den sites should be determined. Snags, damaged and senescent trees with large cavities, and hollow logs are probably important for Fishers, especially where talus and rock crevices are unavailable.

Remarks: Schempf and White (1977) presented several records (mostly sightings) in addition to those listed below and referred to an unpublished paper where these records were documented. Yocum and McCollum (1973) mapped several localities in Del Norte, Humboldt and Trinity counties, but did not present descriptions of the localities. Bruce and Weick (1973) and Gould (1978) also presented data on Fishers in northwestern California and the northern Sierra Nevada, respectively.

Grinnell et al. (1937) considered M. p. pacifica to be inseparable from M. p. pennanti. Goldman (1935), however, found that the two taxa were separable. Hall and Kelson (1959) believed that evidence presented by Goldman was sufficient for subspecific status.

Distribution Records: DEL NORTE CO.: 3 localities unspecified (Yocum and McCollum, 1973). HUMBOLDT CO.: Waterman Ridge, Hawkins Bar Road (Yocum and McCollum, 1973). LAKE CO.: near Lakeport, 1 (CAS). LASSEN CO.: Eagle Lake (Grinnell et al., 1930). MARIPOSA CO.: Big Creek, near Wawona, 2 (USNM); Big Meadows, Coulterville Road, 4000 ft, 1 (MVZ); Bridalveil Creek (Cunningham, 1959); Chinquapin, 1 (MVZ); near Crane Flat, Yosemite National Park, 1 (MVZ); Fort Monroe, 1 (MVZ); Grouse Creek, 1(MVZ); Yosemite National Park, 1 (MVZ); Yosemite Valley, 3 (MVZ), 1 (USNM); Wawona, 1 (USNM). MENDOCINO CO.: Cahto, 1 (USNM); near Covelo, 1 (USNM); Eden Valley, 1 (MVZ). SHASTA CO.: Cassel, Burney Mountain, 1 (USNM)1 Cassel, Rock Creek Mountains, 1 (USNM); Fort Crook, 1 (USNM). SIERRA CO.: Webber Lake Area (Gould, 1978). SISKIYOU CO.: near Cecilville, 4 (MVZ); Mount Shasta, 1 (USNM). TRINITY CO.: near Helena, 2 (MVZ); Wells Creek, E fork, 15 mi E Hay Fork, 1 (USNM); S fork Trinity River, sec. 29, T1N, R7E, 2000 ft, 1 (MVZ). TULARE CO.: Atwell's Mill, 1 (USNM); Kern River, 2 mi downstream from junction with Little Kern River, 1 (MVZ). TUOLUMNE CO.: near Hetch Hetchy Valley, 3 (MVZ); Hog Ranch Ranger Station, Yosemite National Park, 1 (MVZ); head Lyell Canyon (Grinnell and Storer, 1924); Tuolumne Big Trees, 2 (MVZ).

American Badger
Taxidea taxus

1778. *Ursus taxus* Schreber, Die Saugthiere. . ., 3:520. *Type Locality*: Labrador and Hudson Bay, Canada.
1894. *Taxidea taxus*, Rhoads, Amer. Nat., 28:524.

Distribution: American Badgers occur from northern Alberta southward to central Mexico. They range from the Pacific Coast eastward through Ohio. They are absent from the humid coastal forests and from other regions with dense forests. In California, Badgers ranged throughout the state except for the humid coastal forests of northwestern California in Del Norte Co. and the northwestern portion of Humboldt Co. (Long 1973; unpubl. data).

Population Status: Badger populations have declined drastically in California within the last century (Grinnell et al., 1937; Longhurst, 1940). Grinnell et al. (1937) noted that Badgers were reduced in numbers over almost all of their range in California by 1937. At that time they were still numerous in the Central Valley, but now they survive only in low numbers in peripheral parts of the valley and adjacent lowlands to the west in eastern Monterey, San Benito and San Luis Obispo counties. In the coastal areas from Mendocino county south they have been drastically reduced in numbers. They have been extirpated from many areas in southern California. Long and Killingby (1983) regarded the status of Badgers in California as poor. Deliberate killing probably has been a major factor in the decline of Badger populations. Most people regard Badgers as detrimental to their interests and attempt to kill them. Cultivation is adverse to Badgers, as they do not survive on cultivated land. Agricultural and urban developments have been the primary causes of decline and extirpation of populations of Badgers in California. Rodent and predator poisoning pose double threats through direct and secondary poisoning of Badgers and elimination of the food Badgers are dependent upon. Shooting and trapping of Badgers for animal "control" is another source of mortality. The U.S. Fish and Wildlife Service took 4086 Badgers in California from 1966 to 1976 (Lee, 1977). Trapping of Badgers for the fur trade probably has had little impact on populations in many areas because the fur was of low economic value. In the late 1920's to at least the late 1930's, Badger fur was in high demand and trapping increased to levels that may have decimated local populations (Grinnell et al., 1937). Again, subsequent to 1975, demand for Badger pelts has increased and increased efforts are being expended to trap Badgers.

No current data exist on the status of Badger populations in California, but they have obviously declined or disappeared in large sections of the state, particularly areas west of the Cascade-Sierra Nevada mountain axis and in coastal basins of southern California. Badgers were common in mountainous areas only in large, treeless meadows and expanses near timberline. Longhurst (1940) noted that they had nearly disappeared from Napa County by 1940.

Despite the probable continuing decrease in numbers of Badgers statewide, reports of numbers trapped for the fur market indicate substantial increases in captures in recent years (e.g. 107 Badgers reported trapped in 1975-76 and 299 in 1976-77; California Dept. of Fish and Game, unpubl. report). Most of these Badgers were taken in the northern and eastern

counties, although Fresno and San Benito counties produced 45 and 20 respectively, in 1976-77. The increase in numbers trapped most likely reflects the increased prices paid for pelts and the consequently greater effort expended in trapping Badgers. For example, 931 trapping licenses were sold in 1975-76 and 1692 in 1976-77. Less than one-half of the licencees filed reports of their captures both years (207 and 751, respectively).

Habitat: In California, Badgers occupy a diversity of habitats. The principal requirements seem to be sufficient food, friable soils, and relatively open, uncultivated ground. Grasslands, savannas, and mountain meadows near timberline are preferred. Badgers prey primarily on burrowing rodents such as Gophers (Thomomys), Ground Squirrels (Spermophilus, Ammospermophilus), Marmots (Marmota), and Kangaroo Rats (Dipodomys). They are predatory specialists on these rodents, although they will eat a variety of other animals, including mice, Woodrats, reptiles, birds and their eggs, bees and other insects, etc. Grinnell et al. (1937) recounted reports of Badgers breaking open bee hives to eat both the brood and honey. They regularly dig out nests of Bumble Bees.

One report of densities of Badgers reviewed by Long gave an estimated density of one Badger per square mile. Bailey (1905) noted that one Badger spent a summer in a 20-acre field. Sargent and Warner (1972) found that a radio-collared female had a home range of 850 hectares (2091 acres): 725 hectares (1783 acres) in summer, 53 hectares (130 acres) in fall, and 2 hectares (5 acres) in winter. Messick and Hornocker (1981) found that home ranges averaged 2.4 and 1.6 sq. km for adult males and females, respectively, in Idaho.

Recommendations: Current data on Badger populations are needed throughout the state, especially from the lowlands of western California. The effects of continuing habitat loss, rodent poisoning, and trapping for the fur trade should be assessed. Mandatory reporting of take (including animals discarded) by trappers and hunters should be required. Information on home range size and density of prey required by Badgers is needed for effective management. The impact on Badgers of the use of rodenticides and trapping for the fur trade should be assessed.

Remarks: Long (1972) revised Taxidea taxus primarily on the basis of specimens in the U.S. National Museum. While his paper has contributed much to an understanding of geographic variation in this species, it has also confused the taxonomy of Badger populations in California. T. t. jeffersonii (Harlan) generally ranges in the better-watered areas of California, including coastal areas, most of the Sierra Nevada, and most of the Great Basin Province. T. t. berlandieri Baird ranges through the hotter, drier desert and grassland associations of southeastern California and the Central Valley. This makes sense from an ecogeographic point of view: larger, darker-colored Badgers from cooler, moister areas and smaller, lighter-colored Badgers from hotter, drier areas. The problem occurred with the assignment of specimens to particular subspecies. A specimen from Alila (Earlimart), Tulare County, on the floor of the southern San Joaquin Valley, was assigned to jeffersonii, while another specimen from Alila was assigned to berlandieri.

Specimens from geographically adjacent and ecologically continuous areas

(hot and arid) of the San Joaquin Valley were assigned to jeffersonii (e.g. Tulare Lake, Huron, Stanley, Alcalde, and Taft), while others from Tracy, San Joaquin County, were assigned to berlandieri. These and other taxonomic assigments by Long (1972) make no sense from a geographic or environmental perspectives. Long (1972) noted that some of these specimens exhibit intermediate characters, suggesting intergradation. This is probably the case. I can see no compelling reason, however, to assign the Central Valley population to berlandieri. In fact, Long assigned most of the specimens from this region to jeffersonii, although his range map and statements lead to the opposite conclusion. A better arrangement would be to include all specimens from the Central California lowlands in T. t. jeffersonii. For this account, however, I do not use trinomials for Badger populations. The principal concern is for populations in the lowlands of western California, west of the main Cascade-Sierra Nevada mass and the southern California coastal region. This would include some populations that Long (1972) assigned to T. t. jeffersonii and some he called T. t. berlandieri.

Distribution Records: ALAMEDA CO.: Oakland, 2 mi NE Mills College, 1 (MVZ). BUTTE CO.: 18 mi W Oroville, 1 (CSUC). CONTRA COSTA CO.: Rattlesnake Canyon, near Orinda, 1 (MVZ). EL DORADO CO.: Echo, 7500 ft, 2 (MCZ). FRESNO CO.: Alcalde, 1 (USNM); 7 mi SW Coalinga, 1 (CAS); Huron, 374 ft, 1 (USNM); 0.6 mi NE Marion Lake, 10500 ft, Kings Canyon National Park, 1 (MVZ); Panoche Creek, 550 ft, 1 (MVZ). HUMBOLDT CO.: 27 mapped localities without locality descriptions, based on sight records (C. F. Yocum, in litt.). INYO CO.: no specific locality, 1 (LACM); Furnace Creek Ranch, 1 (MVZ); 3 mi NE Jackass Spring, 1 (MVZ); 7 mi E Laws, at Silver Creek, 1 (MVZ); Wild Rose Canyon, 1 (MVZ). IMPERIAL CO.: Alamo Duck Preserve, 8 mi NW Calipatria, 1 (MVZ); Bard, 1 (UCLA); 3 mi N Bard, 2 (SDSNH); 6 mi W Bard, 1 (SDSNH); 5 mi N Laguna Dam, 1 (MVZ); Manganese Wells, Lower Colorado River, 1 (MVZ); Palo Verde, 1 (LACM), 1 (MVZ); 0.75 mi N Palo Verde, 1 (MVZ); 13 mi N Palo Verde, 1 (MVZ); 18 mi WNW Palo Verde, 1 (MVZ); 20 mi N Picacho, Colorado River, 1 (MVZ); Silsbee, 1 (MVZ). KINGS CO.: Stanley, 1 (USNM). KERN CO.: Antelope Valley, near Neenach, 1 (FMNH); Bakersfield, 1 (MVZ); Buttonwillow, 1 (CAS); 3 mi S Cantil P. O., 1 (LACM); 3 mi SE Cantil, M & R Ranch, 1 (LACM); 3 mi ENE Hart's Place, 1 (LACM); 4 mi S Inyokern, 1 (LACM); 4 mi SW Inyokern, 1 (LACM); S Fork Kern River, 25 mi from Kernville, 1 (USNM); 5 mi NW Mojave, 3350 ft, 1 (MVZ); Tulare Lake, mouth of Kern River, 2 (USNM); Taft (Long, 1972); E side Walker Pass, 5000 ft, 1 (LACM); Willow Springs, 1 (AMNH). LAKE CO.: Lakeport, 1 (CAS); several miles N Upper Lake, 1 (WFBM). LASSEN CO.: Amedee, 1 (USNM); Calneva, 1 (MVZ); Hayden Hill, 1 (USNM); Karlo, 2 (MVZ); 2 mi S Madeline, 1 (HSU); Merrillville, 1 (USNM); 7 mi N Observation Peak, 5300 ft, 1 (MVZ); Poison Lake, 1 (USNM); 20 mi E Susanville, 1 (CSUC); 10 mi E Ravendale, 5400 ft, 1 (CAS); Susanville, 1 (USNM); Termo, 1 (MVZ); Willow Creek, Barran Ranch, 1 (CSUC). LOS ANGELES CO.: Covina, 1 (UCLA); Fairmont, Antelope Valley, 1 (LACM), 1 (MVZ); Los Angeles, 1 (LACM); near Lovejoy Buttes, 1 (MVZ); Tejunga Wash, 1 (MVZ). MADERA CO.: San Joaquin Experimental Range (Newman and Duncan, 1973); head San Joaquin River, 2 (USNM). MARIN CO.; Bear Valley Ranch, Olema, 1 (MVZ); Bolinas, 1 (MVZ); 0.75 mi from beach, 1.25 mi NW Bolinas, 1 (MVZ); Fort Barry, 1 (MVZ); 3 mi W Inverness, 2 (MVZ); Millerton Gulch, 2.25 mi NE Inverness, 1 (MVZ); 7 mi N Novato, 1 (MVZ); Tomales Point, 1 (MVZ). MARIPOSA CO.: no locality specified, 1 (USNM); Wawona, 1 (USNM). MENDOCINO CO.: Clarke Ranch, 8 mi SW

Earlimart], 283 ft, 6 (USNM); Otosi, 4 (USNM); 4 mi SW Porterville, 1 (AMNH); White River, 1 (CAS); Whitney Meadows, 9800 ft, 1 (MVZ). TUOLUMNE CO.: Tuolumne Meadows, 4 (MVZ), 1 (USNM). VENTURA CO.: Mount Pinos, 1 (MVZ); Mount Pinos, 5500 ft, 1 (LACM); Saticoy, 1 (MVZ). YOLO CO.: Davis, 1 (UDAV); Woodland, 1 (UDAV).

Channel Islands Spotted Skunk
Spilogale gracilis amphiala

1929. *Spilogale phenax amphialus* Dickey, Proc. Biol. Soc. Washington, 42:158. Type Locality: 2.5 mi N ranch house near coast, Santa Rosa Island, Santa Barbara Co., California.
1933. *Spilogale gracilis amphialus*, Grinnell, Univ. California Publ. Zool., 40:105.

Distribution: Channel Islands Spotted Skunks are known to occur only on the islands of Santa Cruz, Santa Rosa and San Miquel. They are probably extinct on San Miquel Island, however (Walker, 1980).

Population Status: Nothing specific is known about the status of Spotted Skunks on the Channel Islands. Grinnell et al. (1937) noted that "quite a few" skins of these Skunks were received from Santa Cruz Island by Colburn's taxidermy shop in Los Angeles in 1918. Laughrin (1973) noted that Spotted Skunks were quite rare when he surveyed Santa Cruz Island in 1973. According to von Bloeker (1967), Spotted Skunks were once very common on Santa Cruz and Santa Rosa Islands, but by 1967 they were rarely found on either island, at least near human dwellings.

Remarks by these authors were subjective impressions; there have been no studies of population size on either island. The seeming rarity of Spotted Skunks may indicate normal population fluctuations, or reflect a real decline in numbers.

Santa Rosa and Santa Cruz are the two largest of the Channel Islands. Both are privately owned, and both have had less habitat alteration and fewer introductions of exotic mammals than most of the other islands. According to Laughrin (1973) Wapiti (*Cervus elaphus*), Mule Deer (*Odocoileus hemionus*), Wild Pigs (*Sus scrofa*), Cattle and Horses, occupied Santa Rosa Island in 1973 in addition to native mammals. Sheep formerly were present, but apparently have been completely removed. A list of currently extant, introduced species on Santa Cruz Island is unavailable. Von Bloeker (1967) mentioned Horses, Wild Pigs, Cattle, and Roe Deer (*Capreolus capreolus*) as being present, and implied that feral cats were established on both islands. Laughrin (1973) noted that Sheep also occurred on Santa Cruz Island, but fences were erected to restrict them to the north side. A hunting program to reduce their numbers was in effect at that time.

The principal reason for concern about the Channel Islands Spotted Skunk is the scanty information available suggesting a significant decline in populations. Because island biota are more prone to extinction than those of mainlands, concern is heightened. Human disturbances on the islands are probably not sufficient to cause this decline. Domestic cats and/or dogs have possibly introduced diseases to which the Skunks are

Laytonville, 1 (MVZ); Eden Valley Ranch, 18 mi above Willits, 1 (MVZ). MERCED CO.: Los Banos, 1 (MVZ); Los Banos Game Refuge, 2 (MVZ); 10 mi S Merced, 1 (CSCS); 2 mi SW Stevinson, 1 (CSCS). MODOC CO.: 3 mi E Alturas, 1 (MVZ); 16 mi W Alturas, 1 (USNM); Cedarville, 1 (USNM); Dry Creek, 3 (MVZ); Eagleville, 1 (CAS); 5 mi NE Fort Bidwell, 1 (MVZ); 7 mi E Fort Bidwell, 1 (MVZ); Lake City, 1 (MVZ); 2 mi N Lake City, 1 (MVZ); 3 mi E Likeley, 1 (MVZ); Modoc National Forest, Bump Head Mtns., near Clear Lake, 1 (WFBM); Parker Creek, Warner Mountains, 3 (MVZ); 12 mi E Steele Meadow, 5200 ft, 1 (MVZ); Warren Peak, 1 (MVZ). MONO CO.: Sonora Pass, 9600 ft, 1 (MVZ). MONTEREY CO.: Arroyo Seco Wash, 2 mi S Soledad, 150 ft, 1 (MVZ); 10 mi S Carmel, by Road # 1, 1 (MVZ); Highway G16, at Cachagua Creek, 0.3 mi W divide, 1 (MVZ); Jamesburg, 1 (USNM); King City, 1 (UDAV); 2.5 mi E Monterey Municipal Airport, Highway 117, 1 (MVZ); 9 mi E Parkfield, 1 (MVZ); 7 mi E San Lucas, 1 (MVZ); Seaside, 1 (MVZ). NAPA CO.: Napa (Grinnell et al., 1937); 3 mi SW Napa, 1 (MVZ). PLUMAS CO.: Quincy, 1 (USNM). RIVERSIDE CO.: Banning, San Jacinto foothills, 2200 ft, 1 (MVZ); Cahuilla (=Anza), San Jacinto Mountains, 1 (MVZ); Indio, 1 (UCLA); 18 mi NW Palo Verde, 1 (MVZ); Pinto Basin, 1750 ft, 1 (MVZ); San Jacinto, 1 (CAS); Temecula, 2 (MVZ). SACRAMENTO CO.: Indian Mound, N of Hood, 1 (MVZ); Polk, 1 (USNM). SAN BENITO CO.: Hollister, 1 (CAS). SAN BERNARDINO CO.: Cedar Canyon, 5000 ft, Providence Mountains, 2 (MVZ); near Cimia, 3 (MVZ); Indian Cove, 3000 ft, 2 mi S, 6 mi W Twenty Nine Palms, 1 (MVZ); 2.5 mi SW Kelso, 2100 ft, 1 (MVZ); near Lake Arrowhead, San Bernardino Mountains, 1 (LACM); Reche Canyon, near Colton, 1 (MVZ); 2 mi ESE Rock Spring, 4700 ft, Lanfair Valley, 1 (MVZ); San Bernardino, 1 (SDSNH); Vidal, 1 (LACM). SAN DIEGO CO.: California Border, 1 (AMNH); Colorado Desert, Laguna Station, New River, 1 (USNM); near El Cajon, 2 (UCLA); El Cajon Valley, 1 (USNM); Escondido, 1 (SDSNH); Hillsdale, 1 (SDSNH); Lakeside (Bond, 1977); 1 mi N La Jolla, 1 (SDSNH); La Puerta Valley, 2 (CAS), 1 (MVZ), 4 (SDSNH), 1 (USNM); Mexican Boundary at monument 258, 1 (USNM); Ramona, 1 (SDSNH); W of San Marcos, 1 (SDSNH); Santa Ysabel, 1 (USNM); Sequan District, 1 (USNM); Sweetwater Reservoir, 1 (SDSNH); Twin Oaks, 1616 ft, 2 (USNM); Witch Creek, 4 (SDSNH). SAN FRANCISCO CO.: 1666 46th Ave, San Francisco, 1 (CAS); Golden Gate Park, San Francisco, 1 (CAS). SAN JOAQUIN CO.: Corral Hollow, 1 (MVZ); Tracy, 14 (USNM). SAN LUIS OBISPO CO.: 3 mi W Red Hills, near Shandon, 1 (MVZ); 12 mi S Shandon, 2 (MVZ); 14.5 mi S Shandon, 1 (MVZ); 15 mi S Shandon, 1 (MVZ); 6 mi SE Shandon, 1 (MVZ); 7 mi SE Shandon, 1 (MVZ); 8 mi SE Shandon, 1 (MVZ); 9 mi SE Shandon, 2 (MVZ); 10 mi SE Shandon, 2 (MVZ); 17 mi SE Shandon, 1 (MVZ); 18 mi SE Shandon, 2 (MVZ); 18.5 mi SE Shandon, 1 (MVZ); 19 mi SE Shandon, 1 (MVZ); 1.5 mi W Yeguas Mountain, 1 (MVZ). SAN MATEO CO.: Alpine, 1 (SDSNH); Menlo Park, 1 (CAS); near Peak Mountain, 1 (CAS); Pescadero, 1 (USNM); San Francisco Game Refuge, 2 (MVZ). SANTA BARBARA CO.: 4 mi E Cuyama Ranch, 2200 ft, 1 (USNM); 10 mi E Gaviota Pass, 1 (MVZ); Santa Anita Ranch, 7 mi W Gaviota, 2 (MVZ). SANTA CLARA CO.: San Antonio Creek, vicinity of Mountain View, 1 (CAS). SANTA CRUZ CO.: Aptos, 1 (USNM). SHASTA CO.: Burney, 1 (USNM); Dickey Ridge, near Crystal Creek, 4000 ft, 20 mi W Redding, 1 (MVZ); Fort Crook, 1 (USNM); Warner Creek, 6600 ft, 1 (MVZ). SISKIYOU CO.: Beswick, 1 (USNM); Butte Creek, 1 (CAS); 5 mi N Edgewood, 2800 ft, 1 (MVZ); Teenor, 1 (USNM). SONOMA CO.: no locality designated, 1 (CAS); Freestone, 1 (MVZ). STANISLAUS CO.: 2 mi S La Grange, 1 (CSCS). TEHEMA CO.: 10 mi NW Bluff, 1 (CSUC); South Yolla Bolly Mt., 1 (USNM); 2 mi S South Yolla Bolly Mt., 1 (MVZ). TRINITY CO.: on Highway 299, near Big Bar, T5N, R8E, sec. 22, 1 (HSU). TULARE CO.: no locality designated, 1 (USNM); Alila [=

susceptible.

Habitat: Nothing specific has been recorded of the habitat of Channel Islands Spotted Skunks. According to von Bloeker (1967), they were formerly common around human dwellings, particularly on Santa Cruz Island, but by 1967 they were rarely found near any man-made structures on either island.

In much of their range, Western Spotted Skunks (Spilogale gracilis) are common only in areas of rock outcrops such as hillsides and rocky canyons. Spotted Skunks often take up residence in or under buildings, where these occur. They seem generally to avoid flat expanses, cultivated fields, and grasslands where rocks or brush are unavailable for cover and dens. They sometimes use burrows of other animals for dens (Grinnell et al., 1937).

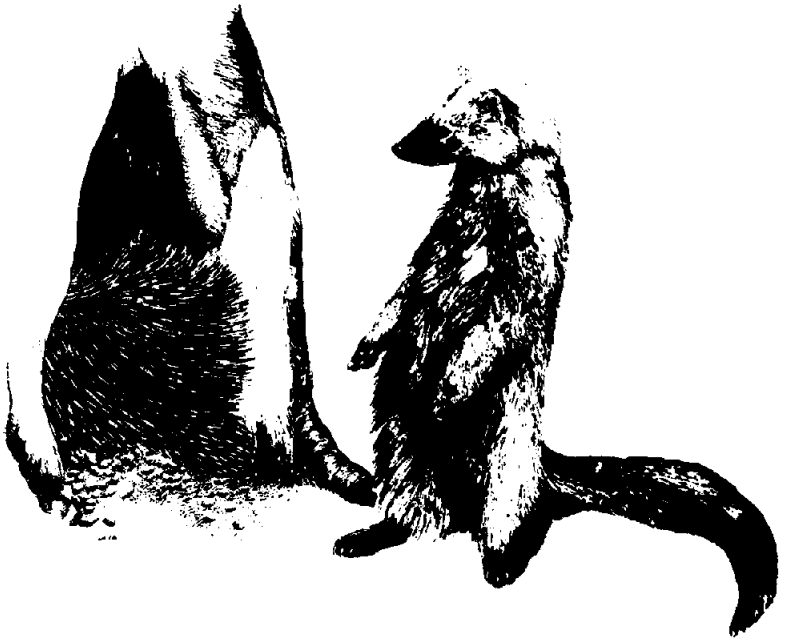
Spotted Skunks appear to be more tolerant of xeric environments than Striped Skunks, and may be found far from water. Food consists of a great variety of small animals -- arachnids, insects, mice and rats, lizards, snakes, eggs, and birds -- as well as fruits and seeds. Insects appear to be the staple, at least during months when they are abundant.

Recommendations: A survey of the islands to determine present numbers of spotted skunks and provide a data base for future monitoring is encouraged. If populations are found to be low, attempts to determine cause of the declines should be made.

Remarks: Von Bloeker (1967) did not indicate the disposition of the nine specimens mentioned in his paper. Some or all of these are probably included in the museum records listed below.

Channel Island Spotted Skunks are larger and with more black coloration (less white) than their mainland relatives. The status of this subspecies is not disputed in the literature. Walker (1980) reported on a subfossil specimen from a midden on San Miguel Island. He referred to unpublished field notes by C. D. Voy (1893), in which Voy related the capture of a small Skunk in a trap on San Miguel Island some years prior to his visit.

Distribution Records: SANTA BARBARA CO.: Santa Cruz Island, 9 (von Bloeker, 1967); Santa Cruz Island, Prisoners Harbor, 2 (MVZ); Santa Cruz Island, Stanton Ranch headquarters, 1 (MVZ); San Miguel Island (Walker, 1980); Santa Rosa Island, Becker's Bay, 16 (LACM); Santa Rosa Island, 2.5 mi N ranch house near coast (Dickey, 1929); Santa Rosa Island, Skunk Point, 1 (LACM).



OTHER CANDIDATES

The species listed in Table 5 were on the original working list or were suggested as candidate Species of Special Concern by others, species listed by the International Union for the Conservation of Nature, or designated as Sensitive by the U.S. Forest Service or the U.S. Bureau of Land Management. None are thought to face significant threats at this time, although lack of information is sufficient reason to consider some as sensitive species. Researchers and land and resource managers should endeavor to gather needed information on distribution and population status for those species indicated as sensitive.

Table 5. List of other candidate species not included on the List of Concern. Page number refers to starting page of species account. Table continues on next page.

Table 5 (continued). List of other candidate species not included on the List of Concern. Page number refers to starting page of species account.

Species	Page #
Merced Kangaroo Rat (Dipodomys heermanni dixoni)	84
Argus Mountain Kangaroo Rat (Dipodomys panamintinus argusensis)	84
Panamint Kangaroo Rat (Dipodomys panamintinus panamintinus)	84
Santa Cruz Kangaroo Rat (Dipodomys venustus venustus)	85
Sonora Beaver (Castor canadensis repentinus)	85
Golden Beaver (Castor canadensis subauratus)	86
Santa Catalina Harvest Mouse (Reithrodontomys megalotis catalinae)	87
Salinas Harvest Mouse (Reithrodontomys megalotis distichlis)	87
Santa Cruz Harvest Mouse (Reithrodontomys megalotis santacruzae)	87
Anacapa Island Deer Mouse (Peromyscus maniculatus anacapae)	87
Santa Catalina Deer Mouse (Peromyscus maniculatus catalinae)	88
Western Cotton Rat (Sigmodon hispidus eremicus)	88
Colorado Valley Woodrat (Neotoma albigula venusta)	88
Monterey Vole (Microtus californicus halophilus)	88
Mohave River Vole (Microtus californicus mohavensis)	89
San Pablo Vole (Microtus californicus sanpabloensis)	89
South Coast Marsh Vole (Microtus californicus stephensi)	89
Owens Valley Vole (Microtus californicus vallicola)	89
San Bernardino Vole (Microtus longicaudus bernardinus)	90
Ringtail (Bassariscus astutus)	90
Humboldt Marten (Martes americana humboldtensis)	90
Inyo Long-tailed Weasel (Mustela frenata inyoensis)	91
Pallid Bobcat (Felis rufus pallescens)	91
Northwestern White-tailed Deer (Odocoileus virginianus ochrourus)	92

Mt. Lyell Shrew

Sorex lyelli was generally thought to live only in montane communities at high elevations in the central Sierra Nevada (Ingles, 1965). Review of accounts of capture of four of the five known specimens (Grinnell and Storer, 1924; Howell, 1924), together with information from recent captures, suggests that S. lyelli is widespread in high montane and cold steppe communities of the central and eastern slopes of the Sierra Nevada (Williams, 1984). Furthermore, S. lyelli is probably conspecific with S. preblei, ranging in similar habitats northward to Washington and eastward at least to northern Utah, Wyoming, and Montana (Williams, 1984, and unpubl. data). They face no threat of extinction.

San Bernardino Dusky Shrew

Published information on the distribution of Sorex monticolus parvidens included records of specimens from a desert spring at about 4200 ft, upward through mixed-conifer forest at about 7500 ft in elevation in the San Bernardino and San Gabriel mountains (Findley, 1955; Hennings and Hoffmann, 1977; Jackson, 1928). Grinnell (1908) captured only Ornate Shrews in the San Bernardino Mountains, including some from the type locality of S. m. parvidens (described by Jackson in 1921). Steve Clifton and I conducted a field study to determine the population status of the San Bernardino Dusky Shrew, trapping at 51 sites in the San Gabriel and

San Bernardino mountains (Williams, 1983). Although several shrews were captured from localities between 6000 and 9000 ft, no Dusky Shrews were found. Comparison of the shrews captured by us and San Bernardino Dusky Shrews identified by Hennings and Hoffmann (1977) with reference series of S. monticolus and S. ornatus showed that S. m. parvidens was indistinguishable from S. ornatus ornatus. Sorex monticolus parvidens is, therefore, considered a junior synonym of S. o. ornatus; these populations are not threatened (Williams, 1983).

Inyo Shrew

At the time this project was initiated, only three specimens of Sorex tenellus were known from two localities in California (Hoffmann and Owen, 1980). Their probable distribution, on the eastern slopes of the southern Sierra Nevada and in the White Mountains, suggested no cause for concern. Subsequently, discovery of Inyo Shrews in the Sweetwater Mountains (Williams, 1984) and the Mono Basin (Harris, 1982), and at a site on the western slope of the Sierra Nevada in Red Fir forest (Williams, 1984), shows that they are fairly widespread and under no threats.

Monterey Vagrant Shrew

Sorex vagrans paludivagus lives in riparian and tidal and freshwater wetlands of the San Francisco Peninsula, the Salinas River Delta, and adjacent lowlands in the Monterey Bay area (Findley, 1955; Hennings and Hoffmann, 1977). Only scanty information is available to document distribution and populations status. Although the area within the geographic range of Monterey Vagrant Shrews is under intense pressure from human developments, several wetland communities, including the type locality, Elkhorn Slough, are protected from development. S. v. paludivagus may be more vulnerable than many wetland species, particularly birds and Long-toed Salamanders which have received special management considerations in different wetlands within the region. Therefore, it should be considered sensitive.

Salinas Ornate Shrew

Sorex ornatus salarius occupies a variety of riparian, wetland, and upland terrestrial communities in the vicinity of the Salinas River Delta (Owen and Hoffmann, 1983; unpubl. data). Although the region is undergoing intense development, I could not find information documenting its current status. The relatively wide range of communities providing habitat for S. o. salarius suggests that it is probably not jeopardized.

Angel Island Mole

Scapanus latimanus insularis is confined to Angel Island, Marin Co., in the northern portion of San Francisco Bay (Hall, 1981). The island is a state park and under no threat of intensive development. Introduced Mule Deer (Odocoileus hemionus) serious damaged vegetation on the island, resulting in considerable soil erosion, which was probably the major threat to moles. The California Department of Parks and Recreation has instituted measures to control the size of the deer population. Determining the current population status of Angel Island Moles should receive high priority in management of the island.

Alameda Island Mole

Scapanus latimanus parvus is known only from Alameda Island, Alameda, Alameda Co. (Hall, 1981). The island is intensely developed with the Alameda Naval Air Station (Nimitz Field) occupying nearly half; most of the remaining area is occupied by commercial and residential developments. Alameda Memorial State Beach Park is the most extensive state-managed property on the island. I have no current information on the population status of S. l. parvus, but development of Alameda Island warrants treating it as a sensitive species.

Long-tongued Bat

Choeronycteris mexicana seems to be a sporadic visitor to California from Mexico, appearing in San Diego County in autumn (Huey, 1954b; Olson, 1947). Records include bats taken in San Diego in September, 1946 (Olson, 1947), October and December, 1947 (Huey, 1954b), and October, 1963 (Banks and Parrish, 1965). Long-tongued Bats feed mostly on nectar and pollen of night-blooming succulents such as agave. They roost in relatively well-lighted caves and in buildings, and under shallow, cave-like overhangs and portals on buildings. No protection or management of Long-tongued Bats is required in California. Additional information on their occurrence within the state is needed, however, and this need should be brought to the attention of agency biologists and others likely to receive reports of bats.

Mammoth Little Brown Myotis

Myotis lucifugus relictus is known from the Long Valley and Owens Valley (Harris, 1974). In general, M. lucifugus is associated with large, permanent bodies of water in western North America. They often roost and form maternity colonies in the attics of buildings, under bridges, and other structures (Fenton and Barclay, 1980). M. l. relictus was suggested as a candidate species by the U.S. Fish and Wildlife Service (in litt.). I have not found evidence that it is jeopardized, although information on current population status is lacking. Major developments in the region (impoundment and diversion of rivers and streams) probably enhance habitat for the species.

San Joaquin Myotis

Myotis yumanensis oxalis occupies areas on the valley floor and foothills of the San Joaquin Basin and Delta, westward to at least Berkeley, Alameda Co. (Hall, 1981). This species was on the original working list. Within their range, San Joaquin Myotis are among the commonest bats, forming relatively large maternity colonies in attics of buildings, barns, and other structures (unpubl. observations). Populations of all bats appear to have diminished greatly in the last two decades in central California, and this trend will probably continue as more land is developed, more insecticides are used, and as barns and other structures used as roosts and sites for maternity colonies become less numerous. I do not believe the situation warrants high priority consideration now, but treatment as a sensitive species is advisable.

Spotted Bat

Euderma maculatum was listed as a rare species in the U.S. Bureau of Sports Fisheries and Wildlife Rare and Endangered Species List of 1968 (Watkins, 1977). Listing did not confer legal, protected status for the species. E. maculatum was also listed in the 1969 edition of the International Union for Conservation of Nature Red Data Book, and as a Category 2 species by the U.S. Fish and Wildlife Service (1982). Spotted Bats range widely in western North America from southern British Columbia (Woodsworth et al., 1981) to Mexico (Watkins, 1977). In California, records of Spotted Bats include the eastern and southern portions of California, the central Sierra Nevada and the foothills of the Sierra Nevada in the San Joaquin Valley. They probably occur throughout the state in suitable habitat. Most often, Spotted Bats have been found in arid desert and open pine forests in rough, rocky terrain (Easterla, 1971; Findley and Jones, 1965; Leonard and Fenton, 1983; Watkins, 1977; Woodsworth et al., 1981). Spotted bats appear to roost mainly in rock crevices (Leonard and Fenton, 1983; Watkins, 1977), and females appear to favor Ponderosa Pine forest as habitat during the reproductive season (Findley and Jones, 1965). I found no evidence that the Spotted Bat is threatened in California. A review of its distribution and population status by Fenton et al. (1983) found no significant threats that warranted seeking federal Threatened or Endangered Species status.

Sierra Nevada Mountain Beaver

Unpublished observations (Dale Steele) on a population of Aplodontia rufa californica, living near a freshwater seep along historic Lee Vining Creek, about 1 km from Mono Lake, provided the basis for inclusion of this population among the species on the draft List of Concern. It was the only local population of a more widely distributed taxon to be so included. Other populations of Sierra Nevada Mountain Beavers are found at numerous sites, particularly where there is a dense growth of small deciduous trees and shrubs, wet soil, and/or nearby water, and an abundance of herbaceous forbs, ferns, berry vines, etc. (Camp, 1918; Scheffer, 1929). Because of the unique habitat of the Mono Basin population in semidesert surroundings and because water-flow in Lee Vining Creek is usually diverted by the Los Angeles Metropolitan Water District, this population could be jeopardized. On this basis, the population was listed as a Category 2 species by the U.S. Fish and Wildlife Service (1982). Subsequently, additional information on the status of Mountain Beavers in the Mono Basin was published by Harris (1982). John Harris (pers. comm.) believes that Mountain Beavers living near Mono Lake are immigrants from higher elevations along the eastern slope of the Sierra Nevada, and that, periodically, some establish homes in suitable sites. In reconsidering its status in light of the observations by Harris (1982, and pers. comm.) and the recent litigation that has returned water to Lee Vining Creek (at least temporarily), there seems to be little justification for including this population on the List of Concern.

Kingston Mountain Chipmunk

Tamias panamintinus acrus occurs only in the Kingston Mountains in the desert area of northeastern San Bernardino Co. (Hall, 1981). This population is apparently isolated from all other populations of Tamias by

hot, low-lying desert communities (Johnson, 1943). Within the Kingston Mountains, the chipmunks live in arid pinyon-juniper woodlands, occupying nests among rocks in fissured cliffs and ledges. The U.S. Bureau of Land Management listed T. p. acrus as a Sensitive Species in its California Desert Conservation Area Plan (unpubl. documents). Johnson (1943) noted that Kingston Mountain Chipmunks were few in number and occupied a potential geographic range of less than 40 square miles. Major uses of land in the area include cattle grazing and mining (U.S. Bureau of Land Management, in litt.); neither activity poses serious threats to the population. No evidence known to me supports considering it as sensitive.

Mt. Pinos Chipmunk

Tamias speciosus callipeplus is apparently restricted in distribution to the upper slopes and summit of Mt. Abel and Mt. Frazier of the Transverse Ranges, (southwestern Tehachapi Range). Howell (1929) recorded a single specimen from Canyon de Uvas (Grapevine Canyon). Records of elevation extend from 6000 ft on north-facing slopes to 8800 ft in open, coniferous forest (A. I. Roest, in litt.; Grinnell, 1933). Lodgepole Chipmunks (T. speciosus) are generally found in open forests with a mix of shrubs and trees. They are nearly always associated with Lodgepole Pine, although Red Fir, Jeffrey Pine, and Chinquapin are also common plant associates (Johnson, 1943); Red Fir does not occur, and White Fir is probably an important associated species within the range of T. s. callipeplus. Lodgepole Chipmunks frequently take refuge in trees and rarely venture far from tree cover. No information is available to document the status of this isolated population. Dr. Aryan Roest expressed concern about its status and stated that a high level of recreational activities by humans in that area, including extensive vacation home developments might be responsible for a perceived decline in population density. The relatively wide-spread occurrence of Mt. Pinos Chipmunks on public lands and their preference for relatively open forests suggests that they are not currently threatened, but this should be established by field studies. Treatment as a sensitive species is recommended.

Santa Catalina Ground Squirrel

Spermophilus beecheyi nesioticus occurs only on Santa Catalina Island, Los Angeles Co. Although this species was on the original working list, primarily because of its insular distribution, it was shortly dropped from consideration. California Ground Squirrels are widely distributed, occurring from below sea level to high elevations in temperate, mixed conifer forests (Grinnell, 1933). They are most numerous in disturbed communities undergoing secondary succession. During field work on Santa Catalina Island in January, 1983 (Williams, 1983), I observed several Santa Catalina Ground Squirrels. The general degradation of native plant communities by introduced Bison, Feral Goats, Wild Pigs, and other introduced ungulates favor this species. There is no reason to treat it as sensitive.

San Bernardino Golden-mantled Ground Squirrel

Spermophilus lateralis bernardinus is a relictual population of the Golden-mantled Ground Squirrel and is distributed from about 6500 to 11500 ft in the elevation in the San Bernardino Mountains (Grinnell, 1933). In

the western Sierra Nevada, Golden-mantled Ground Squirrels chiefly inhabit forest floors, especially in open forests with a mix of tall trees, brush, and open ground supporting herbaceous plants (White et al., 1980). This species was included on the original List of Concern primarily on the basis of my experiences with S. lateralis on the western slope of the central Sierra Nevada. During field work in the San Bernardino Mtns. (Williams, 1983, and unpubl.), Golden-mantled Ground Squirrels were observed in open pine and mixed conifer forests and in pinyon-juniper woodlands on the northern, desert slopes of the mountains. Their abundance in a broader range of plant communities in the San Bernardino Mountains lessens the importance of threats to the taxon from home and recreational developments.

Palm Springs Round-tailed Ground Squirrel

Spermophilus tereticaudus chlorus was on the draft List of Concern as a Third Priority species. Populations are restricted to areas below about 1200 ft in the Coachella Valley (Grinnell and Dixon, 1918) in Riverside Co. Here, Round-tailed Ground Squirrels occupy dry, level, sandy areas, apparently being most numerous in areas with fine sandy soils supporting abundant herbaceous growth; Mesquite (Prosopis sp.), Suaeda/Distichlis, and Creosote (Larrea) associations are also commonly used. They do not inhabit cultivated fields and lawns but they feed in such areas when the distance from their home burrows is not too great. The habitat for S. t. chlorus has been reduced substantially by urbanization, cultivation, and construction of roads, railroads, airports, and golf courses. Little public land is found in the Coachella Valley, and not all that is publicly owned supports this species. The reason for removing it from the List of Concern is because of the Coachella Valley Macropreserve agreement between the U.S. Department of the Interior, The Nature Conservancy and other organizations. S. t. chlorus should be treated as a sensitive species until information on its status is available.

Townsend Soft-haired Ground Squirrel

Spermophilus townsendii mollis occurs in two disjunct areas in eastern California: the region from the upper Owens Valley to the Mono Lake area in Mono Co.; and in the Honey Lake area in Lassen Co. (Hall, 1981). Townsend Ground Squirrels live in communities with sandy soils supporting Big Sagebrush and Rabbitbrush. Typically, they are found in loosely organized colonies. In California, they are dormant from about July to January or February (Harris, 1982). They do not live in cultivated fields. S. t. mollis was on the working list, but definitive information on its status has not been developed. Much of the land around Honey Lake is under cultivation and the species could be threatened there. There are fewer developments that would threaten the species in the southern sector of its range where extant colonies are known from the Mono Lake Basin (Harris, 1982; and unpubl. data). I found no evidence to support listing this species.

Rock Squirrel

In California, Spermophilus variegatus grammurus only occurs near the eastern border in desert mountains ranges (Clark and Providence ranges) of San Bernardino Co. (Hall, 1981). There, it lives in pinyon-juniper

associations among rocks (Ingles, 1965). I found no information to indicate that the species is threatened in California.

San Bernardino Flying Squirrel

Glaucomys sabrinus californicus is known from the San Bernardino and San Jacinto ranges, living between about 5200 and 8500 ft. There probably is a population of G. sabrinus in the San Gabriel Mountains also (Vaughan, 1954). Summer (1927) conducted an extensive trapping survey south of Big Bear Lake in the San Bernardino Range in summer, 1926. He took 22 specimens over the course of several months, all in White Fir trees. Grinnell (1933) remarked that these flying squirrels inhabited woodlands where Black Oak or White Fir trees were common. Grinnell and Swarth (1913) captured a single animal in the San Jacinto Mountains. It was taken in a Black Oak at about 6000 ft. Records of 38 specimens from the two mountain ranges, most of which were taken prior to the 1960's, were located. The San Bernardino Flying Squirrel was listed as a Third Priority species on the draft List of Concern because of high densities of homes and recreation sites in mid-elevation forests in both ranges and killing of trees by air pollution, and because authorities had remarked on the seeming scarcity of these animals (Grinnell, 1908; Grinnell and Swarth, 1913; Summer, 1927). Field work in the San Gabriel and San Bernardino mountains (Williams, 1983) convinced me that the threats from developments were of much lesser magnitude than feared earlier. G. s. californicus was deleted from the final List of Concern for these reasons. All flying squirrels are protected from taking in California, therefore having some protection from direct depredation by humans.

Buena Vista Lake Pocket Gopher

Thomomys bottae ingens is limited to areas in the vicinity of historic Buena Vista Lake, in the southern San Joaquin Valley, Kern Co. (Hall, 1981). Buena Vista Lake has been drained and is under irrigated cultivation; cotton is grown on the historic Lake Bed and on most surrounding land. Periodic field work, especially in 1985 (Williams, 1985) produced evidence of extant colonies in the South Coles Levee Oil Field and the Buena Vista Lake Recreation Area north of the lake bed, and elsewhere within its limited geographic range. Given the ability of pocket gophers to adapt to pastures and fields in perennial crops such as alfalfa and to golf courses, T. b. ingens was dropped from active consideration.

Honey Lake Pocket Gopher

Thomomys townsendii relictus occurs only in a small area in the vicinity of Honey Lake in the western part of Honey Lake Valley, Lassen Co. (Hall, 1981). Its geographic range extends from near Susanville in the northwest to near Amedee in the northeast and Doyle in the south (Thaeler, 1968). Within this area, Honey Lake Pocket Gophers are confined to deep soils of lacustrine origin. They are found in moist meadows along the western edge of the Honey Lake Valley and range into the more arid grasslands in the eastern part of the valley, where their range appears to be coincident with the distribution of saltgrass (Distichlis; Thaeler (1968). Soil type may be the primary limiting factor for this gopher. Although much of the Honey Lake Valley is under cultivation or in irrigated pasture, Honey Lake

Pocket Gophers appear to be common and not threatened by developments in the region (J. L. Patton, pers. comm.).

San Joaquin Pocket Mouse

Perognathus inornatus inornatus occurs along the eastern side of the San Joaquin Valley and possibly in the Sacramento Valley (unpubl. data). The boundaries between the geographic ranges of P. i. inornatus, with 50 chromosomes, P. i. neglectus, with 56 chromosomes (Williams, 1978), and the population from the Sacramento Valley (a single specimen from Lake Co. had 60 chromosomes; unpubl. data) are not well documented. Taxonomic problems in this species complex have complicated the resolution of its populations status further. Typical San Joaquin Pocket Mice from the eastern edge of the San Joaquin valley have been found in areas with friable soils in grasslands and Blue Oak savannas, from near sea level to about 1500 ft in elevation. Some of the oldest and largest collections, made near the beginning of the century (unpubl. data) were from areas of wind-drifted sand, a habitat that has essentially disappeared due to cultivation and urbanization. This species was listed in the Third Priority on the draft List of Concern, based primarily on the extensive loss of habitat in the San Joaquin Valley. Reflection has resulted in removing it from the List of Concern, although it should be treated as a sensitive species until information is available to resolve its population and systematic status.

McKittrick Pocket Mouse

Perognathus inornatus neglectus occurs along the western side of the San Joaquin Valley, in the Mojave Desert, on the Carrizo Plain, and in the upper Salinas Valley (unpubl. data). Its distributional limits and relationships to P. i. inornatus, P. i. psammophilus, and the inornatus group pocket mice from the Sacramento Valley are unclear. McKittrick pocket mice have been taken on a variety of soil types in desert shrub associations supporting Atriplex spp., Ephedra californica, and annual herbaceous plants such as Bromus spp. and Erodium. Most of the available habitat for this pocket mouse is located on the sloping, western margin of the San Joaquin Valley and the adjacent, rugged hills. McKittrick pocket mice seem to be uncommon, or at least only locally common, but probably are not under serious threats now.

Arroyo Seco Pocket Mouse

Perognathus inornatus sillimani was described by von Bloeker (1937); he also described the Salinas pocket mouse (Perognathus longimembris psammophilus) at the same time. The type series of both taxa were collected from the same locality. I have examined all of the available specimens of both species. The specimens of P. 1. psammophilus were all subadults and the specimens von Bloeker (1937) called P. i. sillimani were all adults. The two taxa are based upon different age groups of the same population, which is allied with the inornatus species complex, not P. longimembris. The Arroyo Seco Pocket Mouse is, therefore, a junior synonym of Perognathus inornatus psammophilus. The latter name has priority because of page precedence in the publication describing both taxa (see account of P. i. psammophilus).

Yellow-eared Pocket Mouse

Perognathus parvus xanthonotus is known from the southeastern slopes of the Tehachapi Mountains in the vicinities of Freeman (Walker Pass), Horse, Indian Wells, and Sage canyons in Kern Co. (unpubl. data). Yellow-eared Pocket Mice are associated primarily with arid desert shrub and Joshua Tree communities and in ecotonal areas supporting a sparse cover of Pinyon Pine trees. Altitudes recorded for specimens range from about 4000 to 5300 ft. The Yellow-eared pocket mouse was treated as a separate species from P. parvus by Hall (1981). Its karyotype and aspects of its structure are indistinguishable from most members of the parvus species group (Williams, 1978), and I see no reason to treat it as a separate species. The U.S. Bureau of Land Management designated the Yellow-eared Pocket Mouse as a Sensitive Species in the California Desert Conservation Area Plan. There are no known or projected developments that would jeopardize this taxon, despite its apparent restricted, geographic range and narrow altitudinal distribution.

Sierra Valley Kangaroo Mouse

In California, Microdipodops megacephalus californicus is known only from the type locality in the Sierra Valley, Plumas Co. (Hall, 1981). Although found on substrates of gravelly texture, they are most often associated with sandy soils. The restricted distribution of M. m. californicus was the primary reason for including it on the working list. There is no information on its current status.

Pale Kangaroo Mouse

Microdipodops pallidus pallidus occurs in California as two disjunct populations: one in the Fish Lake Valley, near Oasis, Mono Co., and one in the Deep Springs Valley, Inyo Co. Inhabited areas in California are steppe-desert associations on fine, sandy soils from about 5000 to 5500 ft in elevation (Grinnell, 1933). I found no information on the current population status of M. p. pallidus. Most of the land supporting both population is either privately owned or is public land outside specified multiple-use classes of the U.S. Bureau of Land Management California Desert Conservation Area Plan. Future developments in these areas would pose threats to the only known populations of M. pallidus in California, although I am not aware of any planned developments. During a one-day visit to the area in 1982, I found no evidence that the populations are under serious threats.

Point Conception Kangaroo Rat

Dipodomys agilis fuscus was placed on the working list because of its apparently restricted distribution. It is known only from the vicinity of Point Conception, Santa Barbara Co., in coastal chaparral communities (Boulware, 1943). Best (1983) could find no characteristics separating the more widely distributed subspecies, D. a. perplexus, from fuscus. I believe detailed studies will show the populations are in contact and do not warrant taxonomic recognition as separate subspecies. This is the primary reason for not ranking this kangaroo rat in a priority category.

Lesser California Kangaroo Rat

Dipodomys californicus eximius is found only in the vicinity of Marysville Buttes in Sutter Co. According to Grinnell and Linsdale (1929), eximius differs from the wider-ranging subspecies, D. c. saxitilis, only in its paler coloration. Neither subspecies was numerous at the time Grinnell and Linsdale (1929) investigated their status. D. c. saxitilis apparently was limited to foothill communities just above the edge of the valley floor, in sites on slopes with soils that remained "well-drained through the wet winter months" (Grinnell and Linsdale, 1929). Presumably, the Lesser California Kangaroo Rat has similar requirements. According to Blair Csuti (pers. comm.), eximius had not been collected for several years. It was included on the working list, but was dropped after review of information on its taxonomic status suggested that there was little justification for recognizing the wider-ranging D. c. saxitilis as a subspecies separate from eximius. Current information on its population status and a review of the taxonomy of D. californicus is needed. The Lesser California Kangaroo Rat should be considered vulnerable and treated as a sensitive species until its status is determined.

Big-eared Kangaroo Rat

Published information on the distribution of Dipodomys elephantinus suggests that its range is limited to the southern portion of the Gabilan Mountains in San Benito Co., in the vicinity of Pinnacles National Monument (Grinnell, 1922; Hall, 1981). The Big-eared Kangaroo Rat was included on the working list because of its small geographic range and because it was listed by the International Union for Conservation of Nature Red Data Book. Also, it was listed as a Category 2 species by the U.S. Department of the Interior (1982). I collected kangaroo rats with diagnostic characteristics of D. elephantinus in chaparral communities in Del Puerto Canyon in western Stanislaus Co., and from Clear Creek in the southern Diablo Range, San Benito Co. An additional specimen in the Collections at Fresno State University, from near the border of Fresno and San Benito counties is of this species. I found no justification for recognizing elephantinus as a species separate from D. venustus (Narrow-faced Kangaroo Rat) or to be concerned about its population status. Troy Best (pers. comm.) is presently studying the relationships between D. venustus and elephantinus.

Berkeley Kangaroo Rat

Published records of occurrence of Dipodomys heermanni berkeleyensis are from the Berkeley Hills, Mount Diablo, and the Livermore Valley (Hall, 1981). Berkeley Kangaroo Rats probably occupy suitable habitat throughout the mountain ranges east of San Francisco Bay and west of the San Joaquin Valley. Habitat for Berkeley Kangaroo Rats, in so far as is known, consists of open, grassy hilltops (Grinnell, 1933) and open spaces in chaparral and Blue Oak/Digger Pine woodlands (unpubl. data). Habitat for Berkeley Kangaroo Rats has been reduced significantly in the hills and valleys north of Livermore, and this gives some cause for concern about its status. However, D. heermanni with characteristics attributed to D. h. berkeleyensis (Grinnell, 1922) are fairly common on the east flank of the Diablo Range in Del Puerto Canyon, Stanislaus Co., and Corral Hollow, Alameda Co. (unpubl. data). The limits of the geographic range of D. h.

berkeleyensis and its relationships to D. h. tularensis (Tulare Kangaroo Rat) need to be reviewed in order to clarify their distributional and population status.

Merced Kangaroo Rat

Dipodomys heermanni dixoni is known from eastern Merced and Stanislaus counties (Hall, 1981) in grassland and savanna communities. It was included on the working list because of its limited distribution and the rapid rate of conversion of native plant communities to irrigated fields in this portion of the San Joaquin Valley. Thousands of acres of land in eastern Stanislaus and Merced counties, considered safe from cultivation six years ago has since been converted to orchards and vineyards. No additional information on its population status has been located, but threats to its population from continuing loss of habitat seem great enough to warrant treating it as sensitive until its status is clarified.

Argus Mountain Kangaroo Rat

Dipodomys panamintinus argusensis occurs only in the Argus Mountain Range in Inyo County (Hall, 1981). Its population is isolated from others of D. panamintinus. Nothing specific is recorded of its habitat associations, but, in general, Panamint Kangaroo Rats occur in arid, mountain steppe communities vegetated with Yucca, Pinyon Pine, Juniper, and Big Sagebrush. They appear to be most common on coarse-textured soils on sloping ground (Johnson et al., 1948). This taxon was included on the working list because it was designated as a Sensitive Species in the U.S. Bureau of Land Management California Desert Conservation Area Plan. A portion of the Argus Mountains lies within the China Lake Naval Weapons Center. Nearly all of the rest of the Argus Range is public land administered by the U.S. Bureau of Land Management This land is designated as Class L (limited use), which means use is limited to livestock grazing, mining, and other activities that are unlikely to jeopardize the population of kangaroo rats. There is no known reason for granting special consideration to this population.

Panamint Kangaroo Rat

Dipodomys panamintinus panamintinus occupies the Panamint Range in Inyo Co., between about 4600 and 7000 ft. Distributional records include several specimens from around Jackass Spring, the head of Willow Creek, 1 mi s. of Lee Pump, and South Park Meadow (Johnson et al., 1948; Hall, 1981). Habitat for D. p. panamintinus is probably similar to other populations of this species (see above). It was included on the working list because it was designated as a Sensitive Species in the U.S. Bureau of Land Management California Desert Conservation Area Plan. Panamint Kangaroo Rats were fairly common in Pinyon-Juniper communities around Jackass Spring during field work in 1974 (unpubl. data). Most of the Panamint Mountains lie within Death Valley National Monument and are inaccessible to off-road vehicles and protected from most forms of development. Other portions of the geographic range of the Panamint Kangaroo Rat are public lands designated for limited use (Class L) by the U.S. Bureau of Land Management. There is no known evidence of threats to the Panamint Kangaroo Rat.

Santa Cruz Kangaroo Rat

The geographic range of Dipodomys venustus venustus extends from the Santa Cruz Mountains eastward to Mount Hamilton in the Diablo Range, and southward to Freemont Peak in the northern end of the Gabilan Range (Grinnell, 1922; Hall, 1981). Kangaroo rats of this group are also known from the Diablo Range in western Stanislaus Co., and from the southern Diablo Range in San Benito and Fresno counties (unpubl. data; see account of the Big-eared Kangaroo Rat). Some populations of Dipodomys venustus are found on slopes with a heavy cover of chaparral (Grinnell, 1933). Hawbecker (1940) found burrows of Santa Cruz Kangaroo Rats on sand, sandy loam, and loam soils, but never in soils of "heavy" texture. He trapped Santa Cruz Kangaroo Rats in two abandoned agricultural fields which had supported chaparral originally (Chamise, Black Sage, Manzanita, Buck Brush, and Coyote Brush) and conifer forest (Coast Redwood, Douglas Fir, Madrone, and Tanoak). He speculated that they also inhabited the areas with chaparral, as he trapped Santa Cruz Kangaroo Rats at the edge of chaparral. Animals I have captured in the Diablo Range were taken in chaparral (unpubl. data). In the Santa Cruz Mountains, known collecting localities have sandy soils. Available evidence suggests a severe decline in populations of Santa Cruz Kangaroo Rats in the Santa Cruz Mountains. Michael Marangio (in litt.) reported that his searches at several sites failed to uncover evidence of extant colonies. Increasing density of residential housing and the domestic and feral house cats may be factors in extirpating some populations. Quarrying of sand has probably led to extirpation of others (M. Marangio, in litt.). I have not included the Santa Cruz Kangaroo Rat on the List of Concern because I could find no threats to populations in most portions of the Diablo Range; however, measures to locate and protect populations in the Santa Cruz Mountains should be considered.

Sonora Beaver

Castor canadensis repentinus was originally found along the Colorado River in California. In 1911, upon completion of construction of irrigation and drainage canals between the Colorado River and the Imperial Valley, Sonora Beavers colonized portions of the Imperial Valley (Grinnell et al., 1937). They inhabit slow- to moderate-flowing waters of the main channels of the Colorado River and canals, sloughs, and oxbow lakes. Where the water is shallow and the banks are of rock, lodges are constructed. Elsewhere, however, beavers place nests in burrows in banks and levees. Dams are constructed where waters are shallow, but are uncommon along the Colorado River (Tappe, 1942). Sonora Beavers eat bark and twigs of Willows, Mesquite, Cottonwood, and other woody plants, and Cattails, grasses, Arrow Weed, and other herbaceous plants. The Sonora Beaver was included on the draft List of Concern in a Fourth Priority category for sensitive species, and is currently designated as a furbearer and may be trapped in California. Dixon (1922) estimated that 100 Sonora Beavers lived in the Imperial Valley in 1921. Trapping and water shortage caused a subsequent decrease in the population, and by 1940, Tappe (1942) estimated that there were only 32 left in the Imperial Valley, mostly living along the lower portion of the Alamo River. Tappe found a total of 13 Sonora Beavers in canals and sloughs in the Palo Verde Valley and 272 along the Colorado River (129 on the California side). The present status of the Sonora Beaver population is unknown. Loss of riparian habitat

along the Colorado River has been extensive since the 1940's. River channelization, phreatophyte control, and lining of canals and drains with concrete are probably the most troublesome factors affecting Sonora Beavers. No Sonora Beavers were taken by animal damage-control agents of the U.S. Fish and Wildlife Service in Imperial, Riverside, or San Bernardino counties between 1969 and 1976 (Lee, 1977). A single beaver was reported as taken by a fur trapper in Imperial Co. during the 1975-76 season (Lee, 1977). Periodic contamination of the Alamo River in the Imperial Valley by raw sewage from Mexicali, Mexico, may threaten any remaining Sonora Bevers living there. The Sonora Beaver should be consider as a sensitive species and its status determined.

Golden Beaver

Castor canadensis subauratus was originally found throughout the lower courses of the San Joaquin and Sacramento river systems, including the streams draining into Tulare and Buena Vista lakes. Altitudinal range was from sea level up to about 1000 ft. Golden Beavers probably did not occupy the upper segments of streams of the western Sierra Nevada (Grinnell, 1933), although they have been introduced there at numerous sites (in the 1940's alone, there were 172 different transplants of Golden Beavers). Golden Beavers inhabit slow- to moderate-flowing streams, ponds, and lakes. The main requirement seems to be sufficient food, which consists of roots, bulbs, grasses, Cattails, and other herbaceous plants, and bark and twigs of Willows, Cottonwoods, Alders, and other woody plants (Grinnell et al., 1937). Golden Beavers usually dig burrows in banks of streams and levees. and less frequently construct dams and lodges. The Golden Beaver was included on the draft List of Concern as a sensitive species (Fourth Priority group). Golden Beavers were nearly exterminated by unregulated harvest prior to 1911, when legislation was passed in California to protect Beavers fully. The populations responded to protection by increasing to densities to where trapping was allowed again in 1925. Controls were ineffective against illegal trapping and full protection was extended again in 1933. In 1957, beavers were classified as a furbearer and a season for harvest was designated. No bag limit on the number taken has been in effect since 1957 (Tappe, 1942; Lee, 1977). The history of the harvest of beavers in California suggests that most populations have been fairly stable over the 25 to 30 years prior to 1977 (Lee, 1977). Also apparent from fur trappers' reports is an upward trend in numbers of persons purchasing trapping licenses in the past decade and the increasing prices being paid for furs (California Dept. Fish and Game, unpubl. Licensed Fur Trappers Report, 1976-77). Pelts of beavers did not increase in average price paid, however. In any case, beavers are highly vulnerable to trapping and any market trends or socio-economic factors causing increased trapping pressure could result in a rapid population decline. Alteration of aquatic habitats, including decreased stream flow, increased pollution, channelization of streams, stream-side brush clearing, and regulation of stream flow, also could affect beaver populations adversely. The Golden Beaver should be treated as a sensitive species. Close monitoring of populations of Golden Beavers, including regular field surveys, is recommended. Decisions on trapping regulations should not be made solely on data from reports of licensed trappers, as many trappers fail to report their take (44% of the licensees in 1976-77 did not file reports), and there is no assurance that data based upon such reports are accurate.

Santa Catalina Harvest Mouse

Reithrodontomys megalotis catalinae is found only on Santa Catalina Island, Los Angeles Co. It was included on the original working List of Concern in the Third Priority category because of its insular distribution and because no information was available on its status or habitat requirements (Howell, 1914; von Bloeker, 1967). During field work on Santa Catalina Island during January, 1983 (Williams, 1983), Santa Catalina Harvest Mice were found in all plant communities and were fairly common. There are no known threats to R. m. catalinae.

Salinas Harvest Mouse

Reithrodontomys megalotis distichlis occurs in the region of Monterey Bay (Hall, 1981), in fresh and brackish water wetlands and probably in adjacent upland grasslands. It was included on the working list because of its restricted distribution and the high rate of urbanization in that area. Most of the wetland communities where these mice live are under protection. There is no evidence that they are threatened.

Santa Cruz Harvest Mouse

Santa Cruz Island, Santa Barbara Co., is home to Reithrodontomys megalotis santacruzae (Pearson, 1951). Pearson (1951) noted that Santa Cruz Harvest Mice were found only in a small, grassy area adjacent to a small, fresh-water marsh of Scirpus, Typha, and Salix. He remarked that this habitat was rare, perhaps not found elsewhere on the island, and that Santa Cruz Harvest Mice were probably limited to that one spot on the island. R. m. santacruzae was included on the draft List of Concern in the Highest Priority because of its apparent restricted habitat, Pearson's (1951) belief that the total insular population was very small, and the damage to plant communities on the island by introduced ungulates. Laughrin (1973) Pearson (1951), and von Bloeker (1967) collectively listed Cattle, Pigs, Sheep, Wapiti (Cervus elaphus), Mule Deer, and Roe Deer (Capreolus pyargus = C. capreolus) as introduced mammals to the island. R. m. santacruzae was removed from the final List of Concern because field studies by Bills (1969) found that Santa Cruz Island Harvest Mice were widely distributed on the island, and because the island has recently come under the management of The Nature Conservancy. The current population status of the Santa Cruz Harvest mouse is unknown, but the balance of available information suggests no reason for including it on the final List of Concern. Studies to determine its population status and the nature of any existing threats should be undertaken.

Anacapa Island Deer Mouse

Peromyscus maniculatus anacapae is found on East, Middle, and West Anacapa islands, Ventura Co. (von Bloeker, 1942). Anacapa deer mice live in all terrestrial habitats on the islands and also use the intertidal zone for foraging (Grinnell, 1933; P. W. Collins, in litt.). P. m. anacapae was included on the draft List of Concern as a sensitive species (Priority Four) on the basis of evidence furnished by Paul W. Collins (in litt.). According to Collins (in litt.; unpubl. U.S. Natl. Park Serv. Rept.), Anacapa Deer Mice were restricted to grassland habitats on the islands because of competition with black rats (Rattus rattus). He estimated that

populations were eliminated from 75% of the available habitat. The population on East Anacapa Island was affected most severely. The U.S. National Park Service (Dept. of the Interior) has administrative authority for the Anacapa Islands, which are part of the Channel Islands National Monument. The Anacapa Deer Mouse was not included in a higher-priority category because the National Park Service is aware of the situation and has presumably taken measures to reduce or eliminate black rats from the islands. P. m. anacapae should be treated as a sensitive species and its population status should be monitored.

Santa Catalina Deer Mouse

Peromyscus maniculatus catalinae is confined to Santa Catalina Island, Los Angeles Co., where it inhabits most terrestrial plant communities (von Bloeker, 1967). It was placed on the working list because of its insular distribution, the general degradation of the island by introduced ungulates, possible predation by feral cats which occur in high density on the island (Laughrin, 1973), and possible competition with introduced black rats and house mice (Mus musculus; von Bloeker, 1967). It was not assigned to a priority category on the final List of Concern because during field work on the island in January, 1983, Santa Catalina Deer Mice were found to be fairly common and under no threats (Williams, 1983).

Western Cotton Rat

According to Hall (1981), Sigmodon hispidus eremicus is confined to the region along the lower Colorado River in California. Western Cotton Rats also occur in the Imperial Valley, having immigrated there shortly after completion of the canal from the Colorado River to the Imperial Valley (Dixon, 1922). Western Cotton Rats inhabit wetlands and upland habitats with dense grass and other herbaceous plants. In times of population irruptions, they may be found far from wetlands in a variety of plant communities atypical of their usual habitat (unpubl. data). S. h. eremicus was placed on the working list because of its restricted distribution in an area known to have been significantly altered by human developments. Brad Blood (in litt.) found Colorado River Cotton Rats to be fairly common during field studies in 1979 and 1980. Although not widespread, they are probably not jeopardized.

Colorado Valley Woodrat

In California, Neotoma albigula venusta is found in the low-lying desert areas of Imperial, San Diego, and Riverside counties (Grinnell, 1933; Hall, 1981). It is closely associated with patches of Beaver-tail Cacti (Opuntia spp.) and Mesquite. N. a. venusta was included on the working list, but no evidence indicating that it was threatened was found.

Monterey Vole

According to von Bloeker (1937), who named Microtus californicus halophilus, it is confined to saltwater wetlands around Moss Landing and Seaside, Monterey Co. Although not placed on the original working list, the status of this vole has been questioned since. My impression is that California Voles (including the Monterey Vole) are common in both marshes and in adjoining upland grasslands, vineyards, and weedy fields. They

appear to range widely, especially in the winter months. Although Monterey Voles are recorded from only a restricted area, They are probably more widely distributed. Most wetlands within its range are protected.

Mohave River Vole

Microtus californicus mohavensis is known to occur only along the Mohave River in the vicinity of Victorville and Oro Grande, San Bernardino Co. (Grinnell, 1933). Although on the working list, no information on recent occurrence was found. The desert region in the vicinity of Victorville is undergoing a human population explosion that could threaten many native species. A brief visit to the area in 1983 did not provide time to search for evidence of voles, but habitat suitable for this species (weedy herbaceous growth in wet areas along the river) was noted at several sites between Hesperia and Victorville. Also, some irrigated land in pasture and alfalfa could provide additional habitat for the Mojave River Vole. M. c. mohavensis should be treated as a sensitive species until its population status is determined.

San Pablo Vole

Microtus californicus sanpabloensis is known from the salt marshes of San Pablo Creek, Contra Costa Co., on the south shore of San Pablo Bay (Hall, 1981). M. c. sanpabloensis was not included on the original working list but is included here because of subsequent questions about its status. The decision not to give this and other populations of California Voles with restricted distributions greater consideration was based upon the fact that California Voles live in a wide variety of grassland associations, especially in the wet months when there is an abundance of green, herbaceous plants. Extirpation of a small population at one site is likely to soon be offset by immigration from populations occupying other sites nearby. Field work in San Pablo and Suisun Bays on the opposite shore from where the San Pablo Vole lives, found California Voles to have withstood episodes of record flooding during the winter of 1982-83 (Williams, 1983). Foreman (fide T. Rado, pers. comm.) determined the distribution and status of M. c. sanpabloensis during 1985. On the basis of his findings, priority listing is not warranted.

South Coast Marsh Vole

Populations of Microtus californicus stephensi are recorded from tidal marshes at Point Mugo, Orange Co., and Playa del Rey and Sunset Beach, Los Angeles Co. (Hall, 1981). M. c. stephensi was not included on the original working list for the reasons stated for M. c. sanpabloensis. No information on the current status of M. c. stephensi is available. Human developments in the region may have more severely restricted voles to the extant marshes, and catastrophic episodes of flooding or epidemics may pose a greater threat of extinction to this subspecies than to California Voles elsewhere. M. c. stephensi should be treated as a sensitive species until its status is determined and threats to its population identified.

Owens Valley Vole

Microtus californicus vallicola has been recorded from several sites in the Owens Valley, Inyo Co., from near the head of Willow Creek in the

Panamint Mountains, Inyo Co., and from near Benton, Mono Co. According to Grinnell (1933), Owens Valley Voles inhabit wetlands and "lushly grassy ground." M. c. vallicola was placed on the original working list, but soon was dropped from further consideration. M. c. vallicola was listed as a Category 2 species by the U.S. Dept. of Interior (1982). Even though water diverted from the Owens Valley to the Los Angeles Basin has had significant environmental impact within the range of this subspecies, considerable habitat, including irrigated pastures and alfalfa fields still remain. There is no evidence to support listing this species in a priority category or as sensitive.

San Bernardino Vole

Microtus longicaudus bernardinus has been recorded from the higher elevations, above about 7500 ft, in the San Bernardino Mountains (Hall, 1981). According to Grinnell (1933), it inhabits streamsides and wet mountain meadows. M. l. bernardinus was included on the original working list but was dropped later. Subsequently, in summer of 1982, extensive trapping for shrews, conducted by Steve Clifton and me, produced a number of voles from the San Bernardino Mountains. None were found that could be distinguished from M. californicus, a wide-spread species at lower elevations in southern California. In my opinion, M. l. bernardinus is probably a subspecies of californicus, but the taxonomic studies are incomplete. Regardless, these voles are not threatened.

Ringtail

Bassariscus astutus is found throughout most of California, from below sea level to at least 8000 ft in the Sierra Nevada (Hall, 1981). Its principal habitat requirements seem to be den sites among boulders or in hollows in trees and sufficient food in the form of rodents and other small animals. I included two of the four subspecies occurring in California (B. a. octavus, B. a. raptor) on the working list. The status of a third subspecies (B. a. willetti) was also questioned since development of the draft report. Certainly, urbanization in the Southern California coastal basins and in the San Francisco Bay area, and loss and degradation of riparian communities throughout California have depleted and extirpated some populations, but there is no evidence of threats to any of the subspecies over a broad area. Ringtails are protected from taking by state regulations.

Humboldt Marten

Martes americana humboldtensis occurs in California in the coastal conifer forests from Sonoma Co., northward into Oregon. The altitudinal range is from near sea level to over 4000 ft (Grinnell et al., 1937; unpubl. data). Grinnell et al. (1937) remarked that Humboldt Martens were sparsely distributed within this region, although the evidence they reviewed suggested that it was more widely distributed and numerous at an earlier time. According to their report, Humboldt Martens mainly used ridgetops in spruce forests and were rare in redwood forest. Trappers they interviewed believed that squirrels (Tamiasciurus douglasii), mice, and birds were the major prey of Humboldt Martens. Information on the status of the Humboldt Marten was provided by Schempf and White (1977). Although there is no evidence that it is currently threatened, a number

of studies summarized by Strickland et al. (1982) have demonstrated that clear-cutting of forests is incompatible with Martens, whereas low-intensity fires and selective logging have less impact. Mature forest is essential habitat for Humboldt Martens, providing nesting sites in snags, hunting sites, overhead cover from predators, and preferred prey species. Martens are easily trapped and overharvesting is always a potential problem where trapping pressures are high. Even a short trapping period, early in the season, may not solve the problem of overharvest. Public agencies administering lands and resources within the range of the Humboldt Marten should treat it as a sensitive species requiring special consideration in land and resource management decisions.

Inyo Long-tailed Weasel

Mustela frenata inyoensis has been recorded from a few localities in the Owens Valley, in the vicinity of Lone Pine, Independence, and Alvord, Inyo Co. (Hall, 1981). Long-tailed Weasels occur throughout all of California except the southeastern deserts, south and east of Owens Valley. They are common wherever their favored prey, pocket gophers, voles and other rodents are plentiful, even in suburban areas where sufficient open space is available (unpubl. data). The Inyo Long-tailed Weasel was not included on the original working list, but is included here because questions about its status have been raised since. There are no known developments within the range of this subspecies that would pose serious threats to its population.

Pallid Bobcat

Felis rufus pallescens is found on the Modoc Plateau and adjacent areas of the Great Basin province of northeastern California in Lassen, Modoc, Shasta, and Siskiyou counties (Gould, 1977a; Hall, 1981). Bobcats live in most terrestrial communities, but are seldom found on open, flat grasslands and deserts or in areas densely populated by humans. Areas with broken, rocky terrain and/or dense brush are associated with high densities of Bobcats, and also support high densities of small mammals and lagomorphs, their favored prey (Grinnell et al., 1937). The Pallid Bobcat was included on the draft List of Concern as a sensitive species (Priority Four), primarily because of the high price offered for its pelt and evidence reviewed by Gould (1977a). Some of the following data apply to all Bobcats in California, but they illustrate recent trends affecting Pallid Bobcats. The reported annual take of Bobcats in California by fur trappers increased from 241 in 1966-67 to 3618 in 1976-77, a 15-fold increase. Average prices paid for Bobcat pelts increased from $18.00 in 1966-67 to $133.50 in 1975-76 (Lee, 1978). Prices paid for prime pelts of Pallid Bobcats were much higher than this average, the highest recorded by 1977 was $405 (Gould, 1977a). Hunters also take substantial numbers of Bobcats each year. Gould (1977b) estimated that between 9600 and 11400 Bobcats were killed by hunters statewide during 1976. The U.S. Fish and Wildlife Service killed an additional 205 Bobcats in California for predator control. Gould (1977a) documented a probable decline in numbers of Pallid Bobcats between 1971 and 1976, listing increased fur trapping as the likely cause. A 4.5-fold increase in numbers taken by trappers in Lassen, Modoc, Shasta, and Siskiyou counties occurred between 1960-61 and 1975-76 (91 and 406). This probably represents only a fraction of the total take, because, according to Gould (1977a), considerable illegal

trapping and hunting occurs, both within and outside of season. Also, many trappers do not file reports, and hunters not marketing pelts are not required to report on taking Bobcats. Zezulak (1980) studied Pallid bobcats between 1976 and 1979, radio-collaring and determining movements and size of home range for 5 adult males, 5 adult females, and 5 juveniles. He also determined litter size for females over a 2-year period. He reported that trappers filing reports took 162 Pallid bobcats near his study area between 1976 and 1979. Zezulak (1980) concluded that because 75% of the animals trapped were less than 2-years old, the population was expanding in response to "moderately heavy" human-caused mortality. Another interpretation of these data are that increased mortality due to trappers and hunters caused the reduction in the average age of bobcats in the population, without speculating as to whether the population was stable, declining, or increasing in size. In any case, evidence available to Zezulak (1980) suggested that the population was not jeopardized by the level of pressure exerted by hunters and trappers during the period of his study. Present regulations and management practices should be changed to facilitate collection of reliable estimates on take by hunter, illegal trapping, and licensed trapping by persons who fail to submit reports on captures. Treating the Pallid Bobcat as a sensitive species, requiring periodic monitoring of its population status and special consideration in land management decisions, is recommended.

Northwestern White-tailed Deer

Odocoileus virginianus ochrourus were reported from localities in Lassen, Modoc, Mono, Shasta, and Siskiyou counties (Grinnell, 1933; Hall and Kelson, 1959). Little is known of the habitat of White-tailed Deer in California. Walsingham (1873) remarked that they occurred on the plains around the Klamath marshes in Oregon and in the upper Pit River drainage of Shasta Co., California. He stated that in east-central Oregon, near Bend, they frequented thick clumps of willows and other woody shrubs bordering streams and marshes. Walsingham (1873) noted that Mule Deer were abundant on hillsides and that White-tailed Deer occupied the floodplains. Cowan (1936) wrote that over much of their former range, this subspecies of White-tailed Deer occupied riparian and floodplain communities. Bailey (1936) reviewed field notes of early explorers and other sources and concluded that members of this subspecies lived mainly in thickets of willows and other woody plants along streams. He noted that sometimes they were found in the hills and attributed this to being crowded out of more favorable areas by settlers in the valleys. Fisher (in Grinnell et al., 1937) believed that White-tailed Deer in eastern Lassen County occupied a geographic range approximately corresponding to the average winter range of Mule Deer. O. v. ochrourus was included on the working list because of its disputed status. Adams (1963) reviewed evidence of White-tailed Deer in California and disputed its occurrence within the state in historic times. Adams' (1963) conclusion was based on two factors: the habitat in California was not like the habitat for this species in Montana; and a general lack of undisputed specimens known to him. He stated that the habitat for White-tailed Deer in northeastern California was "strikingly different from that of the whitetail habitat that . . . [he] had known in northwestern Montana." To reach his conclusion he had to discount one specimen of a White-tailed Deer from California that he could not dispute and ignore the account by Walsingham (1873), an international authority on the family Cervidae, of his travels

through northern California and his observations of White-tailed deer. He also discredited the writings of a number of other prominent naturalists (e.g., Bailey, 1936; Cowan, 1936; Dixon, 1927; and N. Hollister and C. H. Merriam in Adams, 1963) supporting the occurrence of White-tailed Deer in California. That few specimens from California were located by him is true, although there is no indication that Adams (1963) attempted to locate and examine a complete skin and partial skeleton (for a whole mount) donated to the Oakland Museum (Dixon, 1927). The lack of scientific specimens is not surprising in view of the lack or scarcity of specimens from California of other large mammals, such as the Bison, California Grizzly Bear, Gray Wolf, and Mexican Jaguar (Grinnell et al., 1937; Merriam, 1919, 1926). Geographic variation in habitat requirements was apparently unfamiliar to Adams, or at least that White-tailed Deer in California might differ in their use of habitat from those in Montana was a possibility that he did not accept. Arguing against his viewpoint is an extant population of Columbian White-tailed deer, in the vicinity of Roseburg, Oregon, less than 100 miles from the northern border of California. Its habitat is quite different from the riparian habitat along the Columbia River where the other population is found (Fisher et al., 1977; Suring and Vohs, 1979). In summary, the evidence strongly supports the occurrence of Northwestern White-tailed Deer in California. They were probably extirpated from California sometime between the 1930's and 1950's, mainly beccause of loss of habitat.

DISCUSSION

The major developments threatening mammalian species are virtually the same as identified in jeopardizing several species of birds in California (Remsen, 1978), with the loss and degradation of riparian woodlands and wetlands at the top of the list. Of the 36 species and subspecies on the List of Concern (Table 2), 15 are limited to or depend upon riparian and wetland communities, or are thought to be so dependent (Table 3). Four of these require habitat in riparian communities along the Colorado River: the Arizona Myotis, Arizona Cave Myotis, Colorado River Cotton Rat, and Yuma Mountain Lion. Three others require habitats in riparian and wetland communities on the floor of the San Joaquin Valley: the Buena Vista Lake Shrew, Riparian Brush Rabbit, and Riparian Woodrat. The Salt-marsh Wandering Shrew and Suisun Shrew occupy tidal marshes in San Francisco and San Pablo bays, respectively. The Southern California Salt-marsh Shrew and Southern Marsh Harvest Mouse live only in the tidal marshes along the southern California Coast. The Point Reyes Mountain Beaver and Point Reyes Jumping Mouse require wetland communities in the Point Reyes region, north of San Francisco Bay, and the Point Arena Mountain Beaver occupies wetlands in the vicinity of Point Arena, Mendocino Co. Additionally, Snowshoe Hares use riparian communities extensively, and the two on the List of Concern (Oregon Snowshoe Hare, Sierra Nevada Snowshoe Hare) require habitat in these communities.

Species of concern confined to lowland desert, grassland, and savanna communities of the southern California coastal basins include the Los Angeles Pocket Mouse and Pacific Pocket Mouse (Table 3). Also of concern in that region and elsewhere in the southern lowlands of California are the American Badger, California Leaf-nosed Bat, Big Free-tailed Bat, Pocketed Free-tailed Bat, and California Mastiff Bat. Loss of habitat probably is the principal factor jeopardizing these species.

Species jeopardized by loss of grassland and desert communities in the San Joaquin Valley and contiguous areas such as the Carrizo Plain are the Tipton Kangaroo Rat, Short-Nosed Kangaroo Rat, and populations of the American Badger. Loss and degradation of native communities in the San Joaquin Valley lowlands are especially serious problems. The importance of the San Joaquin Valley to populations of the California Mastiff Bat is unestablished, but it was probably a major area for foraging Mastiff Bats. No recent records of California Mastiff Bats are known from the San Joaquin Valley, although scanty data suggest they were more common into the 1950's or 1960's. In addition to the four species mentioned here and the three species requiring riparian and wetland communities listed above, four species of mammals with Rare and Endangered Status are confined to the region (San Joaquin Antelope Squirrel, Fresno Kangaroo Rat, Giant Kangaroo Rat, and San Joaquin Kit Fox; Table 1). There are also other endemic species and subspecies of mammals of the San Joaquin Valley, all of whose populations have been seriously reduced in size. Some, including the San Joaquin Pocket Mouse (Perognathus inornatus inornatus and P. i. neglectus) and Tulare Grasshopper Mouse (Onychomys torridus tularensis) also may be in danger, but available data suggest lesser threats to these species than those listed.

Loss and fragmentation of old-growth conifer forests pose threats to two

species on the list, the Red Tree Mouse and the Pacific Fisher. Too little is known about the distribution and habitat of the White Footed Vole to state with certainty, but it too may be jeopardized by current forest harvest practices. Insufficient information is available to identify species of bats that might be similarly jeopardized, although a number of species are distributed mainly in conifer forests and may be jeopardized by widespread loss of mature and old-growth forests.

Nine species of concern are presently classified as game or furbearing species: the Riparian Brush Rabbit and Yuma Mountain Lion in the highest priority; and the Pygmy Rabbit, Oregon Snowshoe Hare, Sierra Nevada Snowshoe Hare, Western White-tailed Hare, Pacific Fisher, American Badger, and Channel Islands Spotted Skunk in the third priority. Only the Pacific Fisher is currently protected from taking. The Yuma Mountain Lion is classified as a game species, although at present there is no open hunting season on Mountain Lions in California. Regardless of whether or not other populations of Mountain Lions in California are allowed to be hunted, those of the southeastern desert areas should continue to be fully protected. Killing and trapping are likely to be major threats only for the populations of the American Badger of concern. For the American Badger, the Riparian Brush Rabbit, and species of hares on the List of Concern, data sufficient to justify the seasons and bag limits must be gathered. Determining the status of, and the impacts of hunting on, these species should be high priorities of the Department of Fish and Game.

Emphasis in the species accounts has been given to determining the population status and potential threats to individual species. State and federal legal protection should be sought for those species for which information is adequate to estabish their threatened or endangered status. While these activities will focus concern on individual species and provide a measure of protection for those found to require it, they are probably not the most efficient and cost-effective way to ensure their survival.

Preservation of the mammalian species of concern listed here, species already with state or federal threatened and endangered status, and species of birds, reptiles, plants, and other taxonomic groups can be best accomplished by concentrating conservation efforts on their biotic communities rather than emphasizing single-species management. This also would provide more security to members of their communities that are not normally accorded protected status, but which may be essential to the perpetuation of their communities (e.g., lower plants, fungi, invertebrates).

An integrated, intergovernmental development/conservation approach which focuses upon preserving representative segments of each unique biotic community while other resource- and land-use goals are being formulated is needed. This would lessen the need for listing of most of these species as threatened or endangered and probably save much of the money and duplication of efforts expended on managment of threatened and endangered species on a one-by-one basis.

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APPENDIX

Acronyms for museums where research collections of specimens and other documentation of localities referred to in the lists of distribution records are listed below. Museum acronymns generally follow Choate and Genoways (1975).

AMNH	American Museum of Natural History, New York
ANSP	Philadelphia Academy of Natural Sciences
CAS	California Academy of Sciences, San Francisco
CM	Carnegie Museum of Natural History, Pittsburgh
CSCS	California State University, Stanislaus
CSLB	California State University, Long Beach
CSUC	California State University, Chico
CSUF	California State University, Fresno
CSUS	California State University, Sacramento
DFW	Sight records and uncataloged specimens, Daniel F. Williams
FMHN	Field Museum of Natural History, Chicago
HSU	Humboldt State University
KU	University of Kansas, Museum of Natural History
LACM	Natural History Museum of Los Angeles County
LSU	Louisiana State University
MCZ	Harvard University, Museum of Comparative Zoology
MSB	University of New Mexico, Museum of Southwestern Biology
MVZ	University of California, Berkeley, Museum of Vertebrate Zool.
PM	Paris Museum
ROM	Royal Ontario Museum, Toronto
SDSNH	San Diego Society of Natural History Museum
SFSU	San Francisco State University
TCWC	Texas A & M University, Texas Cooperative Wildlife Collections
UCLA	University of California, Los Angeles
UDAV	University of California, Davis, Museum of Zoology
UI	University of Illinois, Museum of Natural History
UMMZ	University of Michigan, Museum of Zoology
USNM	National Museum of Natural History, Washington, D.C.
WFBM	University of California Davis, Museum of Wildlife and Fisheries Biology

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