State of California
The Resources Agency
DEPARTMENT OF FISH AND GAME

REPORT TO THE FISH AND GAME COMMISSION:

STATUS REVIEW OF THE RIPARIAN BRUSH RABBIT (*Sylvilagus bachmani riparius*) IN CALIFORNIA

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EXECUTIVE SUMMARY

This report was prepared in response to a petition received by the Fish and Game Commission from Mr. Donald W. Murphy, Director, California Department of Parks and Recreation to list the Riparian Brush Rabbit (*Sylvilagus bachmani riparius*) as an Endangered Species.

On December 4, 1992, pursuant to Section 2074.2 of the Fish and Game Code, the Commission determined that the petition contained sufficient information to indicate that the petitioned action may be warranted. Pursuant to Section 2074.6 of the Fish and Game Code, the Department undertook a review of this petition. Based on the best scientific information available on the Riparian Brush Rabbit, the Department has evaluated whether, in fact, the petitioned action should be taken. Information and comments on the petitioned action and the species in question were solicited from interested parties, management agencies, and the scientific community.

This report presents the results of our review and analysis.

FINDINGS

The Riparian Brush Rabbit is an isolated subspecies of the Brush Rabbit, one of the eight subspecies of Brush Rabbit found in California. As a game animal, the Brush Rabbit is generally widespread in the State. However, the Riparian Brush Rabbit is only found in Caswell Memorial State Park in southern San Joaquin County. The entire population is restricted to 261 acres of remaining native riparian forest along the Stanislaus River.

The population has undergone a serious long-term decline since historical times primarily due to continuing habitat loss. The current population is estimated at 200 to 300 individuals and considered to be at carrying capacity. However, as recently as the mid 1970s and mid 1980s, the entire population often dipped to extreme lows of 10 to 20 individuals during severe flooding. The current population comprises considerably less than 1% of the estimated historic population of 110,000 individuals, is completely isolated, and undergoes severe fluctuations of numbers. The entire remaining Riparian Brush Rabbit population is restricted to a fragment of suitable habitat found at Caswell Memorial State Park.

The Riparian Brush Rabbit is considered the most sensitive mammal in California because of its susceptibility to floods, fire, disease, predation, human disturbance, and flood control activities. This subspecies could become extinct during a single catastrophic event.

CONCLUSIONS

The Department concludes that the Riparian Brush Rabbit is in serious danger of extinction in California because the species has declined by over 99% from historical levels; consists of a single population isolated in a very small area; continues to be endangered by numerous factors; and, in our best professional judgment, seems highly likely to decline to the point of extinction in the foreseeable future. The petitioner has requested that the Riparian Brush Rabbit be listed as Endangered. After reviewing the status of the Riparian Brush Rabbit in California and based on the best available scientific information regarding the biology of this subspecies, the Department finds that listing as Endangered is an appropriate action. This finding is based on the following:

1. Habitat modification and destruction have been extensive since historical times.

2. Severe predation by both native and feral predators affects the Riparian Brush Rabbit population during floods when they must retreat to elevated areas without adequate groundcover.

3. The Riparian Brush Rabbit is subject to increased competition from the larger and more common Desert Cottontail (*S. audubonii*).

4. Due to the isolated population of Riparian Brush Rabbits, disease is a serious threat; and, should an outbreak occur, the Riparian Brush Rabbit is highly vulnerable to extinction.

5. Human-related activities may pose a serious threat to the continued viability of Riparian Brush Rabbits.

6. Small population size makes the Riparian Brush Rabbit highly susceptible to extinction due to natural environmental occurrences, such as catastrophic fire or flood.

7. Current low numbers, coupled with isolation, place the only remaining population at risk of extinction due to biological and genetic factors associated with small population size. These factors seriously threaten the continued viability of this species.

8. In the absence of listing, existing regulatory mechanisms are inadequate to insure the continued survival of a viable Riparian Brush Rabbit population. This subspecies is endemic to California and only occurs at one location.

RECOMMENDATIONS

1. The Commission should find that the petitioned action is warranted for the listing of this subspecies as State Endangered.

2. The Commission should publish notice of its intent to amend Section 670.5, Title 14, CCR (California Code of Regulations) to add the Riparian Brush Rabbit (*Sylvilagus bachmani riparius*) to its list of Endangered Species.

3. The Department should establish the interagency coordination and commitment necessary to halt the further loss and deterioration of Riparian Brush Rabbit habitat and begin restoration and preservation of suitable habitat deemed essential to maintaining the subspecies in perpetuity.

4. Remaining and potential habitat areas within the floodplain of the San Joaquin River and its tributaries within the historical range of the Riparian Brush Rabbit of a size sufficient to maintain self-sustaining populations should be identified, restored, and permanently preserved.

5. At least five additional Riparian Brush Rabbit populations should be established after habitat restoration is accomplished.

6. State, Federal, local, and private land maintenance and management activities should be conducted to minimize disturbance to Riparian Brush Rabbits and their habitat and any other areas with potential for restoration between existing levees.

7. A population viability analysis of the Riparian Brush Rabbit should be undertaken to determine the breeding population levels and management actions necessary to insure that each population will be healthy and viable and be able to naturally exist in perpetuity in the State.

8. The Department should establish a recovery planning team to develop a comprehensive management plan for Riparian Brush Rabbits that is specific to the situation within the historic range and implement the plan.

9. Once habitat is restored such that new populations can be introduced, the current hunting regulations for Brush Rabbits should be modified to preclude take of rabbits and hares within these local areas. After recovery occurs, hunting restrictions should be removed.

10. Planned development or any further disruption of remaining San Joaquin Valley riparian forest or other areas within the floodplain between levees within the historic range of the Riparian Brush Rabbit should be closely reviewed for presence or absence

of any habitat suitable for restoration and possible reintroduction, prior to approval of such plans.

11. Habitat currently occupied by Riparian Brush Rabbits at Caswell Memorial State Park should be slightly modified to provide high ground with cover for protection from floods and additional fire breaks to protect habitat destruction due to wildfires. Flood levees adjacent to the Park should be modified to allow for cover and protection of rabbits during floods.

PUBLIC RESPONSES

During the 12-month review period, the Department contacted a number of affected and interested parties, invited comment on the petition, and requested any additional scientific information that may be available. A copy of the Public Notice and a list of parties contacted are contained in Appendix A. Copies of comments received and responses to those portions incorporating biological information are provided in Appendix B. Responses to nonscientific comments were not addressed in this analysis but will be addressed as part of the regulatory proceedings should the Commission find that the petition warrants action.

REPORT TO THE FISH AND GAME COMMISSION:

A Status Review of the Riparian Brush Rabbit (*Sylvilagus bachmani riparius*) in California

INTRODUCTION

PETITION HISTORY

On August 17, 1992, the Fish and Game Commission received a petition from Mr. Donald W. Murphy, Director, California Department of Parks and Recreation, requesting State listing of the Riparian Brush Rabbit (*Sylvilagus bachmani riparius*) as an Endangered Species. The Department of Fish and Game reviewed the petition and recommended to the Commission that they accept it as complete pursuant to Sections 2072.3 and 2073.5 in the California Endangered Species Act (CESA). On December 4, 1992, the Commission accepted the Department's recommendation and designated the Riparian Brush Rabbit as a Candidate Species as provided for in Section 2074.2 of CESA. That action initiated a 12-month review period, pursuant to Section 2074.6 of CESA, within which the Department must review the status of the subject species and provide a written report to the Commission. This report contains the results of the Department's status review, and a recommendation to the Commission, based on the best scientific information available, of whether or not the petitioned action is warranted. It also includes preliminary identification of the habitat that may be essential to the continued existence of the species and suggests management activities and other recommendations for recovery of the species.

DEPARTMENT REVIEW

During the 12-month review period, the Department contacted affected and interested parties, invited comment on the petition, and requested any additional scientific information that may be available. A copy of the Public Notice and a list of parties contacted are contained in Appendix A. Copies of comments received and responses to those portions involving biological information are provided in Appendix B. Responses to nonscientific comments are acknowledged, but not addressed in this document.

FINDINGS

LIFE HISTORY

Description

Riparian Brush Rabbits, a subspecies of the Brush Rabbit, are small brownish cottontail-like rabbits with a white belly, relatively short ears, and a small inconspicuous tail. The hind legs are short and hind feet are slender and not covered with long or dense hair. The white belly and ventral tail hairs are gray near the skin, and the ears lack dark areas at the tips (Orr 1940, Ingles 1965, Chapman 1974). Adults are about 13 inches long (300-375 mm). The Riparian Brush Rabbit can be distinguished from other subspecies by its relatively pale color, gray sides, and darker back (Orr 1935), its restricted range and habitat requirements, and its skull characteristics. When looking down at the head from above, their cheeks protrude outward rather than being straight or curving inward as in other subspecies (Orr 1935, 1940).

A similar species, the Desert Cottontail (*S. audubonii*), occurs within the range of the Riparian Brush Rabbit. Desert Cottontails are found in numerous habitat types, are slightly larger, have larger eyes and ears, are more yellowish in coloration, and have dark-tipped ears and a very conspicuous tail. The belly and undertail hair of a Desert Cottontail is pure white (Ingles 1965).

Taxonomy

The Riparian Brush Rabbit is recognized as a distinct subspecies of the Brush Rabbit (Orr 1935 and 1940, Chapman 1974, Hall 1981). The Brush Rabbit species is found along the Pacific Coast of North America from the Columbia River to the tip of Baja California and from the western slope of the Cascade-Sierra Nevada Range west to the Pacific Ocean. It is a member of the family Leporidae (Rabbits and Hares) of the Order Lagomorpha (Rabbits, Hares, and Pikas) in the Class Mammalia. The Brush Rabbit was first described as a species, *Lepus bachmani*, by Waterhouse in 1838, renamed *L. trowbridgii* by Baird in 1855, and eventually redescribed as *Sylvilagus bachmani* by Lyon in 1904 (Chapman 1974). There are 13 recognized subspecies of Brush Rabbit, and eight of these occur in California. The Riparian Brush Rabbit (*S. b. riparius*) was first described by Orr in 1935 with the type locality designated as the west side of the San Joaquin River, two miles northeast of Vernalis, Stanislaus County, California.

Biology

The biology of the Riparian Brush Rabbit and of Brush Rabbits in general is summarized based on technical information provided in Orr (1935, 1940), Chapman (1974), Chapman et al. (1982), Williams (1986, 1988, 1993), Williams and Basey (1986) and Basey (1990).

Food Habits and Foraging Behavior: Riparian Brush Rabbits forage on herbaceous vegetation in general, including grasses, sedges, clover, forbs, shoots, and leaves. The vegetation is generally clipped off using the teeth while the animal moves slowly along the ground. Occasionally, an animal will rise up on its hind legs to reach a slightly elevated item, but edible items are not manipulated by the forepaws. Vegetation is eaten in available areas within or very close to brushy cover, usually along trails, fire breaks, or at the edge of brushy areas. They seldom venture more than several meters from brushy cover, and do not forage in large open areas. Foraging activity occurs during the early morning and early evening hours.

Home Range and Population Density: Home ranges for Riparian Brush Rabbits in Caswell Memorial State Park are smaller for females than for males, with male territories typically overlapping with those of several females. Home ranges are generally small, and are located within and usually shaped by the extent of available brushy areas. The average home range size for males was 957 m^2 and for females was 244 m^2 during the mid 1980s. Female home ranges overlapped slightly at the edges, but the core areas did not overlap. Brushy clumps smaller than 450 m^2 are rarely occupied.

At Caswell Memorial State Park, the overall population density of Riparian Brush Rabbits at carrying capacity is estimated to be three animals per hectare (3/ha). This varies greatly depending on whether areas are highly suitable or marginal for use by these animals. In highly suitable areas the density is higher, but in marginal areas it is lower or nonexistent. Nevertheless, the overall density at carrying capacity is an appropriate and useful estimate.

Reproduction: The breeding season of Riparian Brush Rabbits in Caswell Memorial State Park occurs from January into May. Breeding is restricted to this period, and they do not breed year round like Desert Cottontails. Thus, Riparian Brush Rabbits are at a competitive disadvantage to cottontails outside the Park. Male Brush Rabbits are able to breed from October through June and are not reproductively active from July through December. Breeding is limited to the period of female receptivity from January to May. This season is probably related to the weather, and could possibly begin in December.

The gestation period is about 27 days, and three to four young are born in a shallow burrow or cavity lined with grasses and fur and covered by a plug of residual vegetation. The young have fine thin hair and their eyes are closed. They are nursed only at night, and after about 10 days their eyes open. They remain in the nest for about two weeks and continue to nurse for two more weeks after that. The young do not become reproductively active until

the following breeding season. Adult females can breed again shortly after birth of a litter. They have about three to four litters during the season, with an average of nine to 16 young produced per female per year. Five out of six rabbits (*Sylvilagus* sp.) do not survive until the next breeding season, so population turnover is rapid.

Activity Patterns and Dispersal: Riparian Brush Rabbits are crepuscular, with activity patterns in the evening occurring between sunset and 2:00 a.m. and in the morning from 6:00 a.m. until 10:30 a.m. In between active periods, they groom and rest in a small cleared area about the size of a rabbit or elevated on a downed log, and may sun themselves during the afternoon. These small areas are attached by a maze of well-used runways. When being chased they are difficult to flush into the open, but stick to dense cover and may climb up into the vegetation. They will climb into small trees or snags when necessary to escape flooding.

The habits of dispersal are generally unknown. It is assumed that animals may travel a very short distance if necessary to find a suitable unoccupied home range within riparian habitat during the breeding season. They are closely restricted to dense brushy cover and probably are unable or unwilling to disperse through large open areas, so the Riparian Brush Rabbit population is confined to the Park. Animals that are displaced farther than 350 m from their home range have extreme difficulty returning to their original territory. They travel during clear nights, using vision for orientation. Due to rather short homing ability, animals displaced by floods may not be able to return to their original location.

Mortality Factors and Predation: Riparian Brush Rabbits are preyed upon by various native raptorial and carnivorous species that normally occur within the riparian habitat, such as hawks, owls, foxes, and snakes. They are also susceptible to predation by feral dogs and cats. Riparian Brush Rabbits are subject to diseases and parasites that typically affect all rabbit species, many of which are contagious and fatal. During chance environmental events resulting in flooding or wildfire, they can suffer direct mortality. Five out of six rabbits of the genus *Sylvilagus* are not expected to survive from one year to the next.

Associated Species: The Riparian Woodrat (*Neotoma fuscipes riparia*) is associated with the Riparian Brush Rabbit in the riparian forests of the upper San Joaquin Valley. The Riparian Woodrat is a Category 1 Candidate for Federal listing as Threatened or Endangered and considered a Mammal Species of Special Concern in California. The historic range of this subspecies is nearly identical to that of the Riparian Brush Rabbit. Presumably, suitable habitat restoration, expansion, and preservation for the Riparian Brush Rabbit will also benefit the Riparian Woodrat.

DISTRIBUTION AND ABUNDANCE

The Riparian Brush Rabbit is strictly associated with San Joaquin Valley riparian forests with dense brushy understory. This habitat was found within the floodplain on the valley floor in northern San Joaquin Valley. The original forest and floodplain have been cleared, altered, and degraded. The wholesale destruction of this essential habitat has resulted in the disappearance of the Riparian Brush Rabbit from all but a very tiny portion of its historic range (Williams 1986, 1988, and 1993; Williams and Basey 1986; Basey 1990).

Historic Distribution

Riparian Brush Rabbits occupied the native riparian forests within the natural floodplain along the northern portion of the San Joaquin River and its tributaries from Stanislaus County to the Delta (Orr 1940). During historical times, this area had ample brushy understory associated with the forest and suitable upland areas for cover and retreat from annual floods. The Riparian Brush Rabbit occurred within suitable habitat throughout this area (Figure 1).

Historic Abundance

Wholesale alteration of the native riparian forest began in the mid 1800s, prior to any mammalogical surveys or a full description of Brush Rabbit subspecies. The historic abundance of Riparian Brush Rabbits can be estimated based on extrapolation from currently known population numbers and density estimates in remaining suitable habitat. All evidence indicates that Riparian Brush Rabbits are now completely dependent on the remaining suitable habitat in Caswell Memorial State Park. They are not found in any other habitats or at any other locations. Williams (1993) found that the population was presently at carrying capacity, and estimated their current density at three individuals per hectare (3/ha). The pre-settlement extent of riparian forests along the San Joaquin River and its tributaries from its confluence with Merced River to just outside Stockton was 36,700 hectares (Katibah 1984). Based on this information, the estimate for historic abundance of Riparian Brush Rabbits is 110,000 individuals.

Current Distribution

The Riparian Brush Rabbit is currently only found at Caswell Memorial State Park on the Stanislaus River at the southern edge of San Joaquin County (Figure 1). Recent surveys along rivers within the historic range were conducted by Williams and Basey (1986) and Basey (1990). No Riparian Brush Rabbits were found anywhere outside Caswell Memorial State Park.

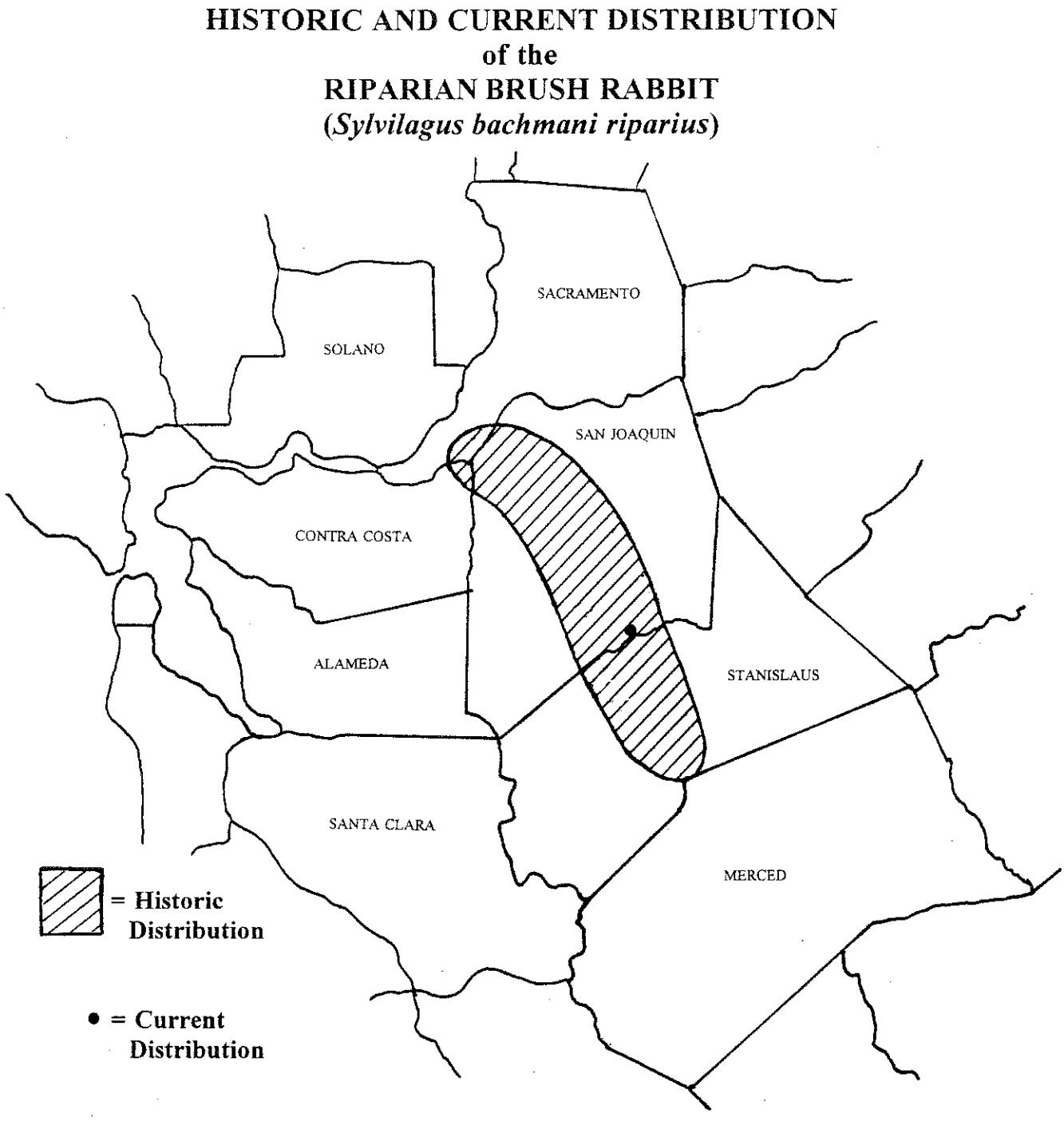

Figure 1. Historic and current distribution of the Riparian Brush Rabbit in California, based on Orr (1940), original extent of riparian forest (Katibah 1984), and studies conducted by Williams and Basey (1986), Williams (1988, 1993), and Basey (1990).

Current Abundance

A current census of the Riparian Brush Rabbit population was conducted during January 1993 in Caswell Memorial State Park by Williams (1993). The current population size is 213 to 312 individuals. The population is presently at carrying capacity at the Park due to the several years of current drought. Based on the estimated historic abundance, there is only 0.23% of the original population still surviving. During the mid 1970s and 1980s, this population drastically dropped yearly to a low of 10 to 20 individuals during flooding. In one year during the 1970s, the survivors were removed from trees and shrubs by Park personnel in boats and released on solid ground (Williams and Basey 1986, Basey 1990).

THREATS

Habitat Destruction, Fragmentation, and Degradation

The major cause of decline for the Riparian Brush Rabbit in California has been the destruction, fragmentation, and degradation of the San Joaquin Valley native riparian forest habitat within their historic range (Williams and Basey 1986, Basey 1990). The remnant population remains dependent on this habitat for survival and successful reproduction. Originally, there were 36,700 ha (90,600 ac) of this habitat within the range of the Riparian Brush Rabbit, from the confluence with the Merced River to just outside Stockton (Katibah 1984). Approximately 5.8% of the original habitat remained in the mid-1980s (2,100 ha or 5,200 ac), but the majority of this remaining riparian forest habitat is impacted by human activities (Katibah 1984). Caswell Memorial State Park is the largest area (104.5 ha or 261 ac) within the historic range of the Riparian Brush Rabbit that has suitable habitat. It also is the only place within the historic range with a surviving population of this subspecies.

Surveys along the rivers within the historic range of the Riparian Brush Rabbit were completed in the mid-1980s, but none were found anywhere outside the Park (Williams and Basey 1986, Basey 1990). In addition, the remaining riparian habitat is severely fragmented, highly disturbed, regularly subjected to prolonged flooding, and thus is not likely to provide adequate support for viable populations of Riparian Brush Rabbits. Even if there were suitable habitat areas, it is not possible for the animals to disperse from the Park to these fragments of habitat on their own.

Flooding

Caswell Memorial State Park is subject to periodic flooding that often inundates the entire area. During periods of flooding, Riparian Brush Rabbits climb up into vegetation or

onto cleared levees to escape drowning. During this time, they are subject to severe predation pressure. Without normal cover, they become easy targets for both native and non-native predators. Since the Riparian Brush Rabbit population is already at an extremely low level, this excess predation during periodic flooding contributes directly to population decline and accelerates extinction (Williams and Basey 1986, Basey 1990, Williams 1988, 1993).

Wildfire

There is a normal buildup of downed logs, dried vegetation, and ground litter in the riparian forest. Long-term suppression of fire and prolonged drought adds to the danger, making the remaining habitat highly subject to wildfire. This type of habitat is preferred and typically occupied by Riparian Brush Rabbits, but any wildfire occurring within the remaining habitat where the rabbit population persists could cause direct mortality as well as massive habitat destruction (Williams and Basey 1986, Basey 1990, Williams 1988, 1993).

Disease

Riparian Brush Rabbits are subject to the common rabbit diseases that occur in California (Williams 1988), such as tularemia, plague, myxomatosis, silverwater, encephalitis, listeriosis, Q-fever, and brucellosis. These diseases are typically contagious and fatal, so that if any disease becomes epidemic in this small and restricted population of rabbits, extinction could easily occur in a very short time period. These diseases could easily be introduced into the Riparian Brush Rabbit population by Desert Cottontails.

Competition

Unlike Riparian Brush Rabbits, Desert Cottontails can easily exist in most riparian areas, especially those areas without heavy brushy cover. In areas subject to prolonged flooding, willows (*Salix* sp.) predominate, and brushy ground cover, low vegetation, and ground litter are absent. This is a normal step in the reestablishment of mature riparian forest. Since they breed year round, Desert Cottontail populations are at a competitive advantage over Riparian Brush Rabbits after any event such as flooding or wildfire. Within interim unsuitable habitat, Riparian Brush Rabbits can become extirpated, and it is unlikely that they can later reestablish a population that can outcompete the Desert Cottontail (Basey 1990). Should the remaining habitat at Caswell Memorial State Park undergo any adverse modification, the Desert Cottontail population existing outside the boundary could become established within the Park and cause accelerated extinction of the Riparian Brush Rabbit.

Population Viability

Populations that are restricted to a very small fragment of suitable habitat and reduced to an extreme low level, such as the Riparian Brush Rabbit, are highly susceptible to chance genetic events that could cause extinction. Such population aberrancies could cause severe reductions in reproductive capability of the single remaining Riparian Brush Rabbit population, resulting in extinction.

Since five out of six *Sylvilagus* rabbits are not expected to survive from one year to the next under normal circumstances due to normal mortality factors, their populations regularly undergo a rapid turnover (Chapman et al. 1982). When population levels are high and at carrying capacity within a wide range, mortality factors such as disease, drowning, fire, and predation do not have adverse consequences. Large healthy populations well distributed over a large area are able to survive in perpetuity and recover from any temporary adverse situations. However, at the current low population level and severely restricted range of the Riparian Brush Rabbit, any competition or mortality factor can become serious, and total extinction of the Riparian Brush Rabbit could very easily occur.

Environmental Variation

Excessive rainfall or severe drought are normally occurring environmental variations that can result in flooding or wildfires. Although these are natural events that a large, widely dispersed, and healthy population of Riparian Brush Rabbits is able to withstand, their already reduced numbers and restricted location places them at special risk. During a catastrophic event, the breeding population level may quickly become too low to adequately recover from this type of environmental perturbation, especially if it occurs for several years in a row. The small numbers of remaining Riparian Brush Rabbits could be reduced to such a small population over a several year event that there will not be a viable population to recover when conditions improve.

ESSENTIAL HABITAT

Riparian Brush Rabbit habitat requirements have been described by Williams (1988), Williams and Basey (1986), and Basey (1990). General habitat requirements for Brush Rabbits, described by Orr (1940) and Chapman (1971, 1974), are directly applicable to Riparian Brush Rabbits. Essential habitat requirements are described by summarizing these studies.

Riparian Brush Rabbits are restricted to the native San Joaquin riparian forest habitat originally found on the valley floor in the floodplain along the San Joaquin River and its tributaries from Stanislaus County to the Delta. During pre-settlement times, there were

natural levees along the edges of these rivers and large floodplain areas with native vegetation. Periodic flooding occurred during natural variations in precipitation and waterflow. These floodplain areas were uneven with enough topography so that upland areas with appropriate vegetative cover were available for retreat during flooding. Areas above the normal flood level supported brush and trees.

Riparian Brush Rabbits are strictly confined to areas with dense brushy and herbaceous groundcover within the riparian forest. They seldom venture more than one to two meters from brushy cover. Some large shrubs, small bushy trees, large trees, and snags must be present, along with brushy areas that are at least 460 m^2 in size and some raised areas with appropriate cover. Open areas and areas subject to prolonged flooding, where ground cover and litter are regularly removed and willows predominate, are not typically used by Riparian Brush Rabbits. Typical vegetation forming essential habitat within the riparian forest for Riparian Brush Rabbits includes Wild Rose (*Rosa* sp.), Coyote Bush (*Baccharis* sp.), Blackberries (*Rubus* sp.), Elderberries (*Sambucus* sp.), Wild Grape (*Vitus californicus*), Box Elder (*Acer negundo*), Valley Oak (*Quercus lobata*), and Cottonwoods (*Populus* sp.).

CURRENT MANAGEMENT

A management plan for the sensitive species occurring within Caswell Memorial State Park was prepared by the California Department of Recreation (Blankenship 1989) based on recommendations made by Williams (1988). For Riparian Brush Rabbits, specific activities included monitoring populations, controlling feral cats and dogs, opening fire lines and access roads as additional fire breaks, precluding expansion of camping and recreation areas, maintaining optimum habitat by balancing fuel removal and brush control, enhancing habitat with mounds of soil and artificial shelters, and altering mosquito abatement activities. Implementation of the plan has been limited due to lack of funding. However, some activities have been undertaken and accomplished. Two additional trails/fire breaks were constructed, valve boxes were covered to prevent entrapment, and mosquito abatement activities have been modified.

The U.S. Fish and Wildlife Service has classified the Riparian Brush Rabbit as a Federal Candidate Species, Category 1, since 1989. Category 1 classification indicates that the Service has enough information on file regarding the threats and vulnerability to list this taxon as Threatened or Endangered, but Proposed Rules have not been issued because this action has been precluded by other listing activities. Service staff is currently preparing a listing petition for this subspecies. In addition, the Service is supporting the San Joaquin Valley Endangered Species Recovery Planning Program, which is including the Riparian Brush Rabbit in the plan, although it is not yet listed. The Department of Fish and Game, the Department of Parks and Recreation, and the U.S. Fish and Wildlife Service have actively exchanged all available research information on Riparian Brush Rabbits, and Fish and Game's Wildlife Management Division has designated it a "Mammal Species of Special Concern" since 1986.

There are currently no official or mandated management programs specifically directed to preserve the Riparian Brush Rabbit. Mostly, this is because the species is not yet specifically listed by either the State or Federal governments as Threatened or Endangered. As a State Candidate species, the Riparian Brush Rabbit is protected from direct take under CESA, but biological consultation is not mandated in advance of any project unless the species is actually listed. Thus, mitigation measures or project alternatives are not mandated, but left up to the discretion of the decision-making body. In such cases, the decision is often based on local economic considerations rather than available scientific information and overall welfare (Statewide) for a particular subspecies. In the meantime, the Riparian Brush Rabbit remains on the Federal Candidate List (Category 1). As a Federal Candidate species, it must be addressed in environmental documents where impact could occur, but, again, any mitigation or project alternatives remain optional on the part of the decision-making body.

The State Department of Parks and Recreation has written the subject petition to the Fish and Game Commission requesting that the Riparian Brush Rabbit be listed as State Endangered. All of the remaining population resides on Park property, but they are unable to justify spending funds on specific management on park property until the Riparian Brush Rabbit is officially listed.

RECOVERY CONSIDERATIONS

The Fish and Game Commission has specifically requested that consideration be given to recovery alternatives, including the identification of State-owned lands (Department of Fish and Game and Department of Parks and Recreation) which could be utilized in the reintroduction of the Riparian Brush Rabbit to its native range. Since there is only one existing population, a major attempt must be made to establish several additional viable populations elsewhere within the historic range. In addition, expansion of the existing occupied habitat is desirable.

River surveys along the San Joaquin River and its tributaries have already been conducted (Basey 1990, Williams 1988, Williams and Basey 1986). Sites between flood levees outside of Caswell Memorial State Park showed signs of frequent flooding, were dominated by willows, and had little or no ground cover. These areas are typically occupied by Desert Cottontails. Only one area with existing suitable habitat for Riparian Brush Rabbits was found at Hatfield State Recreation Area, but it is only about three hectares in size and subject to flooding, so an introduced population would be unlikely to remain viable. In short, there are no Park or Fish and Game properties that provide suitable habitat for Riparian Brush Rabbits outside of Caswell Memorial State Park.

The proposed San Joaquin River National Wildlife Refuge, located at the confluence of the San Joaquin and Stanislaus rivers, does not currently have suitable habitat and is subject to regular flooding. After establishment, habitat restoration, and creation of areas protected from floods, this could be a prime area for reintroduction of Riparian Brush Rabbits.

Although within the historic range, it is not an option at the present time. It could eventually become prime habitat and the best area for additional populations.

Upstream and downstream of Caswell Memorial State Park, some private property on the Stanislaus River retains original riparian habitat. These areas would require purchase to be added to Caswell, special agreements with private landowners, or establishment of stringent easements for maintenance of wildlife habitat for the Riparian Brush Rabbit. After such habitat is procured and preserved in perpetuity, the existing population could be expanded into these areas.

Between flood levees on the lower Stanislaus River and within the historic range of the Riparian Brush Rabbit, the Army Corps of Engineers manages Federal easements on private property for wildlife habitat protection, ordinary flowage, and channel maintenance. These were established as mitigation for construction of the New Melones Dam. Federal easements for fish and wildlife habitat do not allow habitat reduction, but authorize other uses such as cattle grazing, off-road vehicle use, hunting and target shooting, and other types of human disturbance. Areas with easements for ordinary flowage allow removal of brush. Thus wildlife habitat in these areas is probably not suitable for Riparian Brush Rabbits.

Two areas outside the historic range that have been suggested for reintroduction of Riparian Brush Rabbits are the Kings River and the Consumnes River. Because it is inappropriate to expand these or any other animals outside of their historic range, use of these areas should be allowed only under extreme emergency situations. Prior to any use of these areas, the habitat must be thoroughly studied to determine suitability. It may also be necessary in an emergency to temporarily maintain animals in captivity in an attempt to breed them. However, techniques for breeding other Brush Rabbit subspecies should be established before attempting to breed Riparian Brush Rabbits in captivity.

Within the historic range of Riparian Brush Rabbits, prior to any attempts to reestablish populations, extensive habitat restoration must be undertaken. This will require construction of mounds, revegetation with native habitat, and provision of cover on flood levees to provide protection during flooding. Typical requirements for local levee maintenance requires low or no groundcover, vegetation without thorns, clearing of brush and lower branches from trees for unrestricted water flow, and a wide clear area outside and on top of the levee for access and open view of any potential problems (Reclamation Board 1988). Cover must be maintained at a height of at least 21 cm for Riparian Brush Rabbits (Williams 1988, 1993). Working with the local levee district, particularly in areas to be restored for eventual reintroduction of the rabbit, could result in some exemptions or compromises for vegetation maintained on levees.

ALTERNATIVES TO THE PETITIONED ACTION

If the Commission should choose not to list the Riparian Brush Rabbit, it is the Department's opinion that this animal would be deprived of protection provided through recognition and formal consultation available to a listed species. When a species is listed as Threatened or Endangered, a higher degree of urgency is mandated, and protection and recovery receives more attention and funding from the Department and other agencies than for nonlisted species.

In the absence of listing, it would be possible to devise a management plan for this species after further study. However, this departmental status review indicates that the future existence of this species is already in serious jeopardy. Despite good intentions on the part of the Department and the Commission, promises of management and protection for nonlisted species do not have the weight of law behind them, thus seldom receive high priority in the eyes of other agencies, especially in these times of limited funding. Without the benefits of listing and the cooperation of other agencies in preservation and recovery actions, the Riparian Brush Rabbit could decline further until their population is no longer viable, and they will no longer be able to exist in perpetuity. Eventually extinction would occur.

The petitioner has requested listing of the Riparian Brush Rabbit as Endangered. When listed as State Endangered, the Riparian Brush Rabbit would receive special consideration and protection under the CESA and the California Environmental Quality Act (CEQA). The Department's status review indicates that the continued existence of the Riparian Brush Rabbit is seriously endangered in California and that listing as Endangered is appropriate.

PROTECTIONS RESULTING FROM LISTING

If listed, the Riparian Brush Rabbit will receive protection from take during development activities subject to CEQA and be subject to formal consultation requirements under CESA. They will also be eligible for the allocation of resources by government agencies to provide protection and recovery. During the CEQA environmental review process, listed species receive special consideration, and protection and mitigation measures can be implemented as terms of project approval. Species that are not listed do not readily receive protection. The status of listing provides a species with recognition by lead agencies and the public, and significantly greater consideration is given to the Department's recommendations resulting from project environmental review.

Listing this species increases the likelihood that State and Federal land and resource management agencies will allocate funds towards protection and recovery actions that benefit the Riparian Brush Rabbit. With limited funding and a growing list of Threatened and Endangered species, priority has been and will continue to be given to species that are listed. Those that are not listed, although considered to be of concern, are rarely given serious consideration under these circumstances.

ECONOMIC CONSIDERATIONS

Designation of the Riparian Brush Rabbit as Endangered will formally subject it to CESA and CEQA. These acts would prohibit its taking and possession except as may be permitted by the Department, and subject it to formal consultation procedures. CEQA presently requires local governments and private applicants undertaking projects to consider de facto Endangered Species to be subject to the same requirements under CEQA as though they were already listed by the Commission in Section 670.2 (CEQA Guidelines, Section 15380, CCR). The Riparian Brush Rabbit has qualified for protection under CEQA Guidelines Section 15380 for several years.

Required mitigation as a result of lead agency actions under CESA and CEQA, whether or not the species is listed by the Commission, may increase the cost of a project. Such costs may include, but are not limited to, development of management plans, purchasing or restoring additional habitat, and long-term monitoring of mitigation sites. Project modification to avoid impacts may be a less costly alternative than implementing required mitigation. The total expenses incurred in hiring consultants, preparing management plans, purchasing or restoring habitat, and long-term monitoring may be more costly than setting aside and restoring San Joaquin Valley riparian habitat for the Riparian Brush Rabbit within its historic range. Lead agencies may also require additional measures to be employed should the mitigation project fail, resulting in additional expenditures of funds by the project proponent. Specific management actions by the Department of Parks and Recreation at Caswell Memorial State Park may require mitigation and expenditure of Park funds to meet the needs of the species whether or not it is officially listed.

Listed status would not necessarily result in significant adverse economic effects on businesses or significant cost to private persons or entities, especially in the agricultural industry. Less that 6% of the original San Joaquin Valley riparian forest is remaining due to past clearing for agriculture. Private agricultural companies own and currently use all of these converted lands, making these cultivated areas unsuitable for Riparian Brush Rabbits. If any of these privately owned areas are within the floodplain, retain fragments of riparian habitat, or are candidate areas for habitat restoration, private landowners could sell or donate such property to private or public entities interested in preservation.

Listing of the Riparian Brush Rabbit as Endangered could result in additional expenditures of funds for purchase of privately owned property by the Department and other

pertinent agencies. Restoration and expansion of riparian forest by purchase and restoration of suitable land is a necessary recovery action for this species. Purchase of property within the floodplain between levees will ease any losses the private landowner faces from not pursuing agricultural activities. Donation of property could result in reduction of corporate taxes.

CONCLUSIONS

Based on this status review of available scientific information, we conclude that the Riparian Brush Rabbit is seriously endangered throughout its range in California due to loss of habitat, change of habitat, habitat fragmentation, loss of genetic viability, danger of catastrophic floods or fires, competition, disease, and predation. This species has declined as a result of extensive alteration of the San Joaquin Valley riparian forest that historically occurred in the natural floodplain from Stanislaus County to the Delta. This rabbit is completely dependent on and adapted to breeding in riparian forests with abundant brushy groundcover, does not inhabit clear or open areas, and is now restricted to one isolated fragment of habitat remaining in Caswell Memorial State Park on the Stanislaus River. The extreme destruction and fragmentation of its habitat has resulted in an isolated restricted population on 261 acres in San Joaquin County. There is no possibility of natural expansion of this population due to lack of adjacent suitable habitat. This isolated population is highly vulnerable to extinction. There is little or no suitable habitat now available for establishing additional populations without undergoing extensive, longterm, habitat restoration. Severe population reduction and isolation lowers the overall viability of the subspecies, and under these conditions it cannot be expected to survive over the longterm. In our professional judgment, the Riparian Brush Rabbit qualifies for listing as Endangered under the California Endangered Species Act.

RECOMMENDATIONS

PETITIONED ACTION

1. The Commission should find that the petitioned action is warranted for the listing of this subspecies as State Endangered.

2. The Commission should publish notice of its intent to amend Section 670.5, Title 14, CCR to add the Riparian Brush Rabbit (*Sylvilagus bachmani riparius*) to its list of Endangered Species.

RECOVERY AND MANAGEMENT ACTIONS

The Department's objective is the protection and expansion of the existing population and reintroduction of a sufficient number of additional viable Riparian Brush Rabbit populations in restored and permanently protected sites to insure their long-term survival within their native habitat and range. In order to achieve recovery, the remaining population and any reintroduced populations must be protected, monitored, and proven to be self-sustaining to the satisfaction of the Department and the Commission. At the successful conclusion of restoration, reintroduction, and long-term monitoring, the Department may develop appropriate downlisting or delisting criteria and reexamine the status of the Riparian Brush Rabbit. When, in the Department's judgment, recovery goals and downlisting or delisting criteria have been met, it will make recommendations to the Commission regarding changing the status of this subspecies.

In order to achieve management and recovery objectives, the following actions should be taken:

1. The Department should establish the interagency coordination and commitment necessary to halt the further loss and deterioration of Riparian Brush Rabbit habitat and begin restoration and preservation of suitable habitat deemed essential to maintaining the subspecies in perpetuity.

2. Any remaining San Joaquin riparian forest and other areas within the floodplain that can be restored to allow support of additional populations of Riparian Brush Rabbits must be protected from any further adverse modification. Private agricultural lands in this category could be secured through various actions including: 1) agreement with landowners as mitigation for activities within the floodplain between levees; 2) acquisition of conservation easements by responsible agencies; 3) development of a habitat conservation plan by the responsible agencies and the major landowners; and 4) in-fee acquisition of suitable restorable habitat by responsible agencies when other means are not feasible.

3. Any destruction or modification of suitable or potential riparian habitat within the floodplain should be curtailed, especially in areas adjacent to remaining riparian habitat. Consideration should be given to restoration of habitat wherever possible within the historic range of the Riparian Brush Rabbit so that additional populations may be established.

4. Remaining and potential habitat areas within the floodplain of the San Joaquin River and its tributaries within the historical range of the Riparian Brush Rabbit of a size sufficient to maintain self-sustaining populations should be identified, restored, and permanently preserved.

5. After restoration is completed, at least five additional Riparian Brush Rabbit populations should be established. If possible, this should include dispersal corridors of suitable habitat along the riparian corridor to allow for gene flow between genetically isolated populations. The overall goal should be to establish additional viable populations and physically eliminate isolation of these populations by expanding existing habitat and by developing connecting habitat. Appropriate property should be purchased, restored, and protected to accomplish this goal.

6. State, Federal, local, and private land maintenance and management activities should be conducted to minimize disturbance to Riparian Brush Rabbits and their habitat and any other areas with potential for restoration between existing levees.

7. A population viability analysis of the Riparian Brush Rabbit should be undertaken to determine the breeding population levels and management actions necessary to insure that each population will be healthy and viable and be able to naturally exist in perpetuity in the State. Ongoing basic research on the Riparian Brush Rabbit should continue with support from the Department and other public and private organizations to determine specific information needed to conduct such an analysis and develop recovery and habitat conservation plans.

8. The Department should establish a recovery planning team to develop a comprehensive management plan for Riparian Brush Rabbits that is specific to the situation within the historic range and implement the plan.

9. Once habitat is restored such that new populations can be introduced, the current hunting regulations for Brush Rabbits should be modified to preclude take of rabbits and hares within local areas, wherever they will be reintroduced outside Caswell Memorial State Park. This will include some areas within the historic range between flood levees from Stanislaus County to the Delta.

10. Planned development or any further disruption of remaining San Joaquin Valley riparian forest or other areas within the floodplain between levees within the historic range of the Riparian Brush Rabbit should be closely reviewed for presence or absence of any habitat suitable for restoration and possible reintroduction, prior to approval of such plans.

11. Habitat currently occupied by Riparian Brush Rabbits at Caswell Memorial State Park should be slightly modified to provide high ground with cover for protection from floods and additional fire breaks to protect habitat destruction due to wildfires. Flood levees adjacent to the Park should be modified to allow for cover and protection of rabbits during floods.

LITERATURE

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Appendix A: Public Notice and List of Interested Parties Notified by the Department.

STATE OF CALIFORNIA—THE RESOURCES AGENCY PETE WILSON, Governo

DEPARTMENT OF FISH AND GAME
1416 NINTH STREET
P.O. BOX 944209
SACRAMENTO, CA 94244-2090
(916) 324-8348

February 10, 1993

PUBLIC NOTICE

TO WHOM IT MAY CONCERN:

Pursuant to Section 2074.4 of the California Fish and Game Code (FGC), **NOTICE IS HEREBY GIVEN** that on December 4, 1992, the California Fish and Game Commission accepted a petition from the Department of Parks and Recreation to amend the official State list of endangered and threatened species (Sections 670.2 and 670.5, Title 14, California Code of Regulations) as follows:

Species	Proposal
Riparian Brush Rabbit (*Sylvilagus bachmani riparius*)	List as Endangered

The California Endangered Species Act (FGC, Chapter 1.5, Section 2050 et seq.) requires that the Department of Fish and Game (Department) notify affected and interested parties that the Commission has accepted the petition for the purpose of receiving information and comments that will aid in evaluating the petition and determining whether or not the above proposal should be adopted by the Commission. If the above proposal includes adding a species to the list as endangered or threatened, the Commission's action has resulted in this species receiving the interim designation of "candidate species." The Department has 12 months to review the petition, evaluate the available information, and report back to the Commission whether the petitioned action is warranted (FGC, 2074.6). The Department's recommendation must be based on the best scientific information available to the Department. Therefore,

NOTICE IS FURTHER GIVEN that anyone with data or comments on the taxonomic status, ecology, biology, life history, management recommendations, distribution, abundance, threats, habitat that may be essential for the species, or other factors related to the status of the above species, is hereby requested to provide such data or comments to:

Natural Heritage Division
California Department of Fish and Game
1416 Ninth Street
Sacramento, California 95814

Copies of the petition may be requested from the letterhead address.

Responses received by April 15, 1993 will be included in the Department's final report to the Commission. If the Department concludes that the petitioned action is warranted, it will recommend that the Commission adopt the above proposal. If the Department concludes that the petitioned action is not warranted, it will recommend that the Commission not adopt the proposal. (If the petitioned action is to list a species as endangered or threatened and the Commission accepts the Department's recommendation to not adopt the proposal, the species will lose its candidate status.)

Following receipt of the Department's report, the Commission will allow a 45-day public comment period prior to taking any action on the Department's recommendation.

NOTICE IS FURTHER GIVEN that any species above, proposed to be added to the State list as endangered or threatened, is a "candidate species" pursuant to Section 2074.2 (FGC), and pursuant to Section 2085 (FGC), may not be taken or possessed except as provided by Section 2080, et seq., of the Fish and Game Code, or other applicable statutes.

Sincerely,

Susan A. Cochrane, Chief
Natural Heritage Division

STATE OF CALIFORNIA—THE RESOURCES AGENCY PETE WILSON, Governo

DEPARTMENT OF FISH AND GAME
1416 NINTH STREET
P.O. BOX 944209
SACRAMENTO, CA 94244-2090
(916) 327-5957

February 10, 1993

The Stockton Record
P.O. Box 900
Stockton, California 95201

ATTENTION: LEGAL NOTICES

Please publish the enclosed Public Notice on any two days during the week of February 15, 1993 through February 20, 1993. Please send an invoice and proof of publication to:

Celeste Cushman
Assistant Endangered Species Coordinator
California Department of Fish and Game
Natural Heritage Division
1416 Ninth Street
Sacramento, California 95814

Thank you.

Sincerely,

/S/

Celeste Cushman, Assistant Coordinator
Endangered Species/Tax Check-off
Natural Heritage Division

CC:kyb

Enclosure

bc: Mr. Boyd Gibbons
Director

Mr. Banky E. Curtis
Deputy Director

Ms. Susan A. Cochrane, Chief
Natural Heritage Division

SAME LETTER SENT TO INDIVIDUALS ON ATTACHED LIST

Merced Sun-star
P.O. Box 739
Merced, California 95341-0739

The Modesto Bee
P.O. Box 3928
Modesto, California 95352-3928

Turlock Journal
P.O. Box 800
Turlock, California 95381-0800

The Sacramento Bee
P.O. Box 15779
Sacramento, California 95852

The Stockton Record
P.O. Box 900
Stockton, California 95201

Riparian Brush Rabbit
Public Notice Mailing List

San Joaquin County
Board of Supervisors
222 E. Weber Avenue, Room 701
Stockton, CA 95202

Planning Director
San Joaquin County
1810 E. Hazelton Avenue
Stockton, CA 95205

Stanislaus County
Board of Supervisors
1100 H Street
Modesto, CA 95354

Planning Director
Stanislaus County
1100 H Street
Modesto, CA 95354

Merced County
Board of Supervisors
2222 M Street
Merced, CA 95340

Planning Director
Merced County
2222 M Street
Merced, CA 95340

Mr. Donald W. Murphy, Director
Department of Parks and Recreation
1416 Ninth Street
P.O. Box 942896
Sacramento, CA 94269-0001

Mr. Gary Waldron
Department of Parks and Recreation
P.O. Box 1450
Lodi, CA 95241-1450

Mr. Edward G. Heidig, Director
Department of Conservation
1416 Ninth Street, Room 1320
Sacramento, CA 95814

Mr. Charles Warren
Executive Officer
State Lands Commission
1807 13th Street
Sacramento, CA 95814

Mr. W. John Schmidt
Executive Director
Wildlife Conservation Board
1416 Ninth Street
Sacramento, CA 95814

Mr. David N. Kennedy, Director
Department of Water Resouces
1416 Ninth Street
Sacramento, CA 95814

Mr. Raymond E. Barsch
Genenal Manager
The Reclamation Board
Department of Water Resources
1416 Ninth Street
Sacramento, CA 95814

Mr. W. Don Maughan, Chairman
State Water Resources Control Board
901 P Street
Sacramento, CA 95814

William H. Crooks, Executive Officer
Sacramento - Central Valley
Water Resources Control Board
3443 Routier Road
Sacramento, CA 95827

Water Resources Control Board
Central Valley Region
3614 E. Ashlan
Fresno, CA 93726

Mr. Jack C. Parnell, Director
Department of Food and Agriculture
1220 N Street
Sacramento, CA 95814

Mr. Edward L. Hastey
California State Director
U.S. Bureau of Land Management
Federal Office Building, Room E-2841
2800 Cottage Way
Sacramento, CA 95825-1889

Mr. Stanley T. Albright
Western Regional Director
National Park Service
600 Harrison Street, Suite 600
San Francisco, CA 94107

Mr. Roger G. Patterson
Regional Director
Mid Pacific Region
Bureau of Reclamation
Federal Office Building
2800 Cottage Way
Sacramento, CA 95825

Mr. Marvin L. Plenert
Regional Director, Region 1
Pacific Regional Office
U.S. Fish and Wildlife Service
Eastside Federal Complex
911 N.E. 11th Avenue
Portland, OR 97232-4181

Mr. Pete Sorenson
U.S. Fish and Wildlife Service
California Endangered Species Office
2800 Cottage Way
Sacramento, CA 95825

U.S. Department of the Army
Army Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814-4794

Mr. Jim Sanders, Park Manager
U.S. Army Corps of Engineers
Sacramento District
Stanislaus River Parks
650 Capitol Mall
Sacramento, CA 95814-4794

Mr. Richard Harriman, President
California Natural Resources
Federation
928 12th Street, Suite 611
P.O. Box 3426
Modesto, CA 95353

Ms. Ann Riley, Executive Director
California Natural Resources
Federation
2530 San Pablo Avenue, Suite D
Berkeley, CA 94702

Mr. Roy Eisenhardt, Director
California Academy of Sciences
Golden Gate Park
San Francisce, CA 94118

Dr. Luis F. Baptista
Chairman and Curator
Dept. of Ornithology and Mammalogy
California Academy of Sciences
Golden Gate Park
San Francisco, CA 94118

Dr. James L. Patton, President
American Society of Mammalogists
501 Widtsoe Building
Department of Zoology
Brigham Young University
Provo, UT 84602

Dr. Richard J. Mackie, President
The Wildlife Society
Department of Biology
Montana State University
Bozeman, MT 59717

Mr. John G. Kie
Western Section Representative
The Wildlife Society
Forestry Sciences Lab
2081 East Sierra Avenue
Fresno, CA 93710

Mr. Richard Spotts
Defenders of Wildlife
1228 N Street. #6
Sacramento, CA 95814

Mr. Glenn Olson, Vice President
Western Region
National Audubon Society
555 Audubon Place
Sacramento, CA 95825

Mr. Martin J. Rosen, President
The Trust for Public Land
116 New Montgomery Street, 4th Floor
San Francisco, CA 94105

Ms. Joan Reiss, Director
California and Nevada Region
The Wilderness Society
116 New Montgomery St., Suite 526
San Francisco, CA 94105

Mr. Phillip S. Berry, President
Sierra Club
730 Polk Street
San Francisco, CA 94109

Ms. Barbara Boyle and
Ms. Frannie Waid
Northern California - Nevada
Representatives
Sierra Club
4171 Piedmont Avenue, Suite 204
Oakland, CA 94611

Mr. Bob Hattoy
Southern California Representative
Sierra Club
3550 W. 6th Street #323
Los Angeles, CA 90020

Mr. Fredric P. Sutherland, President
Sierra Club Legal Defense Fund, Inc.
180 Montgomery Street, Suite 1400
San Francisco, CA 94104

Dr. Stanley A. Temple, President
Society for Conservation Biology
Department of Wildlife Ecology
University of Wisconsin
Madison, WI 53705

Mr. Rudy J.H. Schafer
Region 12 Representative
National Wildlife Federation
2820 Echo Way
Sacramento, CA 95281

President
Natural Resources Defense
Council, Inc.
71 Stevenson Street
San Francisco, CA 94105

Mr. Steve McCormick
The Nature Conservancy
Western Regional Office
785 Market Street, 3rd Floor
San Francisco, CA 94103

Dr. Gerald H. Meral
Planning and Conservation League
909 12th Street, Suite 203
Sacramento, CA 95814

President
California Wildlife Federation
P.O. Box 1527
Sacramento, CA 95812-1527

Mr. Jim Wright
Chairman of the Board
Environmental Defense Center, Inc.
906 Garden Street, Suite 2
Santa Barbara, CA 93101

California Representative
The Environmental Defense Fund, Inc.
5655 College Avenue
Oakland, CA 94618

Mr. Ernest White, President
California Association of Resource
Conservation Districts
21592 Gallagher Avenue
Corning, CA 96021

Dr. Paul Ehrlich
Center for Conservation Biology
Department of Biological Sciences
Stanford University
Stanford, CA 94305

Director
Museum of Vertebrate Zoology
University of California, Berkeley
Berkeley, CA 94702

Department Chair
Department of Biological Sciences
San Francisco State University
1600 Holloway Avenue
San Francisco, CA 94132

Department Chair
Department of Biological Sciences
San Jose State University
One Washington Square
San Jose, CA 95192

Department Chair
Department of Biological Sciences
California State University, Fresno
Shaw and Cedar Avenues
Fresno, CA 93740

Department Chair
Department of Biological Sciences
California State University,
Stanislaus
800 W. Monte Vista Avenue
Turlock, CA 95380

Department Chair
Department of Biological Sciences
California State University,
Sacramento
6000 J Street
Sacramento, CA 95819

Dr. Gene R. Trapp
Department of Biological Sciences
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6000 J Street
Sacramento, CA 95819

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California State University, Chico
Chico, CA 95929

Department Chair
Department of Biological Sciences,
Zoology, and/or Natural Resources
University of California, Berkeley
Berkeley, CA 94720

Department Chair
Department of Biological Sciences,
Zoology, and/or Natural Resources
University of California, Davis
Davis, CA 95616

Dr. Daniel F. Williams
Endangered Species Recovery
Planning Program
2727 N. Grove Industrial Drive
Suite 125
Fresno, CA 93727

Mr. Glenn E. Basey
2321 Bellamy Street
Modesto, CA 95354

Dr. David Germano
3520 Sewell Street
Bakersfield, CA 93312

Dr. Sarah B. George
Section of Mammalogy
Natural History Museum of
Los Angeles County
900 Exposition Boulevard
Los Angeles, CA 90007

Mr. Paul W. Collins
Santa Barbara Museum of
Natural History
2559 Puesta del Sol Road
Santa Barbara, CA 93105

A. and R. Brocchini
27001 South Austin Road
Ripon, CA 95366

Mr. Peter Dykzeul
P.O. Box 276
Ripon, CA 95366

Mr. James Sorenson
65 Shasta Way
Salinas, CA 93905

Mr. Robert Muir
27364 South Austin Road
Ripon, CA 95366

Dr. Robert T. Orr
California Academy of Sciences
Golden Gate Park
San Francisco, CA 94118

Appendix B: Responses to Public Comments

1. Daniel F. Williams, Ph.D., California State University, Stanislaus
2. Reggie N. Hill, Secretary-Manager, Lower San Joaquin Levee District

CALIFORNIA STATE UNIVERSITY, STANISLAUS
801 West Monte Vista Avenue · Turlock, CA 95380

5 April 1993

Rec'd NHD
APR 0 8 1993

Natural Heritage Division
California Department of Fish and Game
1416 Ninth Street
Sacramento, California 95814

Re: Proposal to List as Endangered: Riparian Brush Rabbit

Dear Commissioners:

I have conducted studies on Riparian Brush Rabbits periodically since 1984. Results of these investigations fully support the conclusions that **this rabbit is a distinctive race** and its population is endangered. Though **the only remaining habitat**, in Caswell Memorial State Park, is under no threat of development, the population is strongly threatened with extinction from four separate factors:

Wildfire – Caswell Park is overgrown with decadent, flammable shrubs and there is a a large accumulation of ground litter. A single wildfire could destroy all habitat and the entire population of brush rabbits.

Flooding – All habitat for the brush rabbit is located within the flood levees of the Stanislaus River. The entire park is subject to flooding, and a single flood of a height and duration to be expected every 10-25 years could result in extinction of the brush rabbit population.

Disease – Rabbits are susceptible to a number of diseases that reach epidemic proportions. Given that the entire population of Riparian Brush Rabbits is small and contained with an area of less that 250 acres, a single epidemic could extirpate the entire population.

Genetic and Demographic Stochasticity – We estimated that the population was reduce to about 10 or fewer animals following flooding in 1986. Perhaps as few as 5 females contributed to the current population there. Small, inbred populations have very low genetic heterozygosity, which means that individuals are not as vigorous or productive as those in populations with high heterozygosity. They are not able to withstand extremes of environmental variation nor resist diseases and parasites as well. Every time the population is reduced by flood or changes in weather, the small number of surviving individuals represent a smaller fraction of the potential genetic diversity. Loss of genetic diversity is mostly random (genetic stochasticity); and, coupled with random changes in numbers of males and females

and proportions of closely related individuals (demographic stochasticity), can lead directly to additional reduction in numbers. Unless the population can be increased in size and established in new areas, these problems will worsen progressively until the population slips into extinction.

Other factors, such as predation by feral cats, can contribute to reduction of population size and genetic/demographic stochasticity, but probably do not prose direct threats of extinction.

In summary, we have found that: this rabbit is confined now to Caswell State Park; recreation uses of park property are compatible with maintaining optimum population numbers of Riparian Brush Rabbits; its structure is unique among taxonomically recognized populations of brush rabbits; and it faces strong threats of extinction from several factors, singly or in combination.

Listing as Endangered is fully warranted for the Riparian Brush Rabbit. I support the petition for listing and urge that the department recommend its adoption to the Commission.

Sincerely,

Daniel F. Williams
Professor of Zoology

1. Response to Daniel F. Williams, Ph.D., California State University, Stanislaus

Comments noted; no response necessary.

Lower San Joaquin Levee District

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Rec'd NHD

APR 0 9 1993

April 7, 1993

Department of Fish and Game
1416 Ninth Street
P.O. Box 944209
Sacramento, CA 95814-2090

Re: Listing of Riparian Brush Rabbit

The Lower San Joaquin Levee District ("District") has reviewed the petition to the Fish and Game Commission for the listing of the riparian brush rabbit as an endangered species. We understand that the Department of Fish and Game will provide a written report to the Commission in accordance with section 2074.6 of the Fish and Game Code. Please consider these comments in the preparation of your report.

The District is responsible for the maintenance of the levees, channels, bypasses and other appurtenant facilities of the San Joaquin River Flood Control Project, located along approximately 108 linear miles of the San Joaquin River. The project is authorized by federal and state law, and the Operation and Maintenance Manual prepared by the Reclamation Board prescribes actions to remove flow impediments between the levees. The District's maintenance activities are to protect public health and safety and nearby properties from flood damage.

The District does not, at this time, have specific knowledge of the biology of the riparian brush rabbit, and thus, does not have an opinion as to whether it is a distinct species or whether it is now endangered. However, we concur with the observations of the petition that the San Joaquin River is not within the range of species. The District is aware of no sightings of this species along the Lower San Joaquin River.

We believe, however, that there is an inconsistency and collapse of logic in the petition, and urge that it not be carried forward in your report to the Commission. In particular, the petition acknowledges that flood control projects are poor habitat for the species because of flooding within levees and required vegetation removal, but it ignores this fact in its recommended management and recovery measures. The measures recited would propose efforts to establish the species within the

levees of flood control projects, including the San Joaquin River. We are unable to ascertain why it is in the interest of the public or the species to intentionally create such a conflict. Moreover, legislative bodies have acknowledged the importance of flood control and have authorized projects to meet that need. It would be poor policy for the Commission or the Department to unilaterally change public policy by introducing an impediment to flood control and introducing the species in a hostile environment.

If the species is listed and if management and recovery measures include the establishment of new populations, the geographic target for these efforts should be in areas where the species needs are consistent with other land and resource management programs.

Thank you for your consideration of our comments.

Sincerely,

Reggie N. Hill

Reggie N. Hill, Secretary-Manager

cc: Reclamation Board
Fish and Game Commission

2. Response to Reggie N. Hill, Lower San Joaquin Levee District

The historic range of the Riparian Brush Rabbit is the San Joaquin River and its tributaries from Stanislaus County to the Delta. The type specimen was taken from the west side of the San Joaquin River near its confluence with the Stanislaus River. The only place they are now found is in Caswell Memorial State Park within flood control levees along the Stanislaus River, where there is a large remnant of the historic riparian vegetation. In order to manage and recover the Riparian Brush Rabbits, it will be necessary to establish additional populations within its historic range.

Prior to any reintroduction, longterm habitat restoration efforts must be accomplished. Listing the Riparian Brush Rabbit will not result in a unilateral change in public policy or an impediment to flood control. Efforts to restore habitat for this rabbit will not proceed without complete coordination and agreements between many agencies, such as the Lower San Joaquin Levee Control District, the California Reclamation Board, the Army Corps of Engineers, the U.S. Fish and Wildlife Service, the California Department of Parks and Recreation, and the California Department of Fish and Game. The goal will *not* be to introduce Riparian Brush Rabbits into hostile environments or on areas where they conflict with other land and resource management programs, but rather to *include* consideration of them in such management programs.