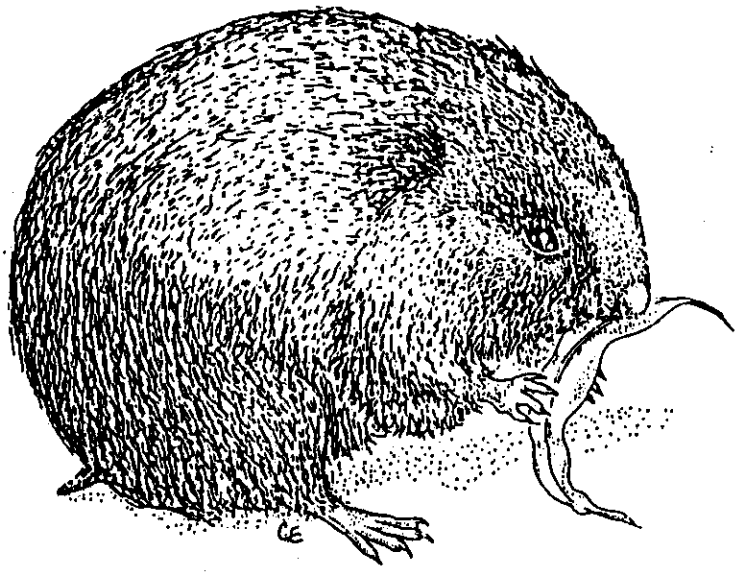
HUALAPAI MEXICAN VOLE
(Microtus mexicanus hualpaiensis)
RECOVERY PLAN



1991

Fish and Wildlife Service
Albuquerque, New Mexico

Recovery Plan for the Hualapai Mexican Vole (*Microtus mexicanus hualpaiensis*)

prepared by

U.S. Department of the Interior
Fish and Wildlife Service
Region 2
Albuquerque, New Mexico

Approved: _____
Regional Director, Region 2
U.S. Fish and Wildlife Service

Date: 8/19/91

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DISCLAIMER

Recovery plans delineate reasonable actions which are believed to be required to recover and/or protect listed species. Plans are published by the U.S. Fish and Wildlife Service, sometimes prepared with the assistance of recovery teams, contractors, State agencies, and others. Objectives will be attained and any necessary funds made available subject to budgetary and other constraints affecting the parties involved, as well as the need to address other priorities. Recovery plans do not necessarily represent the views nor the official positions or approval of any individuals or agencies involved in the plan formulation, other than the U.S. Fish and Wildlife Service. They represent the official position of the U.S. Fish and Wildlife Service **only** after they have been signed by the Regional Director or Director as **approved**. Approved recovery plans are subject to modification as dictated by new findings, changes in species status, and the completion of recovery tasks.

The cost estimates identified for task implementation and the time estimates for achievement of recovery contained in this recovery plan should be considered preliminary figures only and may not represent the actual costs and time necessary for recovery of this species. The present status of the Hualapai Mexican vole is such that efforts to halt continuing declines in the population and achieve some measure of stability will be the highest priority actions to implement during the near term. Implementation of these measures will influence both the costs and time necessary for recovery of this species to an extent that is not now predictable.

LITERATURE CITATIONS

Literature citations should read as follows:

U.S. Fish and Wildlife Service. 1991. Hualapai Mexican Vole Recovery Plan. Albuquerque, New Mexico. 28 pp.

Additional copies may be purchased from:

Fish and Wildlife Reference Service
5430 Grosvenor Lane, Suite 110
Bethesda, Maryland 20814
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The fee for the Plan varies depending on the number of pages in the Plan.

ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY OF THE RECOVERY PLAN FOR HUALAPAI MEXICAN VOLE

Current Status: This species is listed as endangered. Habitat surveys of the four remaining known population sites for the vole found signs of vole activity at only one location. One of the other three sites has been degraded by sediments washed into the habitat by flood events and another receives heavy recreational use that has degraded vole habitats there. All habitats were diminished by drought conditions in 1988 and 1989.

Habitat Requirements and Limiting Factors: Two of the four remaining sites are in private ownership, including the only site with vole sign (clippings and runways) in 1990. Grazing and recreation use and development are the primary threats to the vole and its habitat. Existing vole habitat is in washes supporting abundant grass and/or sedge cover with some riparian or ponderosa pine overstory. All remaining habitat areas are small and isolated from each other and are easily degraded by grazing, drought, and recreational use.

Recovery Objective: Protection of existing populations through habitat protection and identification will be the primary focus of this plan for the foreseeable future. Until the serious declines in both habitat and population levels are controlled, long term recovery is not achievable.

Recovery Criteria: Protection for the four remaining known habitats must be achieved and potential habitats identified to provide for species survival. Criteria for downlisting or delisting the vole have not yet been determined. As resources allow, implementation of studies and surveys described in this plan will provide the necessary data from which quantified downlisting and delisting criteria can be established.

Actions Needed:

1. Monitor existing populations.
2. Protect and manage occupied habitat.
3. Identify, locate, protect, and manage potential habitats.
4. Develop active and passive habitat restoration techniques.
5. Develop cooperative management agreements with non-federal landowners.

Costs ($000's):

Year	Need 1	Need 2	Need 3	Need 4	Total
1992	18.0	60.0	80.0	37.0	195.0
1993	18.0	80.0	105.0	27.0	230.0
1994	15.0	85.0	110.0	22.0	232.0
1995	20.0	85.0	100.0	25.0	230.0
1996	20.0	85.0	100.0	25.0	230.0
Cost of Recovery	91.0	395.0	495.0	136.0	1,117.0

Date of Recovery: If populations and habitat have been stabilized by 1996, other recovery objectives can be set.

PART I. - INTRODUCTION

The Mexican vole (Microtus mexicanus) occurs from the State of Oaxaca in southern Mexico northward through the Sierra Madre into the southwestern United States. Twelve subspecies are recognized (Hall 1981) with four occurring in the United States in Arizona, Colorado, New Mexico, Texas and Utah. This recovery plan is for one of these subspecies, the Hualapai Mexican vole (Microtus mexicanus hualpaiensis), here after referred to as the Hualapai vole, which was listed as an endangered species pursuant to the Endangered Species Act of 1973 (as amended) on November 2, 1987 (52 FR 36776).

Description and Distribution

The endangered Hualapai vole was first described by Goldman (1938) and the taxonomy has been accepted by Hall (1981) and Hoffmeister (1986), although the subspecies is considered poorly defined (Hoffmeister 1986) owing to the limited material available for taxonomic examination.

A thick-set, blunt-nosed and short-legged rodent, the Hualapai vole has a short tail and small ears obscured by coarse, dark cinnamon-brown fur, although there may be some color variation. The mean total length of specimens examined by Hoffmeister (1986) was 137.2 millimeters (mm). Mean tail length was 30.2 mm and mean hind foot length was 19.6 mm in those specimens. Three additional specimens reported by the Arizona Game and Fish Department (Spicer et al. 1985) had a mean weight of 28 grams. Additional morphometric information is available in these two references. A total of 15 Hualapai voles were observed or handled from 1923 to 1984.

The type locality for this subspecies is in the Hualapai Mountains in Mohave County, Arizona (Figure 1). Hoffmeister (1986) assigned two specimens from the lower Prospect Valley, which is 145 kilometers (km) north of the Hualapai Mountains, to M. m. hualpaiensis. The two locales are isolated from each other. In addition to these two areas, there are M. mexicanus voles of an as yet unassigned subspecies in the Music Mountains 80 km north of the Hualapai Mountains (Spicer et al. 1985).

Life History

Past studies of the Hualapai vole primarily report on occurrence and habitat description (Goldman 1938; Peck 1979; Spicer et al. 1985) providing little life history data. Therefore, in this analysis the life history of the Hualapai vole is assumed to be similar to the Mexican vole.

Within the Hualapai Mountains, the Hualapai vole has been found between 1645 meters(m) and 2560m elevation. Three general locales that total 255 acres have been identified as vole habitat. Three populations have been located within those areas. A fourth population in Pine Peak Canyon has been reported south of the known locales. The extent of this fourth population is unknown. Surveys in the fall of 1990 confirmed Hualapai vole sign only in Pine Peak Canyon. No extensive trapping was undertaken.

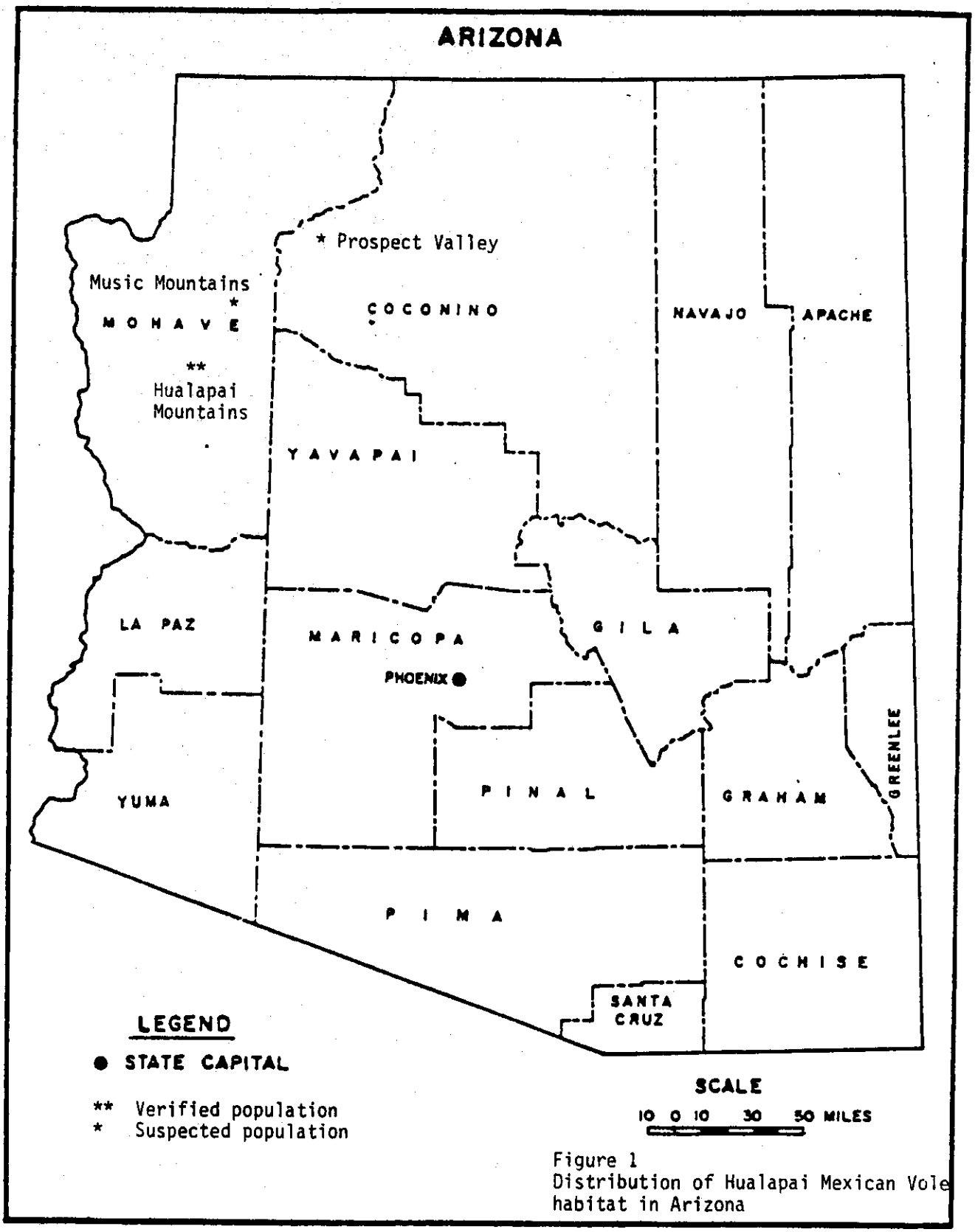

Figure 1
Distribution of Hualapai Mexican Vole habitat in Arizona

M. mexicanus is generally associated with woodland forest types containing grasses and grass-sedge habitats. Habitats tend to be more xeric, although when it is the only vole species present, it also occurs in more mesic habitats (Spicer et al. 1985). The Hualapai vole is currently associated with moist grass-sedge areas along permanent or semi-permanent waters fed by springs or seeps in either open forest or chapparal. Good cover of grasses, sedges and forbs is characteristic of this waterside vole habitat, which is usually found in narrow bands paralleling the water course. Typical plant species observed in Hualapai vole habitat are listed in Table 1.

Although there are no published data on Hualapai vole food habits, Microtus species diet usually includes green plant material when available. Information gathered from surveys of Hualapai vole runways indicates that this subspecies utilizes a typical vole diet of lush forbs and grasses. Bright green fecal pellets found during surveys further supports this dietary hypothesis for the Hualapai vole (Spicer et al. 1985).

Hualapai voles have been observed during both day and night (Spicer et al. 1985) and are likely active year-round, as are other Microtus. Burrows and runways may be present within suitable habitat. Information on home range and activity areas is lacking. Collection data available at this time suggest that the Hualapai vole is colonial.

No data exist on the reproductive attributes of the Hualapai vole, although they are assumed to be similar to those of other M. mexicanus subspecies, which have small litters. They have only two pairs of mammae, which limits the number of young that can be nourished. Hoffmeister (1986) determined a mean of 2.51 embryos per female M. mexicanus, Brown (1968) a mean of 2.23 embryos per female and Keller (1985) determined an average of 2.23 to 2.7 embryos per female. Pregnant females of M. mexicanus are present from at least late spring through summer. One Hualapai vole captured in late May had recently given birth (Spicer et al. 1985). Populations levels may fluctuate on annual and perennial cycles, as is typical of other Microtus. Spicer et al. (1985) suggested that Hualapai vole cycles correspond with precipitation and resulting growth of vegetation.

Other life history data on the Hualapai vole are lacking. Mortality owing to predators is unknown, although several possible predators are present within the range (Table 2).

Present Status

It is assumed that when grassy and herbaceous habitats were more abundant in the Hualapai Mountains, the Hualapai vole was more common and widespread than it is today. In addition, the waterside habitats were more extensive and interconnected, possibly acting as refugia during dry periods with the Hualapai vole populations expanding out into more xeric habitats when environmental conditions favored growth of herbaceous plants and grasses. In other voles, the stimulation resulting from abundant

Table 1. Plants identified with Hualapai Mexican vole habitat, Hualapai Mountains. From Spicer et al. (1985).

Common Name	Scientific Name
grass	Polypogon sp.
sedges	Carex sp.
spikerushes	Eleocharis sp.
rushes	Juncus sp.
monkey flower	Mimulus spp.
smartweed	Polygonum sp.
willowweed	Epilobium sp.
meadow rue	Thalictrum sp.
geranium	Geranium sp.
deer grass	Muhlenbergia rigens
waterweed	Baccharis sergiloides
emory baccharis	Baccharis emoryi
canyon grape	Vitis arizonicus
snowberry	Symphoricarpos sp.
wild rose	Rosa sp.
buckthorn	Rhamnus sp.
coyote willow	Salix lasiolepis
Arizona walnut	Juglans major
ponderosa pine	Pinus ponderosa
pinyon pine	Pinus edulis

Table 2. Possible natural Hualapai vole predators in the Hualapai Mountains, Arizona

Common Name	Scientific Name
coyote	*Canis latrans*
gray fox	*Urocyon cinereoargenteus*
ringtail	*Bassariscus astutus*
raccoon	*Procyon lotor*
bobcat	*Lynx rufus*
striped skunk	*Mephitis mephitis*
hog-nosed skunk	*Conepatus mesoleucus*
red-tailed hawk	*Buteo jamaicensis*
great horned owl	*Bubo virginianus*
screech owl	*Otis kennicottii*
spotted owl	*Strix occidentalis*
gopher snake	*Pituophis melanoleucas*
Arizona black rattlesnake	*Crotalus viridis cerbrus*
striped whipsnake	*Masticophis taeniatus*
black-tail rattlesnake	*Crotalus molossus*
Sonora mountain kingsnake	*Lampropeltis pyromelana*

green vegetation leads to higher birth rates and population expansion. This may also be true for the Hualapai vole, since higher capture rates have been associated with heavy rainfall years (Spicer et al. 1985).

Historically, rainfall cycles and locations of drainage systems probably defined Hualapai vole habitat. Today, grassy areas in and away from drainages have been heavily influenced by land uses that have resulted in significant reductions in the amount of habitat available and the isolation of remaining habitats from each other. Only seven sites in the Hualapai Mountains have yielded specimens since the subspecies was described in 1938 and only fifteen individuals were captured from 1923 to 1984 (Spicer et al. 1985).

Reasons for Decline

Grazing, mining, road construction and recreational uses have significantly contributed to elimination and destruction of Hualapai vole habitat in the Hualapai Mountains. The introduction of non-native wildlife (e.g., elk and Abert's squirrel) to the Hualapai Mountains may also have impacted vole habitat through competition and/or displacement (Gooch undated) Modifications of springs and seeps to provide water for livestock and human uses removed or altered water sources that supplied the Hualapai vole with waterside habitat. The comparatively lush vegetation in Hualapai vole habitats attracted livestock and resulted in trampling and overgrazing of these areas, resulting in removal of the herbaceous layer. Direct destruction by mining operations, construction of roads, and recreational developments also occurred. Destruction of both upland and streamside vegetation and erosion of streamsides often resulted from these activities. Fires, although a natural component of Hualapai vole habitat, may no longer play their proper role due to man-induced changes in the watersheds and fire management policies. Droughts in conjunction with any of the above factors would further reduce both the quality and quantity of Hualapai vole habitat.

These factors affected the Hualapai vole in two primary ways. First, with less habitat there were fewer total animals and fewer subpopulations. Second, there may have been complete isolation of remaining subpopulations with resultant reduction in gene exchange, increased rates of local extinction, and decreased immigration that could re-establish extirpated populations.

Over-harvest by humans has not been a factor in this subspecies' decline although the low population numbers make most types of collecting inadvisable. Nothing is known of disease problems or rates of mortality due to predators.

Conservation Efforts

As a federally listed endangered species, the Hualapai vole is protected under the Endangered Species Act of 1973, as amended. It is also listed as "endangered" on the list of Threatened Native Wildlife in Arizona

(Arizona Game Fish Department, 1988). The Arizona list does not provide mandated legal protection for the Hualapai vole, but ensures that it receives consideration in the analysis of project impacts and management plans.

The Bureau of Land Management (BLM) has made several significant efforts to restore and protect habitat for the Hualapai vole. Two of the four known populations occur on BLM lands, at Grapevine Spring and Upper Bull Canyon. These habitats have been fenced to exclude livestock. The BLM manages a significant portion of the historic range of the Hualapai vole and, as a result of land exchanges, has acquired more habitat. Negotiations are underway between BLM and the private landowners to obtain the habitats containing the two populations not currently on public land.

PART II. RECOVERY

A. Recovery Objectives

Historically, the Hualapai Mountains contained significantly more habitat for the Hualapai vole than today. The primary recovery objectives for the Hualapai vole are to protect existing populations and habitat and restore degraded habitats.

The lack of information on Hualapai vole life history and habitat requirements make specific downlisting criteria difficult to determine. At this time, it can be stated that the criteria would have to involve the vole reoccupation of a percentage of the watersheds determined by inventory and evaluation to have restoration potential for Hualapai voles. Inclusion of restored upland habitat and the interconnection of the watershed populations allowing for gene flow and migrations would also be included in the criteria, as would a time frame to maintain populations and habitat before downlisting could be considered. Data to develop these criteria will be collected as part of the implementation of the recovery plan.

Delisting criteria for the Hualapai vole cannot be developed at this time. The present scarcity of information on the vole's biology and habitat requirements makes it impossible to set meaningful criteria. Data on these subjects will be collected as part of the implementation of the recovery plan.

Given the uncertain numbers of Hualapai vole populations and the extent of available habitat, we believe that recovery of the Hualapai vole will not be accomplished in the near term. A period of at least 25 years will likely be required.

B. Step-down and Narrative Outline - Hualapai vole

1. Protection of habitat. This is the most important goal to be accomplished for continued Hualapai vole survival. Current habitat is extremely limited and further losses could compromise the species' survival and prevent recovery.

11. Protect occupied localities and surrounding watershed. This has partially been accomplished but efforts to expand protected areas to allow for population expansion must be continued. Maintenance and enhancement of these occupied areas must be a continuing effort using at least the following techniques or methodologies.

111. Physical protection. This includes livestock control, fencing, signing, flood control, erosion control and relocation or management of facilities, including recreational facilities, away from Hualapai vole habitats to prevent physical degradation of habitat.

112. Interagency cooperation. Land manageability would be improved by cooperative efforts among Federal agencies, state and local entities, and private land owners. Habitat protection could be achieved through cooperative agreements, memoranda of understanding and acquisition of private, county or state owned lands. A multi-agency Hualapai Mexican Vole Management Team should be formed.

113. Administrative actions. These types of actions include designations for Areas of Critical Environmental Concern (ACEC), mineral withdrawal, and other use or entry restrictions that would prevent destruction of habitat. Acquisition of privately owned lands with populations of voles, or the potential for vole habitat would be included under these actions. Implementation of Allotment Management Plans is of special importance because of the severity of impacts from livestock grazing. Based on existing information, fire suppression within Hualapai vole habitat will continue to be important until the role of fire becomes clear.

114. Law enforcement. Enforce applicable laws.

12. Locate and protect historic and potential localities and surrounding watershed. The long term survival and recovery of the Hualapai vole depend upon restoring former habitat to sustain an expanded Hualapai vole population. These areas need to be identified and managed for Hualapai voles in a timely manner that will require research and management tasks.

121. Research. What is and what is not Hualapai vole habitat and how it can be restored is not well understood. Several specific areas of inquiry need to be addressed.

1211. Grazing impacts. Evaluation of the role of both livestock and wildlife grazing on vole habitats should be accomplished. Restoration techniques for habitat recovery from past impacts should be explored.

1212. Watershed condition. Capability for vegetation restoration to control erosion and flooding will be determined. Methodologies to encourage revegetation and halt flooding or erosion problems should be considered as well as in-stream solutions to repair existing damage.

1213. Vegetation studies. The proper structure and species composition for Hualapai vole habitat will be evaluated to determine when recovering habitat is suitable for reintroduction of voles.

1214. Active and passive restoration techniques. It may be possible to allow passive recovery of some potential habitat while other habitats will require more intensive efforts to bring about recovery. Use of plantings, filling of eroded areas and other strategies may be needed.

122. Management. All present and future Hualapai vole habitat areas will require long term management to provide for proper habitat restoration and maintenance of populations. Plans should provide protection of habitat, the surrounding watershed,including upland habitats, and any corridors to adjacent populations and monitoring of both vole habitat and populations.

1221. Improve range conditions. Hualapai voles are only found in areas where range condition is good to excellent. Much of the rangeland in the Hualapai Mountains is only in fair condition and must be improved to support Hualapai voles. Development of herbaceous vegetation components over the potential habitat areas is critical.

1222. Protect springs and seeps. These areas form the nucleus for Hualapai vole populations and need to be preserved or restored to a natural condition. Riparian habitats are directly dependent upon these waters.

1223. People management needs. Use of Hualapai vole habitat by recreationists, miners and other users needs to be evaluated for its effects on Hualapai vole populations and necessary corrective actions taken.

1224. Administrative protection. The plans should identify needed land withdrawals, designation as ACECs or other special designations.

1225. Management flexibility. New information from research on habitat or life history should be incorporated into plans as it becomes available.

1226. Monitoring. Monitoring of vegetation responses (particularly herbaceous cover) to management actions should be implemented. In addition, vole population responses both to management actions and natural environmental fluctuations should be accomplished.

2. Hualapai vole populations. Additional information on the Hualapai vole is needed to address biological questions. Some of the following investigations could be conducted with closely related subspecies to provide guidelines and controls, especially if Hualapai vole populations are too small to allow disturbance by researchers.

21. Range and taxonomy. The presence or absence of Hualapai voles in the Prospect Valley, Cerbat and Music Mountains and other likely sites needs to be clarified. Once the areas are surveyed, the issue of taxonomic status of any new population can be evaluated.

22. Research. Very little is known about the life history of the Hualapai vole. The tasks under this heading would provide for the gathering of basic data on the species. Research projects that do not involve destructive taking of Hualapai voles would be encouraged, especially during times of low population and individual numbers of the subspecies. Innovative technologies may be needed to implement some research in a non-destructive way.

221. Population dynamics and life history. These studies would be an all-encompassing view of the vole and its life history. Several years of monitoring currently known and potential habitats would be needed to begin to understand Hualapai vole population dynamics. Site-specific techniques may be needed for sampling habitats.

222. Environmental requirements. These would be studied in conjunction with habitat recovery work to clarify the important features of Hualapai vole habitat.

223. Predation. The impact of predation from both natural and introduced predators including dogs and cats is not well understood. Additional knowledge is needed to formulate and implement appropriate habitat development projects.

224. Population biology. Evaluations of population data, distribution, and exchange rates between populations are necessary to recover the subspecies and allow it to maintain itself over time. This would include genetic work and minimum viable population analyses.

23. Contingency plans. These would be developed to address crises that face the species or areas that require special management.

231. Captive breeding. A strategy should be developed to take Hualapai voles into captivity in the event of a habitat catastrophe, disease outbreak or other situation where a population could be lost.

232. Transplant. In situations where unavoidable habitat destruction has occurred (fire, prolonged drought, etc.), or to assist in colonization of restored habitat, it may be necessary to capture and relocate Hualapai voles to new areas. Development of specific strategies for different transplant scenarios would be required.

3. Public education. A steady flow of positive information about the Hualapai vole and its status in the Hualapai Mountains will help to maintain a cooperative attitude among the interested public groups.

31. Develop educational program on the Hualapai vole. This would be for use in schools, parks, museums, meetings of interested groups and organizations as well as the media. Programs would be developed for various groups as appropriate and include information on species' status, habitat, and life history.

C. Literature Cited

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PART III. IMPLEMENTATION SCHEDULE

Priorities in Column 4 of the following Implementation Schedule are assigned as follows:

Priority 1 - An action that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.

Priority 2 - An action that must be taken to prevent a significant decline in species population/habitat quality or some other significant negative impact short of extinction.

Priority 3 - All other actions necessary to provide for full recovery of the species.

GENERAL CATEGORIES FOR IMPLEMENTATION SCHEDULES *

Information Gathering - I or R (research)

1. Population status
2. Habitat status
3. Habitat requirements
4. Management techniques
5. Taxonomic studies
6. Demographic studies
7. Propagation
8. Migration
9. Predation
10. Competition
11. Disease
12. Environmental contaminant
13. Reintroduction
14. Other information

Management - M

1. Propagation
2. Reintroduction
3. Habitat maintenance and manipulation
4. Predator and competitor control
5. Depredation control
6. Disease control
7. Other management

Acquisition - A

1. Lease
2. Easement
3. Management agreement
4. Exchange
5. Withdrawal
6. Fee title
7. Other

Other - O

1. Information and education
2. Law enforcement
3. Regulations
4. Administration

* (Column 1) - Primarily for use by the U.S. Fish and Wildlife Service

Implementation Schedule

Hualapai vole

General Category	Plan task	Task Number	Task Priority	Duration	USFWS Region	Responsible Agencies FWS & Others	Estimated Costs FY1	FY2	FY3	Comments/Notes
M-3	Protect occupied habitat	11	1	Ongoing	2	FWE,AGFD,BLM	30K	30K	30K	BLM has lead on their property
O-4	Interagency cooperation	112	2	Ongoing	2	FWE,BLM,AGFD	-	-	-	
O-4	Administrative protections	113	2	Continuous	2	FWE,BLM,AGFD	-	-	-	
O-2	Law enforcement	114	3	Continuous	2	BLM,AGFD,LE	-	-	-	
R-2	Locate and protect potential habitats	12	1	Continuous	2	BLM,AGFD,FWE	40K	40K	50K	
R-2,3,4	Research	121	2	10 years	2	BLM,AGFD,FWE	20K	10K	10K	
R-2,4	Grazing impacts	1211	2	5 years	2	BLM, FWE	5K	5K	5K	
R-2	Watershed conditions	1212	2	2 years	2	BLM,AGFD,FWE	3K	3K	-	
R-3	Vegetation studies	1213	2	2 years	2	BLM,AGFD,FWE	4K	4K	-	
M-3	Active & Passive restoration techniques for habitat	1214	1	Ongoing	2	BLM,FWE,AGFD	7K	7K	7K	
M-1,2,3, 4,5,6,7	Management of Habitats	122	1	Ongoing	2	BLM,FWE,AGFD	-	-	-	
M-3	Improve range conditions	1221	2	Continuous	2	BLM,FWE,AGFD	30K	80K	90K	
M-3	Protect springs and seeps	1222	1	Ongoing	2	BLM,FWE,AGFD	20K	20K	20K	Existing vole habitat is closely associated with these water sources

Implementation Schedule

Hualapai vole

General Category	Plan task	Task Number	Task Priority	Duration	USFWS Region	Responsible Agencies FWS & Others	Estimated Costs FY1	FY2	FY3	Comments/Notes
O-1,3	People management needs	1223	3	3 years	2	BLM,FWE,AGFD	5K	4K	4K	
O-4	Administrative protections	1224	3	Continuous	2	BLM, FWE	6K	6K	6K	
O-4	Management flexibility	1225	3	Continuous	2	BLM,FWE,AGFD	-	-	-	Allow for updates to Recovery Plan to make use of newly developed information on the vole and its habitat
R-1,5	Range and taxonomy	21	3	5 years	2	FWE, AGFD, BLM, BIA, ASLD, HT	7K	7K	7K	
R-1,6,9, 10,11	Population dynamics, life history studies	221	3	10 years	2	BLM,AGFD,FWE	10K	10K	10K	Not initiate studies using Hualapai voles immediately, due to precariously low population levels. Surrogates may be used.
R-3,13	Environmental requirements	222	2	Continuous	2	BLM,AGFD,FWE	5K	5K	5K	
R-9	Predation	223	3	10 years	2	BLM,AGFD,FWE	2K	2K	2K	
R-6,8 M-2	Population biology	224	3	Continuous	2	BLM,AGFD,FWE	6K	6K	6K	
M-7	Contingency plans	23	3	Continuous	2	BLM,AGFD,FWE	15K	5K	5K	
R-7,13	Captive breeding	231	3	Continuous	2	BLM,AGFD,FWE	3K	3K	3K	Implement as necessary

Implementation Schedule

Hualapai vole

General Category	Plan task	Task Number	Task Priority	Duration	USFWS Region	Responsible Agencies FWS & Others	Estimated Costs FY1	FY2	FY3	Comments/Notes
I-13,	Transplant	232	3	Continuous	2	BLM,AGFD,FWE	2K	2K	2K	Implement as necessary
M-2	Educational program	31	3	1 year	2	BLM,AGFD,FWE	5K	-	-	
					SUBTOTAL		264	275	277	

List of Abbreviations

AGFD - Arizona Game and Fish Department
ASLD - Arizona State Land Department
BIA - Bureau of Indian Affairs (Hualapai Indian Reservation)
HT - Hualapai Tribe
BLM - Bureau of Land Management
FWE - Fish and Wildlife Enhancement Division, Fish and Wildlife Service
MCP - Mohave County Parks
LE - Law Enforcement Division, Fish and Wildlife Service

APPENDIX

List of Reviewers

Copies of the draft Hualapai Mexican Vole Recovery Plan were sent to the following parties for their review on June 4, 1990.

State Director, Bureau of Land Management, Phoenix, Arizona
Area Manager, Kingman Resource Area, Bureau of Land Management, Kingman, Arizona
Superintendent, Bureau of Indian Affairs, Valentine, Arizona
Director, Arizona Game and Fish Department, Phoenix, Arizona
Chairman, Hualapai Tribal Council, Peach Springs, Arizona
Manager, Hualapai Mountain Park, Kingman, Arizona
President, Santa Fe-Pacific Railroad, Albuquerque, New Mexico
Director, Fish and Wildlife Service, Washington, D.C. (HC)
Regional Director, Fish and Wildlife Service, Albuquerque, New Mexico

COMMENTS RECEIVED

Letters of comment on this plan have been reproduced in this section and are followed by the responses made to each comment.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
POST OFFICE BOX 1306
ALBUQUERQUE, N.M. 87103

AUG - 3 1990

In Reply Refer To:
Region 2/FWE/SE
CL AWE 6-019

MEMORANDUM

To: Field Supervisor, Ecological Services, FWS, Phoenix, Arizona

From: Assistant Regional Director-Fish and Wildlife Enhancement

Subject: Hualapai Vole Recovery Plan

A-1 The Division of Endangered Species has reviewed the subject document. There were no substantive comments on the plan itself. The map on page 3 is difficult to read because of the many intersecting boundary lines and grid lines. I suggest you use a simpler map, such as the one I have attached. A copy of the recovery plan is attached, with typographical errors and other minor changes marked.

The plan is well written, and the recovery tasks should add substantially to our knowledge of this species.

Attachments

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United States Department of the Interior

BUREAU OF LAND MANAGEMENT
ARIZONA STATE OFFICE
3707 N. 7TH STREET
P.O. BOX 16563
PHOENIX, ARIZONA 85011

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:
6840 (932)

July 18, 1990

Memorandum

To: Field Supervisor, U.S. Fish and Wildlife Service, Ecological Services

From: Deputy State Director, Lands and Renewable Resources

Subject: Review of Hualapai Mexican Vole Draft Recovery Plan

We have reviewed the Draft Hualapai Mexican Vole Recovery Plan and provide the following comments.

B-1 Page 6, first paragraph under Present Status. We suggest changing "turbaceous" to herbaceous plants.

second paragraph under Present Status, second sentence. We suggest replacing "land management actions" with "land uses." Separate "isolationof" to "isolation of."

B-2 Page 8, last paragraph, third sentence. The subpopulation isolation factor in vole decline is speculation, as there is no data to back up the statement. While we agree to the possibility that isolation was a factor in vole decline, it should not be stated as hard fact.

B-3 Page 9, last paragraph, third sentence. We suggest changing BLM "managed" to BLM "manages."

B-4 Page 10, second paragraph, second sentence. This statement is awkward as written. If we grasp its meaning, we make the following suggested rewording:

". . . to involve the vole reoccupation of a percentage of the watersheds determined by inventory and evaluation to have restoration potential for Hualapai voles."

third sentence. To make this sentence read better, we suggest rewording ". . . to maintain populations and habitat before downlisting . . . ."

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B-5 Page 11, 11. The first sentence has a typo, "abe."

B-6 Page 12, 112. We agree that a multi-agency Hualapai Mexican Vole Management Team should be formed. The actions needed for recovery require not only enhanced coordination, but cooperation with management, research, and administrative actions to benefit the voles.

113. Although the recovery plan discusses BLM's acquisition efforts for the remaining two vole areas on private lands, there is no step in the plan where this need is acknowledged. Probably either Step 111. or 113. would suffice.

B-7 Page 13. 1211. We fail to see how the discussion under grazing impacts relates to grazing impact research. We suggest 1211. be dropped. Rates and stages of vegetation recovery and change are viewed by BLM as monitoring. Monitoring shows the response to Management, Step 122, and other factors. We believe a step applying to monitoring of vegetation responses (particularly herbaceous cover) and population responses, like changes in the number of runways, etc. should be important inclusions in this plan. Monitoring would be necessary to show when enough watersheds became occupied at a certain level for recovery. At the present time, this type of step is left out.

We appreciate the difficulty in preparing an Implementation Schedule for a project as many-faceted as species recovery where factors important to recovery are not well known. With this in mind, we have several comments on the schedule.

B-8 Several actions are slated for FY91 that can not be taken early in the recovery plan, such as Step 231., Transplants. In addition, the costs for transplants seems very low ($2,000). We must incorporate such needs in our planning system, prepare Environmental Assessments, conduct or rely on Section 7 Consultation by another party, and then the "real" work of capturing or obtaining enough voles, preparing "temporary quarters," monitoring progress of the transplant, and other efforts begin. We expect the costs in this type of work would at least double, but the anticipated need for transplants can not be predicted by Fiscal Year.

B-9 We again question the need to research grazing impacts, 1211, when we know what grazing-related management actions are needed to restore the vole's preferred habitat characteristics.

B-10 We view step 1213 as requiring more time and dollars than estimated. There really seem to be two different actions. A habitat model is prepared. Potential vole habitat is monitored over the long term under management to determine when habitat is ready for transplants.

B-11 Determining the vole's range and taxonomy appears to be two tasks. One requires inventory, and the other requires analysis of specimens. Inventory alone over the possible range of the vole would more than readily take roughly two workmonths worth of effort estimated ($7,000). We suggest this can not be accomplished at such a cost, which, perhaps, should be doubled.

B-12 The recovery plan states that population studies and research should not be attempted until vole numbers increase, yet these research programs are listed for funding in the first three years. We feel this is an inaccurate portrayal of the time required to increase vole numbers for most population research.

This plan will be an excellent guide describing what must be done to recover the vole. We realize that the ideas for research and recovery, and the implementation schedule and estimated costs will change as more information is gained and as lessons from management activities are learned.

We look forward to working with the Fish and Wildlife Service and through a Hualapai Mexican Vole Management Team to help recover this species.

If you have any questions regarding these comments, please contact Ted Cordery at (602) 640-5509.

John W. Stephenson

Acting

THE STATE OF ARIZONA

Governor
Rose Mofford

Commissioners
Thomas G. Woods, Jr., Phoenix, Chairman
Phillip W. Ashcroft, Eagar
Gordon K. Whiting, Klondyke
Larry Taylor, Yuma
Elizabeth T. Woodin, Tucson

GAME & FISH DEPARTMENT

2221 West Greenway Road, Phoenix, Arizona 85023-4312 (602) 942-3000

Director
Duane L. Shroufe

Deputy Director
Thomas W. Spalding

December 19, 1990

Sam Spiller, Field Supervisor
U.S. Fish & Wildlife Service
3616 West Thomas, Suite 6
Phoenix, Arizona 85019

Dear Mr.Spiller:

We have completed review of the Agency Review Draft of the Hualapai Mexican Vole Recovery Plan and provide the following comments. The plan is very readable and provides a suitable framework for recovery actions. Most of the comments in the November 26, 1990, letter from the AGFD Nongame Branch do not reflect substantive differences of opinion or philosophy among us (AGFD and USFWS). Some of the comments reflect very recent findings in the continuing evaluation of the Hualapai Mexican vole's (HMV) current status.

However, because of HMV's uncertain status, the Department believes that collection for scientific and management purposes should be
C-1 recognized within the plan as an appropriate management technique. We submit that careful scrutiny of scientific collecting permit applications by both the Department and USFWS has assured that research activities in Arizona do not negatively impact HMV populations during the preparation of the recovery plan. We expect this process to continue operating effectively.

We look forward to continued progress in the recovery of this species.

Sincerely,

Duane L. Shroufe
Director

DLS:DB:fjc

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DEC 1 7 1990
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FIELD OFFICE - PHOENIX, AZ

An Equal Opportunity Agency

Comments on Draft Final HMV Recovery Plan
Dave Belitsky
Arizona Game and Fish Department
November 15, 1990

Page 2, Life History (insert)

C-2 Past studies of the Hualapai vole primarily report on occurrence and habitat description (Goldman 1938; Peck 1979; Spicer 1985) providing little life history data. Therefore, in this analysis, the life history of the Hualapai vole is assumed to be similar to that of the Mexican vole, M. mexicanus.

Page 8, para. 1, insert after first sentence.

C-3 The introduction of non-native wildlife (e.g. elk and Abert's squirrel) to the Hualapai Mountains may also have impacted vole habitat, through competition and/or displacement (Gooch undated).

Page 11, sub-heading #1

1. Identify, secure, protect, and manage extant Hualapai vole habitat.
   11. Identify and secure vole habitats on private lands. The Phoenix District Office , Bureau of Land Management is pursuing exchanges to secure privately owned Hualapai vole habitat. C-4
   12. Identify and manage vole habitats on state lands.
   13. Increase protective management of vole habitat on federal lands.
   14. Develop and implement management plans for secured private and state lands.

Page 16, para. 3, 22 Research

C-1 Very little is known about the life history of the Hualapai vole. The tasks under this heading would provide for gathering basic data on the species. Any studies conducted will include safeguards to minimize removal or injury of voles. However, resolving the uncertainty of Hualapai vole subspecific designation, may require voucher specimen collection. When possible, studies will be conducted on surrogate species.

221. Population dynamics and life history

C-5 Efforts by the Kingman Resource Area, BLM, to monitor Hualapai vole habitat identified by Spicer et al. (1985) have been unsuccessful in verifying continued survival of the subspecies (Bob Hall, pers. comm.). Additional Hualapai vole sites and site-specific sampling techniques must be identified and tested to assure accurate monitoring of the population.

REFERENCES (Integrate these with references listed on p. 19.)

Getz, L.L. 1985. Habitats. In R.H. Tamarin, (ed.). Biology of New World Microtus. Spec. Publ. No. 8, Amer. Soc. of Mamm.

Gooch, M.T. Undated. Elk Habitat in the Hualapai Mountains, Arizona. Unpub. Rep. Prescott College, Prescott, pp.27.

Hall, Robert S. 1990. U.S. Bureau of Land Management. Personal
C-6 Communication.

Keller, B.L. 1985. Reproductive patterns. In R.H. Tamarin, (ed.). Biology of New World Microtus. Spec. Publ. No. 8, Amer. Soc. of Mamm.

Peck, R.L. 1979. Small mammal inventory of the Aquarius and Hualapai planning units, Mohave and Yavapai Counties, Arizona. Unpub. report to the U.S. Bureau of Land Management, Phoenix District Office, pp. 105.

RESPONSES TO COMMENTS

A-1 A new map for Figure 1 has been incorporated into the plan. Minor test changes were made.

B-1 Changes made

B-2 Text changed to reflect hypothesis rather than fact.

B-3 Change made

B-4 Changes made

B-5 Changes made

B-6 Statement on land acquisition added to step 113.

B-7 The Fish and Wildlife Service (FWS) believes there are still some grazing issues that need to be addressed in step 1211, particularly in light of wildlife use of vole habitats and effects of watershed conditions on vole habitats, particularly in light of the recently observed conditions at Grapevine Spring. While grazing was not the likely culprit for the sedimentation into the vole habitat there, the concern exists for other vole habitats.

A step describing monitoring has been added at 1226.

B-8 The fiscal year designation in the Implementation Schedule does not refer to specific years (i.e., FY1 is not FY91), merely the first year that action is contemplated. Some actions called for in the plan may not be initiated for many years.

Costs for steps 231 and 232 have been adjusted.

B-9 See response to B-7

B-10 Costs for step 1213 have been adjusted

B-11 Costs for step 21 have been adjusted

B-12 See response to B-8

C-1 Paragraph was altered to include non-destructive types of collecting and to encourage new techniques be used to minimize the need for destructive collecting.

C-2 Changes made

C-3 Changes made

C-4 Subheadings requested are included under other headings and were not moved.

C-5 Changes made

C-6 New citations used were incorporated