ECONOMIC ANALYSIS
OF
CRITICAL HABITAT DESIGNATION
FOR THE HUACHUCA WATER UMBEL

Division of Economics
U.S. Fish and Wildlife Service
U.S. Department of the Interior

June 1999

Prepared by:

Bruce McKenney, Robert Unsworth, and Rebecca West
Industrial Economics, Incorporated
2067 Massachusetts Avenue
Cambridge, Massachusetts 02140

Send comments on the economic analysis to:

Field Supervisor
Arizona Ecological Services Field Office
U.S. Fish and Wildlife Service
2321 West Royal Palm Road
Suite 103
Phoenix, AZ 85021-4951

TABLE OF CONTENTS

PREFACE **P-1**

EXECUTIVE SUMMARY **ES-1**

SECTION 1
INTRODUCTION **1**

SECTION 2
INFORMATION SOURCES AND FRAMEWORK FOR ANALYSIS **5**

SECTION 3
DESCRIPTION OF SPECIES AND
PROPOSED CRITICAL HABITAT AREAS **9**

SECTION 4
IMPACTS OF CRITICAL HABITAT DESIGNATION ON LAND USE:
FEDERAL, STATE, AND PRIVATE LANDS **13**

SECTION 5
SOCIAL AND COMMUNITY IMPACTS **21**

APPENDIX A
CRITICAL HABITAT UNIT MAPS **23**

PREFACE

This preface provides information on the approach used by Industrial Economics Incorporated (IEc) to assess the economic impacts that may result from designation of critical habitat for the Huachuca water umbel (hereafter referred to as the "umbel"), under contract to the U.S. Fish and Wildlife Service (FWS).

To evaluate the *increment* of economic impacts attributable to critical habitat designation for the umbel, above and beyond those effects associated with the ESA listing, it is necessary to compare a “without critical habitat” baseline to a “with critical habitat” scenario, measuring the net change in economic activity. The "without critical habitat" baseline represents current and expected economic activity under all existing restrictions prior to critical habitat designation, including Endangered Species Act (ESA) listing restrictions.[1] While IEc recognizes that the ESA listing may result in current and future economic impacts, these impacts were not the subject of this analysis.

To assess the incremental economic impacts of critical habitat designation for the umbel, IEc required policy direction from FWS on what restrictions will be imposed under critical habitat designation, over and above those associated with the listing. It is important to note here that it would not be appropriate for IEc to make such a policy determination. IEc requested that FWS consider what land management/use within the proposed critical habitat designation for the umbel might result in a ruling of adverse modification (critical habitat effects) without an accompanying jeopardy ruling (listing effects). Identifying these land management/use actions provides IEc with a basis for evaluating the incremental economic impacts due to critical habitat designation for the umbel.

FWS staff in Phoenix, AZ, Albuquerque, NM, and Washington, DC discussed potential land management/use actions and determined that, for the umbel critical habitat designation, there is no action that would result in an adverse modification ruling without an accompanying jeopardy ruling. In other words, critical habitat designation for the umbel would place no restrictions on land uses and activities *above and beyond restrictions that already exist under the ESA listing* of the umbel. Based on this guidance from FWS, IEc determined that critical habitat designation for the umbel would result in no direct economic impacts.

[1] In addition to Section 7 jeopardy rulings, listing a species may result in economic impacts attributable to Section 9 provisions regarding illegal take and to Section 4(d) protective regulations.

However, to ensure that no land management/use within the proposed critical habitat areas might result in restrictions above and beyond existing listing restrictions, IEc conducted the following assessment:

- Collected information on current and planned land uses in proposed critical habitat areas;
- Identified whether a federal nexus to these activities exists; and
- Requested FWS guidance on: (1) whether each land use might be subject to restrictions under the ESA listing for the umbel; and (2) whether additional restrictions might be imposed under the critical habitat designation.

In all cases, the FWS determined that no additional restrictions would be imposed under the critical habitat designation beyond existing restrictions under the listing.

EXECUTIVE SUMMARY

The U.S. Department of the Interior's Fish and Wildlife Service (FWS) proposed designation of critical habitat for the Huachuca water umbel (referred to as the "umbel" throughout this report) on December 30, 1998. Under Section 4(b)(2) of the Endangered Species Act (ESA) of 1973, the Secretary of the Interior must evaluate economic and other relevant impacts that may result from the proposed critical habitat designation. If the Secretary determines that economic or other benefits of exclusion outweigh the benefits of designating an area as critical habitat, that area may be excluded from critical habitat, unless such exclusion would result in extinction of the species.

The purpose of this report is to identify and analyze the potential economic impacts that would result from the proposed critical habitat designation for the umbel. Three general steps were followed to identify potential impacts:

1. **What land uses and activities within the proposed critical habitat designation may be affected?** Potential impacts were identified by reviewing public comments and hearings on the proposed critical habitat designation and through interviews with federal land management agency staff and private landowners.

2. **Does the land use or activity involve a "federal nexus"?** Critical habitat restrictions can only be imposed on private land uses and activities when a "federal nexus" exists (i.e., the activities or land uses of concern involve federal permits, federal funding, or other federal actions). If no federal nexus exists, private land uses and activities are not restricted by critical habitat designation. For federally managed land, critical habitat designation may restrict land uses and other actions that could adversely modify habitat.

3. **Would the land use or activity face *additional* restrictions under the proposed critical habitat designation, above and beyond existing restrictions under the ESA listing of the umbel?** This analysis only evaluates economic impacts caused by critical habitat restrictions that are above and beyond impacts caused by the ESA listing of the umbel. Determinations of whether a land use or activity would face additional restrictions under the proposed critical habitat designation are based on FWS guidance. It should also be noted that if a land use or activity is limited or prohibited by another existing statute, regulation, or policy, the economic impacts associated with those limitations or prohibitions are not properly attributable to the critical habitat designation.

To evaluate the increment of economic impacts attributable to the critical habitat designation for the umbel, above and beyond the ESA listing, the analysis assumes a “without critical habitat” baseline and compares it to a “with critical habitat” scenario, measuring the net change in economic activity. The "without critical habitat" baseline represents current and expected economic activity under all existing restrictions prior to critical habitat designation. Only those actions that may be affected by restrictions imposed by critical habitat designation, above and beyond existing restrictions, are considered in this economic analysis.

Proposed Critical Habitat

FWS has proposed eight units of critical habitat for the umbel in the southwest Arizona counties of Cochise and Santa Cruz. All eight units include streams and adjacent wetland areas and extend out to the edge of upland vegetation. The proposed critical habitat units include land owned or managed by the following groups:

- U.S. Department of Agriculture, Forest Service
- U.S. Department of the Interior, Bureau of Land Management
- U.S. Department of Defense
- Private Owners

Impacts of Critical Habitat Designation on Federal and Private Land

This analysis identifies uses of these lands subject to restrictions under the proposed critical habitat designation, above and beyond restrictions from the ESA listing or other existing statutes, regulations, or policies. These land uses and activities are evaluated to determine potential national and regional economic effects of critical habitat designation. Exhibit ES-1 summarizes the potential impacts of critical habitat designation for the umbel on federal and private land uses and activities. According to guidance from FWS staff, critical habitat designation will place no restrictions on these land uses and activities above and beyond restrictions that already exist under the ESA listing of the umbel. Therefore, no economic impacts are expected from critical habitat restrictions.

Small entities and communities potentially affected by critical habitat designation include: (1) the City of Sierra Vista; and (2) small businesses operating in the critical habitat designation. As noted previously, FWS guidance suggests that critical habitat designation will not impose additional restrictions above and beyond the restrictions that already exist under the ESA listing. Therefore, no impacts from the critical habitat designation are expected for small entities and communities.

Exhibit ES-1

SUMMARY OF IMPACTS UNDER THE PROPOSED CRITICAL HABITAT DESIGNATION FOR THE HUACHUCA WATER UMBEL

Manager, Holder, or Owner of Land	Description of Current and Planned Land Uses or Activities That May Impact Suitable or Occupied Habitat	Critical Habitat Unit(s) Potentially Affected	Possible Federal Nexus	Possible Restrictions Under the ESA Listing?*	*Additional* Restrictions Under Critical Habitat Designation?*	Estimated Impacts From Critical Habitat Designation Only?
U.S. Dept. of the Interior, Bureau of Land Management	Groundwater pumping	8	Potential lowering of river level due to overdrafting may affect riparian vegetation	Possibly	No	None
	Recreation	8	Potential habitat destruction	Possibly	No	None
U.S. Dept. of Agriculture, Forest Service	Controlled burning	3, 4, 6, 7	Potential habitat destruction	Possibly	No	None
	Grazing	3, 4, 6, 7	Grazing permits	Possibly	No	None
	Recreation	3, 6	Potential habitat destruction	Possibly	No	None
	Land exchange	7	Transfer of ownership	Possibly	No	None
U.S. Dept. of Defense	Weapons training	5	Habitat destruction from artillery range	Possibly	No	None
	Recreation	5	Potential habitat destruction	Possibly	No	None
	Right-of-ways	5	Right-of-way permits	Possibly	No	None
	Controlled burning	5	Potential habitat destruction	Possibly	No	None

* Possible restrictions are based on guidance from FWS staff in Phoenix, Arizona office.
Sources: (1) Public comments received in response to the proposed critical habitat designation; (2) public hearings held on the proposed critical habitat designation; and (3) interviews of federal land management agency staff

INTRODUCTION SECTION 1

The U.S. Department of the Interior's Fish and Wildlife Service (FWS) published a proposed rule to list the Huachuca water umbel (referred to as the "umbel" throughout this report) as endangered on April 3, 1995, under provisions of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531et seq.). Following a review of information and public comments received on the proposed rule, FWS elected to list the umbel as an endangered species on January 6, 1997. ESA Section 4(a)(3) requires that, to the maximum extent prudent and determinable, FWS designate critical habitat at the time a species is listed. FWS determined that any potential benefits of critical habitat beyond that of listing, when weighed against the negative impacts of disclosing site-specific localities, did not yield an overall benefit to the species. Therefore, FWS determined that designation of critical habitat was not prudent.

The Southwest Center for Biological Diversity filed a lawsuit against the Secretary of the Department of the Interior on October 31, 1997, arguing that the FWS determination regarding critical habitat did not include a review of all relevant and applicable data. On October 7, 1998, a Senior U.S. District judge found that there was no evidence that designation of critical habitat for the umbel was not prudent. He later ordered the Department of the Interior to re-evaluate its determination regarding critical habitat. In response, FWS proposed designation of critical habitat for the umbel on December 30, 1998.

Critical habitat designation can help focus conservation activities for a listed species by identifying areas, both occupied and unoccupied, that contain or could develop essential habitat features. The designation of critical habitat contributes to the awareness of land-managing agencies and the public about the importance of these areas. Beyond this informational role, critical habitat designation may provide additional protection to areas where significant threats to the species have been identified. This protection may be provided under ESA Section 7, which requires federal agencies to ensure that activities they fund, authorize, or carry out are not likely to jeopardize the continued existence of listed species or result in destruction or adverse modification of critical habitat.

Consultation Under Section 7 of the Endangered Species Act

During Section 7 consultation, FWS reviews proposed actions and determines whether the action is likely to jeopardize the continued existence of the species or adversely modify its critical habitat. In cases where a species has been listed without designation of critical habitat, FWS only determines whether the proposed action is likely to jeopardize the continued existence of the species. In cases where critical habitat has been designated, FWS also determines whether the proposed action is likely to adversely modify habitat. According to the ESA, jeopardy is defined as any action that would appreciably reduce the likelihood of both the survival and recovery of the species. Adverse modification of habitat is defined as any direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of the species. Determination of whether an activity will result in jeopardy to the species or adverse modification of its habitat is dependent on a number of variables, including type of project, size, location, and duration.

If FWS determines that a proposed action will jeopardize or adversely modify the habitat of a species, it is required to provide, to the extent possible, reasonable and prudent alternatives to the proposed action. By definition, reasonable and prudent alternatives permit the continuance of the project while removing the elements that jeopardize the species or adversely modify its habitat. In the case of the umbel, FWS expects that most landowners will find that a jeopardy or adverse modification determination can be avoided with little or no impact to planned activities. FWS also expects that most activities potentially impacting umbel habitat are expected to result in a jeopardy determination. Impacts attributable to critical habitat designation would only result when an activity adversely modifies critical habitat of the umbel, but does not jeopardize the umbel.

As mentioned previously, this economic analysis examines only the incremental restrictions that result from a determination of adverse modification of critical habitat, as assessed through Section 7 consultation. Based on the expected outcomes of likely Section 7 consultations for the affected areas, this analysis seeks to isolate any costs potentially resulting from determinations of adverse modification of critical habitat designation for the umbel; it does not attempt to estimate economic effects from the ESA listing.

Purpose and Approach of Report

Under Section 4(b)(2) of the ESA, the Secretary of the Interior must evaluate economic and other relevant impacts that may result from the proposed critical habitat designation. If the Secretary determines that economic or other benefits of exclusion outweigh the benefits of designating an area as critical habitat, that area may be excluded from critical habitat unless such exclusion would result in extinction of the species.

The purpose of this report is to identify and analyze the potential economic impacts that would result from the proposed critical habitat designation for the umbel. The analysis was conducted by assessing how designation of critical habitat for the umbel may affect current and planned land uses and activities on federal, state, and private land. For federally managed land, critical habitat designation may restrict land uses, activities, and other actions that threaten to adversely modify habitat. For state and private land, critical habitat designation restrictions on land uses and activities can only be imposed when a "federal nexus" exists (i.e., the activities or land uses of concern involve federal permits, federal funding, or other federal actions). Activities on state and private land that do not involve a federal nexus are not restricted by designation of critical habitat.

In addition to determining whether a federal nexus exists, the analysis must distinguish between economic impacts caused by the ESA listing of the umbel and those additional effects that would be caused by the proposed critical habitat designation. *The analysis only evaluates economic impacts resulting from additional restrictions under the proposed critical habitat designation that are above and beyond impacts caused by existing restrictions under the ESA listing of the umbel.* Finally, in the event that a land use or activity would be limited or prohibited by another existing statute, regulation, or policy, the economic impacts associated with those limitations or prohibitions would not be attributable to the designation of critical habitat.

To evaluate the increment of economic impacts attributable to critical habitat designation, above and beyond the ESA listing, the analysis assumes a “without critical habitat” baseline and compares it to a “with critical habitat” scenario, measuring the net change in economic activity. The "without critical habitat" baseline represents current and expected economic activity under all existing restrictions prior to the designation of critical habitat. Only those actions that may be affected by restrictions imposed by critical habitat designation, above and beyond existing restrictions, are considered in this economic analysis. Moreover, actions must be “reasonably foreseeable,” defined as projects which are currently authorized, permitted, or funded, or for which proposed plans are currently available to the public.

Structure of Report

The remainder of this report is organized as follows:

- **Section 2: Information Sources and Framework for Analysis** - Highlights sources of information for the report and describes the framework and methodology for the economic analysis.

- **Section 3: Description of Species and Proposed Critical Habitat Areas** - Provides general information on the species and a brief description of proposed critical habitat areas.

- **Section 4: Impacts of Critical Habitat Designation on Land Use: Federal, State, and Private Land** - Identifies and assesses potential economic and other relevant impacts from the proposed designation of critical habitat.

- **Section 5: Social and Community Impacts** - Identifies impacts to small entities and communities located within the proposed critical habitat.

- **Appendix A: Maps of Critical Habitat Areas** - Provides maps of the proposed critical habitat units, including information on acreage by ownership/management.

INFORMATION SOURCES AND FRAMEWORK FOR ANALYSIS SECTION 2

This section describes the primary sources of information used to develop this report and provides an overview of the framework for analysis, including a description of the methodology used to determine potential economic impacts from the proposed designation of critical habitat for the umbel.

Information Sources

Numerous sources contributed to the development of this report, providing information on issues such as the ownership and management of lands within the proposed critical habitat designation, potentially affected activities and land uses, and economic impacts. The primary sources of information for this report fall into the following categories:

- **Personal Communications:** Numerous federal and state agency staff involved in the management of land within the proposed critical habitat designation were contacted by phone to identify potentially affected current and planned activities and land uses and to provide data on possible economic impacts. Phone interviews were conducted in March and April 1999.

- **Public Comments:** Public comments received in response to the proposed critical habitat designation for the umbel on December 30, 1998, provided valuable information on potentially affected land uses and activities.

- **Public Hearings:** As part of the public comment period for the proposed critical habitat designation, public hearings were held in Sierra Vista, Tucson, and Coolidge, Arizona in February 1999. Transcriptions of the hearings were reviewed to identify possible impacts from the proposed critical habitat designation.

- **Geographic Information System (GIS) Maps:** FWS provided GIS maps of the proposed critical habitat units.

Framework for Analysis

This economic analysis examines the impacts of restricting specific land uses or activities within areas designated as critical habitat. The analysis evaluates impacts in a "with" critical habitat designation versus a "without" critical habitat designation framework, measuring the net change in economic activity. The "without" critical habitat designation scenario, which represents the baseline for analysis, includes all protection already accorded to the umbel under state and federal laws, such as the National Environmental Policy Act and the Clean Water Act. The ESA listing added additional protection in its listing provisions. The focus of this economic analysis is to determine the impacts from restrictions on land uses and activities from the critical habitat designation that are above and beyond the impacts due to existing restrictions under state and federal laws and regulations.

Steps to Identify Potential Impacts from Critical Habitat Designation

Listed below are the three steps that were followed to identify economic impacts from the proposed designation of critical habitat.

1. **What land uses and activities within the proposed critical habitat designation may be affected?** As noted above, potential impacts were identified by reviewing public comments, public hearings, and through phone conversations with federal and state land management agencies.

2. **Does the land use or activity involve a "federal nexus"?** Critical habitat designation restrictions can only be imposed on land uses and activities on state and private land when a "federal nexus" exists (i.e., the activities or land uses of concern involve federal permits, federal funding, or other federal actions). Activities on state and private land that do not involve a federal nexus are not restricted by critical habitat designation. Therefore, they are not included in this economic analysis. For federally managed land, critical habitat designation may restrict land uses, activities, and other actions that threaten to adversely modify habitat.

3. **Would the land use or activity face *additional* restrictions under the proposed critical habitat designation, above and beyond existing restrictions under the ESA listing?** As noted above, the baseline for analysis includes all restrictions on land use existing prior to the proposal of critical habitat, including listing restrictions. Only impacts from critical habitat designation restrictions above and beyond this baseline are considered. Determinations of whether a land use or activity would face additional restrictions under the proposed critical habitat designation are based on FWS

guidance. Those land uses and activities that would be subject to additional restrictions under the proposed critical habitat designation are evaluated to determine the potential national economic efficiency effects and regional economic impacts.

National and Regional Economic Effects

The economic effects of designation of critical habitat consist of those factors affecting national income (i.e., national economic efficiency effects) and those economic and social impacts that are important on a local or regional level (i.e., regional economic impacts).

- **National economic efficiency effects** are those consequences of critical habitat designation that represent a change in national income. Efficiency effects include, among other things, recreation (consumer surplus) values as well as management and construction costs in an area that would not be required without critical habitat designation. Impacts on national income may be positive (benefits) or negative (costs). For example, if road construction is prohibited in an area to avoid adverse modification, primitive recreation may be preserved in an area (a benefit) while development of motorized recreation is precluded (a cost).

- **Regional economic effects** (or distributional effects) relate to equity and fairness considerations associated primarily with how income and wealth are divided among regions and groups. These effects are represented by changes in regional employment, household income, or state/local tax revenue that may have offsetting effects elsewhere in the economy. For example, if critical habitat designation results in less construction and development activity within critical habitat areas, this activity may increase in other nearby areas suitable for development. While this may have important economic impacts on different local economies, it may have little or no effect on the regional or national economy.

Benefits of Critical Habitat Designation

The designation of critical habitat may also result in economic benefits in terms of preserving or enhancing non-recreational values provided directly by the species and indirectly by its habitat. Categories of potential benefits for the umbel include scenic beauty, biodiversity, ecosystem, and intrinsic (passive use) values.[2] These benefits may result because society, species, and ecosystems are spared adverse and irreversible effects of habitat loss and species extinction. Quantitative or monetary values for these potential benefits of critical habitat designation, however, are not provided in this report due to the lack of available data.

[2] Intrinsic values, also referred to as passive use values, include categories of economic benefits such as existence value, i.e., knowledge of continued existence of a resource or species; and bequest value, i.e., preserving the resource or species for future generations.

Description of Species and Common Habitat[3]

The Huachuca water umbel (*Lilaeopsis schaffneriana* var. *recurvata*) is an herbaceous, semiaquatic to occasionally aquatic plant that is found in southern Arizona and northern Sonora, Mexico. The plant is perennial and features slender, erect leaves extending from creeping rhizomes. Its leaves are bright green or yellow-green, cylindrical, and include septa (thin partitions) at regular intervals. The leaves measure approximately 0.04-0.12 inches (1-2 mm) in diameter and 1-2 inches (3-5 cm) tall, although they can extend up to 8 inches (20 cm) tall under certain conditions. The umbel is a flowering plant, averaging 3 to 10 small flowers per plant.

The umbel resides in the cienegas (desert marshes), streams, and springs of southern Arizona and northern Sonoran, Mexico. The plant's wetland habitats are usually located in mid-elevation range (roughly 3,500-6,500 feet) and most often surrounded by arid environments. These wetland areas also typically support perennial streams and springs, or have permanently or seasonally saturated soils. As such, the wetland soils supporting the umbel are commonly highly organic. The physical and biological habitat features essential to the growth and reproduction of the umbel include:

- A riparian community that is stable over time and in which nonnative species do not exist or are at a density that has little or no adverse effect on the species.
- A stream channel that is stable and subject to periodic flooding that provides for rejuvenation of plant community.
- Refugial sites in each watershed that allow the population to survive catastrophic floods and recolonize larger areas.

[3] The information on the umbel and its habitat included in this section was obtained from the *Proposed Determination of Critical Habitat for the Huachuca Water Umbel, a Plant*, December 30, 1998 (50 CFR Part 17).

- Sufficiently perennial base flows which provide a permanently wetted substrate.

The density of umbel plants, as well as the size of the umbel, varies according to flood cycles and site characteristics.

The cienegas, perennial streams, and springs of the southwest desert that provide habitat for the umbel are extremely rare. It was recently estimated that riparian vegetation associated with perennial streams comprises approximately 0.4 percent of the total land area in Arizona, and that 90 percent of the riparian habitat along the state's major desert watercourses has been lost.[4] Historically, umbel populations in Arizona have been documented in 25 sites in Santa Cruz, Cochise, and Pima Counties, as well as in Sonora, Mexico. Six of these 25 sites no longer support umbel populations. The remaining 19 sites in Arizona providing suitable habitat for the umbel are concentrated in four principal watersheds:

- San Pedro River
- Santa Cruz River
- Rio Yaqui
- Rio Sonora

The proposed critical habitat designation for the umbel includes land in all of the remaining watersheds, with the exception of the Rio Yaqui watershed.

Geographic Background on Proposed Critical Habitats

The proposed critical habitat designation for the umbel includes riparian habitat areas currently supporting the species, as well as areas believed to contain the necessary habitat characteristics to support the species. FWS believes that the designated critical habitat areas, together with other areas of suitable umbel habitat not included in the critical habitat designation, constitute an adequate number of areas to ensure the species' existence.

The proposed critical habitat designation for the umbel includes a total of eight critical habitat units. Two of the eight units are located in Santa Cruz County, while the remaining six units are

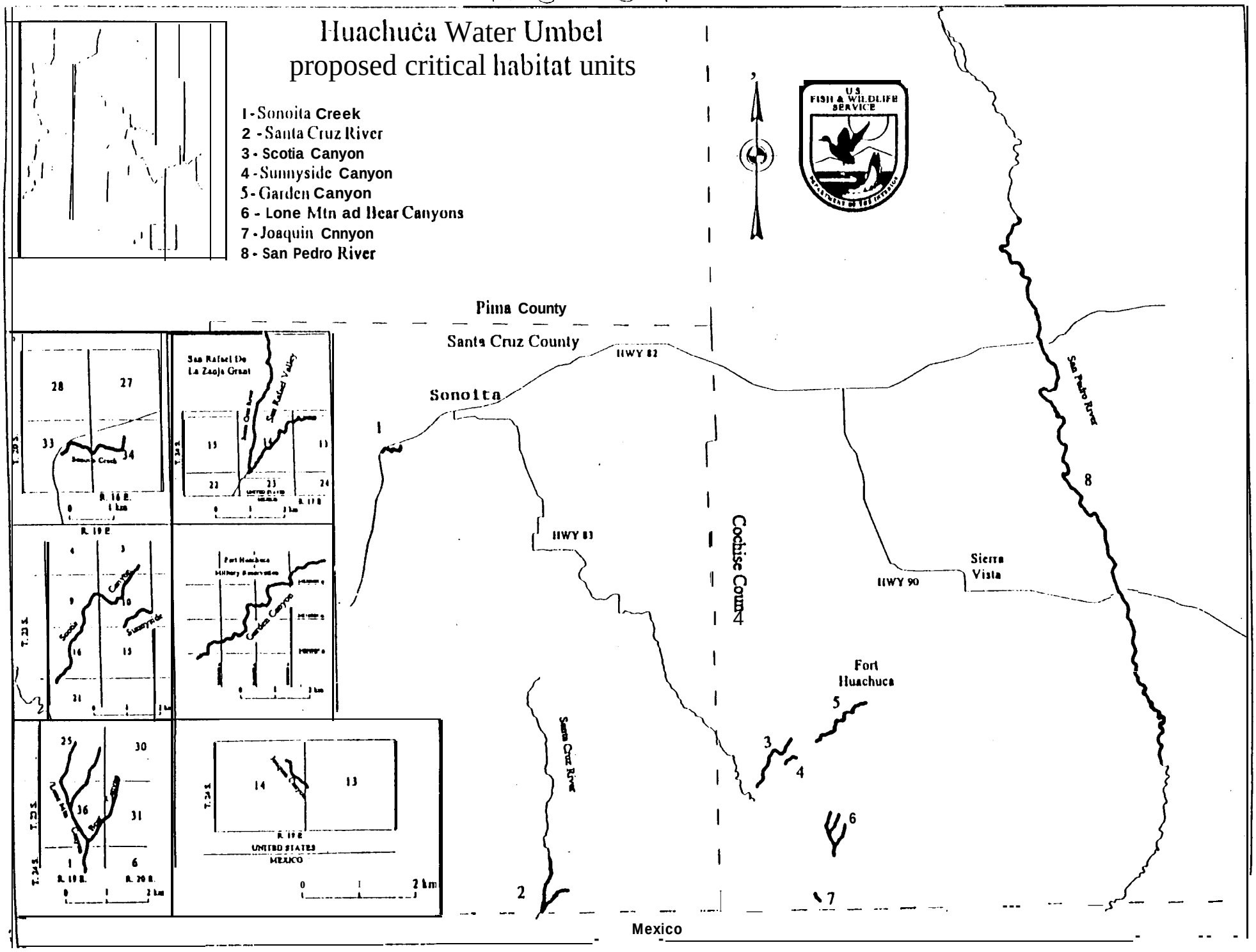
---

[4] The estimated 0.4 percent riparian habitat was reported by the Arizona Game and Fish Department (1993). The lost riparian habitat estimate of 90 percent was reported by the State of Arizona (1990). Both estimates were reported in *Proposed Determination of Critical Habitat for the Huachuca Water Umbel, a Plant*, December 30, 1998 (50 CFR Part 17).

EXHIBIT 3-1

Huachuca Water Umbel
proposed critical habitat units

1 - Sonoita Creek
2 - Santa Cruz River
3 - Scotia Canyon
4 - Sunnyside Canyon
5 - Garden Canyon
6 - Lone Mtn ad Bear Canyons
7 - Joaquin Cnnyon
8 - San Pedro River



located in Cochise County. All eight units include streams and adjacent wetland areas and extend out to the edge of upland vegetation. The proposed critical habitat units include land owned or managed by the following groups:

- U.S. Department of Agriculture
  - Forest Service

- U.S. Department of the Interior
  - Bureau of Land Management

- U.S. Department of Defense

- Private Owners

Exhibit 3-1 displays all eight units proposed as critical habitat designation for the umbel. More detailed maps for each proposed unit are provided in Appendix A. The eight units proposed as critical habitat designation include:

- **Unit 1** is located within Santa Cruz County, near State Highway 82, just south of Sonoita. The unit includes Sonoita Creek, beginning near the highway and proceeding downstream in a westerly direction for approximately 1.25 miles (2 km). All of Unit 1 is privately owned.

- **Unit 2** is located in Santa Cruz, close to the U.S. border with Mexico near Nogales. It includes portions of the Santa Cruz River on both sides of Forest Road 61, beginning in the San Rafael De La Zanja Grant and continuing downstream for 2.7 miles (4.4 km). The unit also includes an unnamed tributary extending for 1.9 miles (3 km) east of the Santa Cruz River. Unit 2 is privately owned.

- **Unit 3** is located in Cochise County, within the Huachuca Mountains of the Coronado National Forest. It follows Scotia Canyon, beginning near Forest Road 48 and continuing upstream for approximately 3.4 miles (5.4 km). Scotia Canyon is managed by the Forest Service.

- **Unit 4** is located in Cochise County, within the boundary of the Coronado National Forest. The unit begins at Sunnyside Canyon in the Huachuca Mountains, near Forest Road 117. It extends for 0.7 miles (1.1 km) along the canyon, and is managed by the Forest Service.

- **Unit 5** is located within the Fort Huachuca Military Reservation in Cochise County. It includes 3.8 miles (6.1 km) of Garden Canyon near its confluence

with Sawmill Canyon. The designated section of Garden Canyon is owned and managed by Fort Huachuca.

- **Unit 6** includes three sections of watercourses within Coronado National Forest in Cochise County. It includes approximately 1.0 mile (1.6km) of Lone Mountain Canyon and 1.1 miles (1.8km) of Bear Creek. The unit is managed by the USFS.

- **Unit 7** is located in Cochise County within the Coronado National Forest, near the U.S. border with Mexico. The unit follows Joaquin Canyon for 0.4 miles (0.7 km) and is managed by the USFS.

- **Unit 8** extends 33.7 miles (54.2 km) along the San Pedro River in Cochise County. The unit begins in the San Rafael del Valle Grant, just south of the Hereford Road bridge, and continues north to the perennial flows reach north of Fairbank. The unit is contained within the San Pedro Riparian National Conservation Area, which is managed by the Bureau of Land Management.

IMPACTS OF CRITICAL HABITAT DESIGNATION ON LAND USE: FEDERAL AND PRIVATE LANDS SECTION 4

The proposed designation of critical habitat for the umbel includes federal and private lands. Critical habitat designation may restrict land uses, activities, and other actions on federally managed land that threaten to adversely modify habitat. In order for activities and land uses on privately owned lands to be affected by critical habitat designation, a federal nexus must exist (i.e., the activities or land uses involve a federal permit, federal funding, or require federal actions). Activities on private lands that do not involve a federal nexus are not restricted by the designation of critical habitat.

The potential impacts of critical habitat designation for the umbel on federal and private land uses are described below.

IMPACTS OF CRITICAL HABITAT ON FEDERAL LAND

The lands proposed as critical habitat designation for the umbel include property managed by the following federal agencies:

- U.S. Department of Agriculture
  - Forest Service
- U.S. Department of the Interior
  - Bureau of Land Management
- U.S. Department of Defense

Federal agencies manage all of the land in six of the eight units proposed as critical habitat for the umbel (Units 3-8). In the following sections, we will discuss current and planned activities for each of the federal agencies that may be impacted by designation of critical habitat for the umbel.

Section 7 of the ESA requires consultation for all federal actions likely to cause adverse modification or destruction of critical habitat. Current and planned land uses and activities on federal land that may be affected by critical habitat designation were identified by reviewing public comments submitted by federal agencies and through phone communication with federal agency staff. According to guidance from FWS staff, critical habitat designation will place no restrictions on any of the identified federal land uses or activities above and beyond restrictions that already exist under the ESA listing of the umbel. Nonetheless, federal agencies remain concerned about the impacts of critical habitat designation on their management of lands. Below we describe land uses, possible federal nexuses, and federal agency concerns about impacts for each federal agency managing land located in the proposed critical habitat.

U.S. Department of the Interior, Bureau of Land Management

The Bureau of Land Management (BLM) manages the longest stretch of proposed critical habitat for the umbel. All BLM lands are contained within Unit 8, which extends for approximately 34 miles (54 km) along the San Pedro River and is entirely located within the San Pedro Riparian National Conservation Area. The National Conservation Area was designated in 1988 to protect the desert riparian ecosystem along the river. It consists of more than 58,000 acres of land, all managed by BLM. The San Pedro riparian corridor is home to an abundance of vegetation and wildlife.

Exhibit 4-1 shows current and proposed activities identified by BLM staff as potentially being affected by critical habitat designation of Unit 8. According to guidance from FWS staff, there will be no restrictions from critical habitat designation to land uses above and beyond existing restrictions under the ESA listing of the umbel. These activities are described in more detail on the following page.

Recreation

Due to the numerous species of birds, a principal attraction of the San Pedro Riparian National Conservation Area is birdwatching. According to BLM staff, thousands of birdwatchers from around the world visit the Conservation Area each year. The Conservation Area features a substantial trail system to support birdwatching activities, in addition to a visitors center near Highway 90. While trails extend through most of the Conservation Area, most birdwatching occurs within close proximity to the visitors center. BLM currently has no plans to expand the recreational infrastructure supporting birdwatching activities.

Exhibit 4-1 U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT: SUMMARY OF IMPACTS UNDER THE PROPOSED CRITICAL HABITAT DESIGNATION FOR THE HUACHUCA WATER UMBEL					
Description of Current and Planned Land Uses or Activities That May Impact Suitable or Occupied Habitat	**Critical Habitat Unit(s) Potentially Affected**	**Possible Federal Nexus**	**Possible Restrictions Under the ESA Listing?***	***Additional* Restrictions Under Critical Habitat Designation?***	**Estimated Impacts From Critical Habitat Designation Only?**
Recreation: Primarily birdwatchers and hikers.	8	Potential destruction of habitat.	Possibly	No	None
Groundwater pumping	8	Potential lowering of river level due to overdrafting; may affect riparian vegetation.	Possibly	No	None
* Possible restrictions are based on guidance received from FWS staff in the Phoenix, Arizona office. Sources: (1) Ted Cordery, Bureau of Land Management, personal communication, March 17, 1999; (2) Tom Cochran, Fort Huachuca Military Reservation, personal communication, March 15, 1999.					

In addition to birdwatching, the Conservation Area features other dispersed recreation. The primary recreational activities include hiking, camping, backpacking, horseback riding, and seasonal hunting. According to BLM staff, these activities are largely concentrated around the road accesses from Highways 90 and 92.

Groundwater Pumping

Groundwater use in excess of supply in the upper San Pedro River basin has created cones of depression in the areas of Fort Huachuca-Sierra Vista, Palominas-Hereford, and other areas of groundwater pumping. The cones of depression capture mountain front recharge that otherwise would flow to the river and in time are expected to decrease reaches of critical habitat unless the basin's water budget is balanced.

A significant decrease in the water level of the San Pedro would impact the riparian habitat surrounding the river. As a result, critical habitat Unit 8 for the umbel could be threatened. Any actions taken to address the possible decline of the San Pedro River water level are complicated by the fact that the subject groundwater wells serve the local populace. No alternative sources of water

for the communities have been identified at this time, and the economic and social impacts of locating substitute water could be substantial.

U.S. Department of Agriculture, Forest Service

The United States Forest Service (USFS) manages property within four of the proposed critical habitat units for the umbel:

- Unit 3 - Scotia Canyon
- Unit 4 - Sunnyside Canyon
- Unit 6 - Lone Mountain Canyon / Bear Creek Canyon
- Unit 7 - Joaquin Canyon

All of these units are located within the Coronado National Forest, which covers a total of 1,780,196 acres in southeastern Arizona and is scattered across twelve mountain ranges. The four canyons within the Coronado National Forest proposed for critical habitat designation are located in the Huachuca Mountain range and are managed by the Sierra Vista Ranger District.

A review of current and planned activities within the National Forest that may be affected by critical habitat designation was conducted based on comments submitted by USFS, and phone interviews with staff at the Sierra Vista Ranger office.[5] Exhibit 4-2 displays current and proposed activities identified by USFS staff as potentially being affected by designation of critical habitat. According to guidance from FWS staff, critical habitat designation will place no additional restrictions on these activities above and beyond restrictions that already exist under the ESA listing of the umbel. These activities are described in more detail in the following.

Grazing

Livestock grazing occurs in all four of the proposed critical habitat units on the Coronado National Forest. Grazing occurs from November through March, subject to varying restrictions, in Scotia Canyon (Unit 3), Sunnyside Canyon (Unit 4), Lone Mountain Canyon and Bear Creek (Unit 6), and Joaquin Canyon (Unit 7). Cattle are now or will soon be excluded yearlong from proposed critical habitat in portions of Scotia Canyon, and in the Lone Mountain Canyon and Bear Creek area. Other recent changes in grazing practices have been proposed in the Scotia, Sunnyside, and Lone Mountain-Bear Creek units to minimize adverse effects to water umbel habitat.

---

[5] Laura Dupee, Sierra Vista Ranger District, Coronado National Forest, personal communication, March 18, 1999; Comments from Coronado National Forest on the proposed critical habitat designation for the umbel are dated March 1, 1999.

Exhibit 4-2

U.S. DEPARTMENT OF AGRICULTURE, FOREST SERVICE:
SUMMARY OF IMPACTS UNDER THE PROPOSED CRITICAL HABITAT DESIGNATION FOR THE HUACHUCA WATER UMBEL

Description of Current and Planned Land Uses or Activities That May Impact Suitable or Occupied Habitat	Critical Habitat Unit(s) Potentially Affected	Possible Federal Nexus	Possible Restrictions Under the ESA Listing?	*Additional* Restrictions Under Critical Habitat Designation?*	Estimated Impacts From Critical Habitat Designation Only?
Grazing: (1) Winter grazing in Scotia Canyon, Sunnyside Canyon, and Bear/Lone Mountain Canyons (2) Year-round grazing in Joaquin Canyon	3, 4, 6, 7	Grazing permits	Possibly	No	None
Recreation: (1) Construction of parking lot and barriers near Bear Canyon (2) Unauthorized off-road driving near Scotia, Bear, and Lone Mountain Canyons	3, 6	Clearing of vegetation; Potential destruction of habitat	Possibly	No	None
Land exchange: Proposed exchange of Coronado National Forest land holdings along Joaquin Canyon for private holdings	7	Critical habitat transferred between federal and private ownership	Possibly	No	None
Controlled burning: Prescribed burning to improve watersheds in Coronado National Forest.	3, 4, 6, 7	Destruction of habitat from prescribed burning on federal lands	Possibly	No	None

* Possible restrictions are based on guidance received from FWS staff in the Phoenix, Arizona office.
Source: Laura Dupee, Sierra Vista Ranger District, Coronado National Forest, personal communication, March 18, 1999.

According to USFS staff, all grazing lands within riparian habitats included in the critical habitat designation are leased by a single permittee, identified as Lone Mountain Ranch. No estimates for the benefits of grazing to USFS or the rancher were available. However, USFS expressed

concern that, if critical habitat designation resulted in restrictions on grazing, Coronado National Forest would be required to install fencing to isolate the critical habitat from neighboring grazing lands. USFS staff is concerned about the feasibility and potential cost of this operation. If fencing is required, Lone Mountain Ranch might face significant costs, as well, associated with locating substitute grazing areas.

Recreation

The four designated canyons -- Joaquin, Scotia, Sunnyside, and Garden -- are popular recreational sites for camping and hiking. Summer is the most active season for canyon recreation, as all of the canyons provide cooler temperatures and a few offer running water. According to USFS staff, there is road access to Scotia Canyon in Unit 3, which greatly increases the amount of recreational activity in this canyon, as well as impact to the natural habitat. USFS staff report that off-road driving occurs on National Forest lands, but it is not authorized. Coronado National Forest has been awarded a grant to construct an access parking lot and barriers near Bear Creek Canyon in Unit 6 to help control the impacts from recreational traffic.

Controlled Burning

USFS indicates that currently there is periodic controlled burning in and around the areas designated for critical habitat. The burning takes place in an effort to improve the quality of watersheds in the surrounding areas.

Land Exchange

USFS is proposing an exchange of properties located in Joaquin Canyon and Scotia Canyon. Under the proposed land exchange, which constitutes a federal action, the USFS would acquire inholdings owned by Lone Mountain Ranch in exchange for USFS land, allowing both the federal government and the private owner to consolidate holdings. The perception that designation of critical habitat will result in additional restrictions on the land, above and beyond existing restrictions under the ESA listing, may potentially affect the ability of USFS to negotiate an exchange of the property.

U.S. Department of Defense

The Department of Defense (DoD) owns and manages land in proposed critical habitat Unit 5. Identified as the Fort Huachuca Military Reservation, the DoD property is located in the Huachuca Mountains near Coronado National Forest and the town of Sierra Vista. Unit 5 consists of approximately 3.7 miles (6 km) riparian habitat in Garden Canyon near its confluence with Sawmill

Canyon; it is encompassed by the Fort Huachuca Reservation, which totals more than 73,000 acres.

Exhibit 4-3 shows current and proposed activities identified by DoD staff as potentially being affected by critical habitat designation of Unit 8. According to guidance from FWS staff, critical habitat designation will place no additional restrictions on these activities above and beyond restrictions that already exist under the ESA listing of the umbel. More detailed information on these activities is provided below.

Exhibit 4-3

U.S. DEPARTMENT OF DEFENSE:
SUMMARY OF IMPACTS UNDER THE PROPOSED CRITICAL HABITAT DESIGNATION FOR THE HUACHUCA WATER UMBEL

Description of Current and Planned Land Uses or Activities That May Impact Suitable or Occupied Habitat	Critical Habitat Unit(s) Potentially Affected	Possible Federal Nexus	Possible Restrictions Under the ESA Listing?*	*Additional* Restrictions Under Critical Habitat Designation?*	Estimated Impacts From Critical Habitat Designation Only?
Weapons training: Artillery and electronic weapons range	5	Artillery range located in critical habitat	Possibly	No	None
Recreation: Primarily hunting and unauthorized off-road vehicle use	5	Potential destruction of critical habitat	Possibly	No	None
Right-of-ways: Utilities	5	Permitting for right-of-ways	Possibly	No	None
Controlled burning: Prescribed burning as part of Fire Management Plan.	5	Potential destruction of critical habitat	Possibly	No	None

* Possible restrictions are based on guidance received from FWS staff in the Phoenix, Arizona office.
Source: Tom Cochran, Fort Huachuca Military Reservation, personal communication, March 15, 1999.

Artillery and Electronic Weapons Training

In addition to classroom education and training at Fort Huachuca, there are a number of ranges designated as sites for desert training for artillery and electronic weaponry. The East Range of the reservation features 27,250 acres of range used for weapons training, including machine guns,

pistols, and self-propelled artillery. Testing also occurs on the designated East Range. Fort Huachuca staff estimate that most of the East Range is classified as an "impact area," or lands receiving artillery hits. Other training sites on Fort Huachuca include a 24,324 acre standard artillery range identified as the South Range, and 7,420 acres identified as the West Range used for vehicle testing. According to staff at the reservation, there is no proposed expansion of the desert training ranges.

Recreation

Hunting is an authorized activity on specified sections of the Fort Huachuca Military Reservation. DoD staff report that it is a common recreational activity, although there are no available records indicating the extent of hunting on the reservation. Use of motorized off-road vehicles is not an authorized activity on the military reservation, but staff report that it occurs within DoD property. In particular, Fort Huachucha lands adjacent to the town of Sierra Vista and near the intersection of Highways 90 and 92 receive the most motorized off-road traffic.

Right-of-ways

Fort Huachuca staff report that a few right-of-ways along major highways currently exist. All of these right-of-way easements correspond to utility power lines. Estimates of the number of existing easements on the military reservation were not available.

Controlled burning:

Fort Huachuca is proposing a Fire Management Plan that includes a fuels reduction and prescribed fire program in the Huachuca Mountains. This controlled burning activity would occur in areas of the proposed critical habitat.

IMPACTS OF CRITICAL HABITAT ON PRIVATE LAND

Of the land proposed for critical habitat designation, private land holders own all of Unit 1 and Unit 2. According to FWS, these lands are used for livestock grazing, recreation, and the preservation of open space. These land uses would not be affected by critical habitat designation because they do not involve a federal nexus. No other information on current or planned land uses in Units 1 or 2 was available.

This section identifies the potential impacts to small entities and communities located within the proposed critical habitat designation for the umbel. Potentially affected small entities and communities include: (1) the Town of Sierra Vista; and (2) small businesses operating in the critical habitat designation. These small entities and communities are described in more detail below. However, as noted previously, FWS guidance suggests that designation of critical habitat will not impose additional restrictions above and beyond the restrictions that already exist under the ESA listing. Therefore, no impacts from the critical habitat designation are expected for these small entities and communities.

Town of Sierra Vista

Overdrafting of the wells that service the City of Sierra Vista and the Fort Huachuca Military Reservation is causing an overall drop in the water table in the upper San Pedro River basin. At present, there are limited data on the severity of impact to the nearby environment. Nonetheless, a lowering in the San Pedro River's water level would impact the riparian habitat surrounding the river. As a result, Unit 8 critical habitat for the umbel could be threatened.

Any actions to address the possible drop of the San Pedro River water level could have significant economic and social impacts for Sierra Vista and Fort Huachuca. Also, it is important to note that any impact on Fort Huachuca will have an effect on Sierra Vista; Fort Huachuca employs a work force of over 10,000, approximately 8,000 people live on-post, and military personnel rent 76 percent of the rental units in Sierra Vista. The population of Sierra Vista, which includes Fort Huachuca, is approximately 38,800.[6] At this time, no feasible alternative sources of water have been identified.

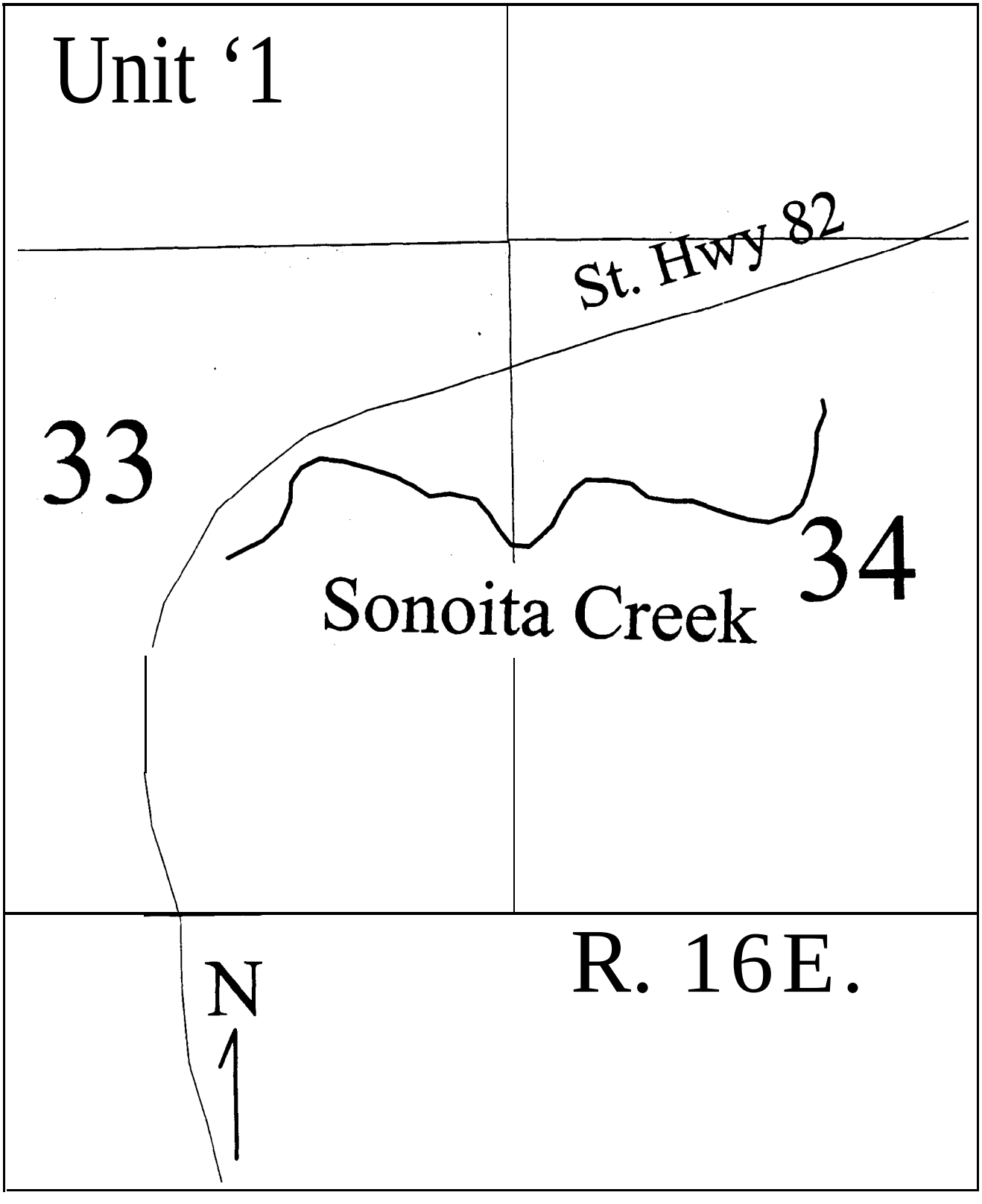
[6] Information provided by Jim Rorabaugh, U.S. Fish and Wildlife Service, April 14, 1999.

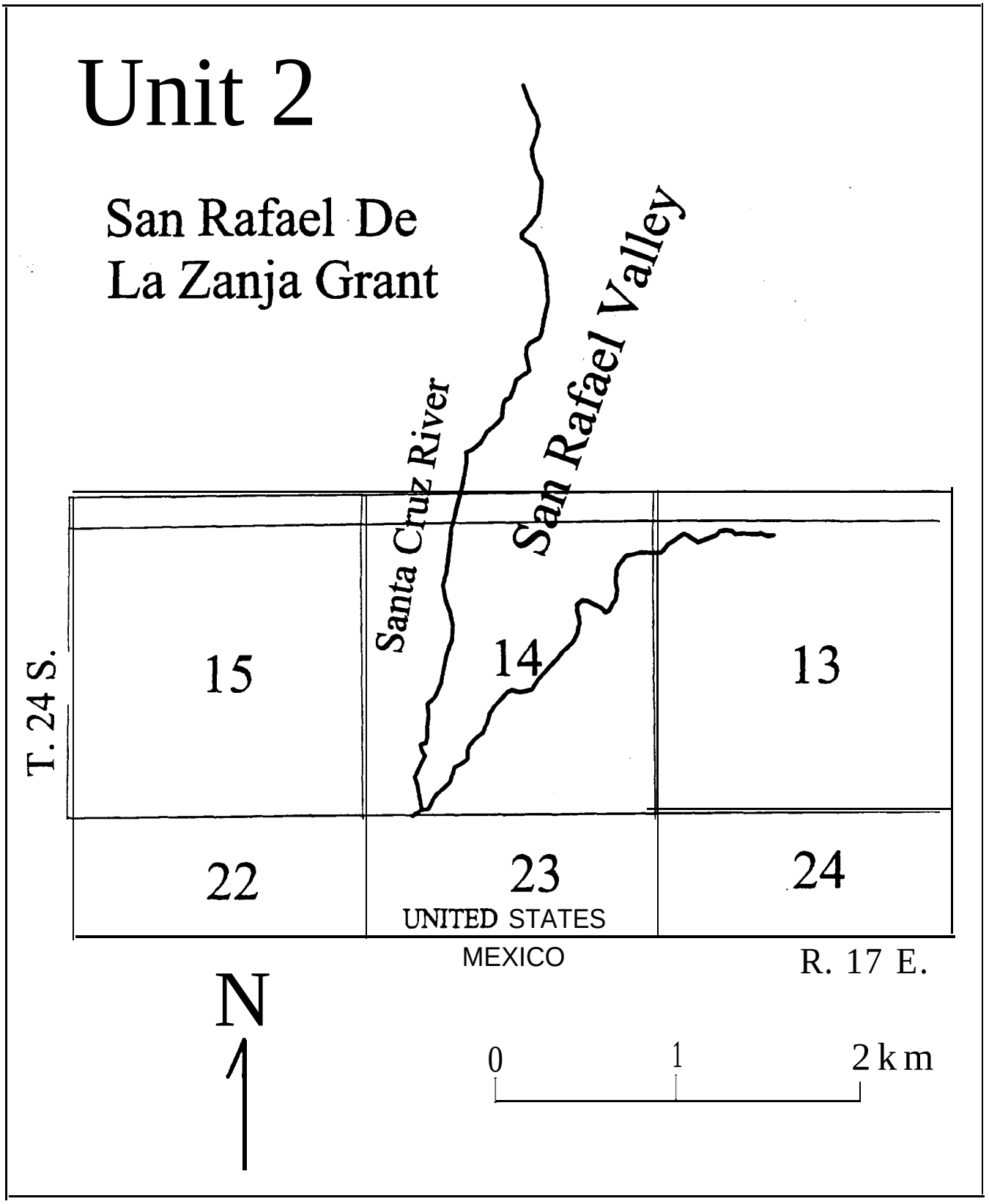
Small Businesses

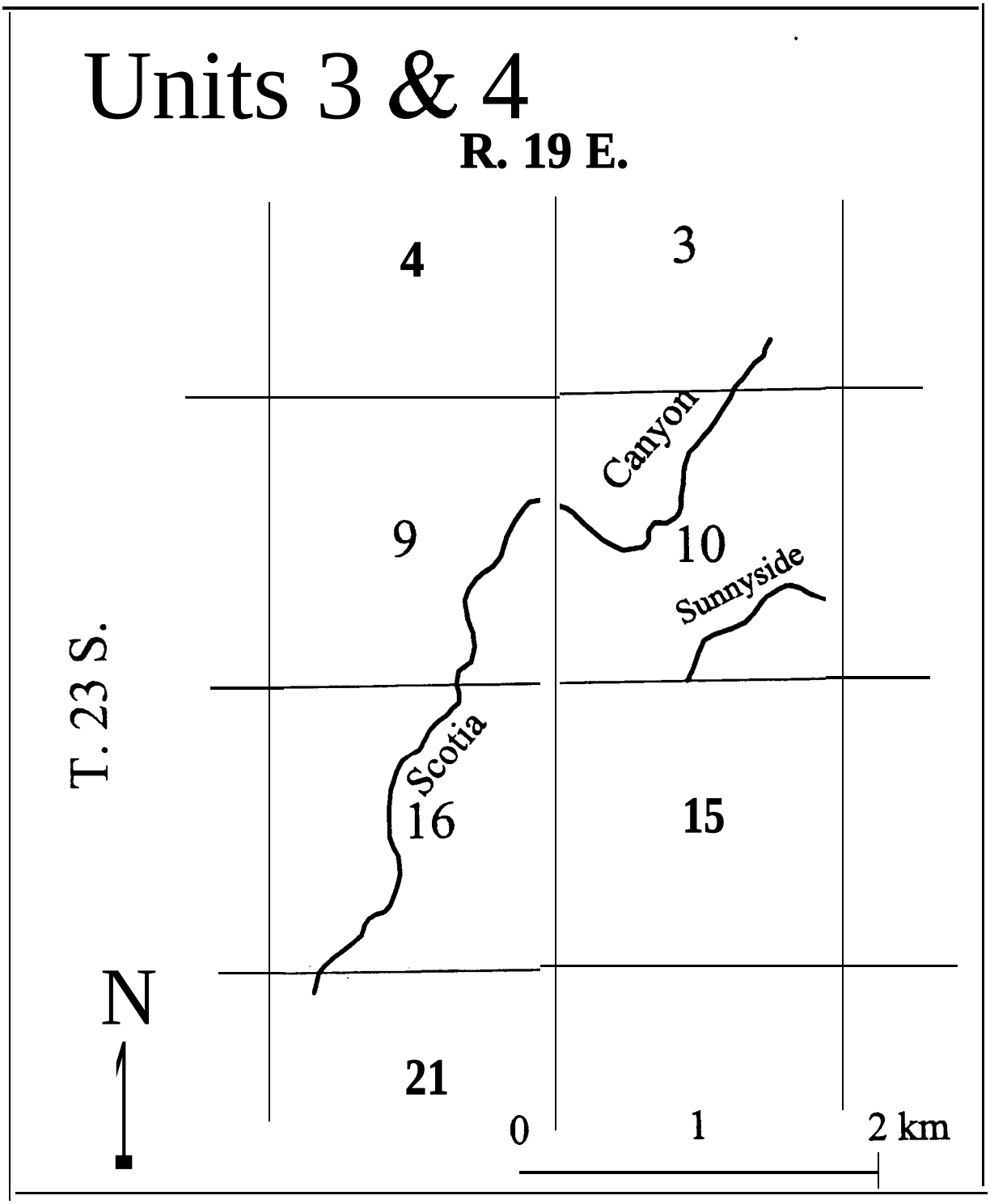
As with other activities and land uses, according to FWS guidance, small businesses will not face any additional restrictions from critical habitat designation above and beyond those restrictions that already exist under the ESA listing. Data were not available to identify the number of small businesses operating in each proposed critical habitat unit for the umbel. However, of the eight proposed critical habitat units, only Unit 1 and 2 contain private land. No data were available to identify what, if any, economic activity currently takes place on these lands.

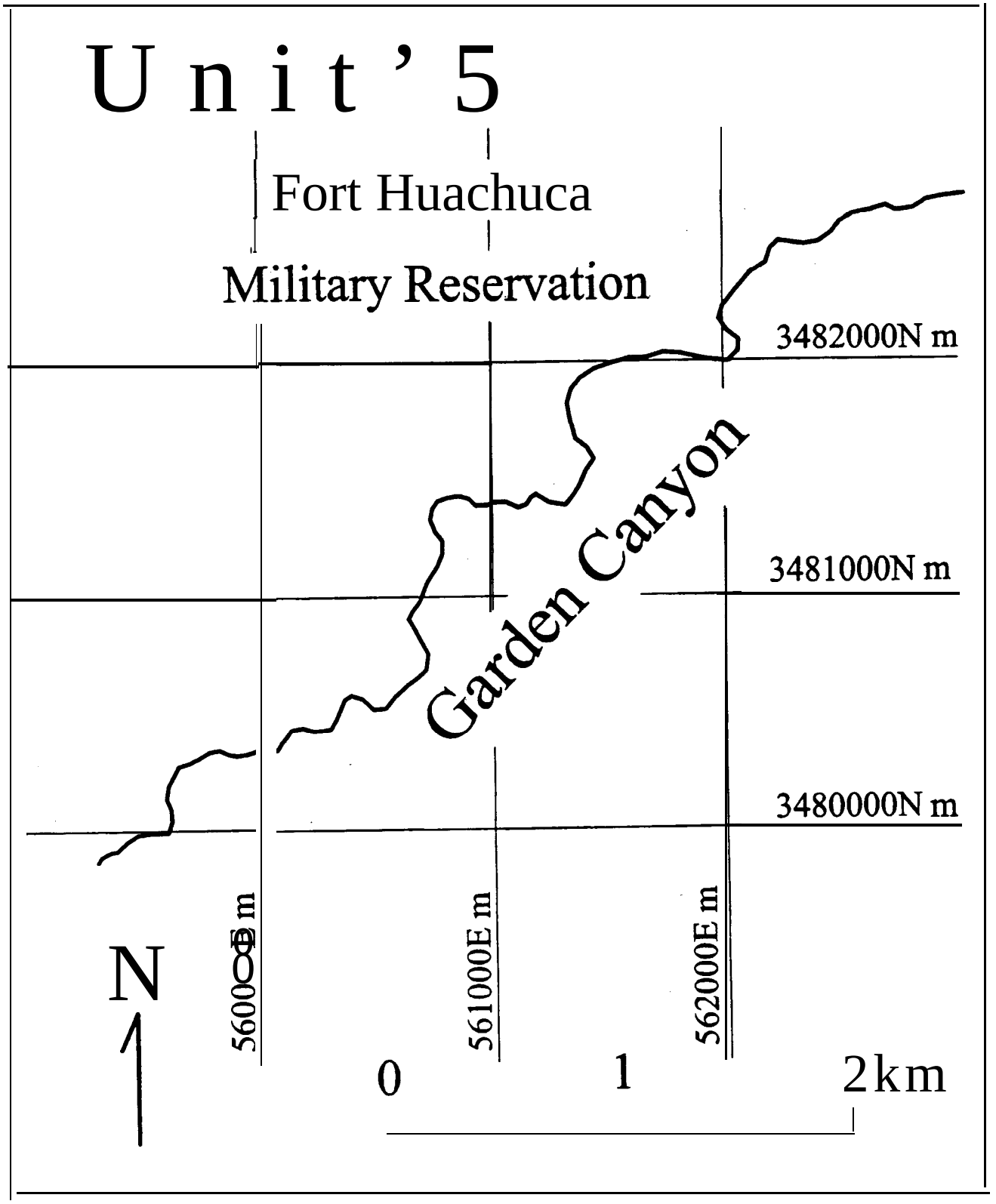
CRITICAL HABITAT UNIT MAPS APPENDIX A

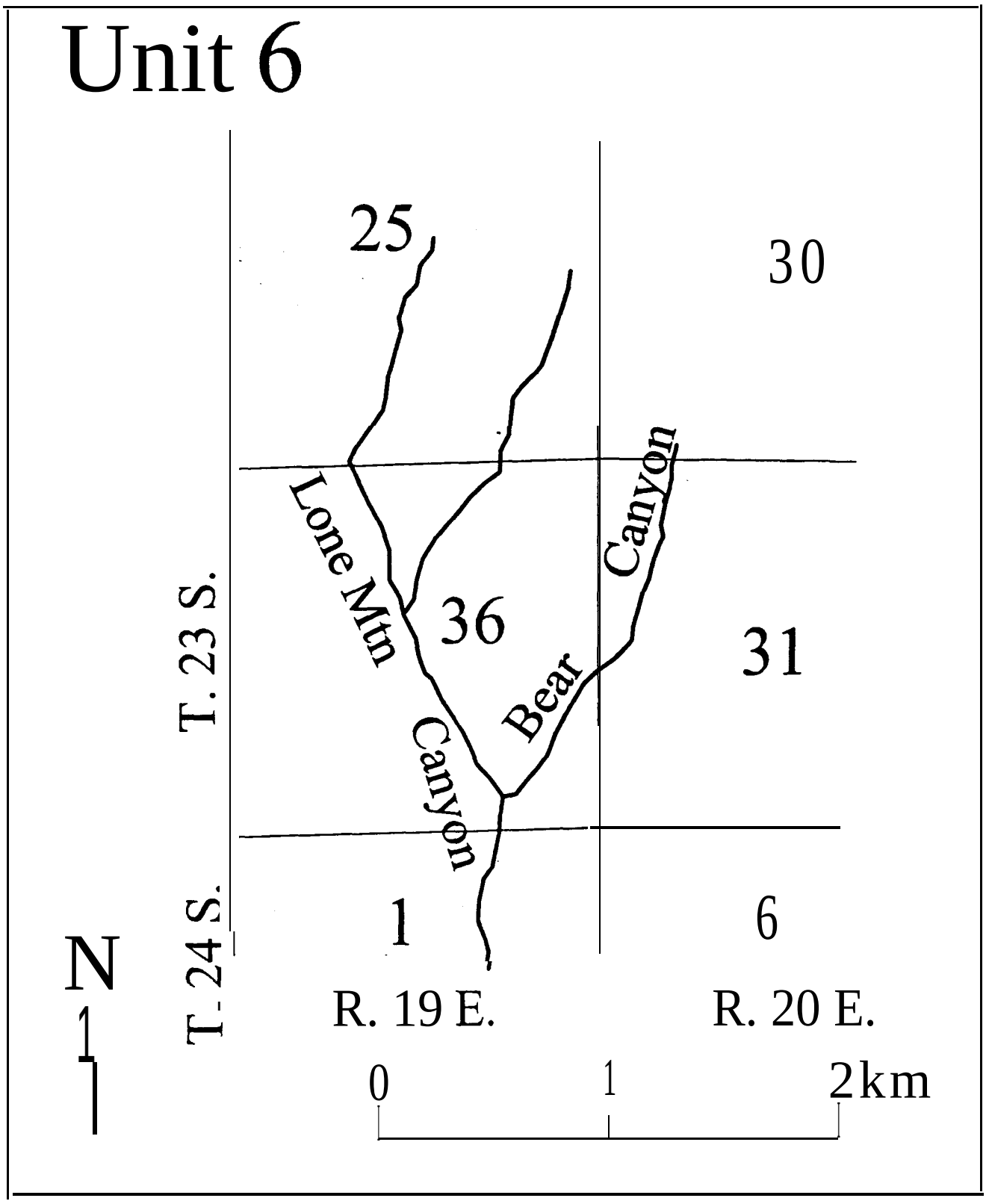
The following maps show each of the eight units proposed as critical habitat designation for the umbel. The maps were developed by FWS and were previously included in the *Proposed Determination of Critical Habitat for the Huachuca Water Umbel, a Plant*, December 30, 1998 (50 CFR Part 17).

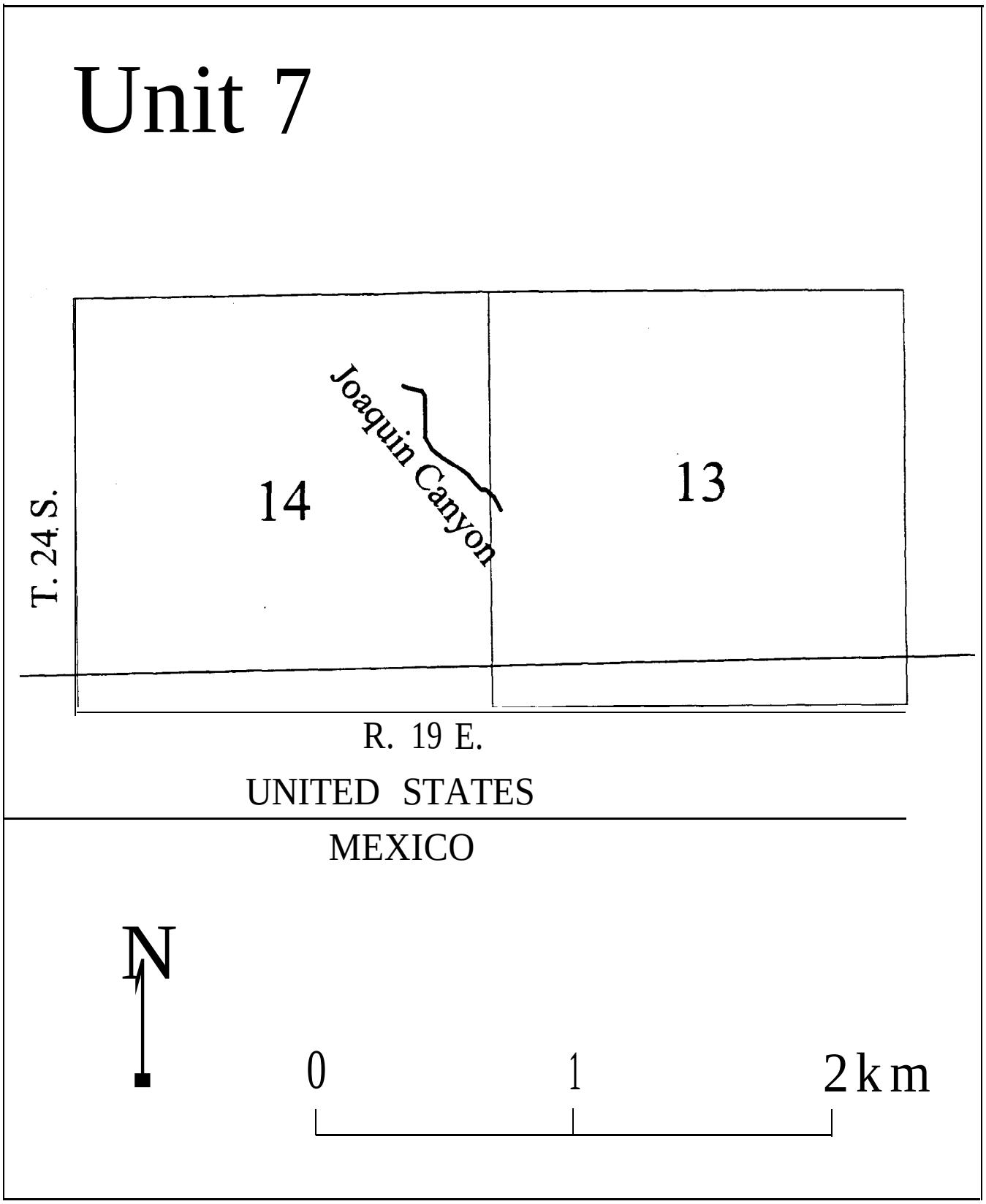

Unit '1
St. Hwy 82
33
34
Sonoita Creek
R. 16E.
N


Unit 2
San Rafael De
La Zanja Grant
Santa Cruz River
San Rafael Valley
T. 24 S.
15
14
13
22
23
24
UNITED STATES
MEXICO
R. 17 E.
N
0
1
2 km


Units 3 & 4
R. 19 E.
T. 23 S.
4
3
9
10
15
16
21
Canyon
Sunnyside
Scotia
N
0
1
2 km


Unit' 5
Fort Huachuca
Military Reservation
3482000N m
3481000N m
3480000N m
Garden Canyon
560000E m
561000E m
562000E m
N
0
1
2km


Unit 6
25
30
Lone Mtn
Canyon
36
31
Bear
Canyon
T. 23 S.
T. 24 S.
1
6
N
R. 19 E.
R. 20 E.
0
1
2km


Unit 7
Joaquin Canyon
14
13
T. 24 S.
R. 19 E.
UNITED STATES
MEXICO
N
0
1
2 km