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FIELD SURVEYS, IOC VALLEYS. VOLUME II, PART II. BIOLOGICAL RESO--ETC(U)

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PHOTOGRAPH THIS SHEET

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DTIC ACCESSION NUMBER

III

LEVEL

INVENTORY

E-TR-48, Vol. II, Part II

Final Aug. 81

DOCUMENT IDENTIFICATION

Contract F04704-80-C-0006

DISTRIBUTION STATEMENT A
Approved for public release;
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E-TR-48-II-II

FIELD SURVEYS, IOC VALLEYS
BIOLOGICAL RESOURCES SURVEY
PINE AND WAH WAH VALLEYS, UTAH

VOLUME II PART II

Prepared for:

U.S. DEPARTMENT OF AIR FORCE
Ballistic Missile Office (BMO)
Norton Air Force Base, California 92409

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER
E-TR-48-II-II

2. GOVT ACCESSION NO.

3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle)
Field Surveys, IOC Valleys
Biological Resources Survey
Pine And WahWah Valleys, Utah Vol. II, pt. II

5. TYPE OF REPORT & PERIOD COVERED
Final

6. PERFORMING ORG. REPORT NUMBER
E-TR-48-II-II

7. AUTHOR(s)
ERTEC Northwest, Inc

8. CONTRACT OR GRANT NUMBER(s)
F04704-80-C-0006

9. PERFORMING ORGANIZATION NAME AND ADDRESS
Ertec Western Inc. (formerly Fugro National)
P.O. BOX 7765
Long Beach Ca 90807

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
64312 F

11. CONTROLLING OFFICE NAME AND ADDRESS
U.S. Department of the Air Force
Space and Missile Systems Organization
Norton AFB Ca 92409 (SAMSO)

12. REPORT DATE
Aug 81

13. NUMBER OF PAGES
460

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)

15. SECURITY CLASS. (of this report)
Unclassified

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)
Distribution Unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)
Distribution Unlimited

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)
Biological Resources, Plants, Wildlife, Abiotic Environment, Biotic Environment, Hydrology, Biology, Climate, Vegetation, Plant Species, Raptors, Wildlife Habitats, Land Use, Land Management, Birds, Reptiles, Amphibians, Mammals

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
Results of the biological resources survey of Pine and Wah Wah Valleys, Utah revealed 11 species listed as Taxa Currently Under Review in the Federal Register. Pine Valley supports the largest population of pronghorn antelope in southwestern Utah. Pine Valley supports an important population of sage grouse. Wah Wah Valley contains a bald eagle winter use area.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

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FOREWORD

This report was prepared for the Department of the Air Force, Ballistic Missile Office (BMO), in compliance with Contract No. F04704-80-C-0006, Task 4.5. The report, in three volumes, describes and evaluates procedures for shelter layouts and field studies consisting of land and environmental surveys and geotechnical inspections of sites and some road corridors in the IOC valleys.

Volume I presents an overview of the program, evaluates the procedures and summarizes the findings in Dry Lake Valley, Nevada, and Pine and Wah Wah valleys, Utah. Volume II describes the biological resources of the area and is divided into Part I-Dry Lake Valley and this volume, Part II-Pine and Wah Wah valleys. Volume III describes the cultural resources and is similarly divided.

Changes to the baseline criteria and requirements made during the field surveys include:

- o Deletion of the Remote Surveillance Sites (RSSs) as of 12 March 1981;
- o Major rerouting of the Designated Transportation Network (DTN) in northern Wah Wah Valley; and
- o Modification of the road pattern from straight-line to direct-connect.

No shelter relocations or reorientations were made as a result of the baseline change from straight-line cluster roads to direct-connect roads. Recent layout studies indicate that shelter sites investigated for the study can be used for the direct connect concept, however, the orientation of some shelters could be improved if new direct connect layouts were performed. It is expected that most or all of the CMF sites will have to be relocated for the direct-connect concept.

Additional studies are planned as part of the IOC program. These include:

- o Consultations with Utah and Nevada State Historic Preservation Offices (SHPO) to evaluate significance of sites in the IOC valleys and their potential for inclusion in the National Register of Historic Places;
- o determination of project effects on significant cultural resources;
- o development of possible cultural resource mitigation measures; and

- o Native American consultations.

The results of these additional tasks will be incorporated in revisions of Volume III of this report and in a supplemental report which will be complete during FY 82.

VOLUME II
PART II

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont.)

TABLE OF CONTENTS (Cont.)

APPENDICES

TABLE OF CONTENTS (Cont.)

LIST OF TABLES

TABLE OF CONTENTS (Cont.)

LIST OF TABLES (Cont.)

TABLE OF CONTENTS (Cont.)

LIST OF FIGURES

TABLE OF CONTENTS (Cont.)

LIST OF FIGURES (Cont.)

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LIST OF EQUATIONS

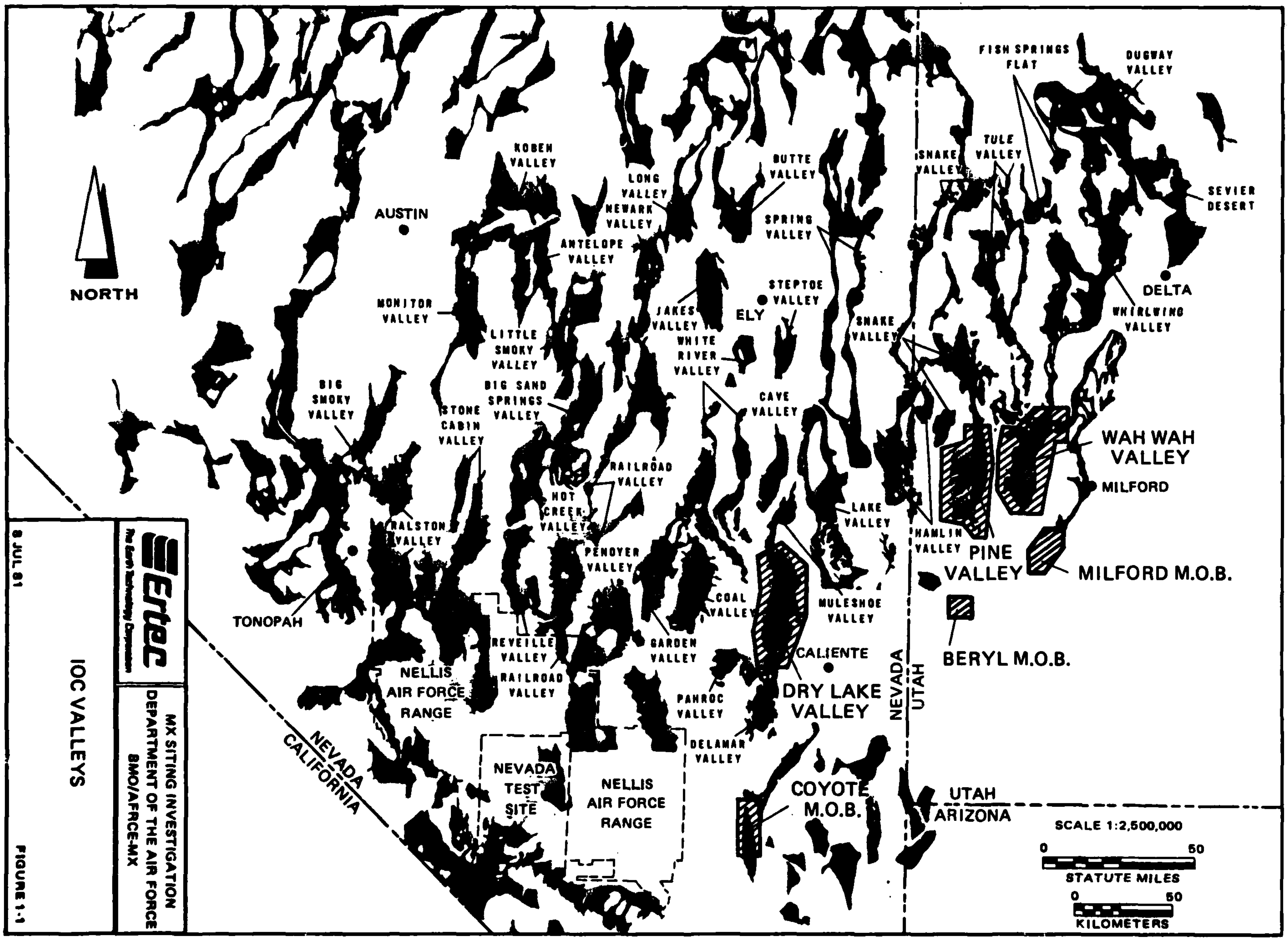
1.0 INTRODUCTION

1.1 BACKGROUND

In April and May of 1980, the AFRCE proposed to initiate field studies in selected Nevada and Utah valleys for the purposes of testing cluster layout procedures and determining potential field problems in actual shelter siting. Dry Lake, Nevada, was selected because it was large enough to support 10 clusters and was relatively close to the proposed Operational Base (OB) site in Coyote Spring Valley. Pine and Wah Wah valleys, Utah, were selected because they were the closest valleys to proposed OB sites near the towns of Beryl and Milford and, together, could support 10 clusters (Figure 1-1).

According to present Air Force plans, there is to be an Initial Operational Capability (IOC) of 10 clusters by mid-1986. There is a high likelihood that shelter construction would start either in Dry Lake Valley, Nevada, or Pine and Wah Wah valleys, Utah, to meet the IOC schedule. For this reason, the present program is referred to as field surveys, IOC valleys.

The intent of the IOC field surveys program was to support the development of the siting methodology and the land withdrawal application being submitted to Congress by the U.S. Air Force. The land withdrawal package must include a legal description of federal lands to be withdrawn for MX. The field program for the IOC valleys was developed after consultations with AFRCE-MX and Utah and Nevada state offices of the Bureau of Land Management (BLM).



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IOC VALLEYS

8 JUL 81

FIGURE 1-1

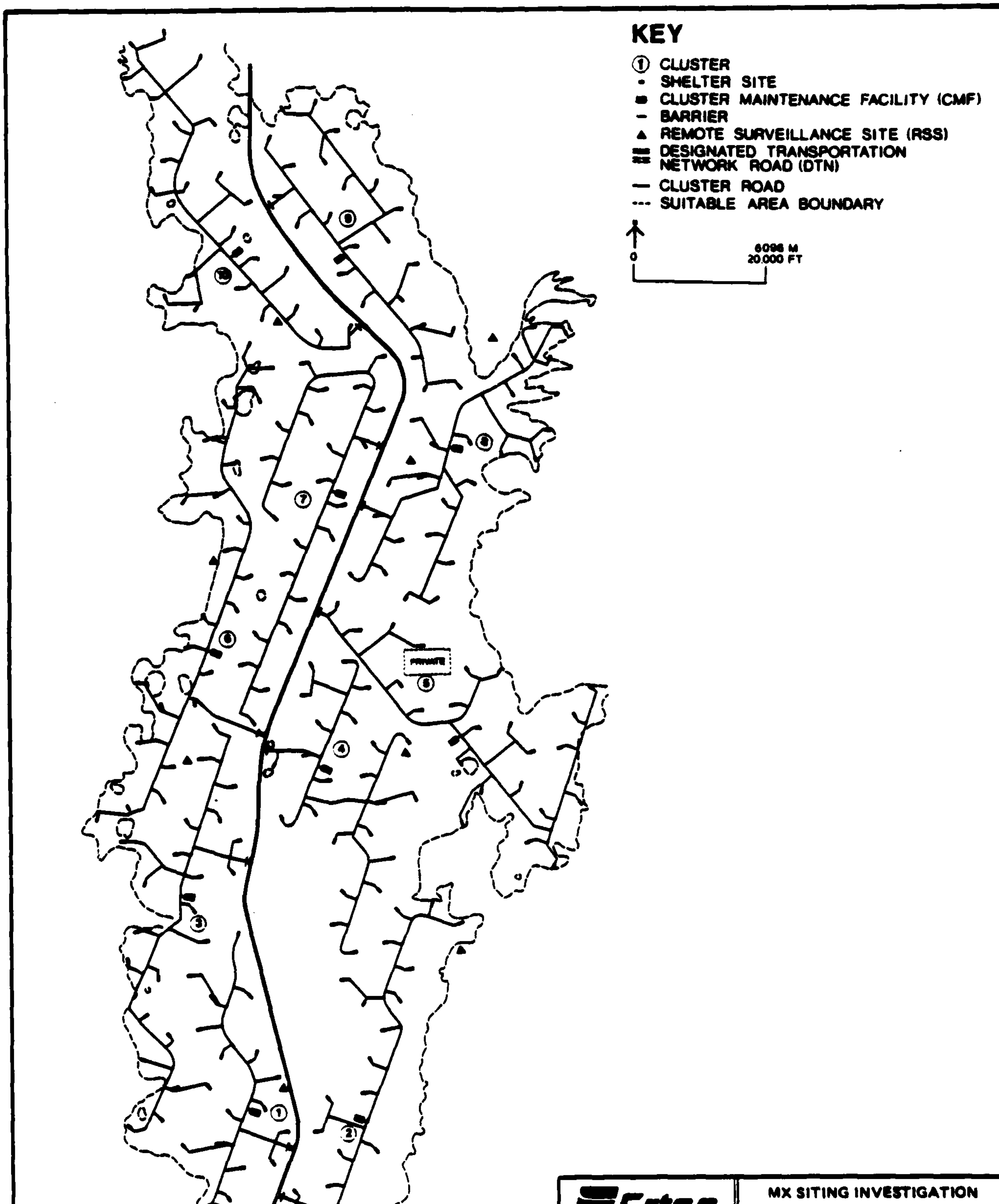
1.2 OBJECTIVES

The primary objectives of the IOC field surveys were to:

- o Identify problems associated with siting criteria or layout procedures by actually locating Horizontal Shelter Sites (HSSs), Cluster Maintenance Facilities (CMFs) and Remote Surveillance Sites (RSSs) in the field;
- o Assess environmental and geotechnical conditions at the shelter, CMF, and RSS sites and along a few road corridors and determine what changes are needed to minimize impacts;
- o Develop a methodology for performing field surveys in the Designated Deployment Area (DDA); and
- o Provide legal descriptions of surveyed sites for the land withdrawal application.

The elements of the program are as follows:

- o Complete shelter layouts for Dry Lake, Pine, and Wah Wah valleys at a scale of 1:62,500 showing all shelter, CMF, and RSS sites (Figures 1-2, 1-3 and 1-4).
- o Submit layouts to BMO/AFRCE for review. Modify the layouts, if needed, in accordance with review comments.
- o Transfer the layout to 1:9600 scale topographic maps. Adjust site locations, if necessary, to avoid drainages and other features that can be identified on the drawings at this scale.
- o Determine the state plane coordinates and bearings of all structures. In Dry Lake Valley, determine the coordinates of points of intersection of the Designated Transportation Network (DTN) and Cluster 2 roads. Provide the land surveyors with these data.
- o Perform field surveys to locate and monument each site and stake the centerline of the DTN and Cluster 2 roads in Dry Lake Valley.
- o Perform geotechnical inspection of sites to determine if they are located in suitable area and to evaluate site-specific geotechnical and terrain conditions. Based on evaluations, recommend which sites should be relocated.
- o Inventory cultural resources including prehistoric and historical artifacts and sites and determine which resources may be adversely affected by project construction. Based on consultation with Bureau of Land Management archeologists,



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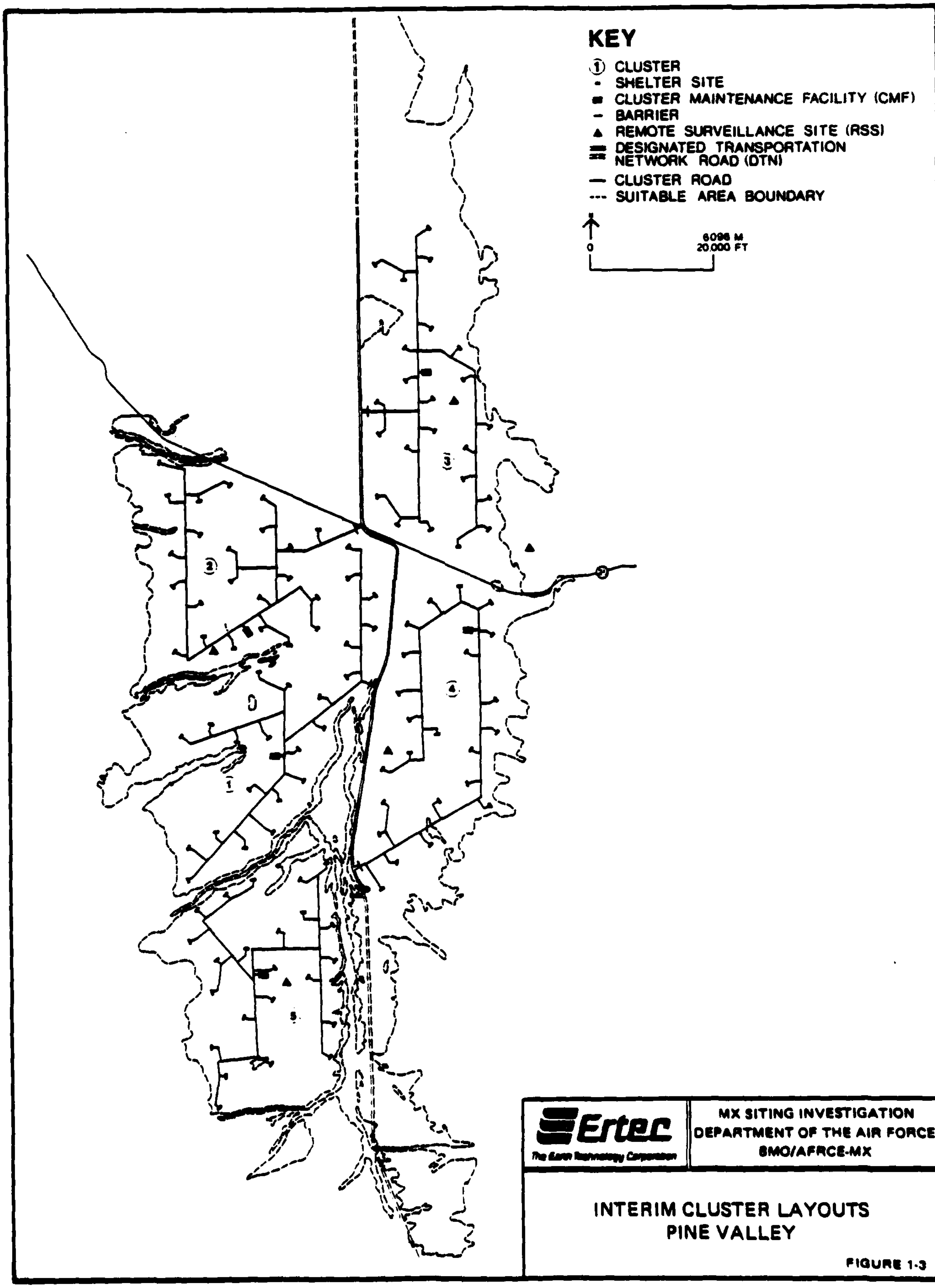
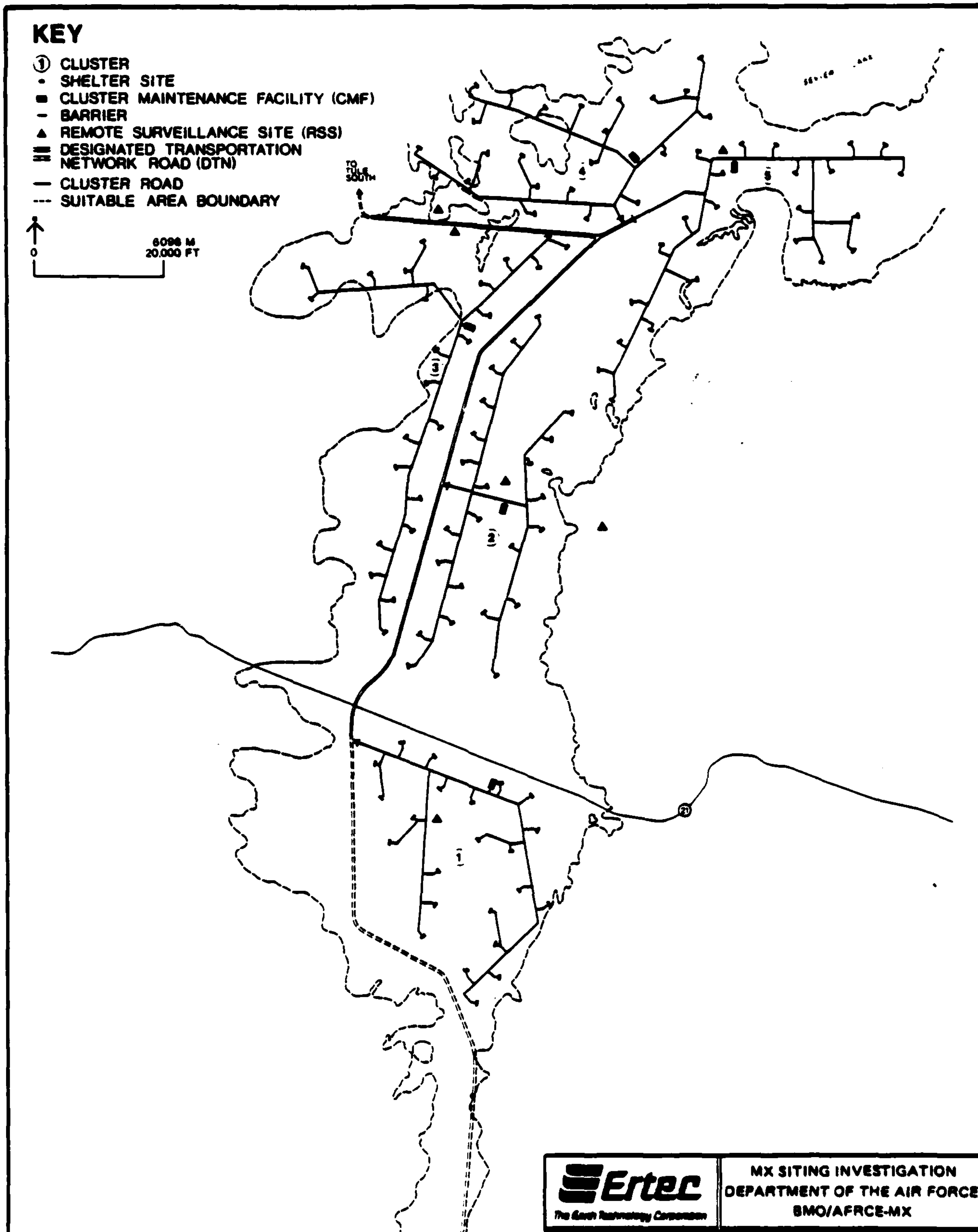
INTERIM CLUSTER LAYOUTS
DRY LAKE VALLEY

FIGURE 1-2



INTERIM CLUSTER LAYOUTS
PINE VALLEY

FIGURE 1-3



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INTERIM CLUSTER LAYOUTS
WAH WAH VALLEY

FIGURE 1-4

make recommendations to mitigate adverse effects on resources eligible for the National Register of Historic Places or considered significant for other reasons.

- Perform biological field surveys to determine the location of sensitive, threatened, and endangered plant and wildlife species that may be adversely affected by project construction. Recommend mitigative measures, when possible, based upon consultation with personnel from state and federal agencies.
- Submit recommendations to BMO/AFRCE for field and office review. After final decisions have been made regarding the number of sites to be relocated, layouts are revised, new coordinates are generated, sites are resurveyed, and monumented, and environmental surveys are completed.
- Prepare legal descriptions of the land at each site that will be withdrawn from public use.
- Prepare an environmental report and general report of the program.

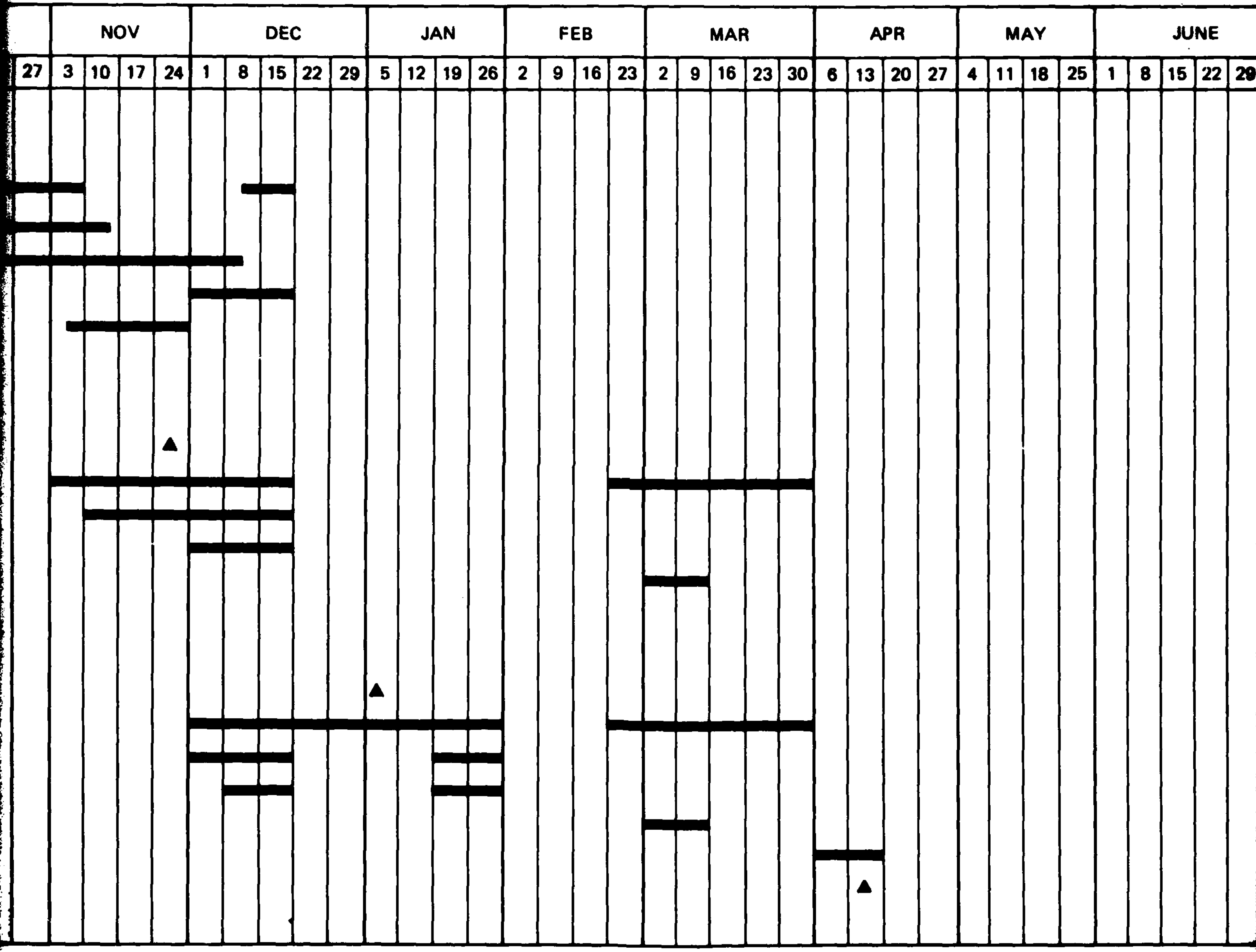
The layouts for Dry Lake, Pine, and Wah Wah valleys, at a scale of 1:9600, were completed 8 September 1980, 25 November 1980, and 8 January 1981, respectively. Locating existing survey controls and establishing a control grid over Dry Lake Valley began on 28 August 1980; surveying and monumenting shelter sites began shortly thereafter. The cultural resources and biological field surveys and geotechnical inspections began 29 September 1980 in Dry Lake Valley and were completed for all valleys on 15 March 1981. An effort was made to complete as much field work as possible by December 1980 knowing there would be delays in the winter months because of weather conditions. A completed schedule is shown in Figure 1-5.

1.3 REPORT ORGANIZATION

This report presents a description of the data and techniques used to derive shelter layouts. Valley specific information

TASK DESCRIPTION	AUG			SEPT				OCT				
	11	18	25	8	15	22	29	6	13	20	27	3
DRY LAKE VALLEY												
LAYOUT COMPLETED (1:9600 SCALE)				▲								
SURVEYING AND MONUMENTING												
ENVIRONMENTAL INSPECTIONS												
GEOTECHNICAL INSPECTIONS												
ENVIRONMENTAL FIELD SURVEYS—RESITINGS												
DETAIL OF CLUSTER 2 (SURVEYING)												
PINE VALLEY												
LAYOUT COMPLETED (1:9600 SCALE)												
SURVEYING AND MONUMENTING												
ENVIRONMENTAL FIELD SURVEYS												
GEOTECHNICAL INSPECTIONS												
ENVIRONMENTAL FIELD SURVEYS—RESITINGS												
WAH WAH VALLEY												
LAYOUT COMPLETED (1:9600 SCALE)												
SURVEYING AND MONUMENTING												
ENVIRONMENTAL FIELD SURVEYS												
GEOTECHNICAL INSPECTIONS												
ENVIRONMENTAL FIELD SURVEYS—RESITINGS												
COMPLETE RESITINGS (CHANGES TO LAYOUT AFTER FIELD SURVEYS)												
DRAFT REPORT TO U.S. AIR FORCE												
FINAL REPORT												

TIME SCHEDULE



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SCHEDULE OF

NOTE: FIGURE 1-5 SAME AS 1-2 IN VOL. I

2

AY		JUNE					JULY			
18	25	1	8	15	22	29	6	13	20	27

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SCHEDULE OF FIELD SURVEYS

FIGURE 1-6

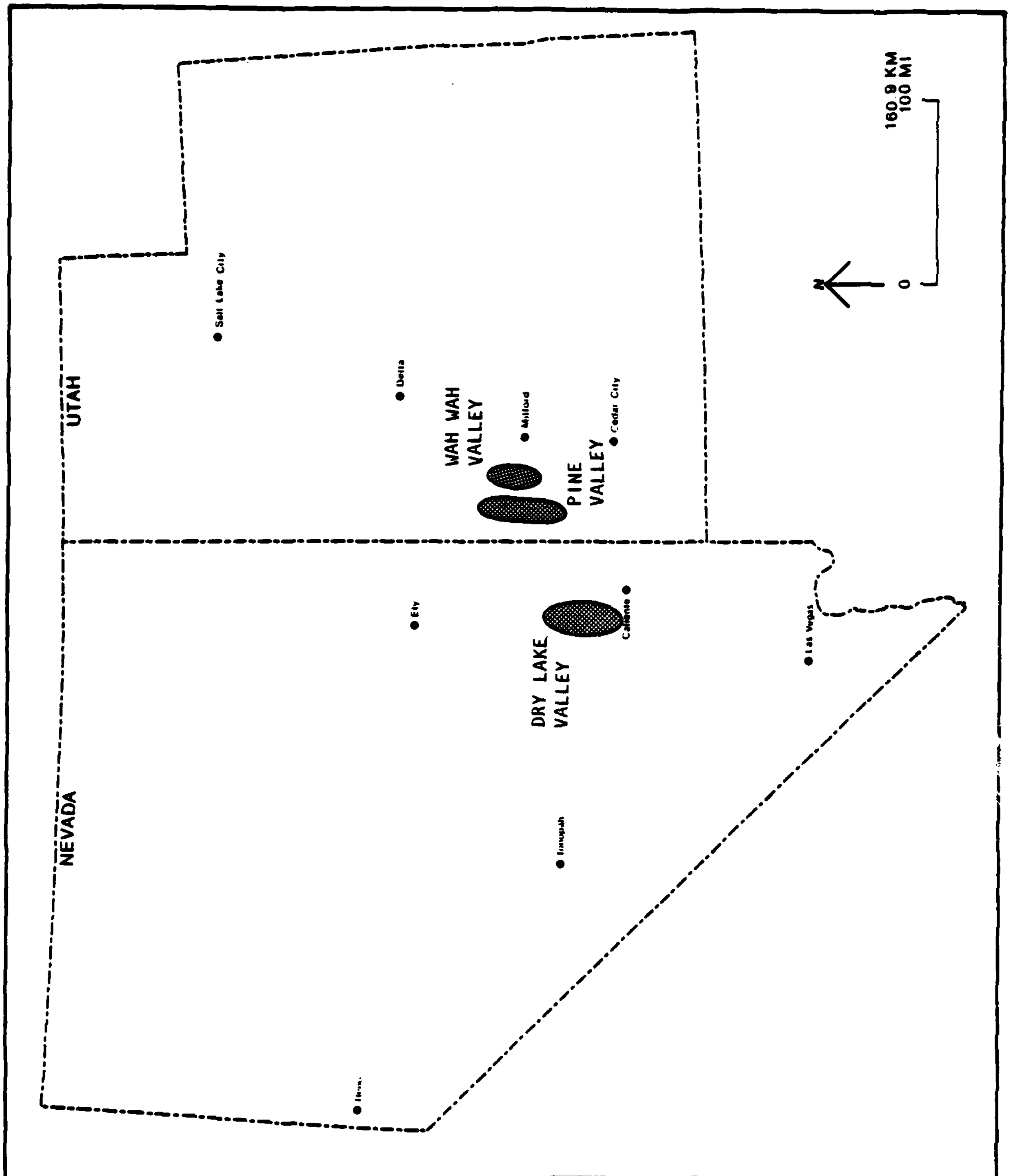
3

and results of the field surveys for the three IOC valleys are summarized. An evaluation of the methods and techniques forms the basis for recommended program and method changes.

The report consists of three volumes. Volumes II and III contain two parts which are bound separately. The contents of each volume are as follows:

Volume I - Program Overview and Methodology;
Volume II, Part I - Biological Resources, Dry Lake Valley, Nevada;
Volume II, Part II - Biological Resources, Pine and Wah Wah valleys, Utah;
Volume III, Part I - Cultural Resources, Dry Lake Valley, Nevada; and
Volume III, Part II - Cultural Resources, Pine and Wah Wah valleys, Utah.

This volume (Volume II, Part II) presents the methodology and results of biological resources surveys of 10 CMFs, 8 RSSs, 230 HSSs, and 48 resitings in the Pine Valley/Wah Wah Valley Study Area (Figure 1-6). Background research and field survey methods are given in Section 2.0; a review of existing data and field survey results for Pine and Wah Wah valleys are given in Sections 3.0 and 4.0, respectively. Section 5.0 discusses impacts and mitigations, and Section 6.0 contains conclusions and an evaluation of procedures. Section 7.0 contains the bibliography. Appendices contain federal and state threatened and endangered species listings, listings of animals expected in Pine and Wah Wah valleys, transect results for both valleys, examples of biological forms, location descriptions of the survey areas, BLM memorandum 80-722, a list of contacts, a list of preparers, and vegetative maps.



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STUDY AREA

FIGURE 1-6

2.0 BIOLOGICAL RESOURCES METHODOLOGY

2.1 BACKGROUND RESEARCH METHODS

Information concerning biological resources in Pine and Wah Wah valleys was obtained from federal and state agencies, local and state organizations, private individuals, and a review of the literature. Contacts included the Cedar City and Richfield District BLM offices, the Utah State BLM office, the Utah Division of Wildlife Resources, Utah Native Plant Society, Brigham Young University, the U.S. Fish and Wildlife Service, and individual professional researchers in the area. Locations and distributions of threatened, endangered, or sensitive plants, sensitive wildlife habitat, and ranges of sensitive or protected wildlife species were researched and mapped to provide background for the field crew during data collection. This information was also used to compile a species list to simplify data recording and compilation during field sessions.

Lists of threatened, endangered, or sensitive species and habitats were requested from the BLM, Utah Division of Wildlife Resources, and U.S. Fish and Wildlife Service. Listings were also obtained from the Federal Register, the Utah Native Plant Society, and other sources. There are significant differences among these lists in terms of format and content. Some lists are specific to protected game animals, others are limited to threatened or endangered species, and still others cite "sensitive" species, not legally protected by law but felt to be important for various reasons. Many species were present on several lists; some were on only one. This study emphasized plant and wildlife species protected as threatened or endangered species under federal law and wildlife species protected as game species under state law. These lists and their applications are discussed further below.

2.1.1 Threatened, Endangered, and Sensitive Plant Species

The Endangered Species Act, P.L. 93-205, was enacted in December 1973 to provide a means for conserving threatened and endangered species and their ecosystems. The Act includes the following definitions:

> Endangered Species -- Those species of plants in danger of extinction throughout all or a significant portion of their range.
>
> Threatened Species -- Those species of plants that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.

Plant species whose existence is threatened or endangered are currently listed in the Federal Register (15 December 1980). The purpose of the list is to advise interested agencies and conservation groups of the species and associated habitats that are in need of special protection (Ayensu and De Filipps, 1978). Because of their lengths, the current Federal Register lists and guidelines concerning these lists are included in Appendix A.

Two lists from the 15 December 1980 Federal Register were considered in this study: Taxa Currently Listed and Taxa

Currently Under Review (or candidate species). The third list -- Taxa Currently Proposed -- includes no species within Nevada or Utah and, thus, is not addressed further here. Taxa Currently Under Review were considered in this study because of the possibility that they may eventually become listed and because the Federal Register states that they should be considered in environmental planning. The U.S. Fish and Wildlife Service also recommends that an informal Section 7 (Endangered Species Act of 1973) consultation be initiated whenever a candidate species might be affected (Hohn, 1981; Gore, 1981).

The Utah Native Plant Society also maintains a current priority list of plants they consider to be threatened, endangered, or sensitive. This list is provided in Appendix B.

The Sikes Act of 1973 (16 U.S.C. 670h) requires that, in addition to the Federal Register listing, the BLM also honor state laws and lists. The policy statement and management guidelines of BLM concerning threatened and endangered plants reflect this and are contained in Memorandum No. 80-722 (Appendix G). It is BLM policy to "protect, conserve and manage federally and state-listed or candidate listings of sensitive, threatened or endangered plants [species]." The policy memo states:

> The objective of all programs will include the means to conserve officially listed plants, to promote delisting, and/or to enhance or maintain the ecosystems occupied by plants on Federal or official State inventories. It is also policy to ensure that the habitats of sensitive plants will be managed and/or conserved to minimize or eliminate the need for Federal or State listing in the future.

BLM Memorandum No. 80-722 (see Appendix G) contains management guidelines which state that all candidate species for federal threatened or endangered status should automatically be added to appropriate BLM state lists. These guidelines further state that:

> Candidate species for Federal threatened and endangered status and sensitive species must be accorded full protection of the Endangered Species Act unless it is determined by the State Director on a case-by-case basis that information on the occurrence of a plant species is adequate to allow a specific action.

Threatened and endangered plants usually occupy niches in locally unique, unusual, or isolated habitats that are ecologically and geographically restricted. These habitats include rocky ridges, rocky outcrops or breaks, high elevations, lowland valleys, limestone outcrops, and heavy, saline, and sandy soils (Welsh et al., 1975; Harrison, 1980).

Prior to the field work, a number of threatened and endangered species were known from the literature for both Pine and Wah Wah valleys (Welsh and Neese, 1980). These are discussed further in Sections 3.0 and 4.0.

2.1.2 <u>Threatened, Endangered, and Sensitive Wildlife Species</u>

The federally listed threatened and endangered wildlife species expected to occur in Utah and Nevada are shown on Table 2-1. These species were of special concern during the study.

Species	State Expected	Status
Brown or grizzly bear (Ursus arctos horribilis)	UT, NV	T
Utah prairie dog (Cynomys parvidens)	UT	E
Black-footed ferret (Mustela nigripes)	UT	E
Bald eagle (Haliaeetus leucocephalus)	UT, NV	E
American peregrine falcon (Falco peregrinus anatum)	UT, NV	
Arctic peregrine falcon (Falco peregrinus tundrius)	UT (migrant)	E
Whooping crane (Grus americana)	UT (migrant)	E
Pahranagat bonytail (Gila robusta jordani)	NV	E
Bonytail chub (Gila elegans)	UT, NV	E
Humpback chub (Gila cypha)	UT	E
Cui-ui (Chasmistes cujus)	NV	E
Moapa dace (Moapa coriacea)	NV	E
Pahrump killifish (Empetrichythys latos)	NV	E
Devil's Hole pupfish (Cyprinodon diabolis)	NV	E
Warm Springs pupfish (Cyprinodon nevadensis pectoralis)	NV	E
Colordado River squawfish (Ptychocheilus lucius)	UT, NV	E
Lahontan cutthroat trout (Salmo clarki henshawi)	NV	T
Woundfin (Plagopterus argentissimus)	NV, UT	E

(a) Source: Federal Register, 20 May 1980

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THREATENED AND ENDANGERED WILDLIFE EXPECTED IN NEVADA AND UTAH

TABLE 2-1

The State of Utah maintains a listing of wildlife species considered of high interest to the state. This group represents "all game species and species of special aesthetic, scientific, or educational value" and includes federally listed species (State of Utah, 1980). Species on this list, especially mammals, were emphasized during the study because it was believed that, because of their size, visibility, and value as game species, they would be more vulnerable to impact than other vertebrate taxa such as fish. These high interest species are listed in Appendix B.

Nongame species in Utah that are considered endangered, declining, and limited by the Utah Division of Wildlife Resources were also considered during the study. A listing of these is given in Appendix B.

2.1.3 Sensitive Wildlife Habitat

In addition to the federal and state species listings, the following areas have been identified as critical habitats by the Utah Division of Natural Resources (Day, 1980).

- o Natural and/or developed open waters; such as seeps, springs, wells, troughs on waterlines, ponds, and guzzlers;
- o Any riparian or wetland vegetation associated with water;
- o Trees that provide nesting for any birds and/or winter roosting for the endangered bald eagle;
- o All habitat within 1 mile (2 km) of open water;
- o Areas supporting rare, threatened, or endangered plants;
- o All habitat within 1 mile (2 km) of transplanted colonies of the endangered Utah prairie dog;

- o All habitat within 1.8 miles (3 km) of sage grouse strutting ground(s) that may also include nesting habitat;
- o Kit and gray fox and bobcat burrows or den sites;
- o Burrowing owl burrows;
- o Bat caves and/or hibernaculums;
- o Foothill areas with black sagebrush used by pronghorn antelope year-round or for the majority of the four seasons, including winter range and fawning areas;
- o Foothill areas with desert mallow and/or other forbs used by pronghorn antelope primarily in spring, including fawning areas;
- o Foothill areas at lower limits of pinyon-juniper used by the ferruginous hawk for nesting and feeding;
- o Any habitat within 1 mile (2 km) of rock cliffs that provide nesting sites for the golden eagle, prairie falcon, red-tailed hawk, or other raptors;
- o Snake dens;
- o Sagebrush-pinyon-juniper areas of foothills and adjacent higher elevations that provide deer and elk winter range;
- o Aspen-fir areas of highest elevations that pro'ide deer and elk summer range.

2.2 FIELD SURVEY METHODS

2.2.1 Survey Areas

Biological surveys were conducted at proposed shelter sites, cluster maintenance facilities, and remote surveillance sites in Pine and Wah Wah valleys from November 1980 through March 1981. Table 2-2 summarizes the type and number of facilities in the three IOC valleys, facility dimensions, and the size of the biological survey area.

The area biologically surveyed at each location was much larger than the area expected to be directly impacted by the facility

Type Facility	Number of Facilities Surveyed(b)		Facility Dimensions (feet)	Biological Survey Area (feet)
Horizontal Shelter Sites (HSS)	Dry Lake	230	265 x 410	665 x 810
	Pine	115		
	Wah Wah	115		
Cluster Maintenance Facility (CMF)	Dry Lake	10	250 x 700 and 250 x 740	750 x 1140
	Pine	5		
	Wah Wah	5		
Remote Surveillance Site (RSS)	Dry Lake	10	100 x 100	300 x 300
	Pine	4		
	Wah Wah	4		
Designated Transport Network (DTN)	Dry Lake	39 miles	75' ROW	75 feet on each side of centerline
	Pine	0		
	Wah Wah	0		
Cluster Road	Dry Lake (Cluster 2)	26 miles	75' ROW	75 feet on each side of centerline
	Pine	0		
	Wah Wah	0		

(a) See Volume II, Part I, for report on Dry Lake Valley.
(b) Does not include resitings.

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TYPE, NUMBER, AND DIMENSIONS OF FACILITIES SURVEYED IN IOC VALLEYS

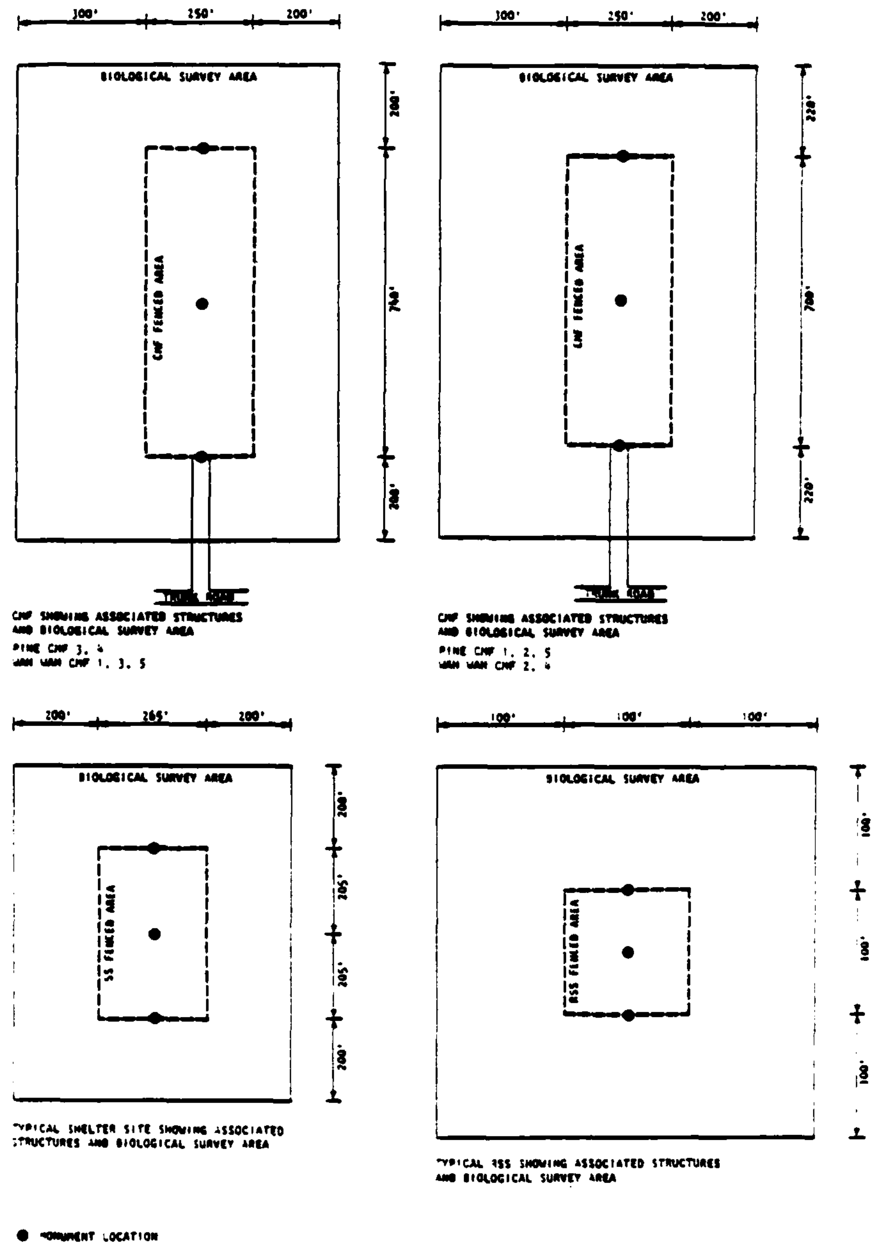
TABLE 2-2

itself. This approach allowed for evaluation of indirect disturbance that might affect adjacent areas during construction.

Field crews located the study sites by use of a 1:62,500 topographic base map illustrating the cluster layout for the entire valley, as shown in Figures 1-3 and 1-4. Once in the general area of the site, 1:9600 (1" = 800') topographic maps were used by field crews to determine precise site locations.

The center line of the environmental survey area was identified by cadastral survey. Because only the center line was marked by the surveyors, the field crew identified the perimeters of the survey areas prior to conducting the survey. This procedure usually consisted of measuring the appropriate distances from the cadastral survey monuments to the survey perimeters and then establishing the corners with a right-angle prism. Measurements were made with metric-calibrated hip chains. Because the dimensions of HSS, CMF, and RSS units vary, the procedures used to establish and transect sample survey areas are discussed separately below.

HSS locations were identified by three capped rebar survey monuments. The three survey monuments lie 205 feet (62 m) apart along the centerline of the long axis of each shelter site. The monument designating "the true point of beginning" (TPB) is stamped with an arrow pointing into the shelter. Monument locations are shown in Figure 2-1.



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MX FACILITY LAYOUTS AND BIOLOGICAL SURVEY AREAS

FIGURE 2-1

The biological survey area for each shelter site was 665 feet (203 m) by 810 feet (247 m) and encompassed 12.36 acres (5 ha). The corners of the survey area were flagged along the centerline of the unit, 200 feet (61 m) from either the TPB or the end survey monument. Then a flag was placed at both corners 332.5 feet (101 m) out from and at right angles to the centerline flag. The procedure was then repeated for the other end of the survey unit. The layout of the survey area is illustrated in Figure 2-1.

RSS locations were identified by three capped rebar monuments and adjacent temporary survey stakes located 50 feet (15 m) apart. The survey area for each of the RSS sample units was 300 feet (91 m) by 300 feet (91 m), and encompassed 2.06 acres (1 ha). The corners were marked by placing a flag along the center-line 100 feet (30 m) from the end monument. Corner flags were then placed 150 feet (46 m) out from and at right angles to the centerline flag. The layout of the RSS survey area is illustrated in Figure 2-1.

CMF locations were identified by three capped rebar survey monuments placed along the long axis of the CMF but offset from the survey area centerline. The survey area for each CMF was 750 feet (229 m) by 1140 feet (348 m) and encompassed 19.6 acres (8 ha). Although even-numbered and odd-numbered CMFs were different sizes, the same survey areas were inspected for both types.

Corners of the smaller CMF survey areas were located by placing a flag in line with the survey monuments 200 feet (61 m) out from TPB monument at the branch road end of the unit. Then, facing into the unit, the right-hand corner was placed out 325 feet (99 m) and the left-hand corner was placed out 425 feet (130 m), both at right angles to the monument line. The procedure was then repeated in mirror image for the other end of the CMF. The same basic procedure was followed for the larger CMFs except that the distance measured from the TPB monument to the flag was 220 feet (67 m) instead of 200 feet (61 m) to compensate for the shorter distance between survey monuments. The layouts of both types of CMFs are illustrated in Figure 2-1.

Each facility site was numbered to facilitate reference and to eliminate confusion of the data. Site MX-5-SS 3/6, for example, indicates Cluster 3, Shelter Site 6, in Pine Valley (Hydrographic Area 5).

2.2.2 Traverses

After establishment of the survey area perimeter, a visual survey of the biotic and abiotic conditions was conducted at each site. Crew members walked a series of parallel traverses at approximately 81-foot (25-m) intervals, the entire length of the study area. The number and distance between traverses varied with the type of facility; these are summarized in Table 2-3.

Facility Type	Number of Traverses	Approximate Distance between Traverses
Horizontal Shelter Sites (HSSs)	8	81 ft (25 m)
Cluster Maintenance Facilities (CMFs)	10	72 ft (22 m)
Remote Surveillance Sites (RSSs)	4	75 ft (23 m)

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TRAVERSE PROCEDURES FOR MX FACILITIES

TABLE 2-3

While traversing the area, the field crew used standardized data forms to record significant abiotic factors such as slope, elevation, disturbance, and soil characteristics, as well as all identifiable vegetative and wildlife components. Threatened and endangered plants, important wildlife sign and sightings, and sensitive habitats were mapped on a metric grid sheet to indicate their location within the study area, so that they could be easily relocated in the future if necessary.

Relatively few animals were observed during the field survey; some use the area only on a seasonal basis, many are nocturnal, and most hide when humans approach. Consequently, mammals were identified primarily from tracks, burrow construction, fur, scat, or other sign.

Special data forms were used to record additional data on important characteristics of wildlife and habitats observed within and/or adjacent to a study area. Threatened and endangered plant species encountered were photographed, and their location, population, and habitat data were recorded on a special form for plants. Examples of biological forms used in the survey are given in Appendix C.

2.2.3 Line-Intercept Survey

The line-intercept method is a standard technique used in vegetation analysis (Canfield, 1941; Van Dyne, 1960). A transect tape is placed over an area, the number and species of organisms intersecting the line are tabulated, and the distance of line covered by each species is calculated. This method was chosen because quantitative measurements can be obtained in a much shorter period of time than by the use of quadrats.

To obtain data on percent cover and density, two 163-foot (50-m) line-intercept transects were completed within each HSS and CMF area. Transects were placed near the TPB and rear monuments, with one transect to the east and one to the west of the monuments. In study areas having two vegetation types, one transect was placed in each vegetation type regardless of monument locations. When this occurred, the transect locations were mapped on a metric grid in the record form.

Due to the smaller area, only one 163-foot (50-m) transect was made in the RSS study areas. This transect was always laid to the north or south of monument 1, the TPB.

The distance of the transect line intercepted by each individual plant was recorded to the nearest decimeter. Due to the season of the survey, most annual plants were dead, and only perennial plants were included in the transect data. Percent total perennial cover, percent relative cover, density, and percent relative density were calculated. These parameters have been described by Smith (1974) and were calculated from the following equations:

$$\text{total cover}(\%) = \frac{\text{total plant cover (dm)}}{\text{distance of transect (dm)}} \times 100 \qquad 2.2.3\text{-}1$$

$$\text{relative cover of species A }(\%) = \frac{\text{total cover of species A (dm)}}{\text{total cover of all species (dm)}} \times 100 \qquad 2.2.3\text{-}2$$

Density may be calculated in several ways, and the problems associated with the definition of density have been outlined by Strickler and Sterns (1963). According to Smith (1974), density and relative density are defined as:

$$\text{density of species A} = \frac{\text{number of individuals of species A}}{\text{distance of transect (dm)}} \qquad 2.2.3\text{-}3$$

$$\text{relative density of species A (\%)} = \frac{\text{number of individuals of species A}}{\text{number of individuals of all species}} \times 100 \qquad 2.2.3\text{-}4$$

Data obtained at each study site were analyzed and correlated with information obtained from the literature and from state and federal agencies.

Strickler and Sterns (1963) define an individual as the aerial parts of a single root system. However, due to vegetative propagation, an individual plant is not always easily delineated. Complications also arise because what appears to be a multiple-stem shrub above ground, if excavated, may actually be discovered to be two or more plants with individual root systems. Because of the inherent difficulty with density, percent cover was used to define the dominant and subdominant plant species in each biological survey area.

2.2.4 Voucher Collection

Voucher specimens were collected from each vegetation association in the study area and pressed in a standard plant press. The specimens were mounted on herbarium sheets and labeled with the date of collection, habitat, and elevation. Voucher specimens are maintained at the Ertec Northwest office in Seattle.

Species not identifiable in the field were collected and sent to an expert. However, due to the season of the survey, many plants did not have flowers or reproductive structures necessary for positive species identification.

Taxonomic difficulties were also encountered in distinguishing for species of Chrysothamnus because of morphological variations. Specimens were sent to a taxonomist at Florida State University for positive identification.

Collections of sensitive, Currently Listed, or Currently Under Review plants were taken only from populations which exceeded 20 individuals or in cases when field identification was uncertain.

2.2.5 Vegetative Mapping

As existing vegetation maps sometimes lack detail or contain uncertainties, it was decided that additional maps based on quantifiable data would be useful.

The vegetation associations in both valleys were mapped by NRC, Inc. using aerial photography interpretation. The valleys were photographed by Ertec Airborne Systems (formerly Fugro Geometrics) in 1978 and 1979 at a scale of 1:25,000. The dominant and subdominant vegetation species were determined from the transect data, the aerial photographs were interpreted, and the field data extrapolated to obtain a vegetative map for each valley. BLM maps were used in some instances to supplement the field data and photo interpretation. Portions of the map showing individual clusters are found in sections 3.0 and 4.0, and a map of the entire study area is given in Appendix J.

2.2.6 Photography

A color slide representative of the area was taken from the southwest corner of each survey site. The site number, date, photographer's initials, roll number, and frame were recorded on a photographic record form. This information was also displayed on a clipboard placed in one corner of each area photographed. Slides are filed at the Ertec Northwest office in Seattle.

Sensitive, threatened, or endangered plant and wildlife species were also photographed. A close-up photo of the species and a photograph of the surrounding habitat were taken when possible.

2.2.7 Field Journals

A journal was maintained by each crew member, and survey conditions, procedural deviations, unusual findings, or other factors affecting the survey were documented. This information was used in analysis and interpretation of the information gathered in the field.

2.2.8 Off-Road Travel

Due to the great damage that can be inflicted and the slow growth and recovery rates of desert vegetation, travel was limited to existing trails when possible. When traveling off-road, field crews followed trails or surveyors' tracks, creating new tracks only when previous tracks to the study area could not be located.

3.0 PINE VALLEY

3.1 ABIOTIC ENVIRONMENT: DATA REVIEW

3.1.1 Valley Description

Pine Valley is located in southwestern Utah, primarily in Beaver County but extending southward into Iron County and northward into Millard County. It is a small valley, with a total area of 730 mi^2 (1890 km^2). The valley is bounded on the east by the Wah Wah Mountains with elevations to 9105 feet (2802 m), on the north by Snake Valley, and on the west by the Needle Range, which includes Indian Peak (9784 feet or 3010 m). The southern end of the valley is composed of low hills extending out from the Wah Wah and Needle ranges. Elevations on the valley floor range from approximately 5000 to 6500 feet (1538 to 2000 m). At the edges of the valley, several canyons extend into the hills between rocky outcrops of the surrounding mountains (U.S. Department of Interior, 1978). Pine Valley is crossed by State Highway 21 and is approximately 40 miles (64 km) west of Milford, Utah.

The Desert Range Experimental Farm and Range Headquarters are located in the northern end of the valley, and the Indian Peak Wildlife Management Area borders the southwestern edge of the valley. The Wah Wah Mountains are to be given extensive study as a potential wilderness area (U.S. Department of the Interior, 1980b).

Domestic stock, especially cattle, have extensively grazed the valley. There has also been considerable off-road driving.

These and other disturbances tend to be of greater biological significance in the desert than elsewhere because the slow growth and recovery rate of desert vegetation may result in long-term or permanent effects from the disturbance.

There is considerable mining activity along the edges of the valley and in the mountains bordering the valley (USGS, 1972).

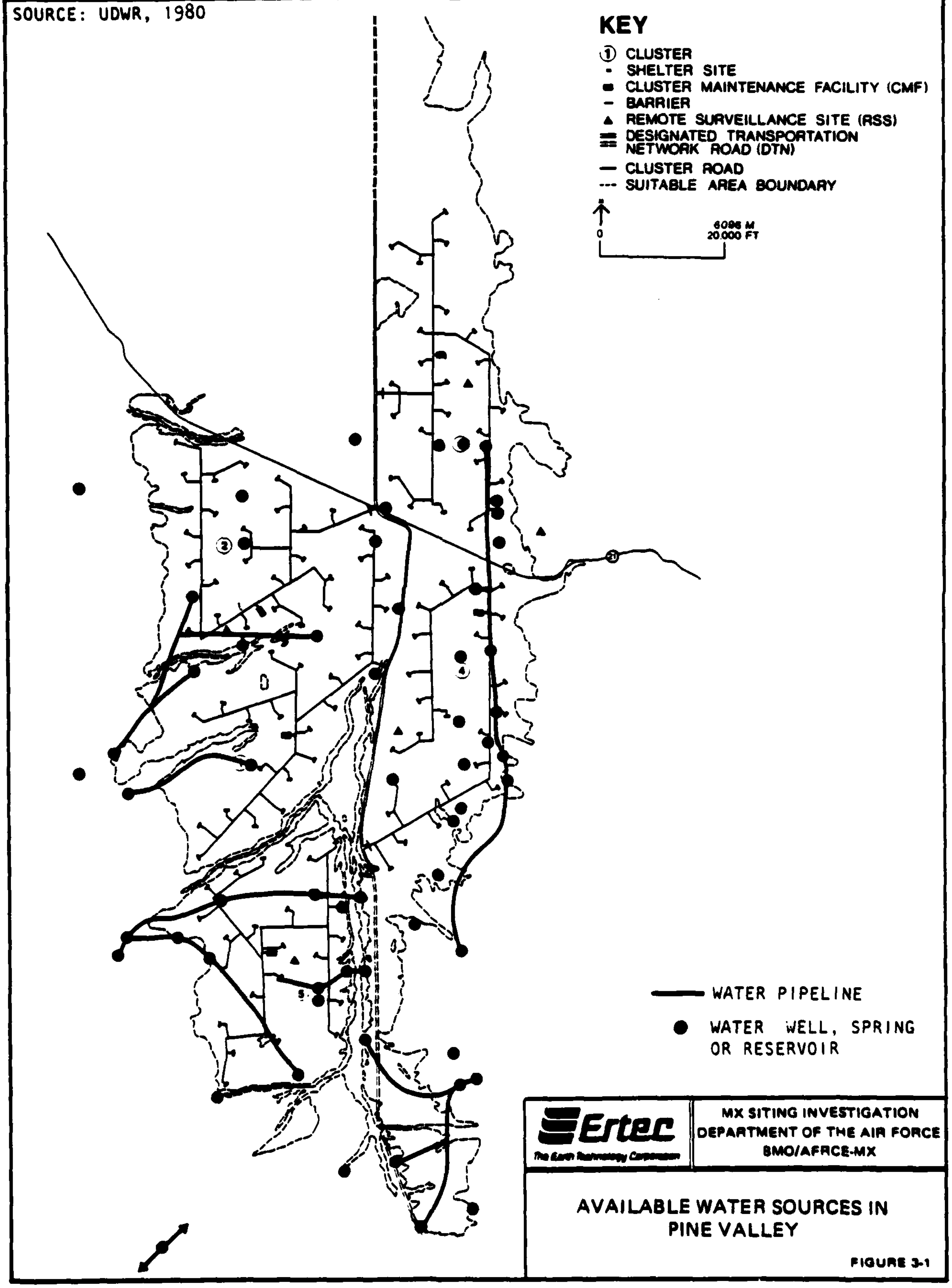
3.1.2 Hydrology

Pine Valley is a closed drainage basin and contains no permanent rivers or streams. Intermittent streams form numerous washes and arroyos that eventually drain into the large Pine Valley Wash that runs northward into the central playa or Pine Valley Hardpan. There are 80 known springs in the Pine Valley drainage basin, mostly issuing from the Needle Range (Stephens, 1976). Stock watering reservoirs that also serve as water sources for a variety of wildlife have been built in many areas of Pine Valley. Existing springs, pipelines, and reservoirs are shown in Figure 3-1. Observation wells drilled by Ertec Western in 1979 and 1980 showed groundwater depths ranging from 340-443 feet (104-135 m).

3.1.3 Geology

Igneous, carbonate, and quartzite rocks in the Wah Wah Mountains and the Needle Range are eroded and provide materials for alluvial fans along the valley edge. Rocks are thought to be permeable enough for some water seepage to the Wah Wah Valley drainage basin to the east (Stephens, 1976). The central portion of the valley contains bajadas, channel deposits, and a

SOURCE: UDWR, 1980



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AVAILABLE WATER SOURCES IN PINE VALLEY

FIGURE 3-1

central playa, having lacustrine deposits. Since the drainage divide between Pine Valley and Snake Valley is higher than the highest level reached by Lake Bonneville during the Pleistocene era, there are no Lake Bonneville lacustrine deposits in Pine Valley.

3.1.4 Climate

Temperature and precipitation data for the Desert Experimental Range in the Northern portion of Pine Valley are summarized in Table 3-1. The temperature has been known to range from over 100° F in summer to well below 0° F in winter, although average monthly temperatures range from the high 20's to the low 70's. Rainfall is normally less than 6 inches (15 cm) per year, although the presence of *Artemisia tridentata* on the alluvial fans indicates that the southern end of the valley may receive more rainfall.

3.2 BIOTIC ENVIRONMENT: DATA REVIEW

3.2.1 Vegetation Types

The area being considered for the MX system is almost entirely within the Intermountain Region of the United States, which has no water drainage to the sea.

This region is divided into four major vegetation divisions: the Great Basin, the Wasatch Mountains, the Colorado Plateau, and the Uinta Mountains. The Great Basin, which is the largest division, is divided into nine sections. Pine and Wah Wah valleys lie within the Great Basin along the borders of the

Month	Average Monthly Temperature (°F)	Average Monthly Precipitation (in.)
January	26.5	0.25
February	32.7	0.27
March	38.5	0.44
April	46.5	0.63
May	56.1	0.49
June	65.5	0.48
July	73.8	0.81
August	71.7	0.77
September	62.2	0.46
October	50.6	0.44
November	37.0	0.34
December	28.3	0.34
Annual Average	49.1	5.72
Maximum/minimum:		
Period of record	104/-29	--
Annual	--	9.72/2.40
Monthly	--	2.41/0.00

Based on U.S. National Oceanographic and Atmospheric Administration, U.S. Environmental Science Services Administration, and U.S. Weather Bureau publications listed in selected references.

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AVERAGE TEMPERATURE AND PRECIPITATION DATA IN THE DESERT EXPERIMENTAL RANGE

TABLE 3-1

Bonneville Basin and the Calcareous Mountains sections. The Calcareous Mountains section includes the Needle Range and the Wah Wah Mountains; the San Francisco Mountains east of Wah Wah Valley are included in the Bonneville Basin section (Cronquist et al., 1972).

The Calcareous Mountains section, covering more than 16,000 square miles (4,144,000 ha), is typified by limestone mountains, by high valleys containing Artemisia, and by the lack of permanent lakes in the basins. Pine Valley is entirely within this section.

The southern end of the Highland, Schell Creek, and Egan ranges marks the southern limits of this section. This section has the most endemic plant species of any section within the Great Basin. Some of these species include (Cronquist et al., 1972):

Arenaria stenomeres
Astragalus calycosus var. monophyllidius
Astragalus chamaemeniscus
Astragalus convallarius var. finitimus
Astragalus lentiginosus var. latus
Astragalus minthorniae var. gracilior
Astragalus oophorus var. lonchocalyx
Cymopterus basalticus
Erigeron jonesii
Eriogonum eremicum
Eriogonum holmgrenii
Frasera gypsicola
Lewisia maguirei
Machaeranthera grindelioides var. depressa
Penstemon concinnus
Penstemon decurvus
Penstemon francisci-pennellii
Penstemon nanus
Phlox griseola subsp. tumulosa
Phlox kelseyi subsp. salina
Primula nevadensis
Scutellaria nana var. sapphirina

Northern and eastern Wah Wah Valley lie in the Bonneville Basin section, and the western and southern portions lie in the

Calcareous Mountains section. The Bonneville Basin section includes all the lands flooded by Lake Bonneville, a Pleistocene lake. The lake carved terraces in the mountain slopes and alluvial fans in the area. Sevier Lake, north of Wah Wah Valley, is a remnant of Lake Bonneville. Precipitation in this area is very low. Endemic plants include Cuscuta warneri, Eriogonum brevicaule var. cottamii, Eriogonum desertorum, Eriogonum nummulare, Laphamia stansburii, Penstemon tidestromii, and Sphaeralcea caespitosa (Cronquist et al., 1972).

Plant communities within the Great Basin have been divided into vegetation zones, defined as "large climax unit[s] whose boundaries are caused primarily by the effects of the climate and soil on the distribution of the dominant species of the zone" (Billings, 1951).

The four principal intermountain vegetation zones are the Creosote Bush Zone, the Shadscale Zone, the Sagebrush Zone, and the Pinyon-Juniper Zone (Cronquist et al., 1972). The major plant communities within these zones are shown in Table 3-2.

3.2.1.1 Zone I: Creosote Bush Zone

Although most of this zone lies south of Pine and Wah Wah valleys, and no creosote bush (Larrea tridentata) is found in either valley, transitional vegetation such as spiny hopsage (Grayia spinosa), Anderson wolfberry (Lycium andersonii), and Joshua tree (Yucca brevifolia) associations, normally included in Zone I, are found in Pine Valley. Blackbrush (Coleogyne ramosissima) is associated with both Zone I and Zone II.

ZONE I Creosote Bush Zone

Community types:

A. Creosote bush (Larrea tridentata)
B. Hopsage (Grayia spinosa)
C. Joshua Tree (Yucca baccata)

ZONE II Shadscale Zone

Community types:

A. Shadscale (Artriplex confertifolia)
B. Winterfat (Ceratoides lanata)
C. Disturbance (Salsola iberica, Bromus tectorum)
D. Blackbush (Coleogyne spinescens)
E. Greasewood (Sarcobatus vermiculatus)
F. Saltgrass (Distichlis spp.; Sporobolus airoides)

ZONE III Sagebrush Zone

Community Types:

A. Big sagebrush (Artemisia tridentata)
B. Bunchgrass (Hilaria spp.; Aristida spp.)

ZONE IV Pinyon-Juniper Woodland

Community Types:

A. Open Woodland (Pinus monophylla; Juniperus osteosperma)

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* Based on Cronquist et al., 1972.

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PLANT ZONES AND COMMUNITIES
EXPECTED IN PINE AND
WAH WAH VALLEYS

TABLE 3-2

Some shrubs typical of creosote bush zone include:

Acamptopappus shockleyi	Grayia spinosa
Ambrosia dumosa	Krameria parvifolia
Atriplex confertifolia	Lycium andersonii
Dalea fremontii	Menodora spinescens
Encelia farinosa	Opuntia spp.
Ceratoides lanata	Yucca schidigera

3.2.1.2 Zone II: Shadscale Zone

The shadscale and sagebrush zones account for the majority of the vegetation in the Utah IOC valleys. The shadscale zone, also called the saltbush or salt desert scrub zone, is usually dominated by shadscale (Atriplex confertifolia). Shadscale has a lower moisture requirement and a higher salt tolerance than sagebrush and is thus found in more saline areas. Several plant associations are typical of the shadscale zone. The climax community, shadscale (Atriplex confertifolia)/galleta grass (Hilaria jamesii), is found in large areas of Wah Wah Valley. Winterfat (Ceratoides lanata) is often found in pure stands within the shadscale and sagebrush vegetation zones. This is a highly desirable browse species for both wild and domestic herbivores. There is a considerable amount of winterfat within Pine and Wah Wah valleys at present. Disturbance or overgrazing of winterfat areas tends, over a period of time, to eliminate this species in favor of cheatgrass (Bromus tectorum), Russian thistle (Salsola iberica), or halogeton (Halogeton glomeratus). Seedings of crested wheatgrass have also been made in some areas to increase the existing forage.

Several introduced species are typical of disturbed areas. Halogeton glomeratus, an annual weed introduced from Asia, spreads rapidly in disturbed areas, and no means of eradicating it have been found. It contains a large quantity of oxalic acid and is very toxic to grazing livestock (Cronquist et al., 1972).

Cheatgrass (Bromus tectorum) is an annual grass introduced from Eurasia. It spreads rapidly, crowding out native grasses in overgrazed areas. It finishes its growing cycle early in the year and becomes a fire hazard in the summer. Chukars (Alectoris graeca) rely heavily on cheatgrass in the winter (Hitchcock et al., 1969). The barbed seeds of cheatgrass catch in the hair of animals, and it is spread wherever they graze. It also becomes caught in their eyes and ears, causing discomfort and sometimes disability (Muenscher, 1975).

Russian thistle, or tumbleweed (Salsola iberica), is not a true thistle; it is a member of the family Chenopodiaceae. It rapidly invades disturbed or overgrazed ranges and is perhaps the most common weed of the semidesert areas of western North America. Domestic livestock eating green Salsola are subject to scours (Hitchcock et al., 1964).

Blackbrush (Coleogyne ramosissima) and galleta grass (Hilaria jamesii) form a community on non-saline, sandy soils in areas where rainfall is less than six inches (15 cm) (Cronquist et al., 1972).

Bud sagebrush (Artemisia spinescens) is often found with greasewood (Sarcobatus vermiculatus) on the more saline valley floors.

Where the salt level is very high, plants such as iodine bush (Allenrolfea spp.) and dropseed (Sporobolus airoides) appear more frequently.

3.2.1.3 Zone III: Sagebrush Zone

Areas otherwise much like the shadscale areas but with greater than 7 inches (18 cm) of rainfall have a sagebrush or a sagebrush-grass climax vegetation. Big sagebrush (Artemisia tridentata) is the most common species, but A. arbuscula, A. spinescens, and A. nova also cover considerable area within this zone. Bitterbrush (Purshia tridentata) is palatable to many wild and domestic animals and rapidly disappears in overgrazed areas, although it slowly recovers from rootstocks if the roots are not damaged and if wildlife or livestock foraging is not too severe (Cronquist et al., 1972).

Various rabbitbrush communities with dominants such as Chrysothamnus viscidiflorus, C. greenei, and C. nauseosus, are found within the sagebrush zone, and C. viscidiflorus is also a very common subdominant plant in sagebrush areas.

Other important shrubs of the sagebrush zone include:

Coleogyne ramosissima
Ephedra torreyana
Ephedra viridis
Grayia spinosa
Leptodactylon pungens
Ribes velutinum
Symphoricarpos sp.
Tetradymia glabrata

The galleta grass (Hilaria spp.)/three-awn grass (Aristida spp.) community is considered by Conquist (1972) to belong to the sagebrush zone. Plants associated with this community include:

Artemisia filifolia
Berberis fremontii
Bouteloua gracilis
Chrysopsis villosa
Chrysothamnus nauseosus
Encelia farinosa
Ephedra torreyana
Ephedra viridis
Lepidium fremontii
Oryzopsis hymenoides
Poliomintha incana
Quercus undulata
Sphaeralcea grossulariifolia
Sphaeralcea leptophylla
Sporobolus cryptandrus
Stephanomeria pauciflora

3.2.1.4 Zone IV: Pinyon-Juniper Zone

Pinyon-juniper is the major forest type of the Intermountain Region. Its range is usually between elevations of 5000 and 8000 feet (1538 and 2460 m) on the lower mountain slopes and upper bajadas in the valleys. Limited regions of pinyon-juniper woodland are found at the edges of Pine and Wah Wah valleys. The forest canopy in this community is not solid, and the plant community contains a significant number of shrubs (Cronquist et al., 1972), including:

Artemisia spp.
Chrysothamnus spp.
Cowania mexicana
Ephedra viridis
Gutierrezia sarothrae
Quercus gambelii
Sambucus racemosa
Symphoricarpos oreophilis
Tetradymia canescens

The vegetation communities in Pine Valley closely follow the various soil and hydrogeologic boundaries. Pinyon-juniper forests edge the valley, especially in the northern and southern ends. The lowest area in Pine Valley around the playa is characterized by halophytes; other areas of the valley floor are dominated by shadscale or related communities. The bajadas contain mainly sagebrush communities. Agricultural crops also cover some portions of the valley (HDR, 1980).

3.2.2 Threatened, Endangered, and Sensitive Plant Species

A number of plants have been recorded from Pine Valley that are listed as Taxa Currently Under Review in the Federal Register (15 December 1980) or are listed as priority species by the Utah Native Plant Society.

Sclerocactus pubispinus, listed as a Taxon Currently Under Review (Category 2), is reported to have nine populations in the valley, ranging from 3 to 32 individuals, and averaging about 14 plants per population. They occur at elevations between 5600 and 6300 feet (1723 to 1938 m).

Six populations of *Coryphantha vivipara* var. *rosea*, a species listed as a Taxon Currently Under Review (Category 2), are reported from the valley. They range in size from 10 to 94 individuals and average about 45 plants per population. They are found at elevations between 5600 and 6800 feet (1723 to 2092 m).

Penstemon nanus, a Taxon Currently Under Review (Category 2), has been reported from eight different locations in the valley.

Population sizes range from a single individual to over 200 individuals, but the average population size is well over 100 plants. Elevations of the populations range from 5600 to 6400 feet (1723 to 1969 m).

One population of more than 250 individuals of *Penstemon concinnus*, a Taxon Currently Under Review (Category 1), has been reported at an elevation of 7120 feet (2191 m).

Two populations of Cymopterus basalticus, a Taxon Currently Under Review (Category 2), have been reported at elevations of 5600 feet and 6300 feet (1723 and 1938 m); one contains over 200 individuals and the other over 50 individuals.

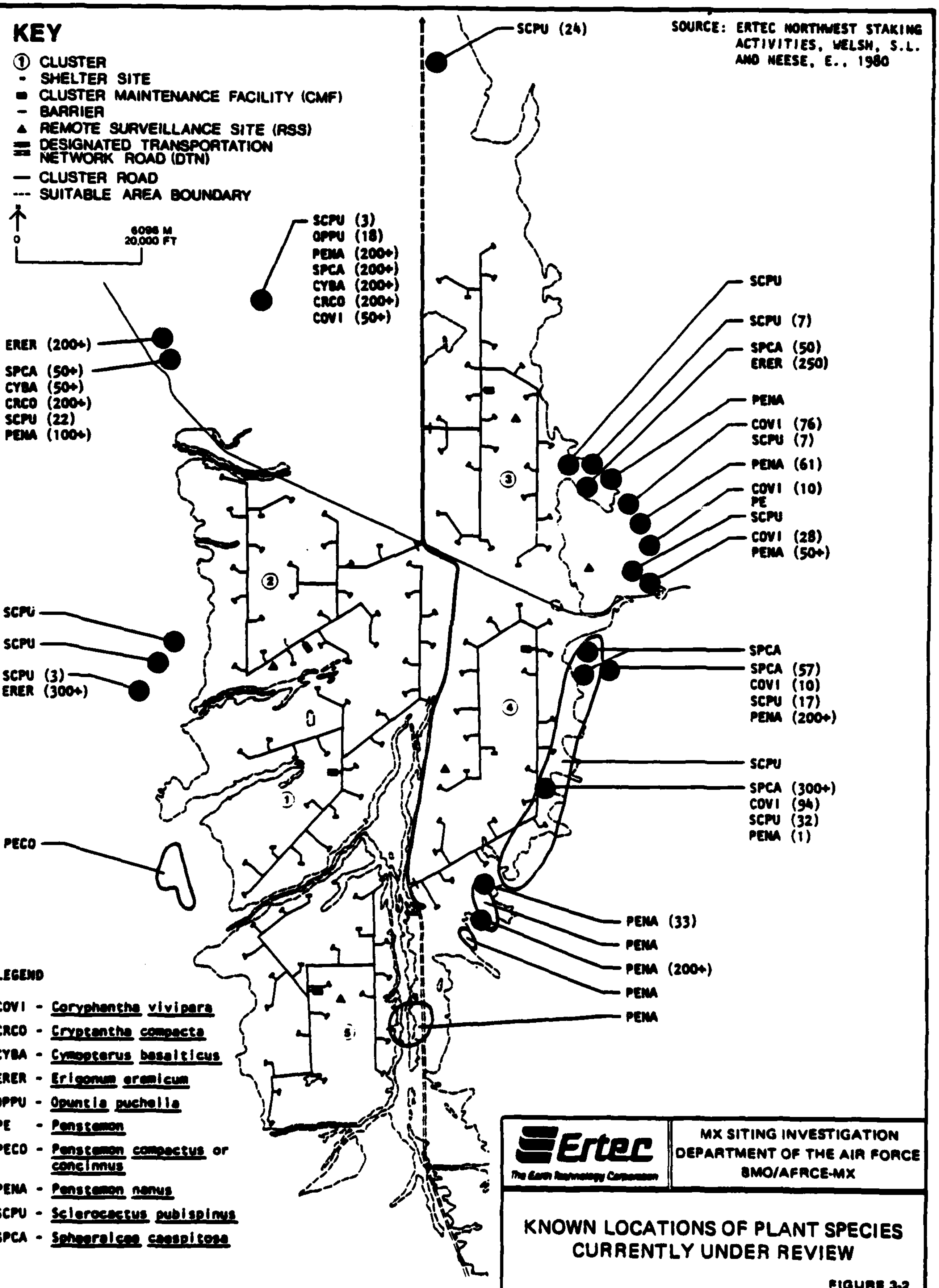
Two populations of Cryptantha compacta, a Taxon Currently Under Review (Category 1), were reported within a mile of the Cymopterus basalticus populations. Each contains over 200 individuals.

Sphaeralcea caespitosa, a Taxon Currently Under Review (Category 1), has been reported from five locations in Pine Valley. Population sizes range from 50 to over 300 individuals, with an average of approximately 150 plants. The plants were found at elevations between 5600 and 6300 feet (1723 and 1938 m).

Three populations of Eriogonum eremicum, a Taxon Currently Under Review (Category 2), are reported from elevations of 5860 and 6300 feet (1803 and 1938 m); each has from 200 to 300 or more individuals.

Lepidospartum latisquamum was recorded from four Pine Valley sites in 1933 and 1935 (Fulmer, 1980). This species is considered rare or unusual and sensitive in Utah by the Utah Native Plant Society, but it is not a candidate for Federal Register listing.

Approximate locations of these populations are shown in Figure 3-2. Most species appear to be located on the valley edges or



LEGEND

COVI - Coryphantha vivipara
CRCO - Cryptantha compacta
CYBA - Cymopterus basalticus
ERER - Erigonum eremicum
OPPU - Opuntia puchella
PE - Penstemon
PECO - Penstemon compactus or concinnus
PENA - Penstemon nanus
SCPU - Sclerocactus pubispinus
SPCA - Sphaeralcea caespitosa

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KNOWN LOCATIONS OF PLANT SPECIES CURRENTLY UNDER REVIEW

FIGURE 3-2

at elevations somewhat above the valley floor, outside of the study area.

3.2.3 Threatened and Endangered Wildlife Species

To avoid repetition, background information for species occurring in both Pine Valley and Wah Wah Valley is presented here, along with information specific to Pine Valley. Specific abundance and range information on species in Wah Wah Valley is discussed in Section 4.2.3.

3.2.3.1 Utah Prairie Dog (*Cynomys parvidens*)

The Utah prairie dog is federally listed as endangered by the U.S. Fish and Wildlife Service (1980). It is found nowhere in the world except Utah, and a number of transplanted colonies are known to inhabit the southern portion of Pine Valley.

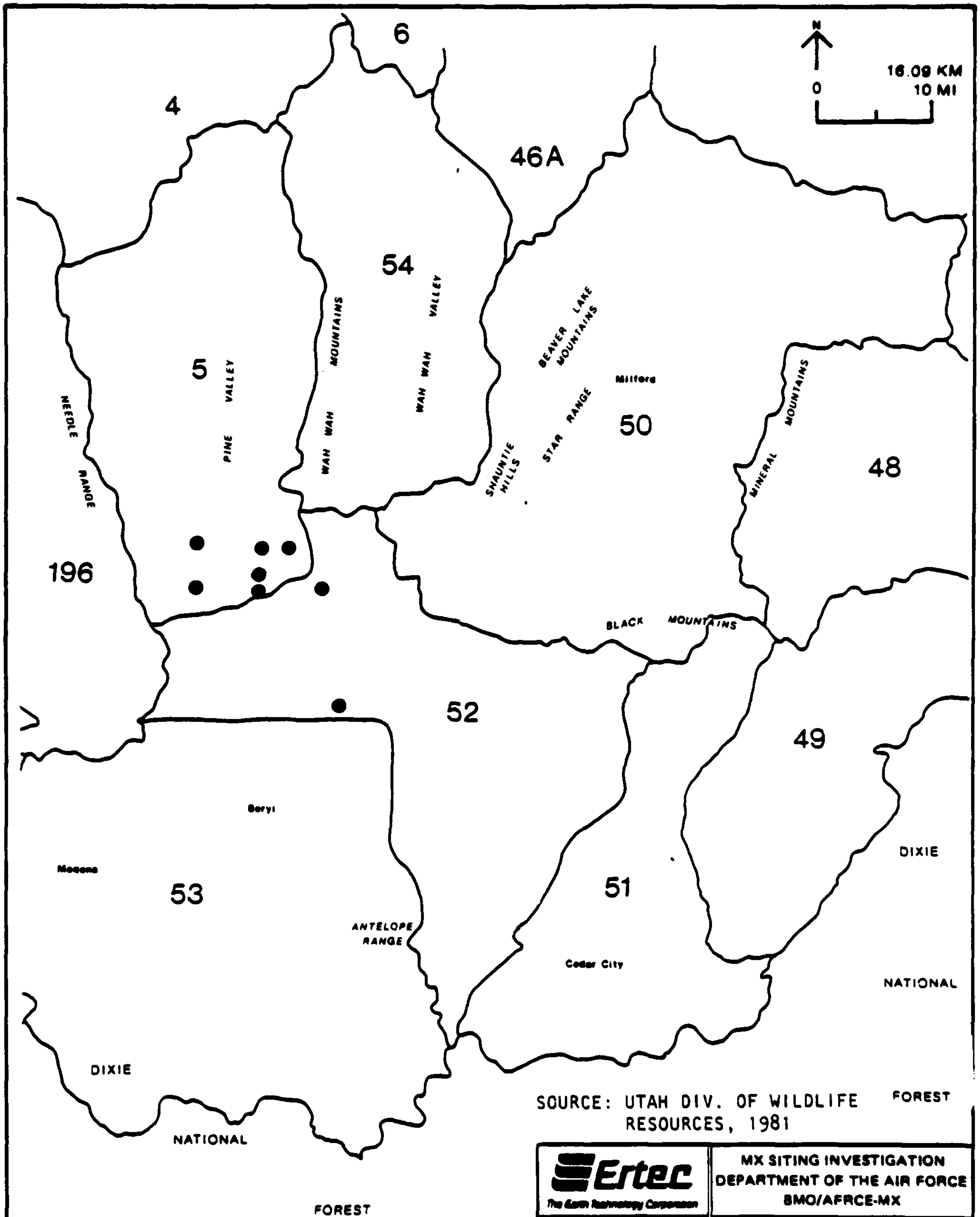
Prairie dogs require a deep, well-drained soil that prevents the burrows from flooding. They favor lightly grazed areas, because the grazing keeps the brush level low enough for a standing prairie dog to survey the surroundings for danger. Since prairie dogs get most of their water from plants, forbs are extremely important in the prairie dog diet. They are particularly fond of alfalfa but also eat Cicadidea insects when available. The breeding season, when females need twice their non-breeding energy, corresponds with the peak abundance of spring growth of forbs (Utah Division of Wildlife Resources (DWR), no date).

Swales at elevations of approximately 7150 feet (2200 m) or less are favorable areas for prairie dogs. Areas with few badgers are best, because badgers seem to be able to dig out poorly situated or new colonies very quickly. Drought is a major factor in decline of prairie dog numbers, as it severely limits the growth of forbs (Utah DWR, no date).

In 1972, the Utah Division of Wildlife Resources began transplanting Utah prairie dogs from private lands to public lands. This process is very expensive and time consuming, and has had only a five percent success rate. The animals must be tended constantly for approximately a week when they are first moved to protect them from predators. Outside their burrows, prairie dogs are very susceptible to predators; they often leave new burrows if the burrows are not suitable or if they are not deep enough for protection. The colonies in southern Pine Valley have been among the most successful of the Utah DWR transplants (Hasenyager, 1981). Locations of the populations in the IOC shelter valley vicinity are shown in Figure 3-3, and locations in relation to the study area are shown in Figure 3-4.

3.2.3.2 Black-footed ferret (Mustela nigripes)

The black-footed ferret is listed as endangered by the U.S. Fish and Wildlife Service (1980). There are scattered, unconfirmed reports of sightings from Uinta Basin in 1972 and 1975, from New Green River in 1976, and from Rich and Emery counties in 1977 and 1978. The primary prey of the black-footed ferret is the prairie dog (Utah DWR, 1980). The recently successfully



SOURCE: UTAH DIV. OF WILDLIFE RESOURCES, 1981

NUMBERS REFER TO HYDROGRAPHIC AREAS.

● PRAIRIE DOG COLONIES

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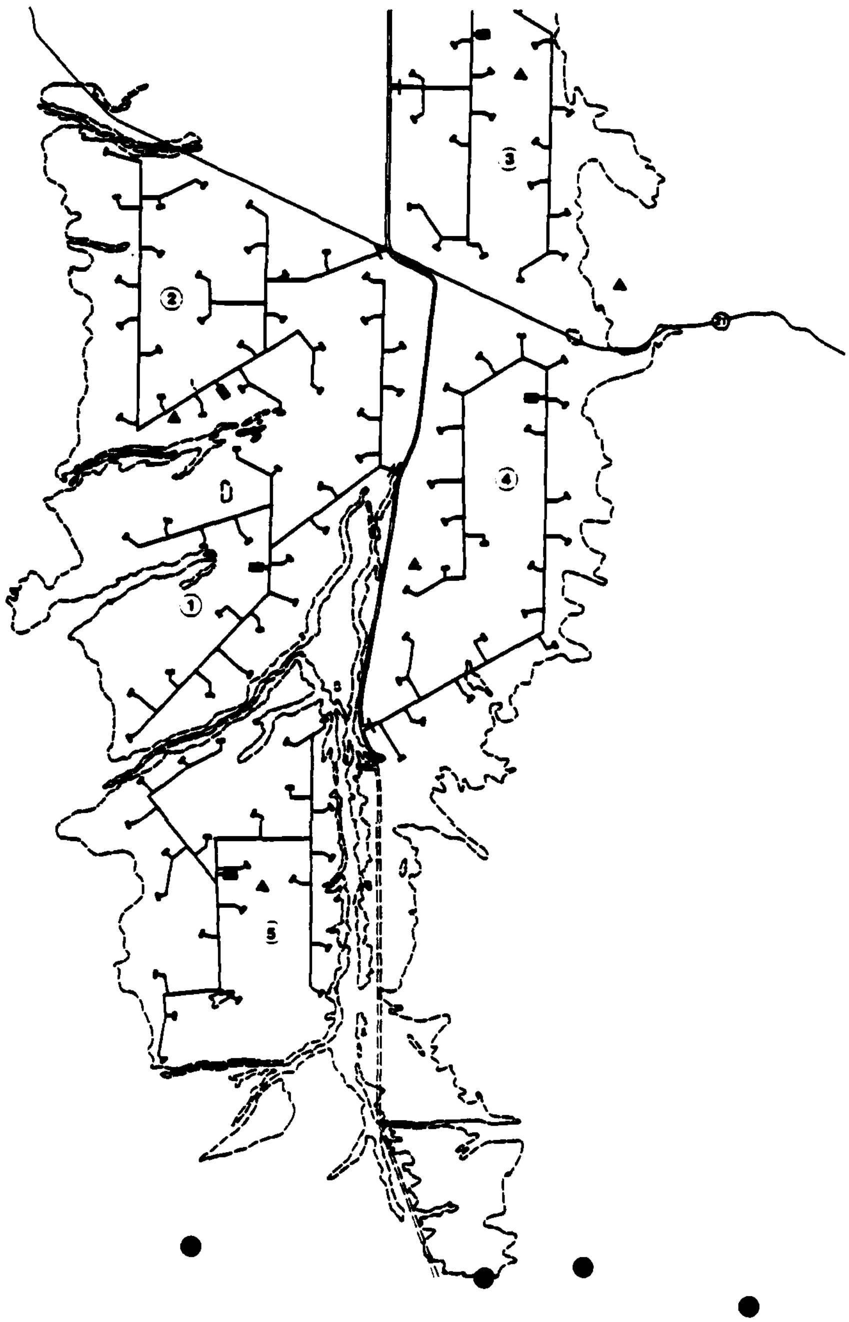
PRAIRIE DOG COLONY DISTRIBUTION IN THE VICINITY OF THE IOC VALLEYS

FIGURE 3-3

SOURCE: UDWR, 1980



KEY

- ① CLUSTER
- • SHELTER SITE
- ▬ CLUSTER MAINTENANCE FACILITY (CMF)
- – BARRIER
- ▲ REMOTE SURVEILLANCE SITE (RSS)
- ≡ DESIGNATED TRANSPORTATION NETWORK ROAD (DTN)
- — CLUSTER ROAD
- --- SUITABLE AREA BOUNDARY

0 6096 M 20,000 FT

● PRAIRIE DOG COLONIES

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PRAIRIE DOG COLONY LOCATIONS IN THE PINE VALLEY STUDY AREA

FIGURE 3-4

transplanted Utah prairie dogs in Pine Valley may provide a potential food source and appropriate habitat for the ferrets, although no ferrets are presently known from the area.

3.2.3.3 Bald Eagle (Haliaeetus leucocephalus)

The bald eagle is federally classified as endangered (U.S. Fish and Wildlife Service, 1980). Utah's population is estimated at 250-350 birds (Utah DWR, 1980).

Although principal prey species of the bald eagle vary with habitat, the birds feed primarily on dead or weak animals. Jackrabbits are the major food source in desert scrub lands. During winter months, bald eagles often roost in communal roosts located in tall trees in canyons or in planted groves in open valleys. The birds are sensitive, especially at the roost site, and may abandon the area if disturbed. Habitat loss from development and pesticide poisoning and shooting are the principal reasons for the eagles' decline.

The bald eagle winters primarily in desert valleys associated with waterways or marshes. A major wintering area for many of Utah's bald eagles is near Cedar City. Northeast of Cedar City, there is a feeding and day use area and a major winter roost site for approximately 70 birds (Platt, 1976; Coffeen, 1981). Documented bald eagle sitings are scattered frou the south end of the Crickett Range to south of Cedar City (BLM, 1980). Pine Valley has had several documented winter sightings, and the valley is used during both fall and spring migration (U.S. Department of Interior, 1980c; Utah DWR, 1980).

3.2.3.4 Peregrine Falcon (Falco peregrinus anatum)

The American peregrine falcon is federally classified as endangered (U.S. Fish and Wildlife Service, 1980). The mountains of western Utah provide peregrine nesting habitat, principally in the Wasatch Range. The peregrine falcon feeds on birds, especially waterfowl and shorebirds; cliffs near permanent waterways are their preferred nesting habitat. The decline in numbers is attributed to pesticide poisoning of their food source and illegal capture by falconers (White, 1981). The status of the peregrine in Pine and Wah Wah valleys is not well known, but small numbers of spring and fall migrants have been documented from the area (Behle and Perry, 1975).

3.2.4 Other Wildlife Species of Concern

3.2.4.1 Bobcat (Lynx rufus)

Bobcats, expected to occur in the vicinity of the study, are classified as being "Under Investigation" by the Utah DWR (1980), because excessive hunting pressure has decreased their numbers.

The bobcat is considered a protected species (Coffeen, 1981) and a species of high interest to the state (Utah DWR, 1980). Bobcat den sites are considered critical habitat by the Utah DWR (Day, 1980).

In Utah, near Pine and Wah Wah valleys, bobcats occur primarily in pinyon/juniper communities found at elevations between 5000 and 8000 feet (1538 and 2640 m) (Ball, 1981; Cronquist, 1972).

The bobcat range extends somewhat lower than this in wash areas, but the bobcat habitat near Pine and Wah Wah valleys does not usually include the valley floor (Ball, 1981).

3.2.4.2 Kit Fox (Vulpes macrotis)

The kit fox is considered a species of high interest to the state (Utah DWR, 1980). It is considered a protected species and is currently in the Status Questioned category of the unofficial state list (Utah DWR, 1980). Kit fox burrows or den sites are considered key habitat areas by the Utah DWR (Day, 1980).

Kit fox are usually widespread in shadscale scrub areas, such as those found in Pine and Wah Wah valleys (Egoscue, 1956; Ball, 1981). Kit fox are fairly common in Pine Valley. High concentrations of kit fox are possible, and their denning areas must be determined by extensive field research (Ball, 1981). The kit fox has little wariness of man, which may allow it to adapt to man's activities but may also make it an easy target for poachers or harassment.

3.2.4.3 Gray Fox (Urocyon cinereoargenteus)

Gray fox burrows or den sites are considered key habitat areas by the Utah DWR (Day, 1980).

Gray fox do not frequent the valley floors in southwestern Utah, although they are present in the surrounding areas of higher elevation (Ball, 1981).

3.2.4.4 Elk (Cervus canadensis)

As a game animal, the elk is protected by state law. It is a species of high interest to the state (Utah DWR, 1980). Sage-brush/ pinyon/juniper areas of foothills and adjacent higher elevations that provide elk winter range and aspen/fir areas of highest elevations that provide summer range are considered critical habitats by the Utah DWR (Day, 1980). Several winter range areas are located in the vicinity of Pine Valley. Populations in the vicinity of the Utah study area are illustrated in Figure 3-5, and range within Pine Valley is shown on Figure 3-6.

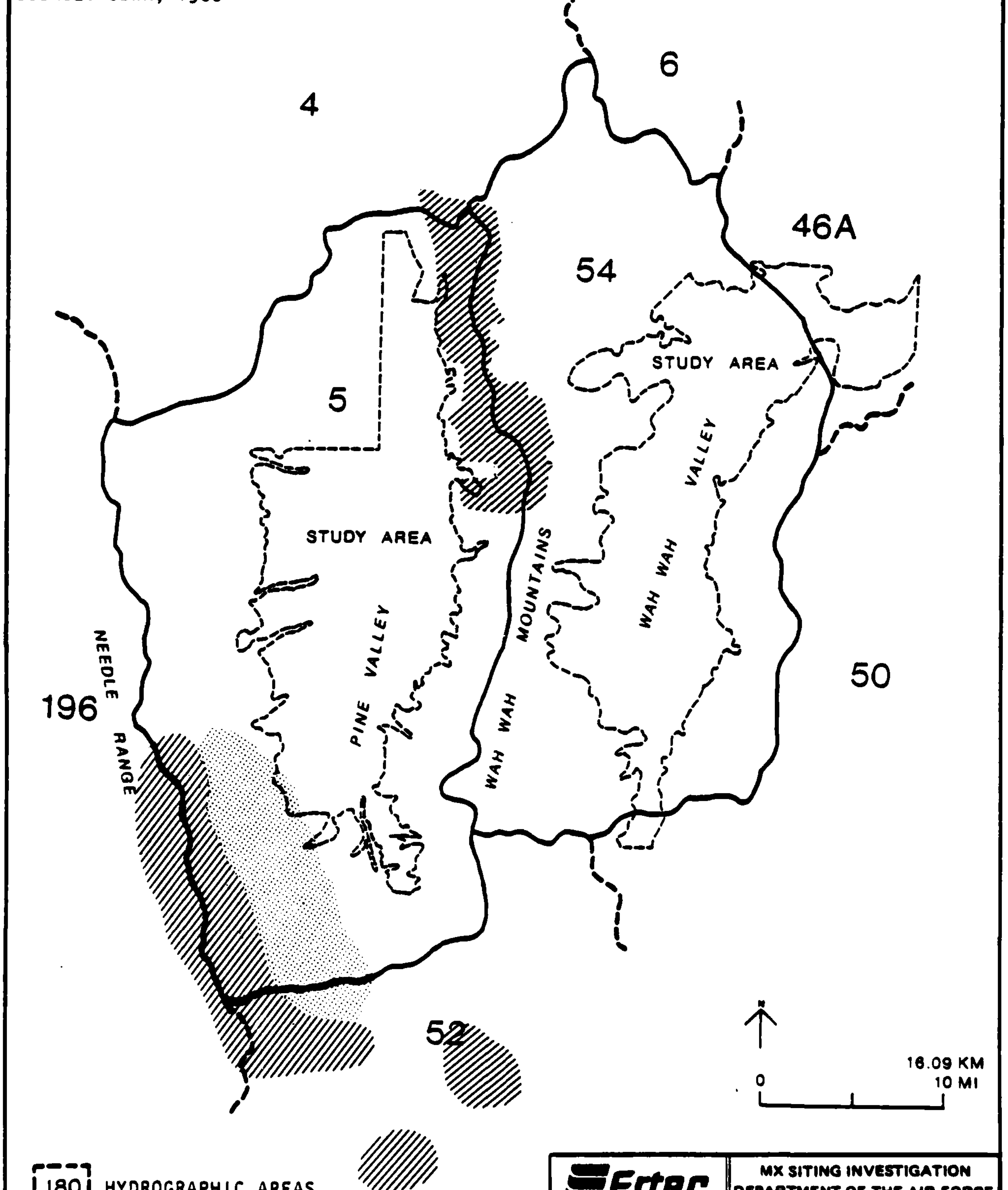
The elk inhabiting these areas migrate from the Indian Peak Wildlife Management Area. It is reasonable to assume that two smaller areas of elk winter range are connected by a corridor to the larger ranges; these corridors should also be determined and avoided (Coffeen, 1981).

The elk in this area were introduced and currently number approximately 50-60 animals. The herd is not yet increasing due at least in part to poaching and to fawns falling prey to cougars (Coffeen, 1981). Spring, summer, fall, and winter range, as well as calving areas, are located adjacent to the southeastern edge of the Pine Valley study area, and the lower limits of the summer range extend into a small portion of proposed Cluster 5.

3.2.4.5 Mule Deer (Odocoileus hemionus)

The mule deer is protected as a game animal in Utah and is considered a species of high interest to the state (Utah DWR,

SOURCE: UDWR, 1980



180 HYDROGRAPHIC AREAS

SUMMER RANGE - LOWER LIMITS

WINTER RANGE - LOWER LIMITS

SUITABLE AREA BOUNDARY

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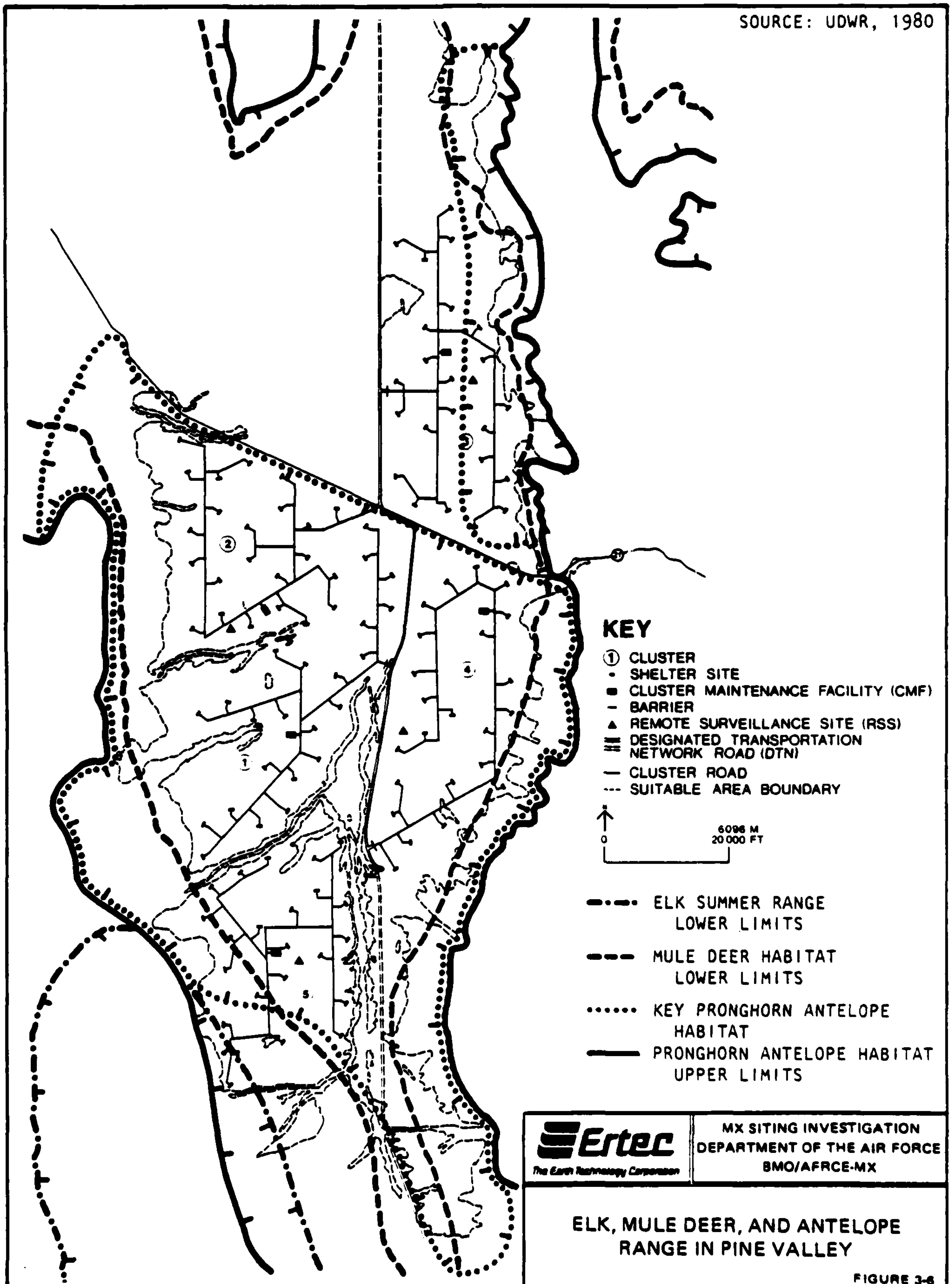
ELK RANGE IN THE VICINITY OF THE IOC VALLEYS

FIGURE 3-6



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ELK, MULE DEER, AND ANTELOPE
RANGE IN PINE VALLEY

FIGURE 3-6

1980). Sagebrush/pinyon/juniper areas of foothills and adjacent higher elevations provide deer winter range, and aspen-fir areas of highest elevations provide deer summer range; these areas are considered critical habitat by the Utah DWR (Day, 1980).

There are several areas of year-round habitat in the study area and vicinity. The mule deer populations in these areas are concentrated at the valley edges (Coffeen, 1981). Spring, summer, fall, and winter range, as well as fawning areas, are located adjacent to the valley and extend into the study area in several clusters. A few shelter sites in proposed Clusters 4 and 5 lie within the lower limits of the range.

3.2.4.6 Pronghorn Antelope (Antilocapra americana)

Antelope are protected as a game animal in Utah and are considered as a species of high interest to the state (Utah DWR, 1980). They are the most abundant big game in the area. Areas used year-round by antelope for fawning and winter range are considered critical habitat by the Utah DWR.

A population estimated at 1200 pronghorn antelope (*Antilocapra americana*) was reported in Utah in 1970. Seventy-five percent resided in a combination of saltbush/greasewood, Great Basin sagebrush, and pinyon/juniper woodlands. Sagebrush (mostly *Artemisia tridentata*) is a major food, especially for winter forage (Sundstrom et al., 1973). Browse is favored over grass in Utah pronghorn diets. In hot areas, forbs are a critical part of the pronghorn diet because the water in the forbs can reduce their dependence on scarce water supplies.

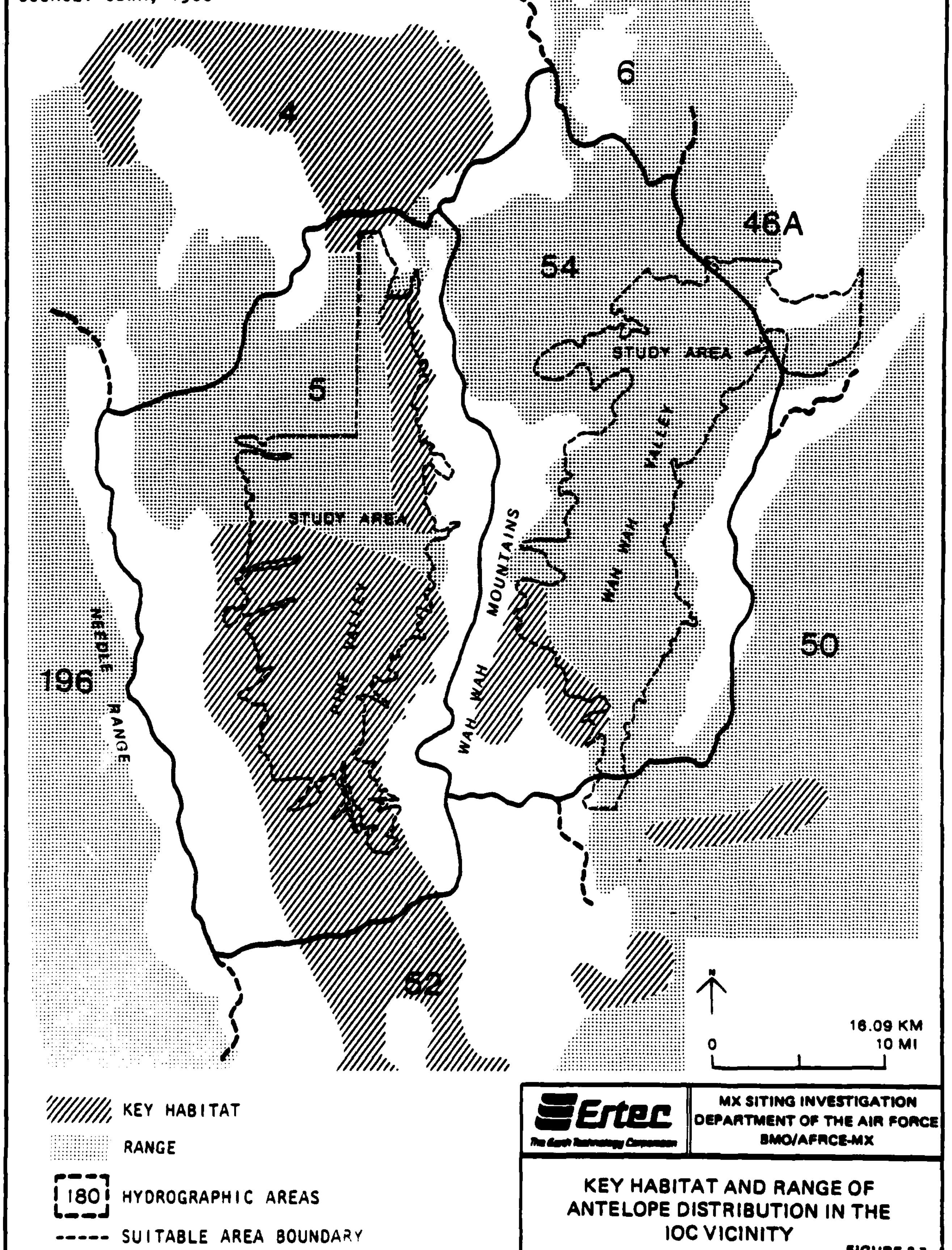
Optimum habitat has been characterized as having an open cover of low vegetation 18 inches (46 cm) or less in height that includes approximately 10-20 percent Artemisia spp., 5-15 percent other browse species, 25-35 percent forbs, and 40-60 percent grass. The animals need 3 to 5 quarts of water a day in hot, dry weather, and they need valleys, arroyos, or trees to protect them against winter cold stress (Sundstrom, et al., 1973).

In the past, human activity has been known to drive off the antelope. Re-introduction may be needed to reestablish a population after such disturbance (Coffeen, 1981).

Fences are also a serious threat to pronghorn survival, because the animals tend to become entangled in barbed-wire fences or, if pursued by predators, run parallel to the fence, becoming trapped in the fence corner (Hinman, no date; Beale and Smith, 1973).

Antelope are usually found in big sagebrush and black sagebrush bench areas in the Utah desert valleys. Pine Valley supports the largest population of pronghorn antelope in the southwest Utah desert. The resident population in Pine Valley consists of at least 400 animals, and the proposed study area contains large areas of key year-round habitat used for fawning, wintering, and watering (Utah DWR,1980). Range and habitat in the area surrounding the Utah IOC valleys is shown in Figure 3-7 and range in Pine Valley in Figure 3-6.

SOURCE: UDWR, 1980



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KEY HABITAT AND RANGE OF ANTELOPE DISTRIBUTION IN THE IOC VICINITY

FIGURE 3-7

3.2.4.7 Sage Grouse (Centrocercus urophasianus)

Sage grouse are protected as a game bird in the State of Utah, and sage grouse strutting grounds are considered critical habitat by the Utah DWR (Day, 1980). Sagebrush is the primary food source of adults, and forbs are also used from May through September (Oakleaf, 1971). In the spring, males perform courting rituals on established strutting grounds, preferring open areas surrounded by sagebrush. There is evidence that the strutting ground is the hub of year-round activity (Eng and Schladweiler, 1972; Wallestad and Pyrah, 1974). Nesting occurs on the ground, primarily within 2 miles of the strutting ground (Gill, 1965; Martin, 1970). The majority of nests are located under sagebrush with a canopy cover between 20 and 30 percent (Patterson, 1952).

During their first months, broods are dependent on the highly nutritious forbs occurring in open stands of sagebrush. As the summer progresses, adults and broods move to higher elevations, following green food plant areas (Klebenow, 1969). In late summer and fall, mountain meadows are used heavily and are important to sage grouse survival (Oakleaf, 1971). Travel distances between seasonal ranges varies with the severity of winter weather, topography, and vegetative cover.

Sagebrush removal, either chemical or mechanical, adversely affects sage grouse through loss of habitat (Peterson, 1970; Braun, et. al., 1977). Disturbance in areas adjacent to sagebrush control also causes abandonment of strutting grounds, brood-use areas, and wintering areas (Higby, 1969).

Pine Valley is known to support a large population of sage grouse (U.S. Department of Interior, 1980). The only strutting ground and the majority of the range in the valley is located in Cluster 5, although a small portion of Cluster 1 is also included within the range. Sage grouse range and strutting grounds in the Utah IOC valleys and vicinity are shown in Figure 3-8.

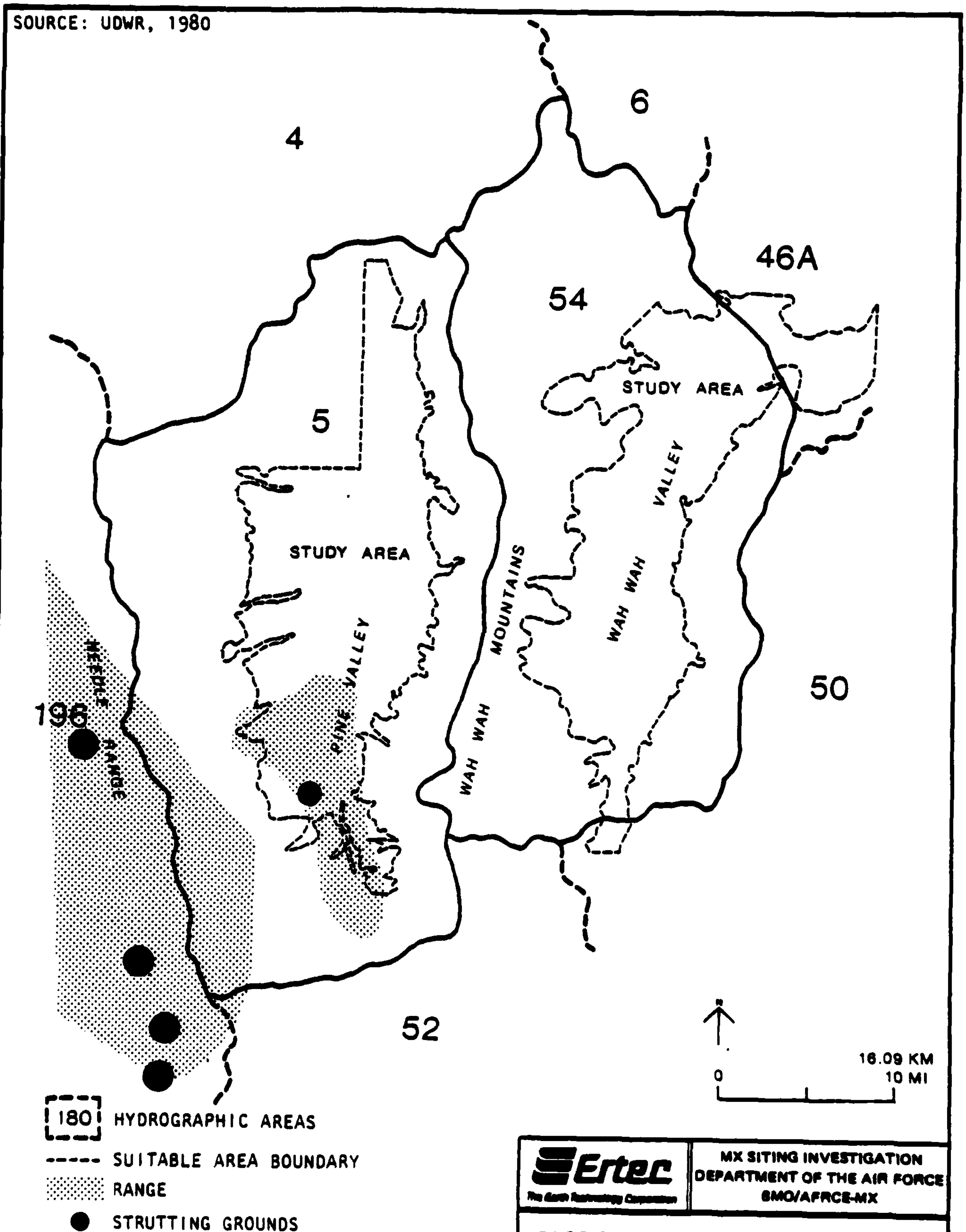
3.2.4.8 Raptors

In addition to the endangered bald eagle and peregrine falcon, a number of other important raptors are present in the valleys. The golden eagle (*Aquila chrysaetos*) is protected by state and federal law. Golden eagle nest sites are known to occur within the valleys, and eagles have been observed hunting within both Pine and Wah Wah valleys. The general relationship of nests to the study area is shown in Figure 3-9. Numerous raptor nests surround the valley, but none are known to be located within the study area itself although the birds utilize the area for hunting.

The ferruginous hawk is classified as a sensitive species by the Bureau of Land Management and the Utah DWR (Day, 1980). Numerous siting records exist for this hawk in southwestern Utah (Hayward, et al.,1976), and one nest is known from the vicinity of Pine Valley (Figure 3-9).

Prey is similar to that of other buteos and includes pocket gophers, ground squirrels, rabbits, and reptiles. Preferred

SOURCE: UDWR, 1980



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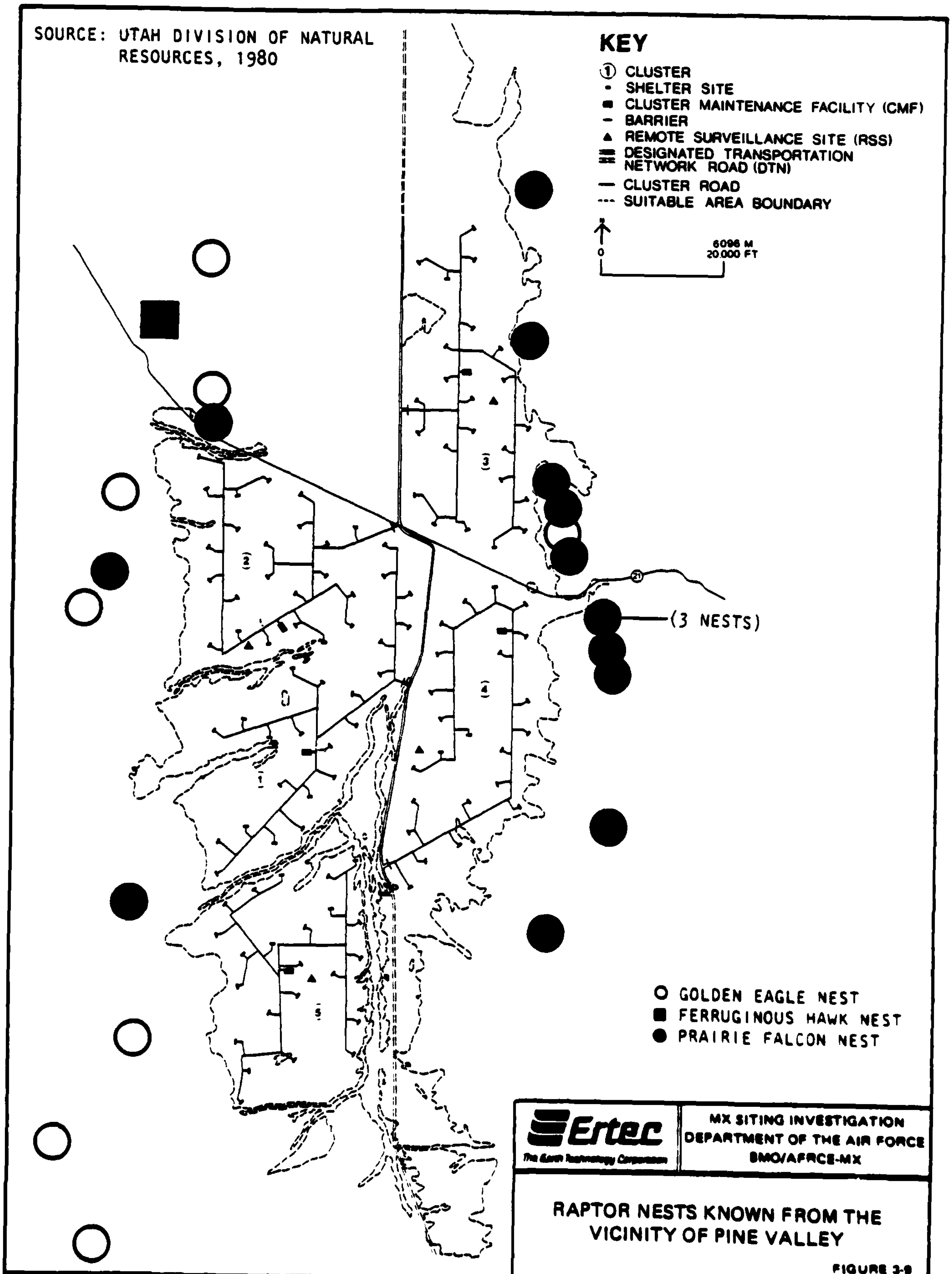
SAGE GROUSE RANGE AND STRUTTING GROUNDS IN THE PINE AND WAH WAH VICINITY

FIGURE 3-8



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RAPTOR NESTS KNOWN FROM THE VICINITY OF PINE VALLEY

FIGURE 3-9

nesting sites are juniper trees that occur along the valley foothills. These hawks are sensitive to human disturbance during the nesting season and activities as far as 1300 feet (1400 m) from the nest may cause stress (White, 1981). In a study of various disturbances at ferruginous hawk nest sites, it was determined that noise from firearms or motor vehicles close to these sites caused repeated flushing of adult birds and, in several instances, nest abandonment (White, et al., 1979).

A raptor survey of the Utah IOC areas (Murphy and White, 1980) indicates that in comparison to other MX valleys, raptors are of average or below average importance in Pine Valley, as shown in Table 3-3.

Breeding and resident raptors depend on the valley floor ecosystem for mammals, birds, and other prey. Migrants passing through the area use the valley floors as well as the surrounding areas for hunting. Wintering populations are also affected when habitat or the prey base is disturbed.

Raptors tend to be indicators of environmental conditions because they are high in the food chain and are sensitive to both direct and indirect disturbances of their habitat (White, 1981). Any significant impact on their prey base will be reflected relatively quickly by changes in raptor population.

Predator-prey relationships have been documented for many species. Buteos, such as the red-tailed hawk, have a diverse diet, which allows them to thrive even when a major prey species

Valley	State	% of Valley Sur-veyed	# Species Nesting (# Nests Observed)	Raptor Density[b]	Prey Base (Quantity)	Prey Base (Diversity)	Raptor Use Rating[c]
Dry Lake	NV	40	6(5)	Moderate	Fair	Good	4
Pine							
(north)	UT	30	4(5)	Sparse	Average	Average	3
(south)	UT	80	2(0)	Low	Low	Poor	2
Wah Wah	UT	80	6(21)	Moderate	Average	Average	3-4

(a) Source: Murphy and White, 1980.
(b) As compared to other valleys in the MX system.
(c) Based on scale of 1 to 5, where 1 is poor, and 5 is excellent.

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COMPARISON OF RAPTORS IN
THE IOC VALLEYS

TABLE 3-3

becomes scarce. However, more specialized hawks would be seriously affected. Eagles prefer larger prey such as jackrabbits, cottontail rabbits, and waterfowl where available. Red-tailed hawks take jackrabbits, cottontails, reptiles, and an assortment of rodents and birds. The prairie falcon prefers ground squirrels but will take other small mammals and birds when necessary. Nesting success and Townsend ground squirrel availability have been correlated for the prairie falcon (Collopy, 1978), and a decline in golden eagle reproduction has been correlated with a decline in black-tailed jackrabbits, their major prey item (Murphy, 1975).

3.2.4.9 Other Wildlife Expected

All fish species in Utah are protected, but no fish are known to be present in Pine Valley (Utah DWR, 1980).

All reptiles and amphibians are protected in Utah (Utah DWR, 1980). The Utah milk snake (*Lampropeltis triangulum gentilis*) and the Utah Mountain King snake (*Lampropeltis pyromelana infralabialis*), both classified as "limited" by the Utah DWR, are expected to occur in the vicinity of Pine Valley.

A number of other wildlife species that include mammals, birds, reptiles, and amphibians are likely to occur in Pine and Wah Wah valleys. A listing of these species is given in Appendix F.

3.3 FIELD SURVEY RESULTS

3.3.1 Overview of Plant Communities in Pine Valley

This section presents an overview of vegetation observed in Pine Valley during the field survey. A cluster-by-cluster discussion is provided in Section 3.3.5.

Xerophytic plant communities in desert regions are usually composed of three basic plant types: succulents; non-succulent perennials that have evolved drought-resistant adaptations; and ephemerals (annuals) (Daubenmire, 1974).

The vegetation of Pine Valley is composed mainly of xerophytic communities in which shrubs or a combination of shrubs and perennial grasses are the dominant plants. Annuals may comprise a large portion of the Pine Valley plant communities, especially in the spring and early summer months. Despite the time of year, the presence of some annual species was noted during the field survey, but proper identification and determination of range extension were not always possible.

In Pine Valley, succulents were represented by four members of the family Cactaceae: Coryphantha vivipara, Sclerocactus pubispinus, Opuntia spp., and Echinocereus engelmannii. The individuals were widely scattered and comprised less than one percent of the cover within the study areas.

Due to the season of the field investigation and the resulting lack of annuals, however, only the percent perennial cover was determined. Dominance was calculated on the basis of the percent cover of each species.

The data obtained from approximately 250 transects made at approximately 130 facilities sites clearly indicates the dominance of perennial shrubs and/or grasses at the time of the study. The percent perennial cover averaged from transects at each shelter site is summarized by cluster in Table 3-4. The average cover ranged from a low of 2.1 percent on Site 1/4 to a high of 41.3 percent on Site 5/23. The percent perennial cover for all shelter sites in Pine Valley averaged approximately 23 percent.

A comparison of the range and average cover in each cluster is summarized in Table 3-5. Because facility locations were selected for specific geologic and topographic conditions, vegetation may have been pre-selected for as well. The playa, for example, was devoid of vegetation. Washes and other unusual land formations likely to be characterized by different vegetation types were avoided in selection of facilities sites. The results obtained on the shelter and CMF sites cannot, therefore, be considered representative of the entire valley.

All coverage and density data obtained in the transects is provided in Appendix E. An examination of the density and coverage data reveals that these measurements do not always correlate. This illustrates that dominance in a community may be based either upon the percent cover or the number of individuals (density).

Dominant plant species were determined from transect results, and vegetation maps were prepared using these in conjunction with aerial photo interpretation. Three major vegetation zones and one subgroup (grasslands) were identified on facilities sites in the valley.

Shelter Site	Cluster				
	1	2	3	4	5
1	19.2	23.7	15.9	24.9	28.3
2	3.7	7.3	13.8	32.9	32.8
3	23.1	18.6	22.2	23.0	24.7
4	2.1	23.7	16.0	18.3	37.4
5	20.1	23.9	16.4	25.8	36.4
6	17.1	13.7	15.5	28.0	33.6
7	26.5	19.7	14.1	31.4	38.8
8	28.2	30.4	23.6	22.8	26.6
9	25.0	19.3	14.2	22.7	26.8
10	24.0	20.1	7.9	34.4	29.6
11	22.8	19.9	11.5	25.0	27.3
12	35.1	29.3	18.5	26.1	35.3
13	22.8	20.5	27.3	24.7	36.9
14	25.2	20.1	19.2	22.7	20.5
15	24.7	22.6	6.3	25.4	15.9
16	29.7	12.6	21.1	9.8	23.6
17	30.3	13.7	6.6	18.0	31.0
18	33.4	21.9	20.0	24.6	28.8
19	30.5	20.6	20.3	15.7	2.6
20	32.9	17.0	20.3	22.6	29.0
21	29.6	20.1	9.8	19.2	32.3
22	31.9	18.1	9.2	24.3	21.9
23	27.7	18.8	7.3	28.1	41.3

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AVERAGE PERCENT PERENNIAL COVER IN PINE VALLEY SHELTER SITES

TABLE 3-4

	Cluster				
	1	2	3	4	5
High	35.1	30.4	27.3	34.4	41.3
Low	2.1	7.3	6.3	9.8	2.6
Average	24.6	19.8	15.5	23.9	28.8

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RANGE AND AVERAGE PERCENT
PERENNIAL COVER BY CLUSTER

TABLE 3-8

Of these groups, the shadscale communities are by far the most common, having 36 different dominant and subdominant associations that cover an estimated 106,490 acres (43,096 ha), approximately 66 percent of the study area. Dominant/subdominant associations and their acreage within the study area are summarized in Table 3-6. The variety of dominant species in Pine Valley demonstrates that distribution of vegetation is determined by microhabitats and microclimates.

Table 3-7 lists all plant species observed in Pine Valley survey sites. Detailed species lists for vegetation and maps showing dominant and subdominant vegetation communities are described by cluster in Section 3.3.5.

3.3.2. Threatened and Endangered Plant Species

Two plants listed as "Taxa Currently Under Review" (Category 1) in the Federal Register (15 December 1980) were identified in Pine Valley. Cryptantha compacta (family Boraginaceae) was tentatively identified on Site 3/6, and definitely found on Site 5/12. Sclerocactus pubispinus (family Cactaceae) was found on Sites 2/16, 3/6, 3/12, and 3/14.

Coryphantha vivipara (family cactaceae), a taxon Currently Under Review (Category 2) was observed on Sites 3/6, 3/9, 3/12, 4/7, CMF4, and Resitings 4/7 and 4/10. It was thought to be variety rosea, but lack of flowers prevented positive identification. Location of these individuals are shown in Figure 3-10.

Zone	Type Number[a]	Dominant/ Subdominant Association[b]	Acreage[c]
Shadscale (Atriplex)	A1	Chgr/Orhy	8,843
	A2	Hija/Chgr	546
	A4	Chgr/Hija	1,534
	A5	Koam/Atco	4,020
	A6	Arsp/Hija	1,223
	A7	Spco/Atco	654
	A8	Atco/Cela	16,371
	A9	Koam/Hija	1,470
	A10	Atco/Gusa	838
	A11	Lyan/Koam	718
	A12	Chgr/Cela	15,672
	A13	Cela/Chgr	2,208
	A14	Orhy/Chvi	2,408
	A15	Chvi/Orhy	15,412
	A16	Cela/Gusa	1,466
	A17	Orhy/Cela	1,684
	A18	Spcr/Atco	3,133
	A20	Cela/Orhy	2,939
	A21	Atco/Chgr	682
	A22	Orhy/Atco	499
	A23	Chvi/Epne	818
	A24	Grsp/Chvi	1,911
	A25	Grsp/Epne	571
	A26	Atca/Orhy	1,871
	A27	Gusa/Chgr	1,495
	A28	Gusa/Spcr	3,250
	A29	Orhy/Gusa	151
	A30	Chvi/Cela	2,032
	A31	Chgr/Bogr	548
	A32	Cela/Atco	2,534
	A33	Chgr/Epne	1,047
	A34	Cela/Chvi	2.740
	A35	Gusa, Bogr	1,403
	A36	Chgr/Gusa	2,323
	A37	Atbo/Atco	1,476
			106,490

(a) Types mapped on Figures 3-25 through 3-29.
(b) Determined by coverage data from transects.
(c) Determined by planimetry and aerial photo interpretation.

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SUMMARY OF VEGETATION ZONES AND DOMINANT/SUBDOMINANT ASSOCIATIONS IN PINE VALLEY

Zone	Type Number	Dominant/ Subdominant Association	Acreage
Sagebrush (Artemesia)	B1	Artr/Hija	4,472
	B2	Arar/Chvi	5,463
	B3	Chgr/Artr	235
	B4	Artr/Chvi	16,873
	B5	Artr/Grsp	212
	B6	Artr ----	1,431
	B7	Chna/Artr	1,039
	B8	Arar/Stco	1,940
	B9	Artr/Gusa	2,653
	B10	Bogr/Artr	1,063
	B11	Arno/Chvi	595
			35,976
Juniper Woodland (Juniperus)	C1	Juos/Artr	7,544
	C2	Juos/Arar	268
			7,812
Grasslands*	D1	Spco/Hija	2,039
	D2	Hija/Orhy	1,584
	D3	Spcr/Orhy	5,305
	D4	Agde/Chvi	1,515
			10,443
		TOTAL ACREAGE	160,721

* Can be considered as a subgroup of the shadscale zone.

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SUMMARY OF VEGETATION ZONES AND DOMINANT/SUBDOMINANT ASSOCIATIONS IN PINE VALLEY

PAGE 2 OF 3

TABLE 3-6

Symbol	Scientific Name	Common Name
Agde	Agropyron desertorum	crested wheatgrass
Arar	Artemisia arbuscula	low sagebrush
Arsp	Artemisia spinescens	bud sagebrush
Artr	Artemisia tridentata	big sagebrush
Atbo	Atriplex bonnevillensis	shadscale
Atco	Atriplex confertifolia	shadscale
Bogr	Bouteloua gracilis	blue grama
Cela	Ceratoides lanata	winterfat
Chgr	Chrysothamnus greenei	Greene's rabbitbrush
Chna	Chrysothamnus nauseosus	rubber rabbitbrush
Chvi	Chrysothamnus viscidiflorus	Douglas rabbitbrush
Epne	Ephedra nevadensis	Mormon tea
Grsp	Grayia spinosa	spiny hopsage
Gumi	Gutierrezia microcephala	threadleaf snakeweed
Gusa	Gutierrezia sarothrae	broom snakeweed
Hija	Hilaria jamesii	galleta grass
Juos	Juniperus osteosperma	Utah juniper
Koam	Kochia americana	green molly
Lyan	Lycium andersonii	Anderson wolfberry
Orhy	Oryzopsis hymenoides	Indian ricegrass
Save	Sarcobatus vermiculatus	greasewood
Spco	Sporobolus contractus	spike dropseed
Spcr	Sporobolus cryptandrus	sand dropseed
Stco	Stipa comata	needle-and-thread grass

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SUMMARY OF VEGETATION ZONES AND
DOMINANT/SUBDOMINANT
ASSOCIATIONS IN PINE VALLEY

PAGE 3 OF 3 TABLE 3-6

AGAVACEAE
Yucca harrimaniae
Yucca sp.

APIACEAE
*Cymopterus sp.

ASTERACEAE
Ambrosia acanthicarpa
Artemisia arbuscula
Artemisia nova
Artemisia spinescens
Artemisia tridentata
*Brickellia sp.
Chaenactis sp.
Chrysothamnus greenei
Chrysothamnus nauseosus
Chrysothamnus viscidiflorus
Chrysothamnus sp.
Cirsium sp.
*Enceliopsis sp.
*Erigeron sp.
*Gutierrezia sarothrae
Leucelene ericoides
*Machaeranthera canescens
*Machaeranthera sp.
*Senecio sp.
Stephanomeria exiqua
Tetradymia axillaris
Tetradymia glabrata
Tetradymia spinosa
Townsendia florifer
*Townsendia sp.

BORAGINACEAE
**Cryptantha compacta
*Cryptantha sp.
Lappula sp.

BRASSICACEAE
Caulanthus pilosus
Descurainia pinnata
Descuriania sp.
*Lepidium montanum
*Lepidium sp
Physaria sp.
Stanleya pinnata
Stanleya sp.
*Unknown mustard

CACTACEAE
*Coryphantha vivipara
Echinocereus engelmannii
*Echinocereus sp.
Opuntia erinacea
*Opuntia sp.
**Sclerocactus pubispinus

CARYOPHYLLACEAE
*Arenaria sp.

CHENOPODIACEAE
Atriplex bonnevillensis
Atriplex canescens
Atriplex confertifolia
Ceratoides lanata
Chenopodium fremontii
Chenopodium sp.
Grayia spinosa
Halogeton glomeratus
Kochia americana
Salsola iberica
Salsola sp.
Sarcobatus vermiculatus

CUPRESSACEAE
Juniperus osteosperma

EPHEDRACEAE
Ephedra nevadensis
Ephedra sp.

FABACEAE
*Astragalus lentiginosus
Astragalus newberryi
*Astragalus sp.

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* Varities or Species of these Genera are listed as Currently Under Review in the Federal Register. The species or variety in Pine Valley could not be identified due to the season of the survey.

** Designated as Currently Under Review in the Federal Register.

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PLANT SPECIES OBSERVED IN PINE VALLEY

PAGE 1 OF 2 TABLE 3-7

HYDROPHYLLACEAE
*Phacelia sp.

LOASACEAE
*Mentzelia sp.

ONAGRACEAE
*Camissonia sp.
Oenothera caespitosa
*Oenothera sp.

PINACEAE
Pinus monophylla

POACEAE
Agropyron desertorum
Agropyron smithii
Aristida longiseta
Aristida purpurea
Aristida sp.
Bouteloua gracilis
Bromus tectorum
*Festuca sp.
Hilaria jamesii
Hordeum sp.
Oryzopsis hymenoides
Sitanion hystrix
Sitanion jubatum
Sporobolus contractus
Sporobolus cryptandrus
Stipa comata
Stipa coronata
Stipa sp.
Unknown

POLEMONIACEAE
*Gilia sp.
Ipomopsis congesta
Leptodactylon pungens
Leptodactylon sp.
*Phlox sp.

MALVACEAE
Sphaeralcea grossulariifolia
*Sphaeralcea sp.

NYCTAGINACEAE
Abronia sp.

POLYGALACEAE
Polygala acanthoclada

POLYGONACEAE
Eriogonum caespitosum
Eriogonum cernuum
*Eriogonum microthecum
Eriogonum pusillum
*Eriogonum sp.

RANUNCULACEAE
Delphinium sp.

ROSACEAE
Prunus fasciculata
Prunus sp.

SCROPHULARIACEAE
*Penstemon sp.

SOLANACEAE
Lycium andersonii
Nicotiana attenuata

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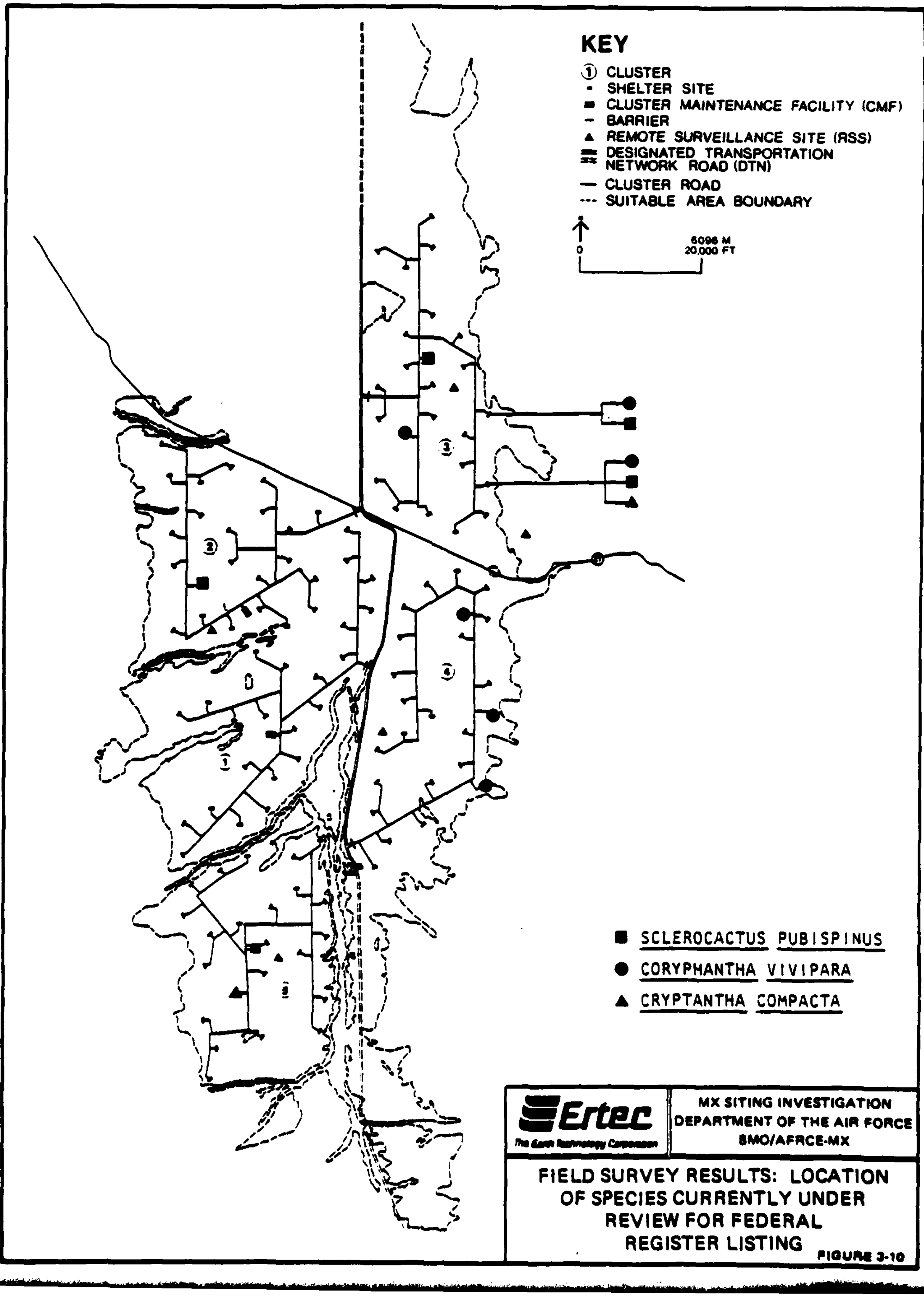
PLANT SPECIES OBSERVED IN
PINE VALLEY

PAGE 2 OF 2 TABLE 3-7



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FIELD SURVEY RESULTS: LOCATION OF SPECIES CURRENTLY UNDER REVIEW FOR FEDERAL REGISTER LISTING

FIGURE 3-10

A number of other plants that may be listed species, but which could not be identified to species or variety because of the condition of the plants in the winter, included: *Cymopterus* sp., *Brickellia* sp., *Enceliopsis*, sp., *Erigeron* sp., *Gutierrezia sarothrae*, *Machaeranthera canescens*, *Machaeranthera* sp., *Senecio* sp., *Townsendia* sp., *Cryptantha* sp., *Lepidium montanum*, *Lepidium* sp., *Echinocereus* sp., *Opuntia* sp., *Arenaria* sp., *Astragalus lentiginosus*, *Astragalus* sp., *Phacelia* sp., *Mentzelia* sp., *Sphaeralcea* sp., *Camissonia* sp., *Oenothera* sp., *Festuca* sp., *Gilia* sp., *Phlox* sp., *Eriogonum microthecum*, *Eriogonum* sp., and *Penstemon* sp.

It is unlikely that many of these are species Currently Listed or Currently Under Review, because many threatened, rare, or endangered species are known only from specific habitats not found in the study area or are known only from outside Utah.

3.3.3. Overview of Wildlife in Pine Valley

Wildlife species and signs were documented during the field survey. However, discontinuity of animal populations in both time and space have long been recognized as a natural phenomenon that complicates interpretation of survey results (Elton, 1927). In arid and semi-arid lands, events influencing population size and distribution are especially irregular in time and intensity (Low, 1979).

The abiotic desert environment has a strong influence on the developmental and reproductive processes of the animal inhabitants. Precipitation is the major factor controlling reproduction in desert habitats. Wildlife are strongly influenced by the annual precipitation rate, a factor that can fluctuate greatly from year to year (Riechert, 1979; Mayhew, 1966; Beatley, 1969b). For example, studies have shown that the spadefoot toad (Scaphiopus bombifrons) will not breed unless at least 2 mm of rain has fallen (Woody and Thomas, 1968). A direct relationship has also been shown between the biomass of rodents in an area and the rainfall (Harris, 1971).

Some animals depend indirectly on precipitation for food (Van DeGraaff and Bulda, 1973; Turner, et al., 1973; Chew and Chew, 1970). In arid regions, plant productivity is greatest in spring when temperature and moisture are less limiting. Animal activity also varies with temperature and light, both of which are functions of time. Species observed in early morning may have disappeared by the noontime heat. For these reasons, all wildlife activity could not be monitored at the time of the field study.

Many animals hibernate during the winter; because the survey was made during this time, little wildlife was observed, and the compiled species list (Table 3-8) does not include many species that may use the survey sites in the valley during other seasons.

The following sections present an overview of the major species observed within the valley during the field survey. A cluster-by-cluster discussion is given in Section 3.3.5.

Mammals

Black-tailed jackrabbit	*Lepus californicus*
Desert cottontail rabbit	*Sylvilagus audubonii*
Pocket gopher	*Thomomys* sp.
Kangaroo rat	*Dipodomys* sp.
Northern grasshopper mouse	*Onychomys leucogaster*
Coyote	*Canis latrans*
Kit fox	*Vulpes macrotis*
Skunk	Mustelidae
Badger	*Taxidia taxus*
Mule deer	*Odocoileus hemionus*
Pronghorn antelope	*Antilocapra americana*

Birds

Falcon	Falconinae
Northern harrier	*Circus cyaneus*
Short-eared owl	*Asio flammeus*
Horned lark	*Eremophila alpestris*
Common raven	*Corvus corax*
Chickadee	*Parus* sp.
Sage grouse	*Centrocercus urophasianus*
Wren	Troglodytidae

Reptiles

Side-blotched lizard	*Uta stansburiana*
Gopher snake	*Pituophis melanoleucus*

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WILDLIFE AND WILDLIFE SIGN OBSERVED ON PINE VALLEY SURVEY AREAS

TABLE 3-8

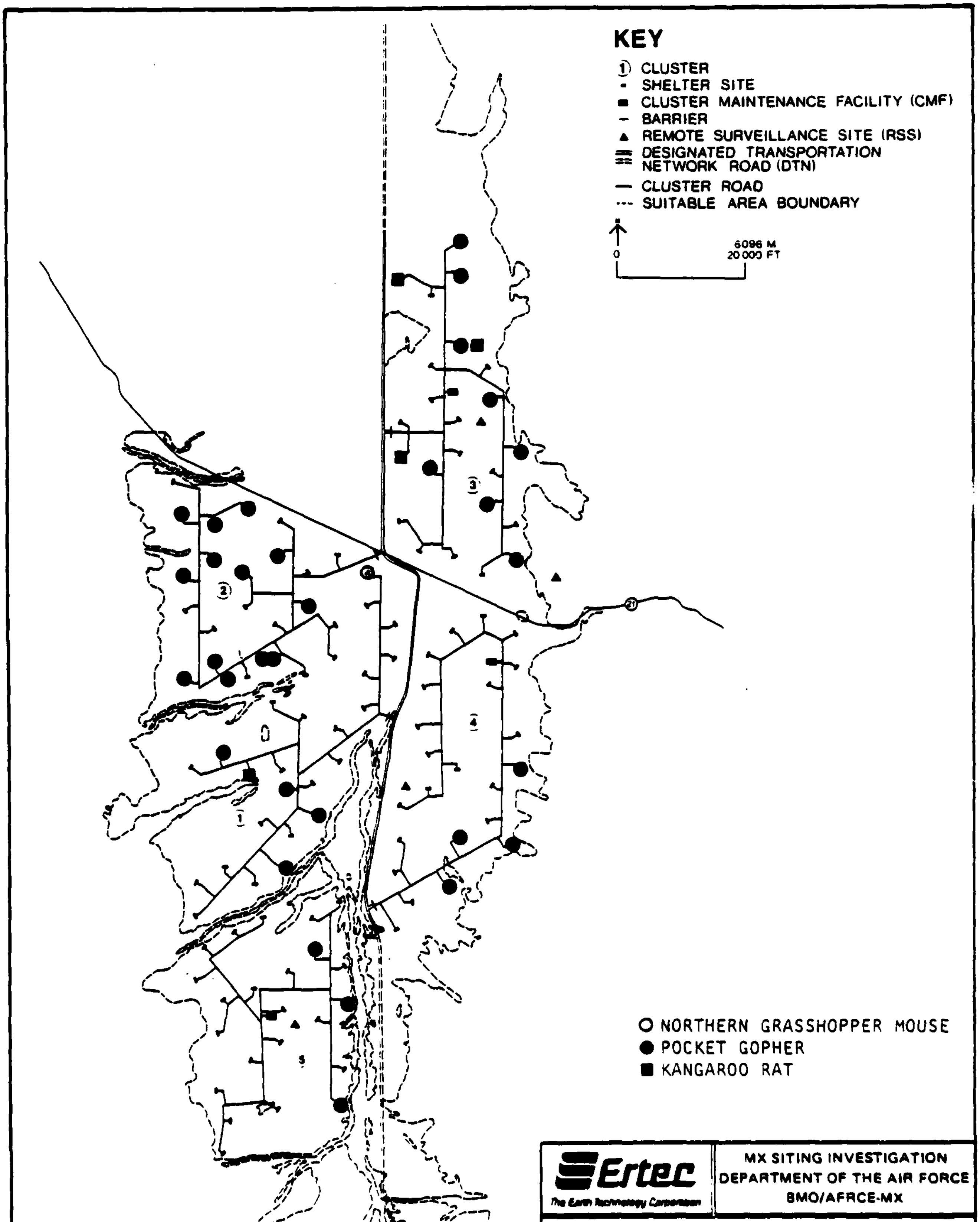
3.3.3.1 Small Mammals

The distribution of many wildlife species in Pine Valley was determined from sign such as bones, tracks, scat, or burrows. Active and inactive mammal and bird burrows were present throughout the valley, and it was possible in many cases to identify below-ground inhabitants by burrow design and construction.

Rodent activity was minimal, which was probably due to the time of year (Beatley, 1969b; Van DeGraaff and Bulda, 1973). Few rodents were sighted directly because they are primarily nocturnal; however, pocket gophers (Thomomys sp.) were seen on a large number of sites, and a northern grasshopper mouse (Onychomys leucogaster) was observed on Site 1/1. Tracks or active burrows of kangaroo rats (Dipodomys sp.) were seen at Sites 1/13, 3/21, and at Resitings 3/10 and 3/19. The majority of unidentified small burrows observed throughout the valley are presumed to be rodent burrows. Distribution of Northern grasshopper mouse, pocket gopher, and kangaroo rat sign are shown in Figure 3-11.

Black-tailed jackrabbits (Lepus californicus) were seen on 29 sites throughout the valley, and one desert cottontail rabbit (Sylvilagus audubonii) was seen at Site 2/2. Distribution of rabbit sightings is shown in Figure 3-12.

Due to the survey season and other constraints, probably only a small portion of mammal species that inhabit the valley were noted on facilities sites during the survey. It should be



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FIELD SURVEY RESULTS: POCKET GOPHER, GRASSHOPPER MOUSE, AND KANGAROO RAT SIGHTINGS

FIGURE 3-11

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FIELD SURVEYS, IOC VALLEYS. VOLUME II, PART II. BIOLOGICAL RESO--ETC(U)
AUG 81 F04704-80-C-0006
UNCLASSIFIED E-TR-48-VOL-2-PT-2 NL

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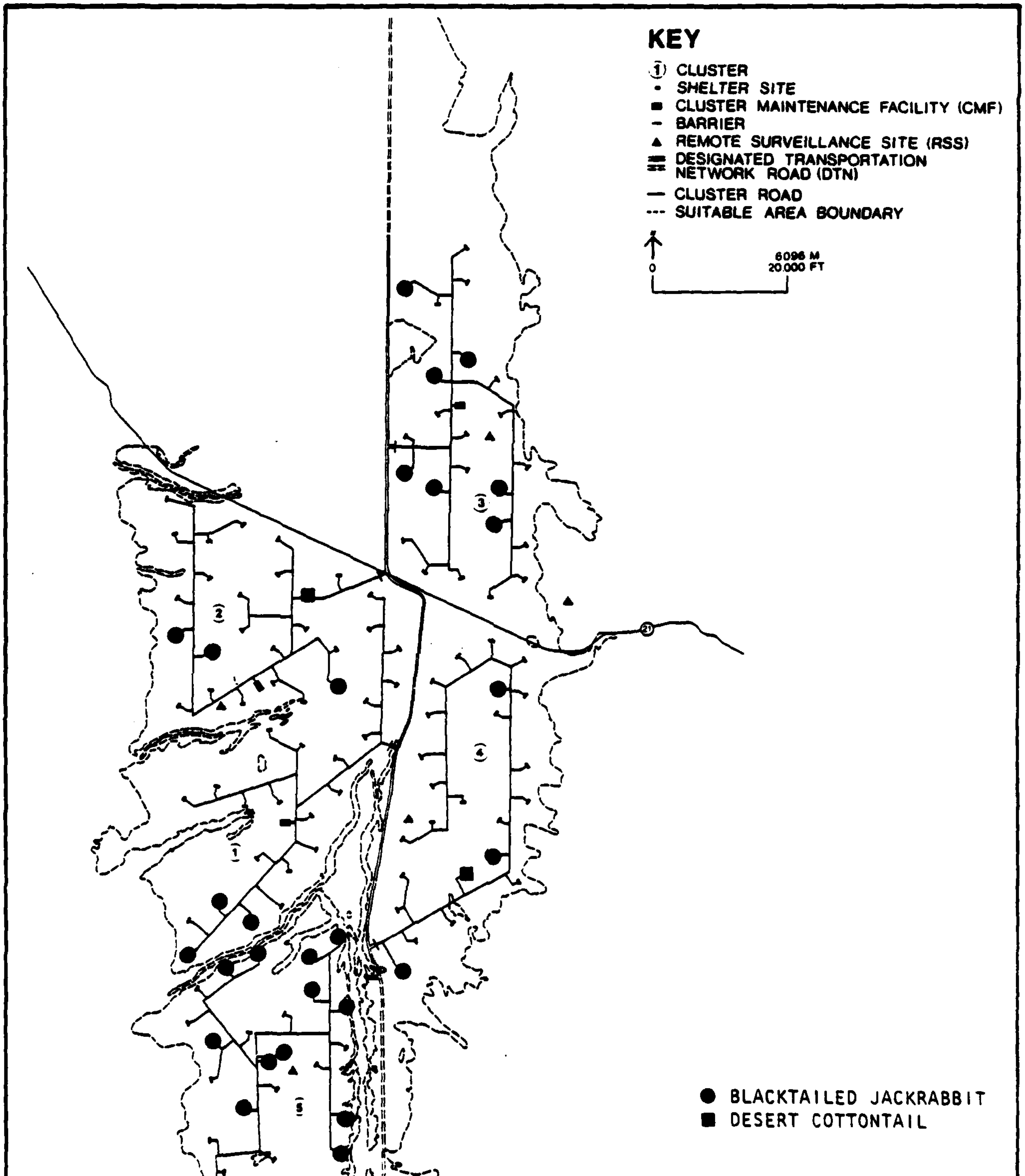

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FIELD SURVEY RESULTS: BLACK-TAILED JACKRABBIT AND COTTONTAIL RABBIT SIGHTINGS

FIGURE 3-12

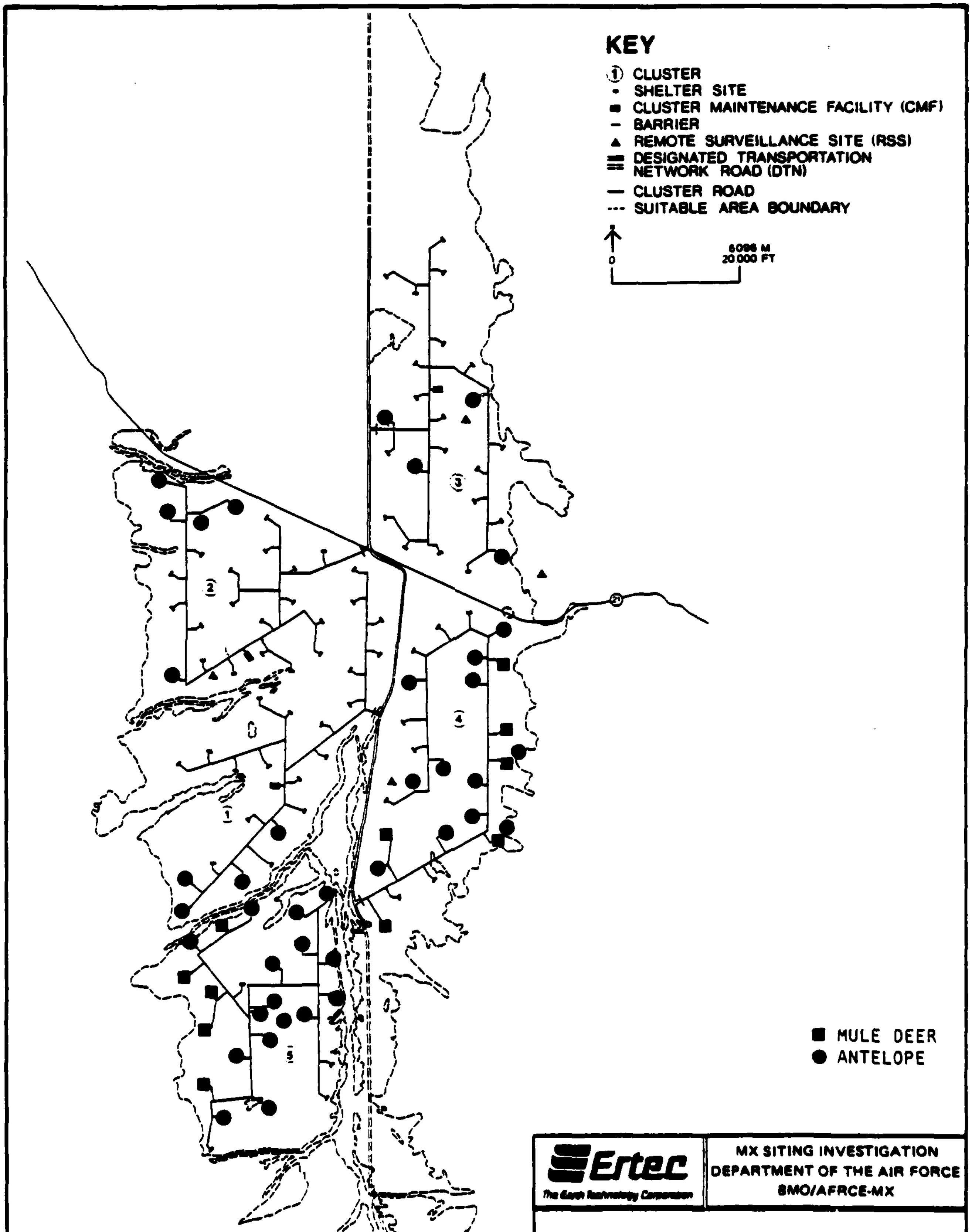
assumed that many others are present at least on a seasonal basis. A list of typical mammal species expected in the valley is provided in Appendix F.

3.3.3.2 Large Mammals

Pronghorn antelope (Antilocapra americana) sign was observed on 5 locations in Cluster 1; on 5 locations in Cluster 2; on 5 locations in Cluster 3; on 13 locations in Cluster 4; and on 17 locations in Cluster 5. The signs show especially heavy use of the valley floor in Clusters 4 and 5. Distribution of antelope sign and sightings is shown in Figure 3-13. Pine Valley's population of pronghorn is the largest in the southwestern Utah desert area, and Cluster 5 contains seasonal habitat and key year-round habitat for fawning, watering, and wintering (Utah DWR, 1980).

Mule deer (Odocoileus hemionus) were seen on 7 sites in Cluster 4 and on 5 sites in Cluster 5. These sites are all in the southern portion of the valley, as were the greater numbers of antelope sign. However, there was only one site (CMF4) where sign of both animals was found together. Mule deer have different habitat requirements than antelope, preferring higher areas. Mule deer distribution is shown on Figure 3-13.

Coyote (Canis latrans) sign was present in all clusters but was extremely dense in Cluster 5. The southern portion of the valley, which contains Cluster 5, is quite different from the drier northern portion. A higher-than-average number of black-



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FIELD SURVEY RESULTS: ANTELOPE AND MULE DEER SIGN

FIGURE 3-13

tailed jackrabbits, the primary prey species of coyote, was also found in Cluster 5. Coyote distribution is shown on Figure 3-14.

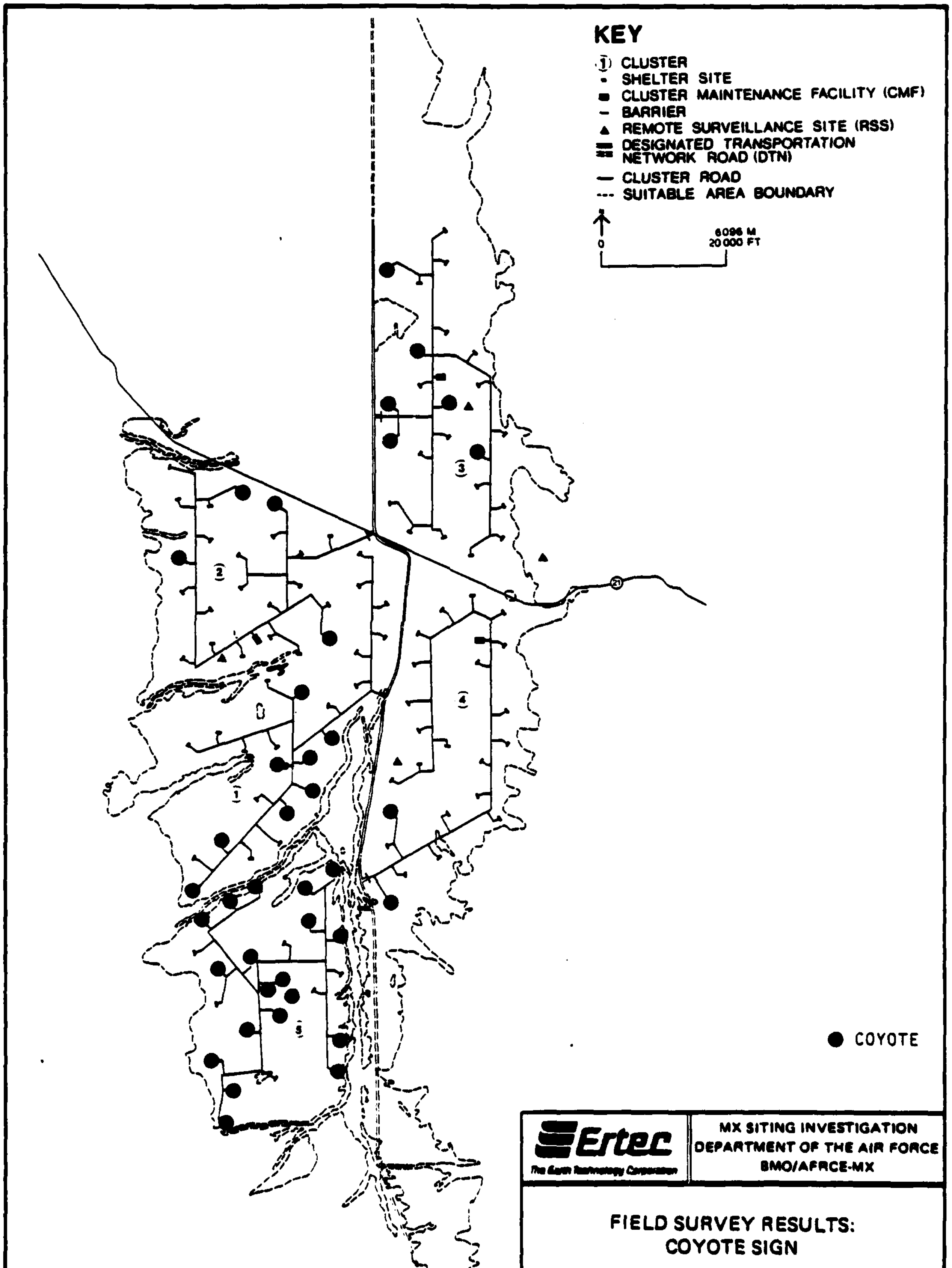
Kit fox (Vulpes macrotis) sign or dens were observed on 4 sites each in Clusters 1, 2, and 3, and on 1 site in Cluster 4. None was observed in Cluster 5. According to a study in Tooele County, Utah, average population density was one pair per 3.6 square miles (Egoscue, 1956). Distribution of kit fox sign is shown on Figure 3-15.

A badger (Taxidea taxus) was observed in its den on Site 4/22. Badger dens were observed on 4 sites in Cluster 1, on 2 sites in Cluster 2, on 6 sites and 2 resitings in Cluster 3, on 3 sites in Cluster 4, and on 1 site in Cluster 5. Distribution of badger sign and sightings is shown on Figure 3-16.

A possible skunk den was observed on Resiting 2/13, although the species could not be positively identified. Numerous large mammal burrows present throughout the valley indicate the presence of other, unidentified burrowing species.

3.3.3.3 Birds

Sage grouse (Centrocercus urophasianus) sign was observed in 8 locations, 7 of which were in Cluster 5. Most were in the vicinity of Turkey Wash. Several strutting grounds are known from Cluster 5. They are located close together in the general vicinity of Site 5/13. Sagegrouse are very sensitive to habitat disturbance since they depend heavily on the sagebrush (Artemisia tridentata) in the vicinity of their strutting grounds for



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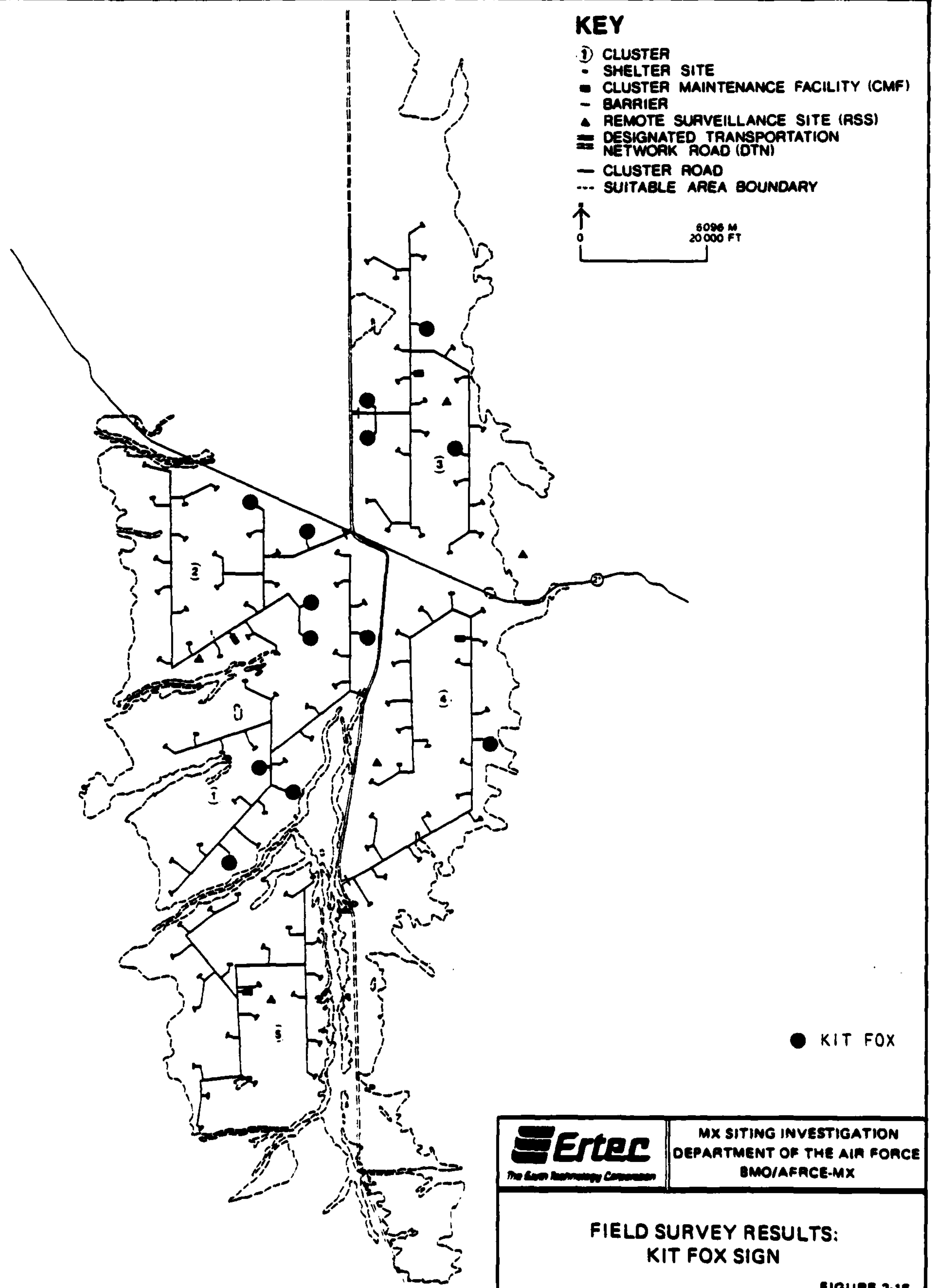
FIELD SURVEY RESULTS:
COYOTE SIGN

FIGURE 3-14



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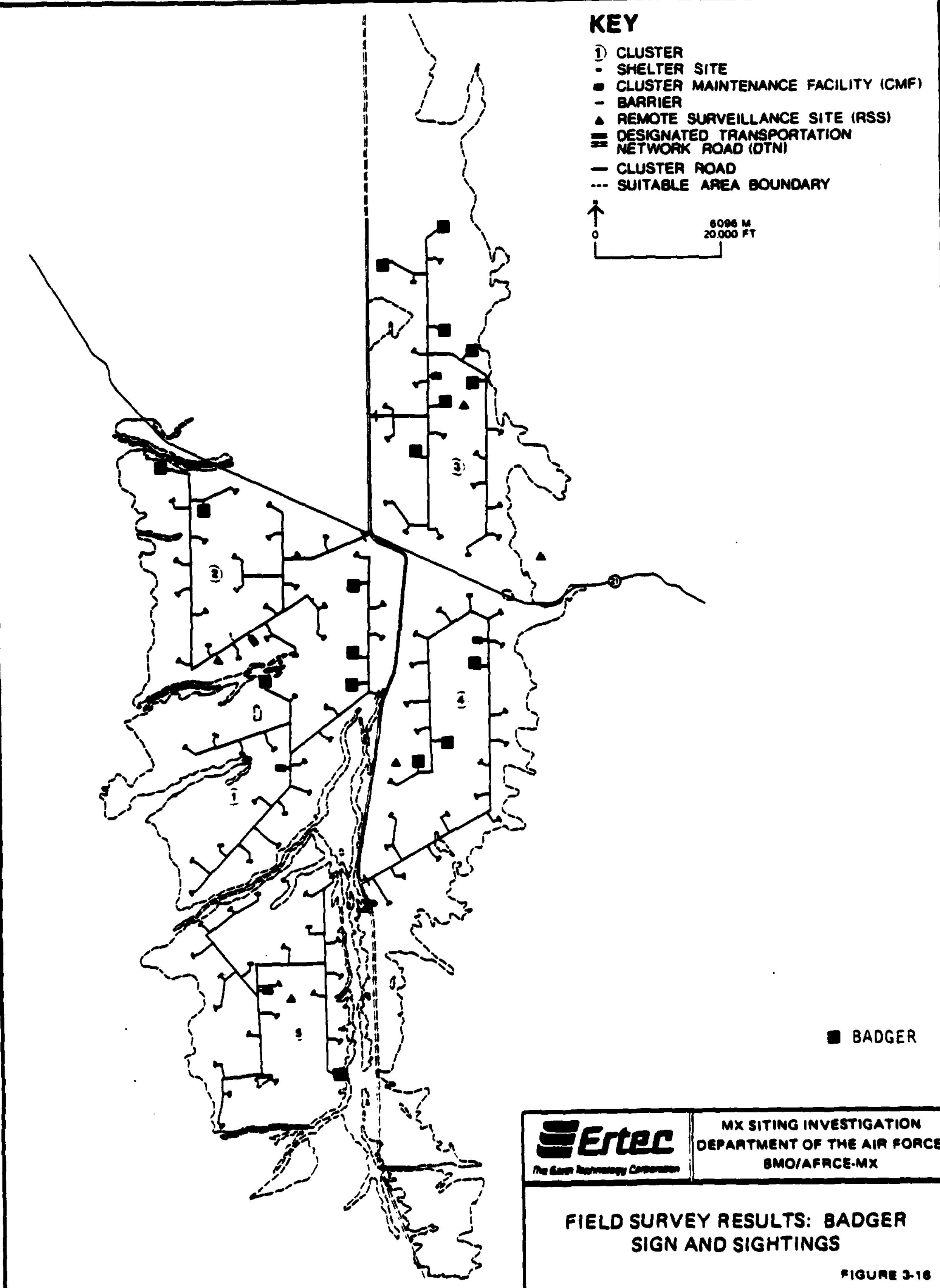
FIELD SURVEY RESULTS:
KIT FOX SIGN

FIGURE 3-15



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FIELD SURVEY RESULTS: BADGER SIGN AND SIGHTINGS

FIGURE 3-16

nesting and food. The vegetation survey indicates most sagebrush in Cluster 5 is located north of the strutting ground area, near Turkey wash. This is also where most of the sage grouse sign was observed. Nesting areas have not been identified in Pine Valley; because of the location of sign and sagebrush, they may be located near the wash as well as near the strutting ground. Distribution of sage grouse sign is shown on Figure 3-17.

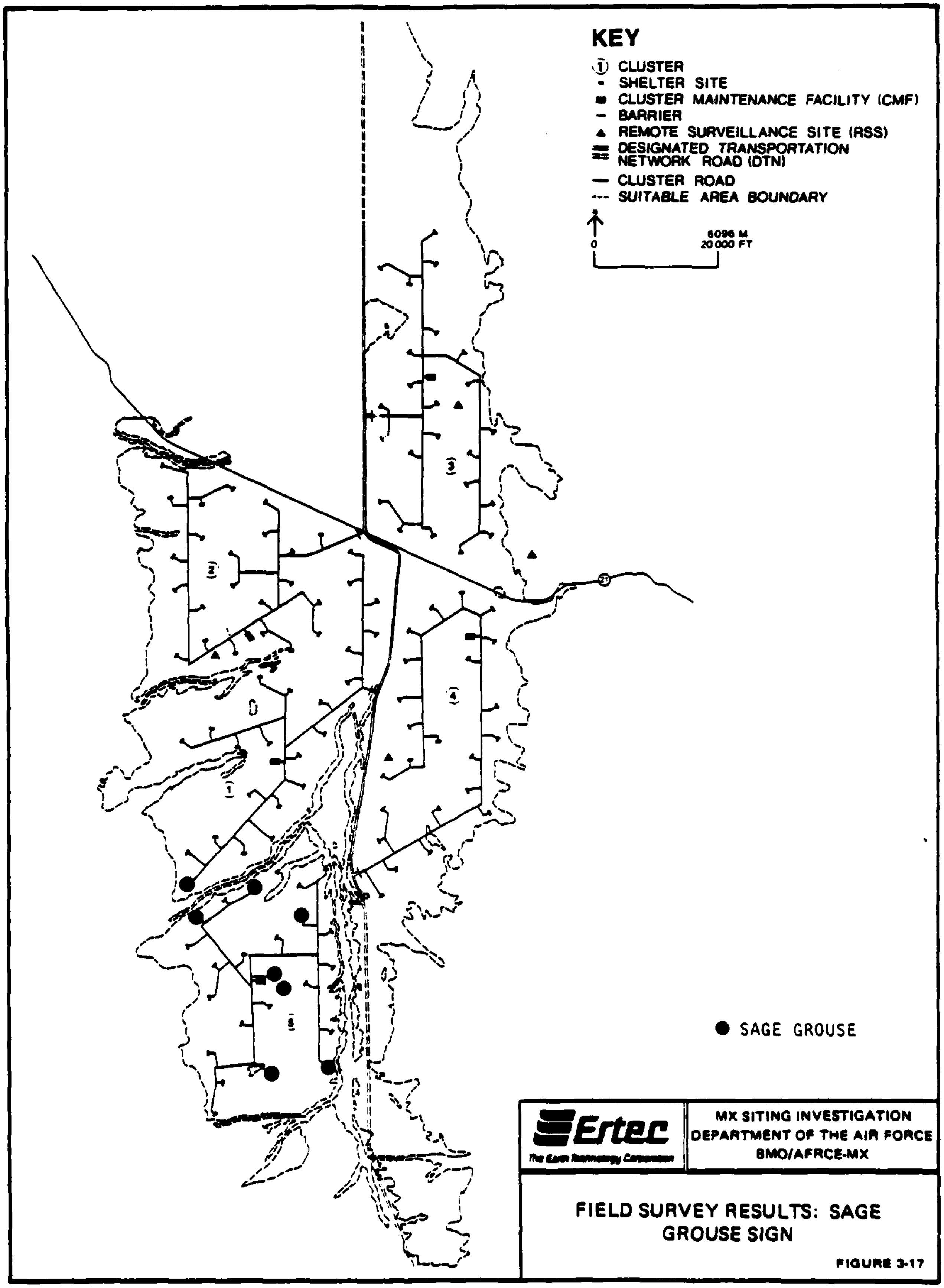
The Horned Lark (Eremophila alpestri) is the only lark native to North America. It was the most frequently observed bird in Pine Valley. They inhabit open country, especially sage flat areas. Nests are built in depressions on the ground, and food consists mainly of seeds and insects (Peterson, 1961).

Ravens (Corvus corax) were also common and were observed on 19 sites throughout the valley. Northern harriers (Circus cyaneus) were observed on 5 sites. These hawks hunt rodents and small birds in open country (Peterson, 1961). An unidentified falcon species was observed near site 4/12, and a short-eared owl (Asio flammeus), a diurnal species of open country, was observed at Site 4/16.

Other birds observed included a flock of chickadees at Site 5/13 and an unidentified wren at Resiting 3/6. Distribution of birds is shown on Figures 3-18 through 3-20.

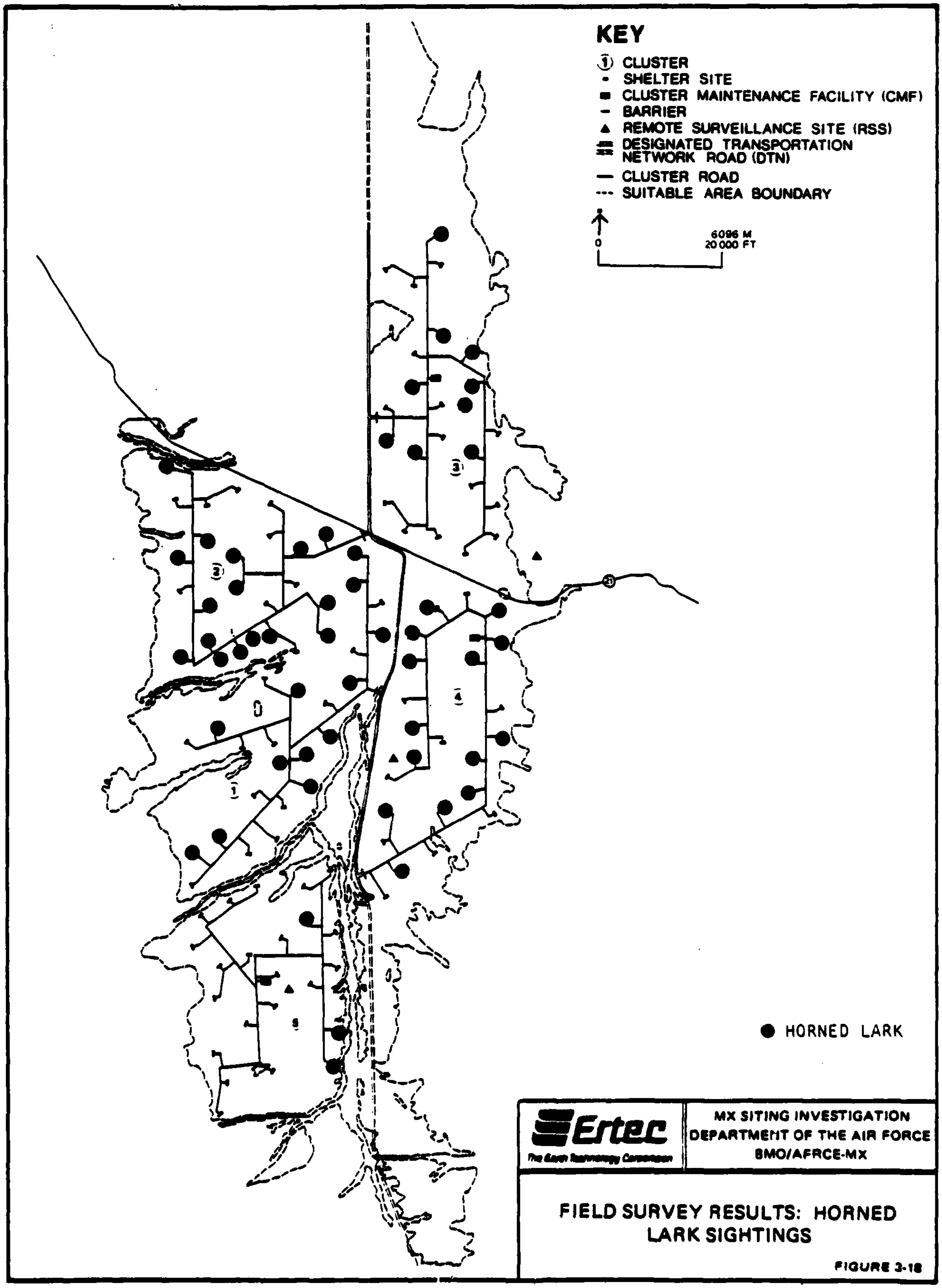
3.3.3.4 Reptiles

Few reptiles were seen, because most of the surveys were made in winter when most reptiles hibernate. Northern side-blotched



FIELD SURVEY RESULTS: SAGE GROUSE SIGN

FIGURE 3-17



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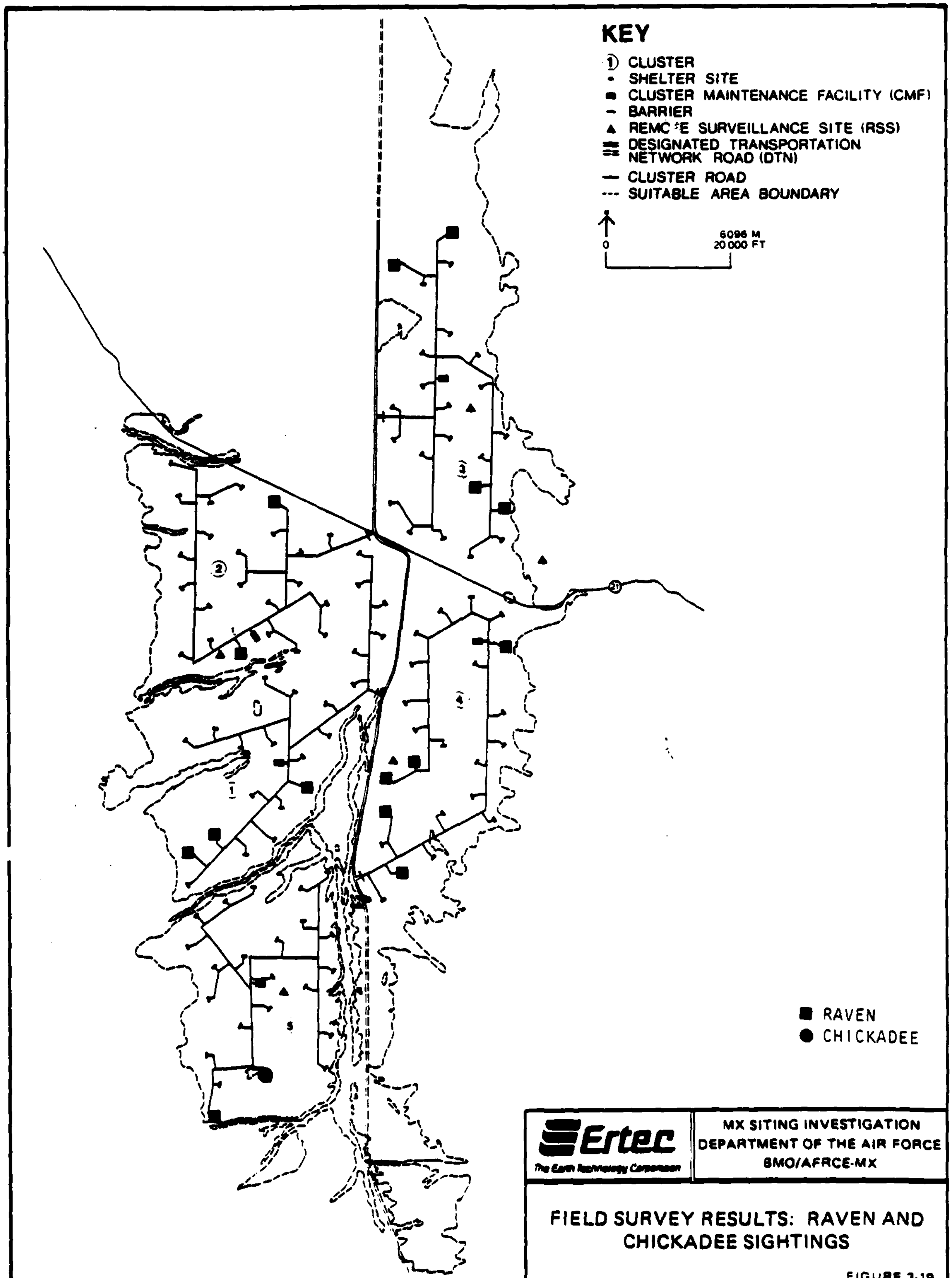
FIELD SURVEY RESULTS: HORNED LARK SIGHTINGS

FIGURE 3-18



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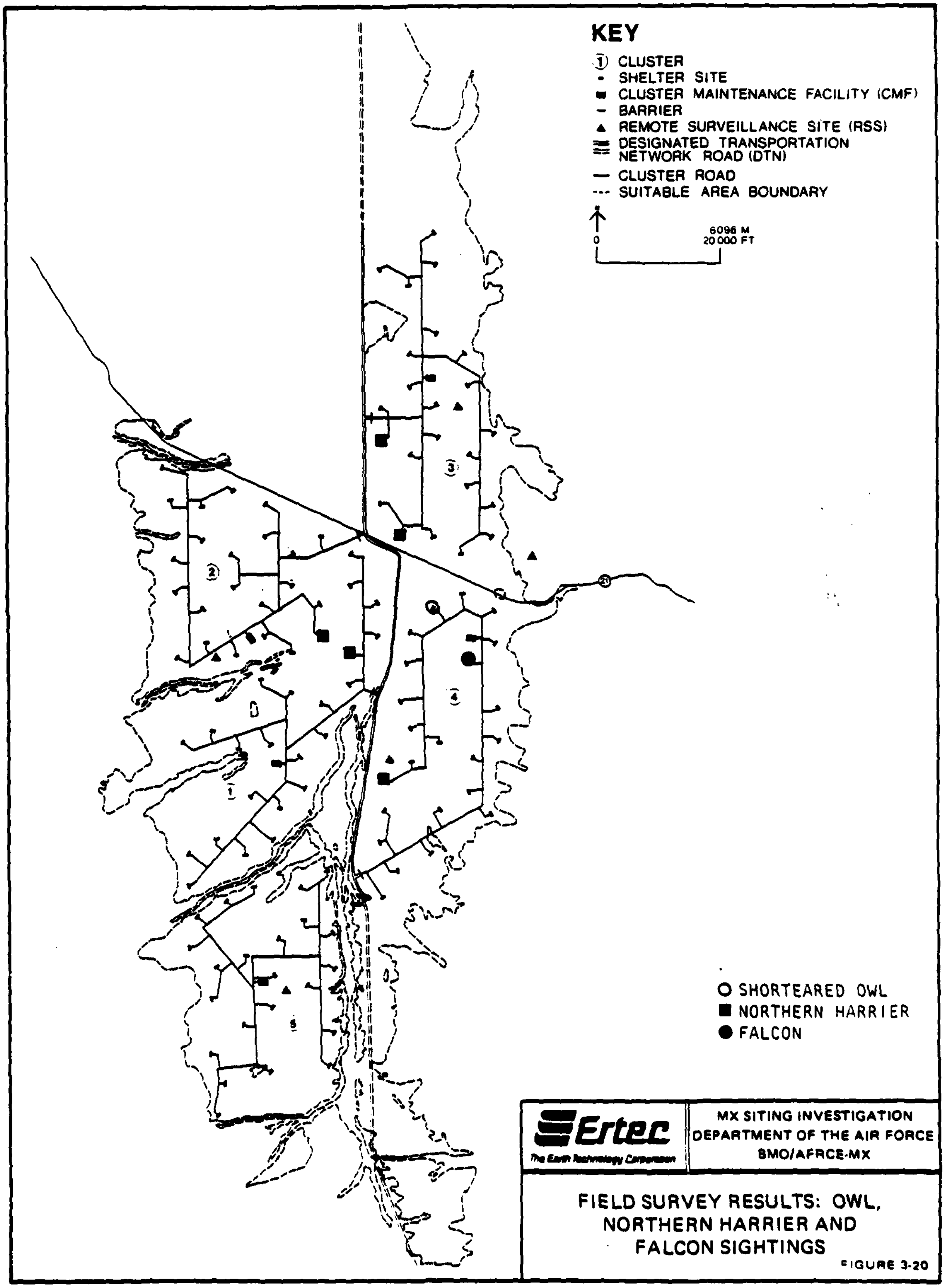
FIELD SURVEY RESULTS: RAVEN AND CHICKADEE SIGHTINGS

FIGURE 3-19



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FIELD SURVEY RESULTS: OWL, NORTHERN HARRIER AND FALCON SIGHTINGS

FIGURE 3-20

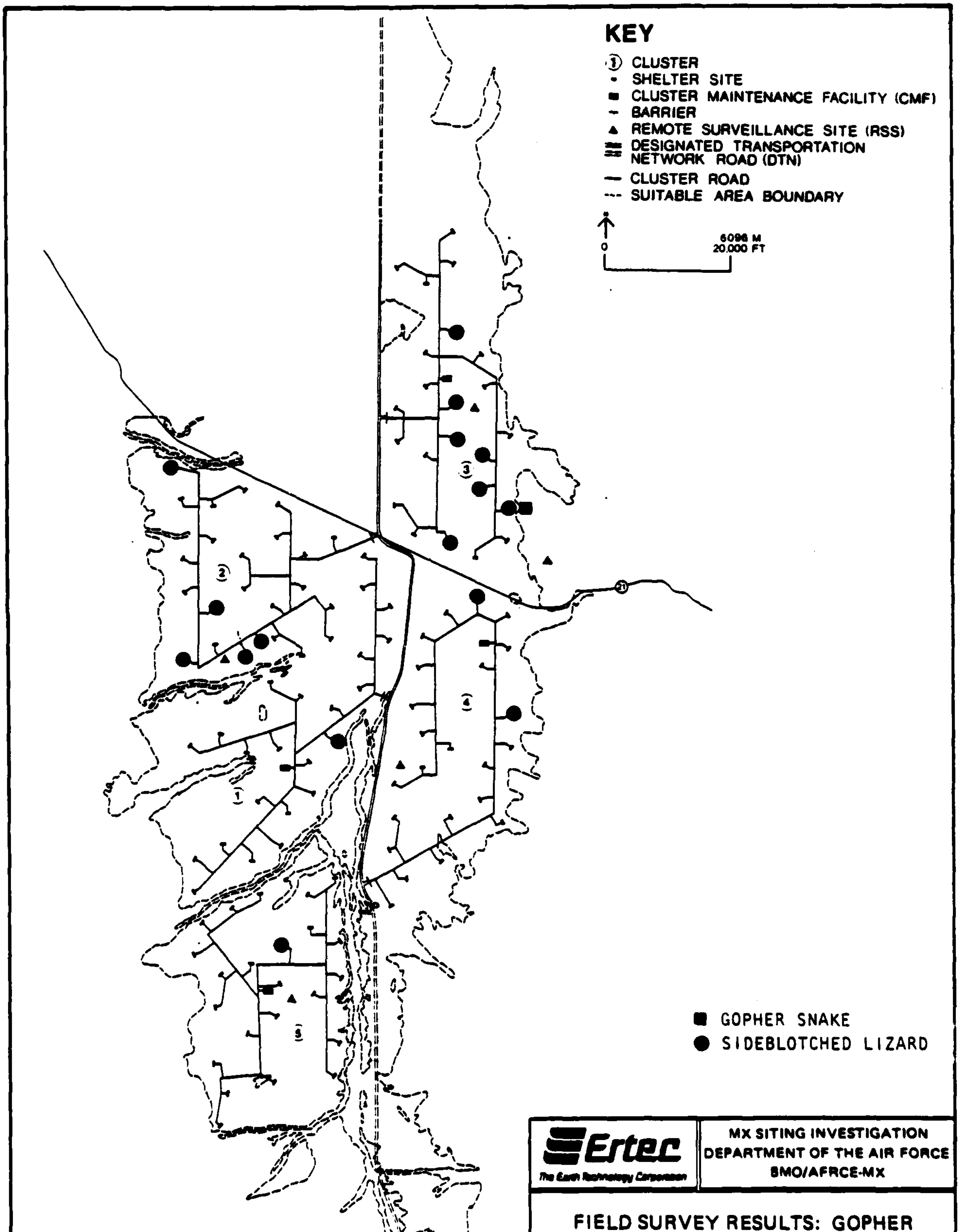
lizards (Uta stansburiana stansburiana) were seen on 1 site in Cluster 1, on 5 sites in Cluster 2, on 9 sites in Cluster 3, on 2 sites in Cluster 4, and on 1 site in Cluster 5. This species is unusual in that it is active all year round when the weather permits (Stebbins, 1966). Unidentified lizard species were observed at Sites 3/2, 3/16, and 4/14.

Gopher snakes (Pituophis melanoleucus) were observed at Sites 3/6 and 3/21. Distribution of reptiles observed during the survey is shown on Figure 3-21.

The reptile species list prepared from the field survey is not an accurate reflection of the numbers or species of reptiles present in Pine Valley. Warm weather surveys would undoubtedly produce a much greater number of reptiles. Species expected from the area are listed in Appendix F.

3.3.4 Overview of Disturbance Factors

A number of man-induced disturbance factors are present in the valley. Disturbance resulting from grazing, off-road driving, and mining or construction activities was observed during the field survey. Invasion of disturbed areas by such undesirable weeds as Halogeton glomeratus and Salsola iberica is also an effect. These plants invade areas where soil has been disturbed or native plant cover has been degraded; thus, they provide a measure of the state of the natural ecosystem within the valley. In areas where grazing occurs, they also present problems for livestock.



FIELD SURVEY RESULTS: GOPHER SNAKE AND SIDE-BLOTCHED LIZARD SIGHTINGS

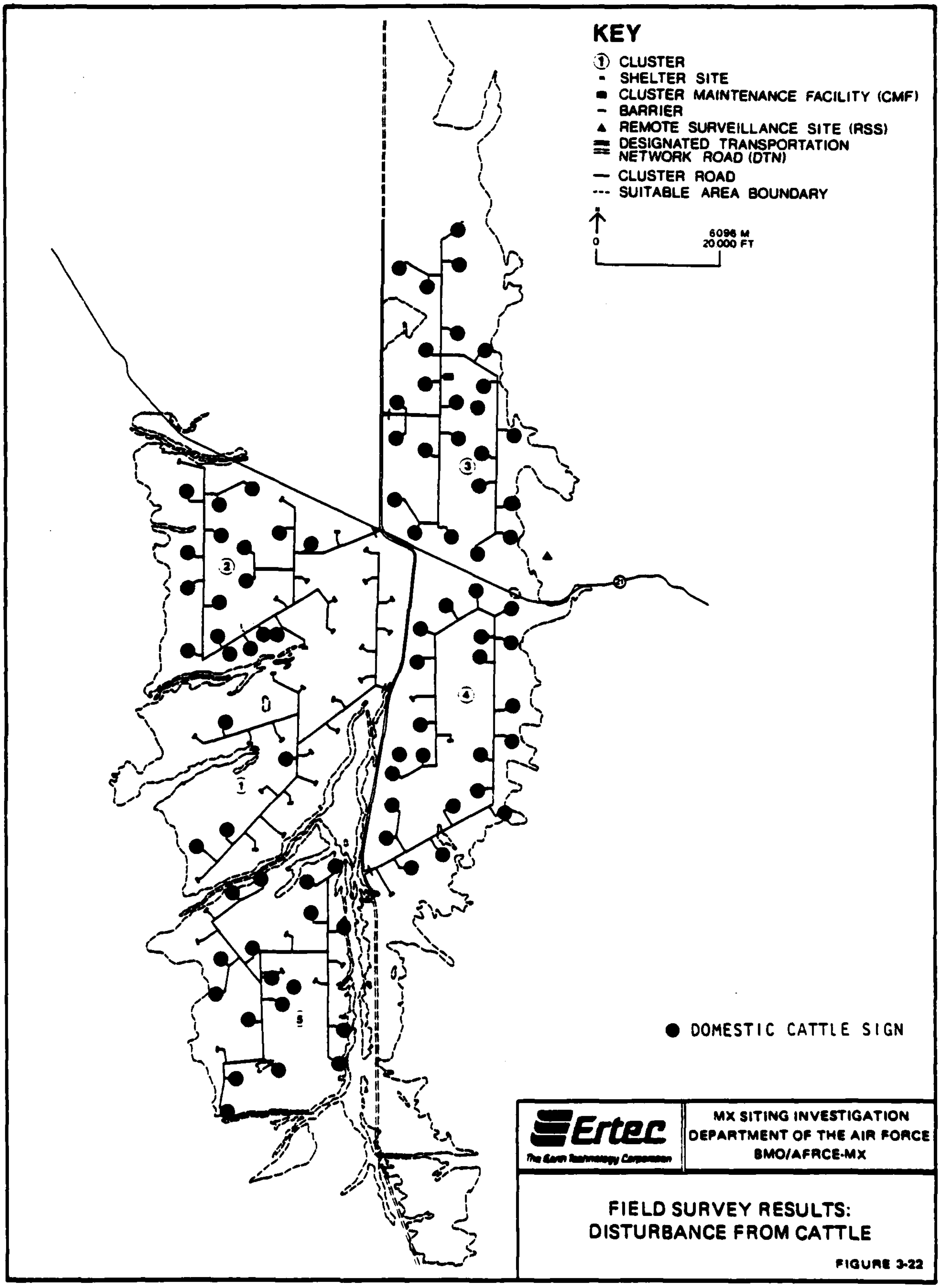
FIGURE 3-21

Off-road driving disturbs soils and vegetation, allowing colonization by undesirable plants. Off-road driving appeared to be one of the primary disturbance factors throughout the valley. It was sometimes difficult to determine whether the disturbance noted at a site was the result of the shelter monuments placement or the result of other previous disturbance. Consequently, disturbance levels as noted on the sites during the biological survey are likely to be higher than are representative for the valley as a whole.

Halogeton has gained a large foothold especially in the northern portion of the valley. Forty-two percent of facilities sites contained halogeton, but none was observed in Cluster 5, or the southern portions of Cluster 1 that lie adjacent to it. Halogeton is toxic, and a number of sheep deaths caused by its consumption have been reported. Cattle apparently consume it only in small amounts. While sublethal effects may occur, no cattle deaths have been attributed to it (HDR, 1980).

Overgrazing contributes to the spread of halogeton, which, in turn, decreases the value of the area for grazing. This is discussed further in Section 5.0. Areas where evidence of grazing was observed are shown in Figure 3-22.

Salsola, another introduced weed, is sometimes cut and cured as a poor substitute for hay. When eaten in considerable quantity in its green condition, it tends to cause severe scour in weak or young animals (Hitchcock et al., 1964). Salsola was observed



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FIELD SURVEY RESULTS:
DISTURBANCE FROM CATTLE

FIGURE 3-22

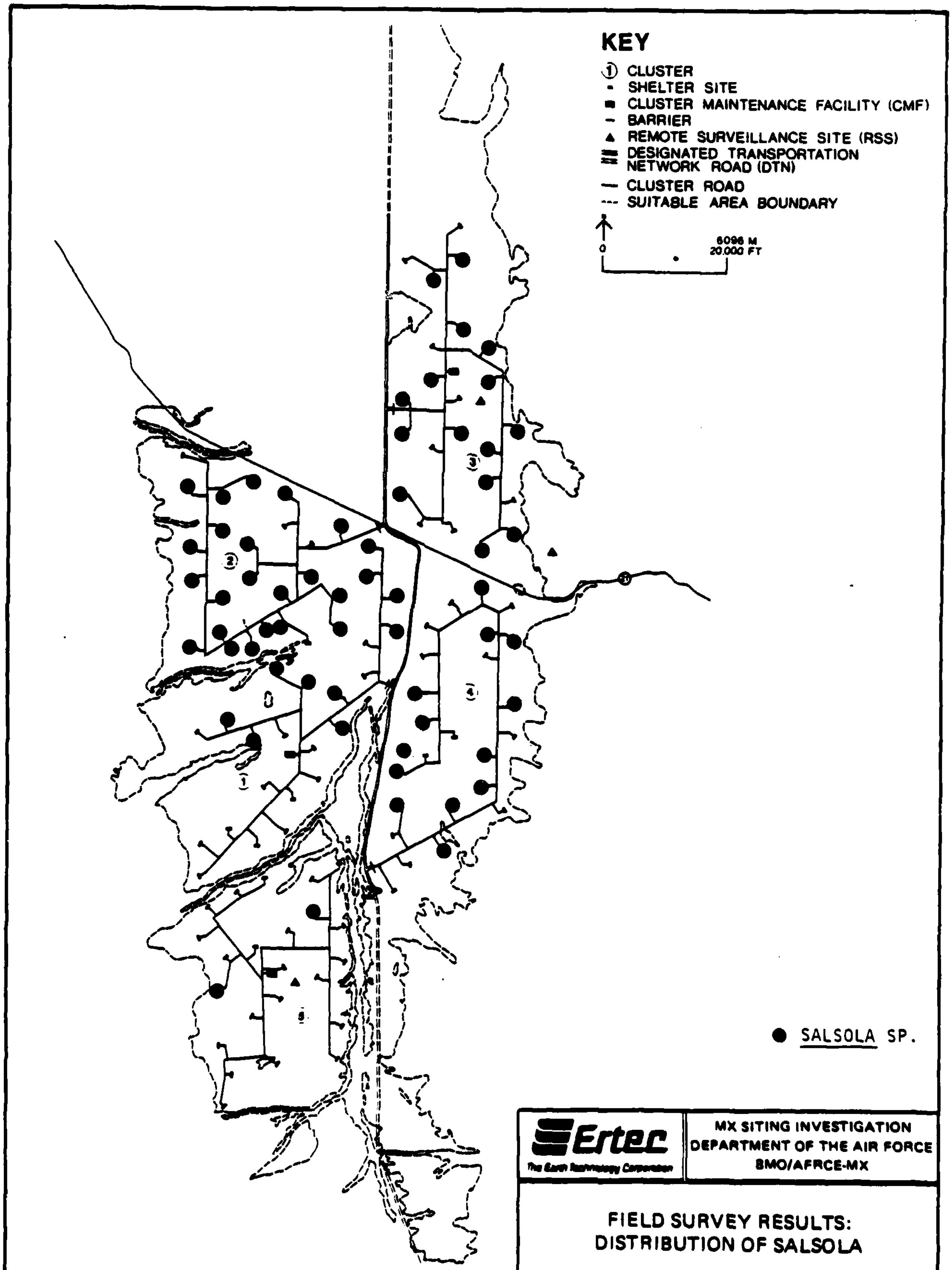
in numerous study areas. Forty-nine percent of the sites contained salsola, but it was more widely distributed in the northern portion of the valley. It was observed only on two sites in Cluster 5. It was not found in the other 23 sites in Cluster 5, or in the southern portion of Cluster 1, which lies adjacent to it. Distribution of halogeton and salsola is shown in Figures 3-23 and 3-24.

3.3.5 Results of Cluster Surveys

3.3.5.1 Summary of Conditions in Cluster 1

a. Abiotic Conditions: The legal descriptions of Cluster 1 sites are given in Appendix D. Elevations range from 5215 to 6070 feet (1065 to 1868 m), and sites are located on slopes of approximately three degrees. The soil is alluvial, composed of gravel mixed with sand and clay. Abiotic conditions within the cluster are summarized in Table 3-9.

b. Disturbance: Disturbance was low to moderate at most sites in Cluster 1, with grazing listed most frequently as the primary cause of disturbance. Evidence of both cattle and sheep grazing was observed within the cluster, but cattle sign was much more abundant. Grazing disturbance was greatest on the sites closest to the main road running north-south through the valley. Evidence of off-road vehicle use was highest at Sites 1, 2, 4, 9, 10, and 11. *Halogeton glomeratus* and *Salsola iberica*, introduced plant species indicative of disturbance, were also present from this part of the cluster. Five sites showed evidence of erosion.



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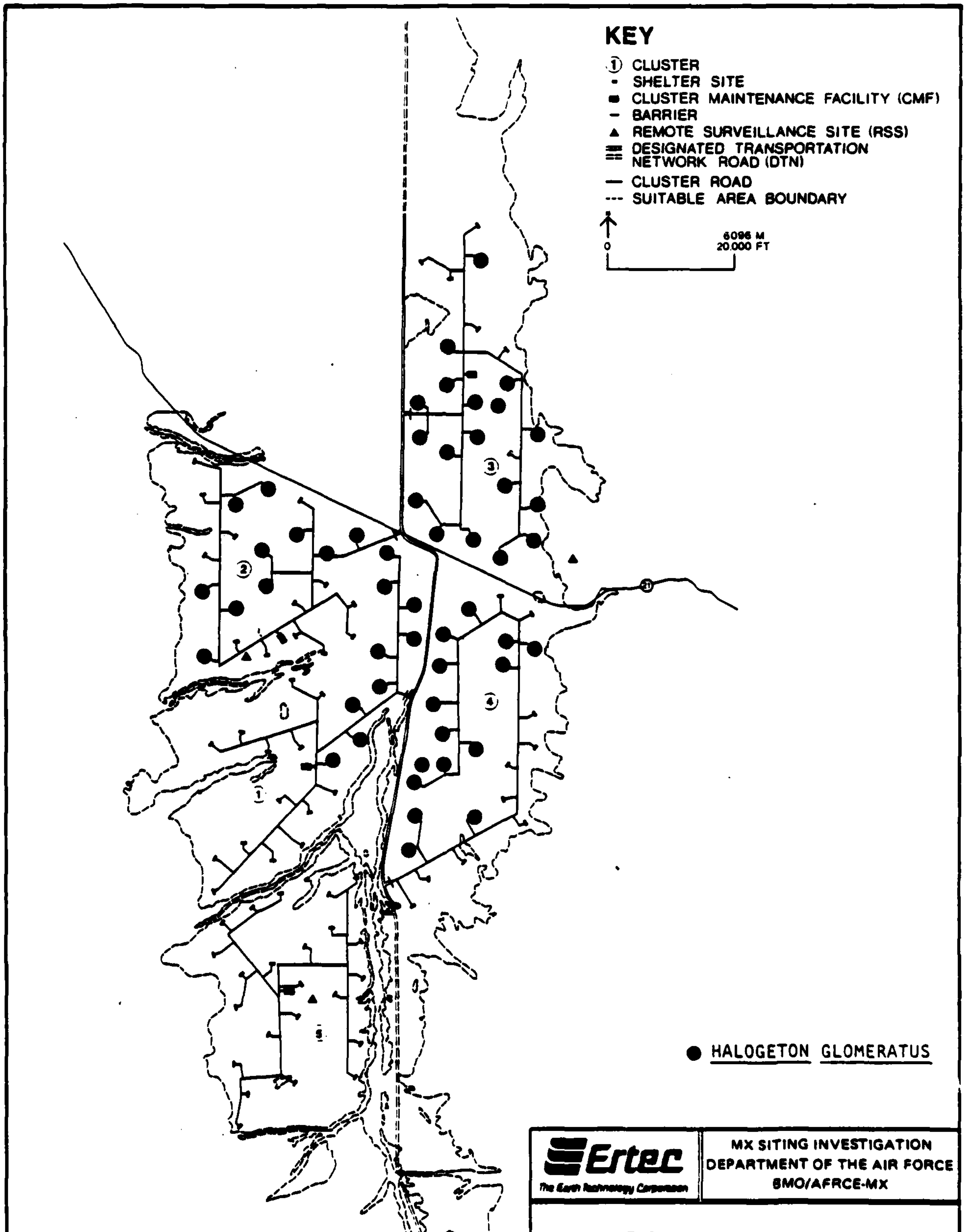
FIELD SURVEY RESULTS:
DISTRIBUTION OF SALSOLA

FIGURE 3-23



FIELD SURVEY RESULTS:
DISTRIBUTION OF HALOGETON

FIGURE 3-24

	Shelter Site Number																							Resitings			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	1	14	21	22
Elevation (feet)	5215	5240	5255	5295	5310	5350	5410	5440	5510	5425	5500	5680	5680 5690	5730	5860	5550	5645	5700	5720 5730	5835	5860	5990 6000	6060 6070	5570 5580	5215	5731	5863	5990
Soil Texture[a]																												
Coarse gravel			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fine gravel			X	X	X	X	X	X	X	X	X	X					X	X		X		X	X			X	X	X
Coarse sand	X		X	X	1	X	X	X	X	X	X	1					1	X		1		1	1		X	X	X	X
Fine sand		X	X	X		X	X	X	X	X	X	X	1	1	1	1	X	1	1		1	X	X	1	1	1	1	1
Silt	1	1	1	1	X	1	1	1	1	1	1	X	X	X	X	X	X	X	X	X	X			X		X	X	X
Clay																										X	X	X
Disturbance[a]																												
Off-road vehicles	1	1	2	1	3	2	2	2	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2		3	2	3
Mining/const.																												
Erosion					1				4													3				2		2
Grazing	2	2	1	2	2	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Other (canal)									3																			
Overall Intensity of Disturbance[b]	M	H	M	M	M	L	L	L	M	L	L	M/L	H	L	L	L	H	M	H	L	H	M	L	L	L	M	M	M

(a) 1-Highest relative importance/impact; 2-lesser relative importance/impact; 3-lowest relative importance/impact.
X-Indicates presence
(b) H-High; M-Moderate; L-Low

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SUMMARY OF ABIOTIC FACTORS ON CLUSTER 1 SITES

TABLE 3-9

c. Threatened or Endangered Plant Species: A number of plants observed within the cluster may be species either Currently Listed or Taxa Currently Under Review in the 1980 Federal Register. They include *Gutierrezia sarothrae*, *Townsendia* sp., *Lepidium montanum*, *Opuntia* sp., *Astragalus lentiginosus*, *Astragalus* sp., *Phacelia* sp., *Sphaeralcea* sp., and *Eriogonum* sp. The *Eriogonum* species on 1/14 is likely to be *E. ammophilum*, a species Currently Under Review. Due to the lack of flowers or other reproductive structures during the season of the survey, positive species or subspecies identification was not possible. It is not likely that many of these are species Currently Listed or Currently Under Review, because many are located in specific habitats not found within the project area, and because a number are known only from outside Utah.

d. Vegetation: The vegetative communities in Cluster 1 are largely composed of winterfat (*Ceratoides lanata*) and rabbitbrush (*Chrysothamnus* spp.), with areas dominated by Indian ricegrass (*Oryzopsis hymenoides*). Other important species present included sagebrush (*Artemisia* spp.), broom snakeweed (*Gutierrezia sarothrae*), *Astragalus lentiginosus*, *Sphaeralcea grossulariifolia*, and the grasses, *Sporobolus cryptandrus*, *Agropyron desertorum*, and *Bouteloua gracilis*. Percent perennial cover in Cluster 1 shelter sites ranged from 2 to 33 percent and averaged 25 percent. The plant species observed on Cluster 1 shelter sites are summarized in Table 3-10, and distribution of the dominant associations is mapped in Figure 3-25.

Species	Original Sites 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	Resitings 1	14	21	22
ASTERACEAE (COMPOSITAE)																												
Ambrosia acanthicarpa																						X						
Artemisia arbuscula																												X
Artemisia nova															X						X	X						
Artemisia spinescens			X	X			X		X											X	X	X						X
Artemisia tridentata																					X	X	X				X	
Chrysothamnus greenei													X	X	X	X			X		X	X		X		X		
Chrysothamnus nauseous											X			X														
Chrysothamnus viscidiflorus	X		X	X	X	X	X	X	X	X	X	X					X	X		X	X	X	X					
Chrysothamnus sp.																											X	X
Gutierrezia sarothrae															X										X			
Machaeranthera canescens			X	X	X	X	X		X	X	X	X																
Stephanomeria exigua																						X						
Tetradymia glabrata				X																								
Townsendia sp.																						X						
BORAGINACEAE																												
Lappula sp.																						X						
BRASSICACEAE (CRUCIFERAE)																												
Descurainia pinnata															X													
Descurainia sp.																						X						
Lepidium montanum									X					X														

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PLANT SPECIES OBSERVED ON CLUSTER 1 SITES

TABLE 3-10

Species	Original Sites 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	Resitings 1	14	21	22
CACTACEAE																												
Opuntia sp.		X		X				X		X	X			X	X		X	X		X		X	X	X				
CHENOPODIACEAE																												
Atriplex canescens	X	X		X			X		X						X													
Ceratoides lanata	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X
Grayia spinosa	X	X		X	X	X	X	X		X			X	X		X	X	X	X	X	X	X	X				X	X
Halogeton glomeratus	X	X	X	X	X	X	X	X	X																			
Salsola iberica	X	X	X	X			X	X		X	X		X	X														
EPHEDRACEAE																												
Ephedra nevadensis					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X		X		
FABIACEAE (LEGUMINOSAE)																												
Astragalus lentiginosus	X		X			X			X	X		X	X								X	X	X					
Astragalus sp.			X	X						X						X											X	
HYDROPHYLLACEAE																												
Phacelia sp.	X																					X						

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PLANT SPECIES OBSERVED ON CLUSTER 1 SITES

TABLE 3-10

	Original Sites																								Resitings			
Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CNF	1	14	21	22
MALVACEAE																												
Sphaeralcea grossulariifolia					X	X	X	X	X	X	X	X		X		X	X	X	X	X	X	X		X				
Sphaeralcea sp.																												X
POACEAE (GRAMINAE)																												
Agropyron desertorum																X												
Aristida longiseta			X	X													X	X		X								
Aristida sp.																			X		X	X						
Bouteloua gracilis												X	X	X		X	X	X	X	X	X							
Bromus tectorum				X		X											X											
Hilaria jamesii	X		X	X	X	X	X	X	X			X	X			X	X	X	X	X	X	X	X	X				X
Oryzopsis hymenoides	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sitanion hystrix			X	X	X	X	X	X	X		X	X					X	X		X		X	X			X		X
Sitanion jubatum													X	X	X				X		X	X	X	X				
Sporobolus cryptandrus			X		X	X				X	X			X	X	X					X			X				
Stipa comata	X				X					X	X	X	X	X	X	X	X	X	X	X	X			X				
POLYGONACEAE																												
Eriogonum cernuum	X	X	X	X			X	X		X	X	X					X					X						
Eriogonum microthecum														X	X													
Eriogonum sp.																										X		
SOLANACEAE																												
Lycium andersonii												X																

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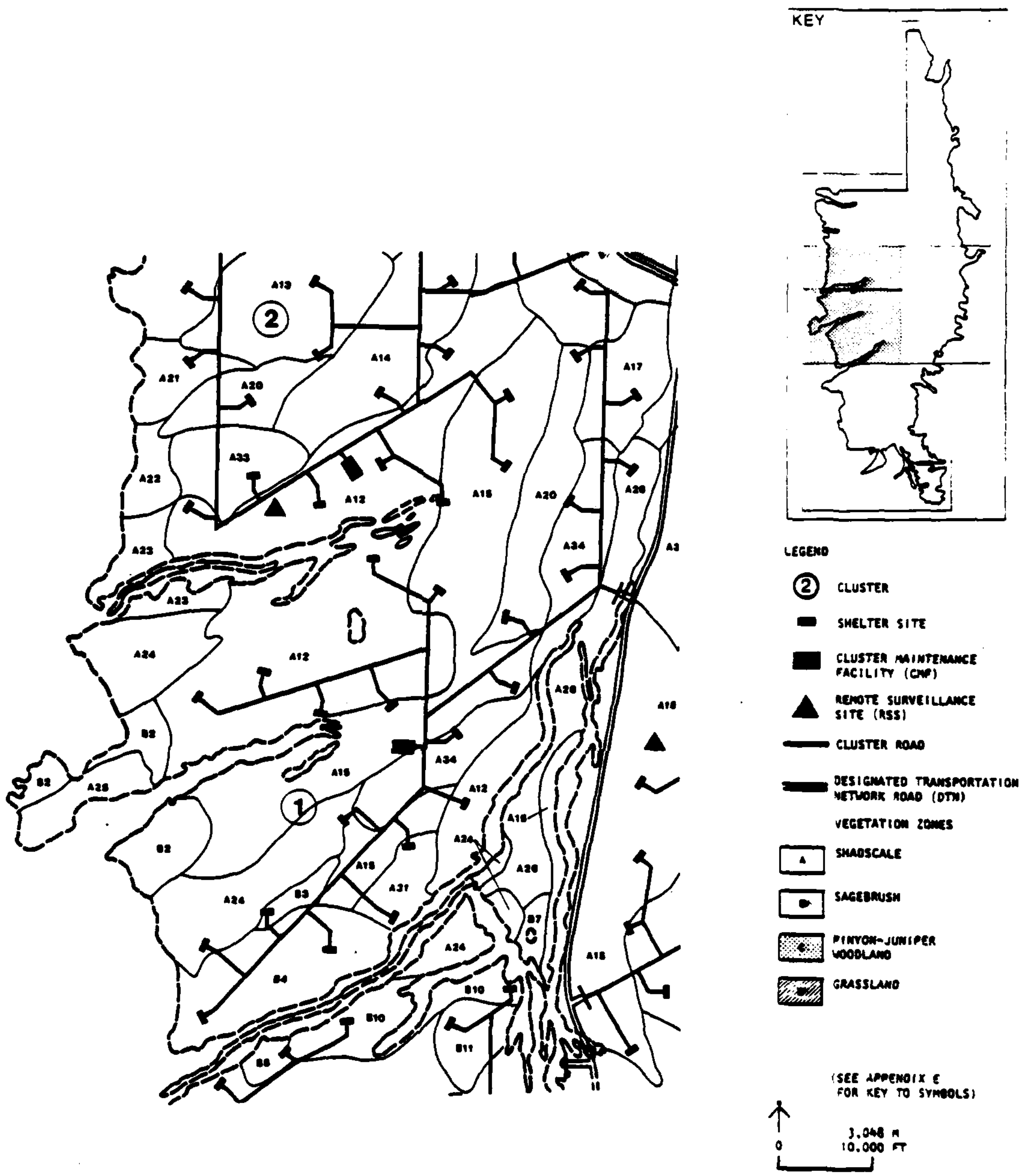
PLANT SPECIES OBSERVED ON CLUSTER 1 SITES

PAGE 3 OF 3

TABLE 3-10



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DOMINANT/SUBDOMINANT VEGETATIVE ASSOCIATIONS IN CLUSTER 1

FIGURE 3-25

e. Wildlife: Wildlife observations in Cluster 1 are summarized in Table 3-11. Common wildlife throughout the cluster included black-tailed jackrabbits and horned larks. Other bird species observed on Cluster 1 included the Northern harrier and raven. At one site near Turkey Wash, sage grouse feathers were observed. This appears to be the northernmost portion of the sage grouse range that covers much of Cluster 5. A northern grasshopper mouse and a side-blotched lizard were also observed. Several other wildlife species were identified by sign; five active kitfox dens, badger dens, coyote tracks and scat, pronghorn antelope tracks and scat, and kangaroo rat sign were observed on facilities sites within the cluster. Numerous large and small mammal burrows indicated the presence of additional, unidentified burrowing species.

3.3.5.2 Summary of Conditions in Cluster 2

a. Abiotic Conditions: The legal descriptions of Cluster 2 sites are given in Appendix D. Elevations range from 5200 to 5735 feet (1600 to 1765 m), and sites are located on slopes of approximat.ly three degrees. The soil is alluvial, consisting mostly of sand and silt mixed with gravel. Abiotic conditions within the cluster are summarized in Table 3-12.

b. Disturbance: Disturbance was considered to be low at all sites except Resitings 13 and 15, where it was moderate, and Resiting 18, where the disturbance was considered high. Grazing was the primary cause of damage on most sites, but off-road vehicle tracks were also present and were the primary cause of

Species	Original Sites 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	Resitings 1	14	21	22
Mammals																												
Domestic sheep													X															
Domestic cattle													X	X	X	X			X		X			X	X	X	X	X
Coyote								X	X	X						X	X						X				X	
Antelope																	X			X			X				X	X
Kit fox dens (active)																5												
Kit fox				X																X				X				
Badger den											X																	
Black-tailed jackrabbit																				2			3				1	
Northern grasshopper mouse	1																											
Rabbit	X	X		X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X
Kangaroo rat													X															
Pocket gopher														X		X			X					X		X		
Large mammal burrows (active)	P	P	P		P	P	P			P		P					P		P	P		P						
Large mammal burrows (inactive)	P	P	P	P	P	P	P	P		P				P			P	P		P	P	P	P					
Small mammal burrows	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P			P	P	P
Birds																												
Horned lark	1	6		1		10			1	25	25						10					1	3			P	P	P
Northern harrier					1																							
Raven																1					2	1						
Sage grouse																							X					
Reptiles																												
Side-blotched lizard								P																				

X = sign observed; Number = actual sighting; P = observed but not counted.

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ANIMALS AND ANIMAL SIGN OBSERVED ON CLUSTER 1 SITES

TABLE 3-11

	Shelter Site Number																									Resitings			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS	13	14	15	18
Elevation (feet)	5200	5280	5260	5255	5310 to 5320	5420 to 5430	5280	5385	5270	5315	5420	5380	5550	5600 to 5610	5730 to 5740	5560	5700	5650 to 5660	5460	5610	5440 to 5430	5350	5630 to 5640	5460 to 5470	5630	5545	5610	5735	5655
Soil Texture(a)																													
Coarse gravel			X	X	X	X	X	X	X		X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X
Fine gravel				X				X	X			X							X		X					X	X	X	X
Coarse sand	X			X		X	X	X	X	1		1								X			X			X	X	X	X
Fine sand		X		X	X	1	X		X	X	1	X	1	X	1	1	1	1	1	1	X	1	1	1	1	X	X	X	X
Silt	1	1	1	1	1	X	1	1	1	X	X	X	X	X	X		X	X	X	X	1	X	X	X	X	1	1	1	1
Clay		X	X																							X	X	X	X
Disturbance(a)																													
Off-road vehicles	2	2	2	2	2	2	2	1	2	1	X	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	3
Mining/const.																													
Erosion																3		3										2	
Grazing	1	1	1	1	1	1	1	3	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Other (established road)								2																					
Overall Intensity of Disturbance(b)	L	L	L	L	L	L	L	L	L	L	L	L	L	-	L	L	L	L	L	L	L	L	L	L	-	M	L	M	H

(a) 1-Highest relative importance/impact; 2-lesser relative importance/impact; 3-lowest relative importance/impact;
X-Indicates presence.

(b) H-High; M-Moderate; L-Low

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SUMMARY OF ABIOTIC FACTORS ON CLUSTER 2 SITES

TABLE 3-12

disturbance at Sites 8, 10, and 12. Cattle sign was observed on most of the sites, but no sheep sign was observed. Russian thistle (Salsola iberica) was present at all sites except Sites 2, 3, 12, and 23, indicating some disturbance in the past.

c. Threatened or Endangered Plant Species: Sclerocactus pubispinus was found at Site 16 in Cluster 2. This is listed as a Taxon Currently Under Review in the Federal Register. It is a Category 1 plant, which means there is presently sufficient information on hand to support the appropriateness of its being listed as a threatened or endangered species, but final publication of rules concerning the species will take several years.

A number of other plants were observed within the cluster that may be species currently listed in the 1980 Federal Register as Taxa Currently Under Review. These include Gutierrezia sarothrae, Townsendia sp., Cryptantha sp., Lepidium montanum, Opuntia sp., Astragalus lentiginosus, Astragalus sp., Mentzelia sp. Sphaeralcea sp., Gilia sp., and Eriogonum sp. Due to the lack of flowers and other reproductive structures during the season of the survey, positive identification of the species or subspecies was not possible. It is unlikely that many of these are species Currently Listed or Currently Under Review because many listed species are located in specific habitats not found in the project area, and a number are known only from outside Utah.

d. Vegetation: The vegetative community in Cluster 2 is a relatively typical shadscale (Atriplex confertifolia) community.

Winterfat (Ceratoides lanata) is present at every site, and the grass Oryzopsis hymenoides is present at nearly every site. Rabbitbrush (Chrysothamnus spp.) is usually present and is dominant or subdominant at 14 sites. Other important plants include Atriplex canescens, Grayia spinosa, Halogeton glomeratus, Salsola iberica, Ephedra nevadensis, Sphaeralcea grossulariifolia, Machaeranthera canescens, and Opuntia sp. Prunus fasciculata was found on Sites 14, 15, 18, and 20, which are on the edge of the valley near a major wash. Important grasses present include Hilaria jamesii, Bromus tectorum, Bouteloua gracilis, and Stipa comata. Percent perennial cover in Cluster 2 ranges from 7 to 30 percent and averages 20 percent.

The plant species observed in Cluster 2 are summarized in Table 3-13, and distribution of the dominant associations is mapped in Figure 3-26.

e. Wildlife: Wildlife observed in Cluster 2 are summarized in Table 3-14. Common wildlife throughout the cluster includes black-tailed jackrabbits and horned larks. A desert cottontail rabbit was seen at one site, badger dens were found on four sites, coyote sign at four sites, and kitfox sign or dens at four sites. Pronghorn antelope sign was seen at Sites 15, 20, 21, 22, 23, and along washes at the edges of the study area. Side-blotched lizards, seen at three sites, were the only reptiles observed. A northern harrier was seen at one site, and raven feathers were found at two sites; additional bird sightings should be expected during other seasons. Numerous large

	Original Sites																								Resitings			
Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMP	RSS	13	14	15	18
ASTERACEAE (COMPOSITAE)																													
Artemisia spinescens		X	X													X	X	X										X	X
Chrysothamnus greenei		X			X	X	X				X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chrysothamnus viscidiflorus				X				X	X	X		X																	
Chrysothamnus nauseous															X													X	
Eriogonum pusillum																			X										
Gutierrezia sarothrae																X	X												
Machaeranthera canescens	X	X		X			X	X	X		X	X	X	X		X	X	X	X	X	X	X	X	X	X				
Tetradymia glabrata															X		X	X	X			X							X
Tetradymia spinosa	X			X													X	X	X	X		X	X						X
Townsendia sp.				X												X			X										
BORAGINACEAE																													
Cryptantha sp.		X																											
Lappula sp.		X				X										X	X												
BRASSICACEAE (CRUCIFERAE)																													
Caulanthus pilosus																		X	X	X			X						
Descurainia sp.		X																											
Lepidium montanum		X													X		X												
Stanleya pinnata				X																									
Stanleya sp.	X																												

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PLANT SPECIES OBSERVED ON CLUSTER 2 SITES

TABLE 3-13

Species	Original Sites																									Resitings			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS	13	14	15	18
CACTACEAE																													
Opuntia sp.	X	X	X	X	X			X	X		X		X	X	X		X			X	X			X	X				
Sclerocactus _pubispinus_																X													
CHENOPODIACEAE																													
Atriplex _canescens_	X	X								X		X	X	X	X											X		X	
Atriplex _confertifolia_	X	X	X	X	X									X	X	X	X	X	X	X	X	X	X						X
Ceratoides _lanata_	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Grayia _spinosa_				X	X			X	X	X		X		X	X			X		X	X							X	
Halogeton _glomeratus_	X	X	X		X	X									X	X	X				X	X							
Salsola _iberica_	X			X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X		X	X				
Salsola sp.																										X	X		
EPHEDRACEAE																													
Ephedra _nevadensis_					X			X			X	X	X	X	X	X	X		X	X			X	X	X	X	X	X	
FABIACEAE (LEGUMINOSAE)																													
Astragalus _lentiginosus_											X			X				X	X	X	X	X	X	X					
Astragalus sp.				X							X	X	X											X	X	X			X
LOASACEAE																													
Mentzelia sp.			X													X													
MALVACEAE																													
Sphaeralcea _grossularii-folia_	X		X	X	X	X		X			X	X	X	X	X	X	X	X	X	X	X	X	X		X		X		
Sphaeralcea sp.																												X	

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PLANT SPECIES OBSERVED ON CLUSTER 2 SITES

TABLE 3-13

Species	Original Sites 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS	Resitings 13	14	15	18
POACEAE (GRAMINAE)																													
Aristida longiseta	X			X																									
Aristida purpurea																													X
Aristida sp.		X															X	X	X	X		X							
Bouteloua gracilis													X	X	X	X	X			X								X	
Bromus tectorum		X	X		X									X	X	X					X								
Hilaria jamesii	X	X	X	X	X		X	X	X		X			X	X	X	X	X	X	X	X	X	X		X			X	X
Oryzopsis hymenoides	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sitanion jubatum						X					X				X	X	X	X		X					X				
Sporobolus contractus								X	X							X													
Sporobolus cryptandrus			X		X	X	X						X		X	X	X	X	X					X	X				
Stipa comata							X	X	X	X	X	X	X	X				X						X	X				
Stipa coronata							X	X						X	X	X				X									
POLEMONIACEAE																													
Gilia sp.							X						X												X				
Leptodactylon pungens															X														
Leptodactylon sp.																											X	X	
POLYGONACEAE																													
Eriogonum cernuum	X			X				X	X	X		X																	
Eriogonum deflexum							X						X											X	X				
Eriogonum sp.																		X								X	X		X
ROSACEAE																													
Prunus fasciculata														X	X			X		X									

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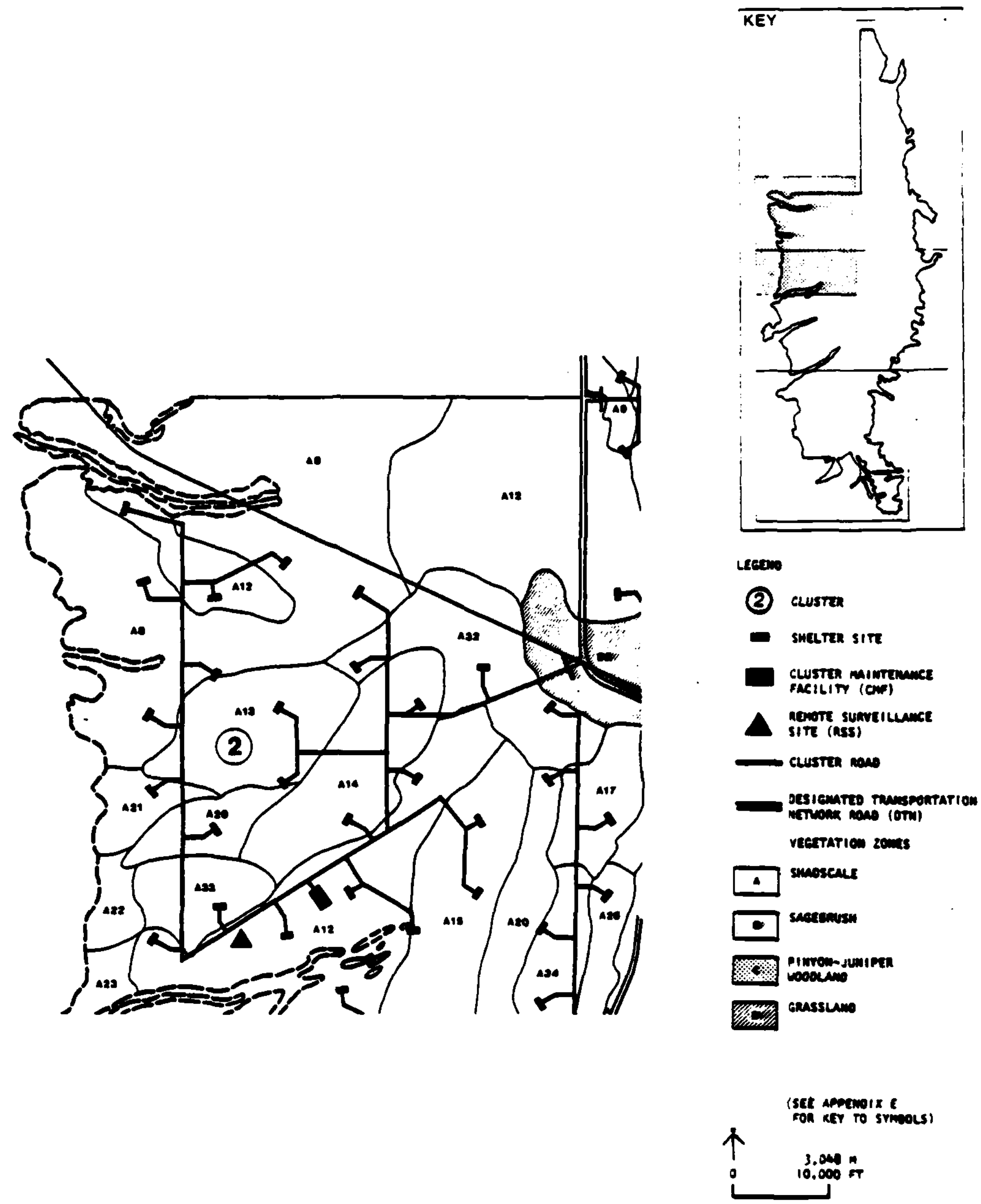
PLANT SPECIES OBSERVED ON CLUSTER 2 SITES

TABLE 3-13



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DOMINANT/SUBDOMINANT VEGETATIVE ASSOCIATIONS IN CLUSTER 2

FIGURE 3-26

Species	Original Sites																								Resitings			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS	13	14	15	18
Mammals																													
Domestic cattle		X	X		X	X					X			X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
Antelope															X					X	X	X	X						
Coyote				X						X								X				X							
Kit fox	X			X					X	X																			
Kit fox (den)	1																												
Badger holes (active)			2		1	1															2								
Badger																							X						
Black-tailed jackrabbit										1						1	1												
Desert cottontail		1																											
Rabbit	X	X		X	X	X	X		X	X	X	X		X	X	X	X		X	X	X		X	X	X	X	X	X	X
Pocket gopher			X		X		X				X							X	X	X	X	X		X	X		X	X	
Skunk den (?)																										X			
Large mammal burrows		X	X	X	X	X	X	X	X		X	X	X	X				X	X	X	X	X	X	X	X				
Small mammal burrows	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Birds																													
Horned larks	P	P			P	P			P	P	P		P	P	P	P			P				P	P	P	P	P	P	P
Northern harrier										1																			
Raven				P									P															1	1
Reptiles																													
Side-blotched lizard																1							1		1	22		15	

X = sign observed; P = observed but not counted; Number = actual sightings.

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ANIMALS AND ANIMAL SIGN OBSERVED ON CLUSTER 2 SITES

TABLE 3-14

and small mammal burrows indicate the presence of other, unidentified burrowing species throughout the cluster.

3.3.5.3 Summary of Conditions in Cluster 3

a. Abiotic Conditions: The legal descriptions of Cluster 3 sites are given in Appendix D. Elevations range from 5090 to 5480 feet (1566 to 1686 m), and sites are located on slopes of approximately three degrees. The soil is alluvial and consists mostly of fine sand and silt mixed with some gravels. Abiotic conditions within the cluster are summarized in Table 3-15.

b. Disturbance: The overall intensity of disturbance in Cluster 3 is low; disturbance is primarily due to grazing and some off-road vehicle activity. Evidence of both cattle and sheep grazing was observed within the cluster, but cattle sign was much more abundant. Some *Halogeton glomeratus* and *Salsola iberica* are present on most sites, indicating that the area has been disturbed in the past.

c. Threatened and Endangered Plant Species: The fishhook cactus (*Sclerocactus pubispinus*) was found at Sites 6, 12, and 14. It is listed as a Taxon Currently Under Review (Category 1) in the 1980 Federal Register.

A number of other plants were observed within the cluster that may be species Currently Listed or Taxa Currently Under Review in the 1980 Federal Register. These include *Brickellia* sp.,

	Shelter Site Number																								Resitings[c]							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMP	RSS	6	7	8	9	10	13	16	19
Elevation (feet)	5195	5206	5255	5365	5205	5385	5290 5300	5170	|	5150	5170	5460 5480	5130	5150	5130	5240	5090	5260	5135	5120	5145	5220	5310		5210	5435	5295	5170	5340	5215	5270	5260	5140
Soil Texture[a]																																	
Coarse gravel				X		X	X		X		X	X			X	1		X				X	X		X	X	X	X	X	X	X	X	X
Fine gravel		X											X			X		X								X	X	X	X	X	X	X	X
Coarse sand																			X		X					X		X	X	X	X	X	1
Fine sand	1		1	1		1	1	X	1		1	1			1		X		X	1	1	1	1		1	X	X	X	X	1	1	X	
Silt	X	1	X	X	1	X	X	1	X	1	X	X	1	1	X		X	1	1	X					X	1	1	1	1		X	1	
Clay	X										X				X		1									X		X	X		X	X	
Disturbance[a]																																	
Off-road vehicles	2	1	1	3	3	3	2	2	3	2	2	2	1	1	2	1	2	1	2	2	2	2	2		2			2	2	1	2		
Mining/const.																																	
Erosion		2		2	1	2	3		1		3	3					3					3	3		3	1			3	2	2		
Grazing	1	3	2	1	2	1	1	1	2	1	1	1	2	2	1	2	1	2	1	1	1	1	1		1	2	1	1	1		1	1	1
Other (road, soil dist.)											3								3														
Overall Intensity of Disturbance[b]	L	L	M	L	M	L	L	L	M	M	L	L	L	M	L	M	L	L	L	M	L	L	L		L	M	L	M	M	L	M	L	H

(a) 1-Highest relative importance/impact; 2-lesser relative importance/impact; 3-lowest relative importance/impact.
X-Indicates presence
(b) H-High; M-Moderate; L-Low
(c) Sites 6, 8 and 19 resurveyed but not resited

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SUMMARY OF ABIOTIC FACTORS ON CLUSTER 3 SITES

TABLE 3-15

Gutierrezia sarothrae, Machaeranthera sp., Senecio sp., Townsendia sp., Cryptantha sp., Lepidium sp., unknown mustard, Coryphantha vivipara, Echinocereus sp., Opuntia sp., Astragalus lentiginosus, Astragalus sp., Phacelia sp., Mentzelia sp., Sphaeralcea sp., Camissonia sp., Oenothera sp., Phlox sp., and Eriogonum sp.

The lack of flowers or other reproductive structures during the season of the survey prevented positive identification of the species or variety. It is unlikely that many of these are species Currently Listed or Currently Under Review because many are located in specific habitats not found in the project area, and a number are known only from outside Utah.

d. Vegetation: Cluster 3 lies at the northern end of the Pine Valley study area, which is considerably drier than other areas, as shown by the plants present. Artemisia spinescens and Sarcobatus vermiculatus are plants typical of saline dry valley floors in the Great Basin, and they were found primarily in Cluster 3. Other typical plants of this area included Ephedra nevadensis, Oryzopsis hymenoides, Hilaria jamesii, Bouteloua gracilis, and, on the higher sites, Ceratoides lanata and Atriplex confertifolia. Cacti were found at 15 sites in Cluster 3. This area is excellent habitat for cacti, some of which may be listed species.

Perennial cover in Cluster 3 ranged from 6 to 27 percent and averaged approximately 16 percent. The plant species observed in Cluster 3 are summarized in Table 3-16, and distribution of the dominant associations is mapped in Figure 3-27.

e. Wildlife: Wildlife observations in Cluster 3 are summarized in Table 3-17. Common wildlife seen throughout the cluster included black-tailed jackrabbits, horned larks, and side-blotched lizards. Antelope sign was seen at three scattered locations within the cluster. Coyote sign and badger dens were present at six sites. Site 13, along the road, contained kit fox sign. Three gophers were observed on Site 12, and gopher sign was present on nine other sites. Numerous large and small mammal burrows indicated the presence of unidentified burrowing species throughout the cluster. At least 30 side-blotched lizards, kangaroo rats, several unidentified lizards, two gopher snakes, ravens, and two Northern harriers were also seen in the cluster during the survey.

3.3.5.4 Summary of Conditions in Cluster 4

a. Abiotic Conditions: The legal descriptions of Cluster 4 are given in Appendix D. Elevations range from 5260 to 5850 feet (1618 to 1800 m), and sites are located on slopes of approximately three degrees or less. The soil is alluvial, composed of gravel, sand, and silt. Abiotic conditions within the cluster are summarized in Table 3-18.

b. Disturbance: Disturbance in Cluster 4 was generally low to moderate, with most disturbance caused by grazing. Evidence of both sheep and cattle was observed within the cluster, although

Species	Original Sites																									Resitings(a)							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS2	6	7	8	9	10	13	16	19
AGAVACEAE																																	
Yucca harrimaniae							X		X																X								
ASTERACEAE (COMPOSITAE)																																	
Ambrosia acanthicarpa																					X		X								X		X
Artemisia spinescens	X		X			X	X		X		X	X	X		X	X			X						X		X		X			X	
Brickellia sp.							?					X													X							X	
Chaenactis sp.															X																		
Chrysothamnus greenei	X		X					X		X	X				X	X				X	X	X	X					X	X				
Chrysothamnus nauseous				X					X			X							X						X				X		X	X	
Chrysothamnus viscidiflorus						X			X																						X		X
Chrysothamnus sp.																													X				
Cirsium sp.						X																											
Erigeron sp.				X		X																											
Gutierrezia sarothrae			X	X		X	X			X	X	X				X			X			X			X	X	X		X			X	
Leucelene ericoides																						X											
Machaeranthera canescens			X			X	X				X												X						X				X
Machaeranthera sp.																X																	
Senecio sp.						X						X																				X	
Tetradymia glabrata																						X											
Tetradymia spinosa										X					X																		
Townsendia florifer																						X											
Townsendia sp.						X						?																					
BORAGINACEAE																																	
Cryptantha compacta						X?																											
Cryptantha sp.																										X							
Lappula sp.				X		X						X													X								
BRASSICACEAE (CRUCIFERAE)																																	
Lepidium montanum			X						X		X	X																	X				
Lepidium sp.							X																										
Unknown mustard											X																						

(a) Sites 6, 8 and 19 resurveyed but not resited

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PLANT SPECIES OBSERVED ON CLUSTER 3 SITES

TABLE 3-16

	Original Sites																								Resitings(a)							
Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS2	6	7	8	9	10	13	16	19
CACTACEAE																																	
Coryphantha vivipara						X			X			X																					
Echinocereus engelmannii												X																					
Echinocereus sp.				X																													
Opuntia erinacea																											X						
Opuntia sp.				X			X	X	X		X	X	X		X	X			X			X	X		X	X			X			X	
Sclerocactus pubispinus						X						X		X																			
CHENOPODIACEAE																																	
Atriplex canescens	X							X									X			X	X	X	X										X
Atriplex confertifolia		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X						X	X	X		X			X	
Ceratoides lanata	X		X	X		X	X	X	X	X	X	X			X	X			X	X		X	X		X	X	X	X	X			X	X
Chenopodium fremontii																									X?								
Chenopodium sp.						X																											
Grayia spinosa	X														X							X	X					X					
Halogeton glomeratus	X	X	X	X	X	X	X		X	X		X	X	X	X	X	X					X			X				X				
Kochia americana		X			X			X		X			X	X			X	X	X														
Salsola iberica	X		X	X			X	X		X	X	X	X		X	X		X		X		X			X						X		X
Salsola sp.																														X		X	
Sarcobatus vermiculatus		X						X		X							X																
EPHEDRACEAE																																	
Ephedra nevadensis				X		X	X		X			X				X			X			X	X		X	X			X			X	
FABIACEAE (LEGUMINOSAE)																																	
Astragalus lentiginosus	X														?							X	X										
Astragalus sp.								X		X			X		X					X	X	X								X	X		X
HYDROPHYLLACEAE																																	
Phacelia sp.						X		X		X		X	X																				

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PLANT SPECIES OBSERVED ON CLUSTER 3 SITES

TABLE 3-16

Species	Original Sites																									Resitings[a]							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS2	6	7	8	9	10	13	16	19
LOASACEAE																																	
Mentzelia sp.															X						X												
MALVACEAE																																	
Sphaeralcea grossulariifolia				X		X	X				X	X										X	X		X								
Sphaeralcea sp.																X			X							X						X	
NYCTAGINACEAE																																	
Abronia sp.																					X	X	X										
ONAGRACEAE																																	
Camissonia sp.								X																									
Oenothera caespitosa				X		X						X																					
Oenothera sp.																				X	X	X	X										
POACEAE (GRAMINAE)																																	
Aristida purpurea																														X	X		
Aristida sp.						?									X					X	X		?										
Bouteloua gracilis				X		X			X			X				X		X	X						X	X							
Bromus tectorum	X	X			X		X						X	X	X																		
Hilaria jamesii	X		X	X		X	X	X		X	X	X	X		X	X	X	X	X	X		X	X			X		X		X		X	X
Oryzopsis hymenoides	X	X	X	X			X	X		X	X	X	X		X	X			X	X	X	X	X		X	X	X	X	X	X	X	X	X
Sitanion hystrix		X	X		X			X		X		X						X									X					X	
Sitanion jubatum				X		X	X																										

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PLANT SPECIES OBSERVED ON CLUSTER 3 SITES

TABLE 3-16

Species	Original Sites																								Resitings(a)							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS2	6	7	8	9	10	13	16	19
POACEAE (GRAMINAE) (Cont.)																																	
Sporobolus contractus									X							X			X	X		X											
Sporobolus cryptandrus			X	X		X	X		X		X	X			X						X				X	X	X		X			X	
Stipa comata							X	X														X	X										
Stipa coronata																																	X
Stipa sp.																										X				X			
POLEMONIACEAE																																	
Leptodactylon pungens									X																								
Leptodactylon sp.																													X				
Phlox sp.												X																					
POLYGALACEAE																																	
Polygala acanthoclada																						X											
POLYGONACEAE																																	
Eriogonum deflexum	X?					X																									X		X
Eriogonum sp.			X					X											X	X		X				X				X		X	
ROSACEAE																																	
Prunus fasciculata																							X										
Prunus sp.																														X	X		
SOLANACEAE																																	
Lycium andersonii					X																X												
Unknown																						X											

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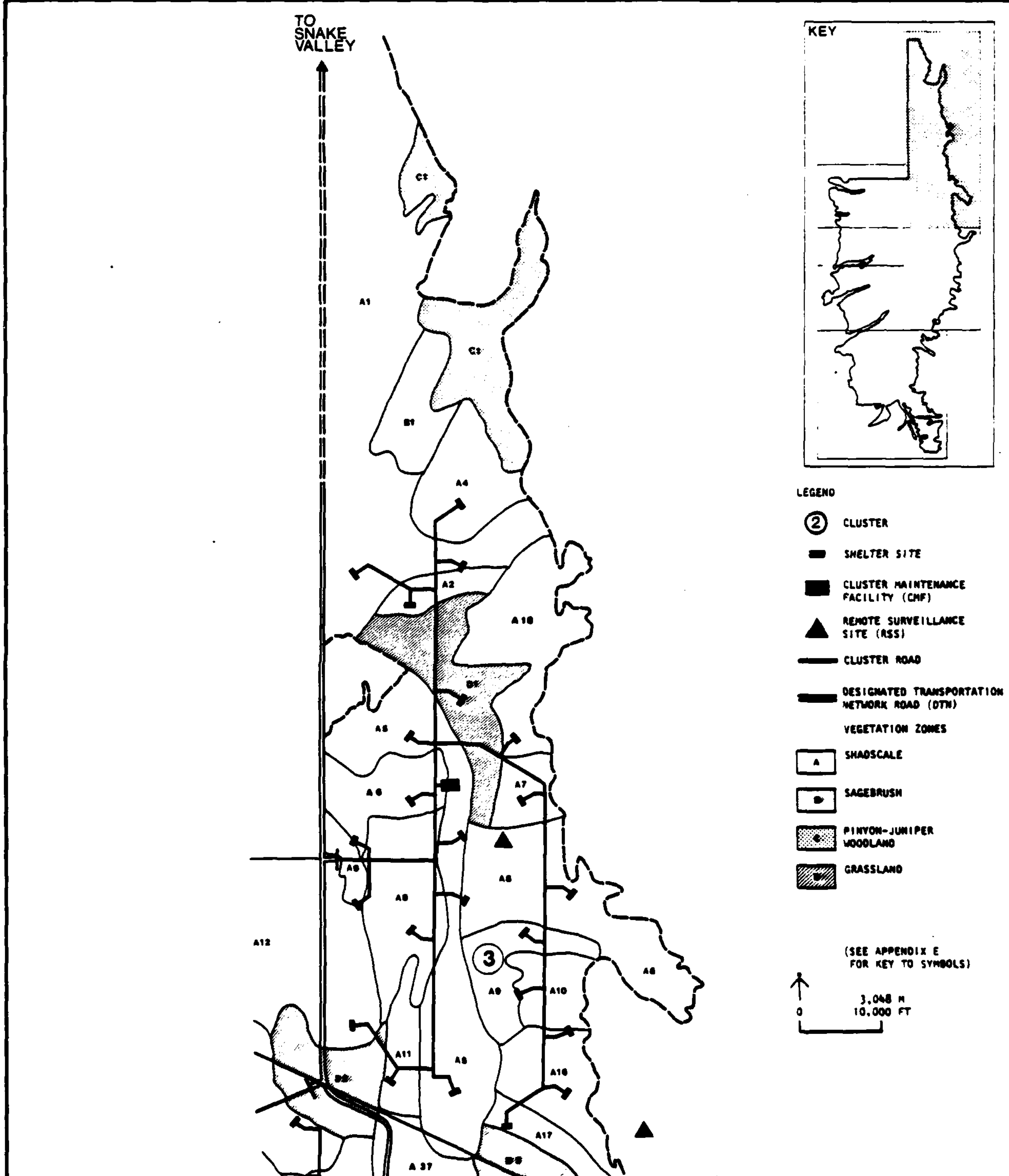
PLANT SPECIES OBSERVED ON CLUSTER 3 SITES

PAGE 4 OF 4

TABLE 3-16



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DOMINANT/SUBDOMINANT VEGETATIVE ASSOCIATIONS IN CLUSTER 3

FIGURE 3-27

	Original Sites																									Resitings							
Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS	6*	7	8*	9	10	13	16	19*
Mammals																																	
Domestic sheep																											X						X
Domestic cattle	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X		X	X	X
Antelope				X									X									X?				X			X				
Coyote								X					X	X			X				X	X?								X	X		
Kit fox den (inactive)																														X			X
Kit fox													X															X					
Badger den														X		X		X	X		X		X?			X			X				
Black-tailed jackrabbit							1	2									1				1							1	1	1			1
Rabbit	X	X			X	X				X	X		X		X	X	X	X		X	X	X	X			X		X	X	X	X	X	X
Kangaroo rat																					X									X			X
Pocket gopher												3																					
Pocket gopher burrows				P			P					P										P	P			P			P			P	P
Large mammal burrows	P					P	P	P			P	P	P	P	P	P	P	P	P	P		P			P								
Small mammal burrows	P	P		P	P	P	P	P		P	P	P	P	P	P	P	P	P	P	P		P	P		P	P		P	P		P	P	P
Birds																																	
Horned larks (numerous)								P		P					P	P		P					P		P	P		P	P			P	P
Raven						P	P			P											P		P			1							
Northern harrier					1					1																							
Wren																										1							
Reptiles																																	
Side-blotched lizard		5				3	10		6			4			1					1						3		5					
Unidentified lizard		1														5																	
Gopher snake						1															1												

X = sign observed; P = present but not counted; Number = actual sightings.
* resurveyed but not resited

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ANIMALS AND ANIMAL SIGN OBSERVED ON CLUSTER 3 SITES

TABLE 3-17

	Shelter Site Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Elevation (feet)	5800	5695	5575	5515	5680 5700	5520	5530 5850	5565	5510	5670	5650	5380	5500	5510	5325	5260
Soil Texture(a)																
Coarse gravel	X	X	X	X	X	X	X	X		X	X	X	X	X	X	
Fine gravel	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Coarse sand	X			1			X	X	X	1	X	X	X	X	1	
Fine sand		1	X	X	X	X	X		X	X		X	1		X	
Silt	1	X	1	X	1	1	1	1	1	X	1	1	X	1	X	X
Disturbance(a)																
Off-road vehicles		2	2	2	3	3		2	2	1		1	1	2	2	3
Erosion																1
Grazing		1	1	1	1	1	1	1	1			2		1	1	2
Excavations					2	2										
Roads											1					
Overall Intensity of Disturbance(b)	L	L	L	M	M	M	L	H	M	L	L	L	L	M	M	M

	Shelter Site Number 17	18	19	20	21	22	23	CMP	RSS 3	Resitings 5	6	7	9	10(c)	11
Elevation (feet)	5280	5320	5360	5400	5405	5440	5480	5385	5450	5685	5525	5870	5510	5725	5635
Soil Texture(a)															
Coarse gravel	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Fine gravel		X		X	X	X	X		X		X		1		X
Coarse sand		1		1	X	X			1	1	X	1	X	X	1
Fine sand	1	X	1	X	X	X	X		X	X	X	X			
Silt	X	X	X	X	1	1	1	1	X		1			1	
Disturbance(a)															
Off-road vehicles	2		2	2	2	2	2	1			3			2	2
Erosion											2	1			
Grazing	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1
Excavations															
Roads		2													
Overall Intensity of Disturbance(b)	L	L	M	L	M	M	L	L	M	L	H	L	L	L	L

(a) 1-Highest relative importance/impact; 2-lesser relative importance/impact; 3-lowest relative importance/impact.
X-Indicates presence

(b) H-High; M-Moderate; L-Low

(c) *resurveyed but not resited*

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SUMMARY OF ABIOTIC FACTORS ON CLUSTER 4 SITES

TABLE 3-18

cattle sign was much more abundant. Grazing disturbance was quite high at Site 8 and Resiting 6. Off-road vehicle tracks were also present on most sites. Gutierrezia sarothrae, an indicator of disturbance, is present throughout most of the cluster, except along the road.

c. Threatened or Endangered Plant Species: A number of plants were observed within the cluster that may be species Currently Listed or Taxa Currently Under Review in the Federal Register. These include Cymopterus sp., Enceliopsis sp., Gutierrezia sarothrae, Machaeranthera sp., Townsendia sp., Cryptantha sp., Lepidium montanum, Coryphantha vivipara, Opuntia sp., Arenaria sp., Astragalus sp., Phacelia sp., Sphaeralcea sp., Festuca sp., Phlox sp., Eriogonum sp., and Penstemon sp.

The lack of flowers or other reproductive structures during the season of the survey prevented positive identification of the species or varieties. It is unlikely that many of these are species Currently Listed or Currently Under Review because many are located in specific habitats not found in the project area, and a number are known only from outside Utah.

d. Vegetation: The land along the existing road in the vicinity of Cluster 4 consisted of typical shadscale and winterfat communities, generally indicating relatively low disturbance. Closer to the edge of the valley, the vegetation contains a larger number of species, many of which are indicative of disturbance, such as Gutierrezia sarothrae, Salsola iberica,

<u>Halogeton glomeratus</u>, and <u>Bromus tectorum</u>. Other plants within the cluster included <u>Juniperus osteosperma</u>, <u>Ephedra nevadensis</u>, <u>Sphaeralcea grossulariifolia</u>, <u>Artemisia nova</u>, and <u>Chrysothamnus</u> spp. <u>Machaeranthera canascens</u> was present in most of the sites in the northern portion of the cluster. Grasses present on most sites included <u>Hilaria jamesii</u>, <u>Oryzopsis hymenoides</u>, <u>Sitanion hystrix</u>, and <u>Sporobolus cryptandrus</u>. Perennial cover in Cluster 4 ranged from 10 to 34 percent and averaged approximately 29 percent.

The plant species observed in Cluster 4 are summarized in Table 3-19, and distribution of the dominant associations is mapped in Figure 3-28.

e. <u>Wildlife</u>: Wildlife observations in Cluster 4 are summarized in Table 3-20. Black-tailed jackrabbits and horned larks were very common. Mule deer sign was observed on 7 sites and antelope on 13 sites within the cluster. Two gophers were observed on one site, and numerous burrows were present on three others. A badger was sighted on one site, and badger burrows were observed on two additional sites. Numerous large and small burrows indicate the presence of other, unidentified burrowing species throughout the cluster. Ravens, a Northern harrier, an unidentified falcon species, and a short-eared owl were also observed within the cluster. Reptiles included a few side-blotched lizards and an unidentified lizard species.

Species	Original Sites																								Resitings						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS3	5	6	7	9	10*	11
APIACEAE (UMBELLIFERAE)																															
Cymopterus sp.																												X		X	
ASTERACEAE (COMPOSITAE)																															
Artemisia nova	X	X	X		X		X																							X	
Artemisia spinescens																	X														
Artemisia tridentata																												X			
Chrysothamnus greenei		X			X	X											X		X			X					X				
Chrysothamnus nauseous	X			X	X		X		X																			X		X	
Chrysothamnus viscidiflorus	X		X	X														X		X	X	X	X		X			X		X	
Chrysothamnus sp.							X																								
Enceliopsis sp.																														X	
Gutierrezia sarothrae	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X								X			X	X		X	X
Machaeranthera canescens												X	X	X	X		X	X	X					X							
Machaeranthera sp.																						X									
Tetradymia axillaris																														X	
Tetradymia spinosa					X												X														
Townsendia sp.												X	X																		
BORAGINACEAE																															
Cryptantha sp.												?		?																X	
Lappula sp.				X	X																						X				
BRASSICACEAE (CRUCIFERAE)																															
Lepidium montanum				X									X	X			X					X		X			X			X	
Mustard sp.											X																				
CACTACEAE																															
Coryphantha vivipara							X																	X				X		X	
Echinocereus engelmannii																												X			

* resurveyed but not resited

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PLANT SPECIES OBSERVED ON CLUSTER 4 SITES

TABLE 3-19

Species	Original Sites 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS3	Resitings 5	6	7	9	10*	11
CACTACEAE (Cont.)																															
Opuntia erinacea																												X		X	
Opuntia sp.	X	X	X				X	X	X		X	X	X	X	X		X			X				X			X				
CARYOPHYLLACEAE																															
Arenaria sp.											X																				
CHENOPODIACEAE																															
Atriplex bonnevillensis																?															
Atriplex canescens	X		X		X	X	X			X	X						X	X			X							X		X	
Atriplex confertifolia												X	X	X	X	X								X							
Ceratoides lanata	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X	
Grayia spinosa	X		X							X																					
Halogeton glomeratus			X	X		X						X	X			X	X	X	X	X	X	X	X	X	X		X				
Salsola iberica				X	X	X		X	X		X		X		X				X	X			X	X	X						
Salsola sp.																											X				
CUPRESSACEAE																															
Juniperus osteosperma			X				X																					X			
EPHEDRACEAE																															
Ephedra nevadensis	X	X	X	X	X	X	X	X	X	X	X													X				X	X	X	X
Ephedra sp.											X																				
FABIACEAE																															
Astragalus sp.																												X		X	
HYDROPHYLLACEAE																															
Phacelia sp.																								X							
MALVACEAE																															
Sphaeralcea grossulariifolia	X	X	X	X		X	X			X	X	X	X	X		X		X						X				X			
Sphaeralcea sp.				X																											

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PLANT SPECIES OBSERVED ON CLUSTER 4 SITES

PAGE 2 OF 3

TABLE 3-19

	Original Sites																									Resitings					
Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMP	RSS3	5	6	7	9	10*	11
POACEAE (GRAMINAE)																															
Aristida longiseta	?													X	X	X								X							
Aristida purpurea																												X		X	
Bouteloua gracilis	X				X		X	X	X	X	X		X	X										X				X		X	
Bromus tectorum	X	X	X	X	X	X	X	X	X	X	X	X	X						X	X	X		X	X			X	X		X	
Festuca sp.	X						X	X	X		X													X							
Hilaria jamesii	X		X	X	X	X			X	X	X	X		X	X		X		X	X	X	X	X	X	X						
Hordeum sp.					X																										
Oryzopsis hymenoides	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X	
Sitanion hystrix	X	X	X	X			X	X	X	X	X	X	X	X							X	X	X	X			X	X		X	
Sitanion jubatum					X	?											X														
Sporobolus contractus																			X									X		X	
Sporobolus cryptandrus	X	X	X	X	X		X	X	X	X	X	X	X	X	X		X	X	X	X				X							
Stipa comata	X	X																										X		X	
Stipa sp.							X																								
POLEMONIACEAE																															
Leptodactylon sp.																								X							
Phlox sp.	X	X																													
POLYGONACEAE																															
Eriogonum cernuum																		X		X	X		X	X							
Eriogonum deflexum																	X													X	
Eriogonum microthecum	X				X																										
Eriogonum sp.	X																					X								X	
RANUNCULACEAE																															
Delphinium sp.																														X	
SCROPHULARIACEAE																															
Penstemon sp.																												X			

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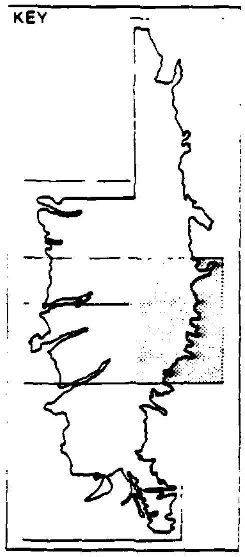
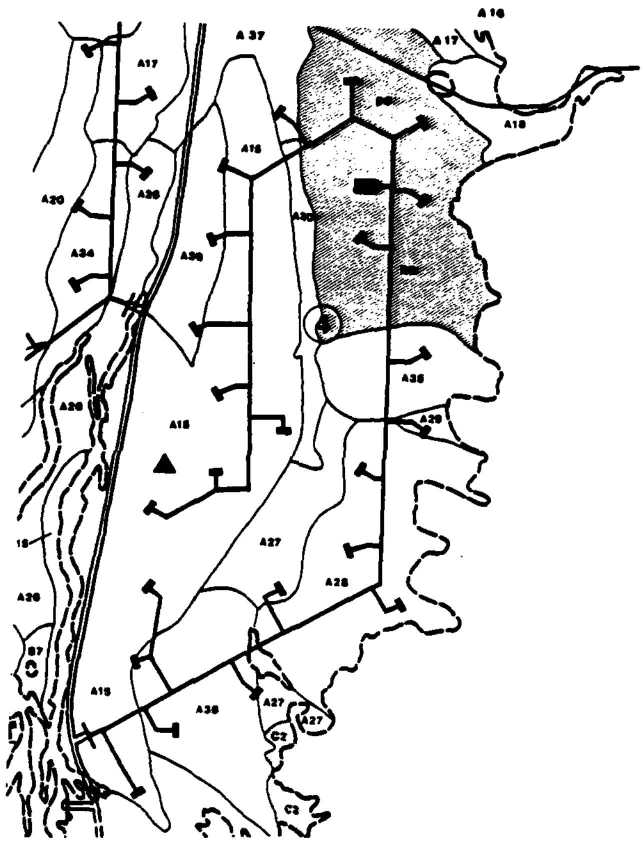
PLANT SPECIES OBSERVED ON CLUSTER 4 SITES

TABLE 3-19





LEGEND

- ② CLUSTER
- SHELTER SITE
- CLUSTER MAINTENANCE FACILITY (CMF)
- ▲ REMOTE SURVEILLANCE SITE (RSS)
- CLUSTER ROAD
- DESIGNATED TRANSPORTATION NETWORK ROAD (DTN)

VEGETATION ZONES

- A SHADSCALE
- B SAGEBRUSH
- C PINYON-JUNIPER WOODLAND
- GRASSLAND

(SEE APPENDIX E FOR KEY TO SYMBOLS)

0 — 3,048 M / 10,000 FT

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DOMINANT/SUBDOMINANT VEGETATIVE ASSOCIATIONS IN CLUSTER 4

FIGURE 3-28

Species	Original Sites																									Resitings					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS	5	6	7	9	10*	11
Mammals																															
Domestic sheep																			X								X				
Domestic cattle		X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Muledeer	X			X			X			X	X		X											X							
Antelope			X			X		X	X			X		X				X			X	X		X			X	X		X	
Coyote	X			X																											
Kit fox den (inactive)																															X
Badger																						1									
Badger burrows												X									X										
Blacktailed jackrabbit	1							1																1							
Rabbit	X	X		X	X		X	X	X	X	X	X		X	X	X	X					X	X				X			X	
Pocket gopher mounds																			X												
Pocket gopher					2																						X	X		X	
Large mammal burrows					P			P		P			P		P	P	P	P	P	P		P	P	P							
Small mammal burrows	P	P		P	P	P		P	P	P	P	P	P	P	P	P	P	P	P	P		P	P	P	P			P			
Birds																															
Horned larks								P	P	P		P	P	P		P	P	P		P		P					P				
Raven		1		1									1									1	1								
Northern harrier																							1								
Falcon sp.												1																			
Short-eared owl																1															
Reptiles																															
Side-blotched lizard										1					5																
Lizard sp.														4																	

X = sign observed; P = present but not counted; Number = actual sightings.
* resurveyed but not resited

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ANIMALS AND ANIMAL SIGN OBSERVED ON CLUSTER 4 SITES

TABLE 3-20

3.3.5.5 Summary of Conditions in Cluster 5

a. Abiotic Conditions: The legal descriptions of Cluster 5 sites are given in Appendix D. Elevations range from 5610 to 6415 feet (1726 to 1974 m), and sites are located on slopes of approximately three degrees or less. The soil is sandy, intermixed with coarse gravel. Abiotic conditions within the cluster are summarized in Table 3-21.

b. Disturbance: With the exception of Sites 3 and 19, the disturbance in Cluster 5 appeared to be the lowest of any cluster in Pine Valley. Both sheep and cattle were present within the cluster, but cattle sign was by far the most numerous. Site 3 had a high level of grazing damage, and crested wheatgrass (Agropyron desertorum) had been planted over most of Site 19. This grass is commonly used to revegetate abandoned croplands and depleted ranges. A native of Russia and Siberia, it is popular with Great Basin ranchers because of its high nutritional value, its hardiness, and its tolerance of grazing stress (Phillips Petroleum Co., 1963).

c. Threatened or Endangered Plant Species: Site 12 in Cluster 5 was found to have Cryptantha compacta, listed as a Taxon Currently Under Review (category 1) in the Federal Register.

A number of other plants were observed within the cluster that may be species either Currently Listed or Taxa Currently Under Review in the Federal Register. These include Cymopterus sp., Gutierrezia sa[illegible]hrae, Machaeranthera sp., Townsendia sp.,

	Shelter Site Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS4	Resitings 1	2	3	8
Elevation (feet)	5710	5610	5730	5695	5870	5860	5890	5970	5840	5910	5990	6140 to 6150	6160	6365	6320	6415	5970 to 5980	6100	6240 to 6250	6170 to 6180	6100 to 6110	5980	5860	5955	5910	--	5625	6100	5975
Soil Texture[a]																													
Coarse gravel	X	X	X	X	X	X		X	X			X	X	X		X				X	X		X	X	X		X		
Fine gravel	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					X		X	X	X		X		
Coarse sand	X	1	1	1	1	1	X	1	1	1	X	1	1	1	1	1					1		1	X	1	1	1	X	1
Fine sand		X	X	X		X	1	X	X	X	1	X	X	X	X	X	1	1	1	1	X	1	X	1	X	X	X	X	X
Silt	1	X	X		X		X				X				X								X	X		X		1	
Disturbance[a]																													
Off-road vehicles		2	3	1	2	1		1	1	1	2	2	1	1	1	1	2	2	2		1	2	2	1	1	2		2	2
Mining/const.			2																										
Erosion				3		2			2	2			3		2	4					2			3					
Grazing	1	1	1	2	1		1	2			1	1	2		3	2	1	1				1	1	2	2	1	1	1	1
Cult. agric.																			1										
Road														2(c)		3(c)			3										
Overall Intensity of Disturbance[b]	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H		L	L	L	L	L	L	L	L	L

(a) 1-Highest relative importance/impact; 2-lesser relative importance/impact; 3-lowest relative importance/impact.
X-Indicates presence

(b) H-High; M-Moderate; L-Low

(c) Tree limbs sawed off.

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SUMMARY OF ABIOTIC FACTORS ON CLUSTER 5 SITES

TABLE 3-21

<u>Cryptantha</u> sp., <u>Opuntia</u> sp., <u>Astragalus lentiginosus</u> <u>Phacelia</u> sp., <u>Gilia</u> sp., <u>Eriogonum</u> sp., and <u>Penstemon</u> sp.

The lack of flowers or other reproductive structures during the season of the survey prevented positive identification of the species or variety. It is unlikely that many of these are listed species, because many of the rare, threatened, or endangered individuals are located in specific habitats not found in the study area, and a number of them are known only from outside Utah.

d. <u>Vegetation</u>: The vegetation in Cluster 5 is quite different from any other cluster in Pine Valley. It is typical of wetter, higher, and less saline areas of the Great Basin. Big sagebrush (<u>Artemisia tridentata</u>) is the dominant species in most of the cluster, typical of Zone III plant communities (see section 3.2.1). The southern half of the cluster is at the edge of a pinyon-juniper woodland (Zone IV, see Section 3.2.1.4) and has shrubs, such as <u>Chrysothamnus viscidiflorus</u>, <u>Ephedra nevadensis</u>, <u>Juniperus osteosperma</u>, and <u>Pinus monophylla</u>, intermingled with such herbaceous plants as <u>Astragalus lentiginosus</u> and species of <u>Descurania</u>, <u>Cryptantha</u>, <u>Eriogonum</u>, and <u>Penstemon</u>. Plant species indicative of disturbance, such as <u>Bromus tectorum</u>, <u>Salsola iberica</u>, and <u>Halogeton glomeratus</u> are rarely found. <u>Opuntia</u> sp. cacti are found at nearly every site.

Perennial cover in Cluster 5 ranges from 3 to 41 percent and averages approximately 29 percent. The plant species observed in Cluster 5 are summarized in Table 3-22, and distribution of the dominant associations is mapped in Figure 3-29.

e. Wildlife: Wildlife observations in Cluster 5 are summarized in Table 3-23. This cluster has more evidence of wildlife than any other cluster in Pine Valley. The big sagebrush vegetation zone bordering pinyon/juniper provides a rich and varied food source for herbivores and, consequently, can support a large number of predators.

This cluster appears to be one of the most important for both antelope and mule deer. Antelope were sighted on 16 sites within the cluster; 39 percent of the sightings within the valley were located in Cluster 5. Sign was generally present in the middle area of the cluster and absent along the western edge.

Mule deer sign was observed in five sites within the cluster. More than 50 percent of the sign within the valley was found in Cluster 5. In contrast to the antelope sign, mule deer sign was found only on the perimeter of the valley, along the western edge of the cluster.

The Indian Peak Wildlife Management Area located nearby supports a variety of wildlife that may also use the habitat in Cluster 5. Elk from this area likely use portions of Cluster 5 as elk

Species	Original Sites																									Resitings			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS4	1	2	3	8
APIACEAE																													
Cymopterus sp.																										X			
ASTERACEAE (COMPOSITAE)																													
Ambrosia acanthicarpa																		X											
Artemisia nova	X			X																									X
Artemisia spinescens	X	X																				X	X						
Artemisia tridentata		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chaenactis sp.											X		X			X	X	X		?					X				X?
Chrysothamnus greenei				X		X	X										X	X							X				
Chrysothamnus nauseous			X																X										
Chrysothamnus viscidiflorus	X						X			X		X	X	X	X	X	X	X	X	X	X	X		X		X		X	X
Chrysothamnus sp.		X			X			X	X		X													X					
Gutierrezia sarothrae																												X	
Machaeranthera canescens																					X								
Machaeranthera sp.																X													
Senecio multilobata																?													
Townsendia sp.	X				X																X	X	X						
Viguiera multiflora																													X
BORAGINACEAE																													
Cryptantha compacta												X																	
Cryptantha sp.													X		X	X													X
Lappula sp.														X															
BRASSICACEAE (CRUCIFERAE)																													
Descurainia sp.																		X	X	X									
Physaria sp.															X														

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PLANT SPECIES OBSERVED ON
CLUSTER 5 SITES

 TABLE 3-22

Species	Original Sites 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS4	Resitings 1	2	3	8
CACTACEAE																													
Opuntia erinacea																													x
Opuntia sp.	x		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x					
CHENOPODIACEAE																													
Ceratoides lanata					x																								
Grayia spinosa	x	x	x	x	x								x					x				x	x		x	x			x
Salsola iberica			x																x										
CUPRESSACEAE																													
Juniperus osteosperma											x	x	x	x	x	x	x												
EPHEDRACEAE																													
Ephedra nevadensis				x		x	x	x		x	x	x	x	x	x	x	x	x		x	x	x	x	x	x			x	
FABIACEAE (LEGUMINOSAE)																													
Astragalus lentiginosus	x	x				x	x	x	x	x	x	x	x		x	x	x	x		x	x	x	x	x	x	x			x
Astragalus newberryi						x														x									
HYDROPHYLLACEAE																													
Phacelia sp.																							x						
MALVACEAE																													
Sphaeralcea grossularii-folia	x	x	x	x	x		x						x					x	x			x							
PINACEAE																													
Pinus monophylla														x		x													

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PLANT SPECIES OBSERVED ON CLUSTER 5 SITES

TABLE 3-22

E-TR-48-II-II

Species	Original Sites																									Resitings			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS4	1	2	3	8
POACEAE (GRAMINAE)																													
Agropyron desertorum																			X										
Agropyron smithii					X																								
Aristida longiseta	X	X			X		X	X			X	X											X						
Aristida sp.																	X	X		X		X							
Bouteloua gracilis	X	X	X		X				X			X					X						X			X			
Bromus tectorum																			X										
Hilaria jamesii	X	X	X		X		X		X	X		X	X				X	X		X		X	X			X		X	X
Oryzopsis hymenoides	X	X	X	X	X		X		X	X	X	X	X			X	X	X		X	X	X	X	X					X
Sitanion hystrix	X	X	X	X	X	X	X	X	X	X	X				X	X							X	X	X				X
Sitanion jubatum												X	X				X	X	X	X	X	X							
Sporobolus cryptandrus	X	X			X																								
Stipa comata		X			X							X	X					X			X	X	X						
unknown grass																													X
POLEMONIACEAE																													
Gilia sp.																X													
Ipomopsis congesta															X														
Leptodactylon pungens													X																
POLYGONACEAE																													
Eriogonum caespitosum												X?																	
Eriogonum cernuum		X			X										X	X													
Eriogonum microthecum															X	X													
Eriogonum sp.		X									X		X			X							X						
SCROPHULARIACEAE																													
Penstemon sp.		X										X	X		X	X													
SOLANACEAE																													
Nicotiana attenuata																			X										

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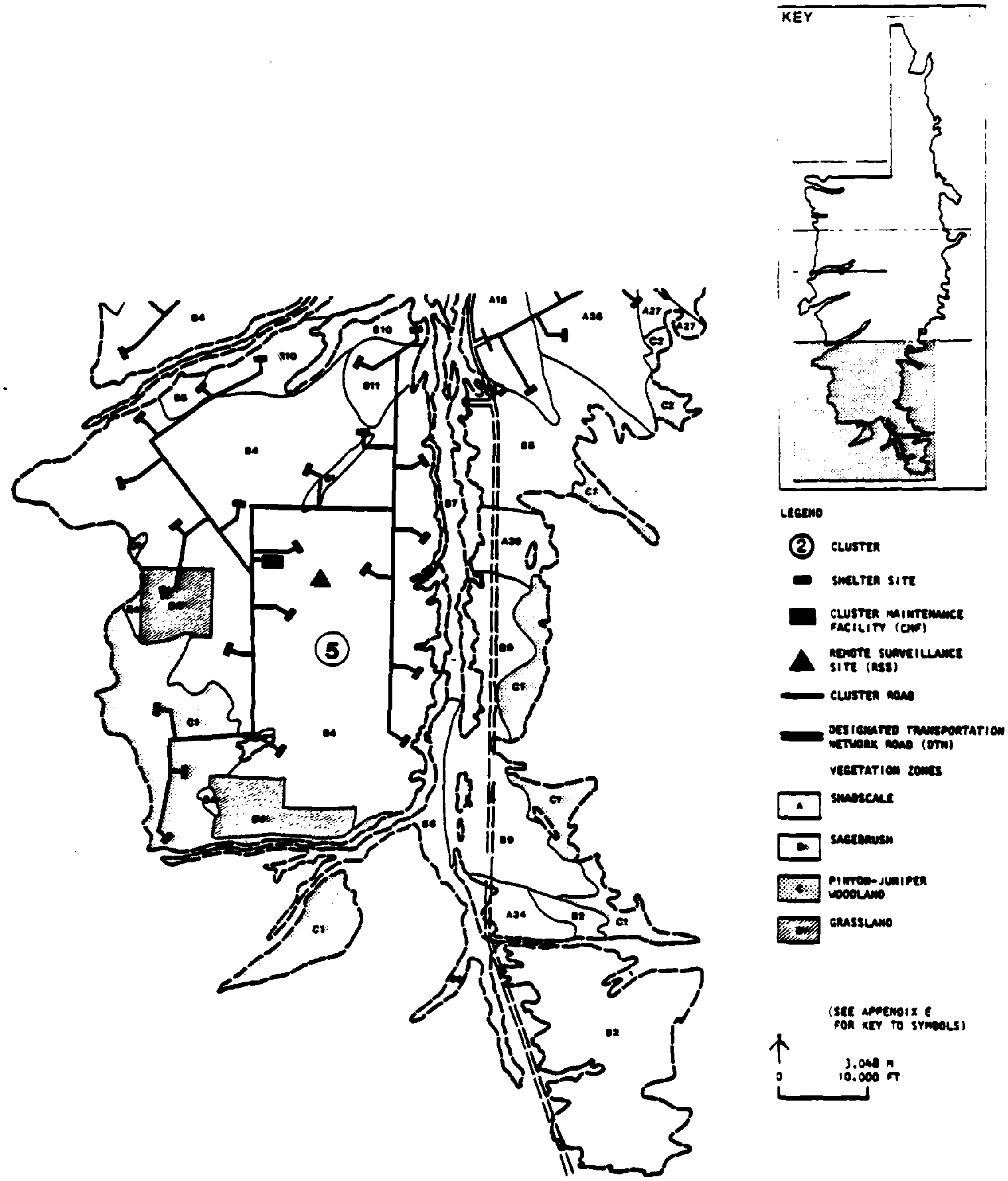
PLANT SPECIES OBSERVED ON CLUSTER 5 SITES

 TABLE 3-22



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DOMINANT/SUBDOMINANT VEGETATIVE ASSOCIATIONS IN CLUSTER 5

FIGURE 3-29

Species	Original Sites 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS	Resitings 1	2	3	8
Mammals																													
Domestic sheep								X																					
Domestic cattle	X	X	X	X			X	X			X	X	X		X	X	X	X	X			X	X	X	X	X	X		X
Muledeer														X				X	X	X		X							
Antelope	X	X	X	X	X	X			X	X	X	X	X		X						X		X	X	X			X	
Coyote		X	X	X			X			X	X	X		X	X	X	X	X			X	X	X	X	X	X		X	X
Badger den								X																					
Black-tailed jackrabbit	1	4	1	2			2			1		1						1				1	1	1					2
Rabbit	X	X	X	X	X	X		X	X	X	X	X		X	X	X	X	X	X	X	X	X	X		X	X		X	X
Pocket gopher					X			X																				X	
Large mammal burrows	P	P																		P									
Small mammal burrows	P	P	P	P	P	P	P		P	P	P	P	P		P	P	P	P	P	P	P	P		P	P				
Birds																													
Horned larks			P				P																						P
Raven																1													
Sage grouse sign										X			X								X		X		X			X	X
Chickadees (species unknown)													P																
Reptiles																													
Side-blotched lizard									1																				

X = sign observed; P = present but not counted; Number = actual sightings.

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ANIMALS AND ANIMAL SIGN OBSERVED ON CLUSTER 5 SITES

TABLE 3-23

range lies within the southwestern portion of the cluster, although no elk sign was observed during the survey.

The only sage grouse strutting grounds and range in the valley are located within the cluster. The strutting grounds are centered approximately equidistant from 5 of the shelters. The nesting areas have not been identified, but the field survey results showed that most of the sagebrush is found north of the strutting ground, and most signs of sage grouse usage were observed in the northern part of the cluster along Turkey Wash. Other birds observed during the survey included horned larks, common ravens, and chickadees. Badger and pocket gopher sign were also observed. Coyote sign was observed at almost every site, and black-tailed jackrabbits were ubiquitous. Numerous large and small mammal burrows indicate the presence of other, unidentified burrowing species throughout the cluster.

The wash between Clusters 1 and 5 is expected to contain a variety of wildlife, much of which may not have been observed on the shelter sites. Although this wash is not included in the study area, it is very close to sites in both clusters, and wildlife using the wash may be affected by the project. Seven transplanted Utah prairie dog colonies are located several miles south of the cluster and should not be directly affected by facilities within it.

3.4 RESITINGS IN PINE VALLEY

Resitings were authorized by the Air Force to mitigate adverse environmental impact by avoidance when possible. The shelter spacing criteria were somewhat flexible; shelters located in highly sensitive areas could therefore sometimes be relocated to avoid significant cultural resources, biological features, or areas where geotechnical difficulties might affect construction. Twenty-two shelters were resited in Pine Valley; 4 resitings were made for cultural resources, 17 for geological reasons, and one for biological reasons. Shelters resited and the reasons for the resitings are listed in Table 3-24.

In general it was possible to relocate a site within 400 feet (124 m) of its original location and avoid the conflict on the original site. A resurveyed site was, in many cases, part of the original survey area, and data obtained from the resurveyed site are therefore often similar to data from the original site. The data from resitings have been incorporated into the appropriate cluster to help provide an overall picture of the clusters. Transect data are given in Appendix E. In some cases, because of the proximity of the original and the relocated sites, additional transects were not necessary.

The first criterion in the determination of whether or not to resite for biological reasons in the IOC valleys was the

Site Number	Reason for Resiting	Site Number	Reason for Resiting
SS 1/1	cultural resources	SS 3/13	criteria
SS 1/14	wash	SS 3/16	wash
SS 1/21	wash	SS 4/5	cultural (man-made ditch)
SS 1/22	wash	SS 4/6	cultural (man-made ditch)
SS 2/13	wash	SS 4/7	biological
SS 2/14	wash	SS 4/9	wash
SS 2/15	wash	SS 4/11	wash
SS 2/18	wash	SS 5/1	wash
SS 3/7	wash	SS 5/2	wash
SS 3/9	wash	SS 5/3	cultural
SS 3/10	playa	SS 5/8	fault

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FACILITY RESITINGS IN PINE VALLEY

TABLE 3-24

presence of a threatened or endangered species. The identification of even a single individual within the survey area was sufficient to consider relocation. Relocation was also considered for such protected species as game animals but only if the species population might be affected by such factors as blockage of a migration route or disturbance of key habitat. Relocation was not considered for single individuals of protected species.

Species-specific characteristics were evaluated in relocation decisions. The federal and state status of the species, the number of individuals and populations within the valley and surrounding area, the amount of critical habitat and proportion of population affected, the species habitat requirements, adaptability, tolerance of human activity, critical seasons, and other factors were taken into account.

No federally listed species are expected to be directly impacted by the HSS, RSS, or CMF surveyed in Pine Valley. If such species had been identified, it would have been necessary for the Air Force to initiate a Section 7 consultation with the U.S. Fish and Wildlife Service. Species listed as Taxa Currently Under Review in the Federal Register are considered candidates for federal listing. When candidate species were found, a number of recognized plant authorities were consulted; it was decided that mitigation by relocation of facilities was unnecessary in most cases, because only a small number of individuals was affected. Mitigation by avoidance was recommended if the field survey encountered a group of individuals of a candidate species.

Shelter Site 4/7 was the only site relocated for biological reasons. On this site, 32 individuals of Coryphantha vivipara were observed. These were believed to be the variety rosea, a species Currently Under Review, although a positive identification was not possible due to the lack of flowers at this time of year.

Mitigation by relocating shelter sites a few hundred meters from the original site may not result in sufficient avoidance because larger, mobile animals may be sensitive to disturbance from a great distance. For example, a buffer zone of 1.8 miles (3 km) should be maintained around strutting grounds (Braun, 1977; Day, 1980). In such situations, a typical resiting is of little use. Thus, while the project will impact antelope, mule deer, and sage grouse in the southwestern part of the study area, primarily in Cluster 5, no mitigation through resiting of single shelter sites was recommended for these species.

A number of plant species that may be Currently Listed or Currently Under Review in the Federal Register were observed within the valley, but species identification was not possible because of the season of the survey. It was decided not to resite for these species at this time. However, a survey should be conducted in the spring season to allow positive species identification, and if the species are determined to be so listed, resiting or other mitigation measures should be considered.

4.0 WAH WAH VALLEY

4.1 ABIOTIC ENVIRONMENT: DATA REVIEW

4.1.1 Valley Description

Wah Wah Valley, located in western Beaver and Millard counties, Utah, approximately 20 miles (32 km) west of Milford, is one of a series of valleys between north-south oriented mountain ranges in southwestern Utah. State Highway 21 crosses Wah Wah Valley in an east-west direction. The valley is bordered on the east by both the San Francisco Mountains, whose highest elevation reaches 9660 feet (2972 m), and the Shauntie Hills, many of which rise above 7000 feet (2154 m); the Sevier Lake playa lies north; and the Wah Wah Mountains, with elevations up to 9785 feet (3011 m), lie west. The southern end of the valley reaches the edge of the Escalante Desert. Valley floor elevations range from approximately 4500 to 6000 feet (1385 to 1846 m).

Wah Wah Valley is bordered by mountains, the lower flanks of which include rocky outcrops between small canyons such as Long Valley and Lawson Cove, which extend some distance into the hills. Several coalesced fans, or bajadas, extend from the mountain edges into the valley (U.S. Department of Interior, 1978).

The central portion of the valley near Highway 21 is privately owned, and both this and the surrounding areas are used for grazing. There is mining activity in the mountains on both sides of the valley and on the valley floor, especially on the eastern edge.

4.1.2 Hydrology

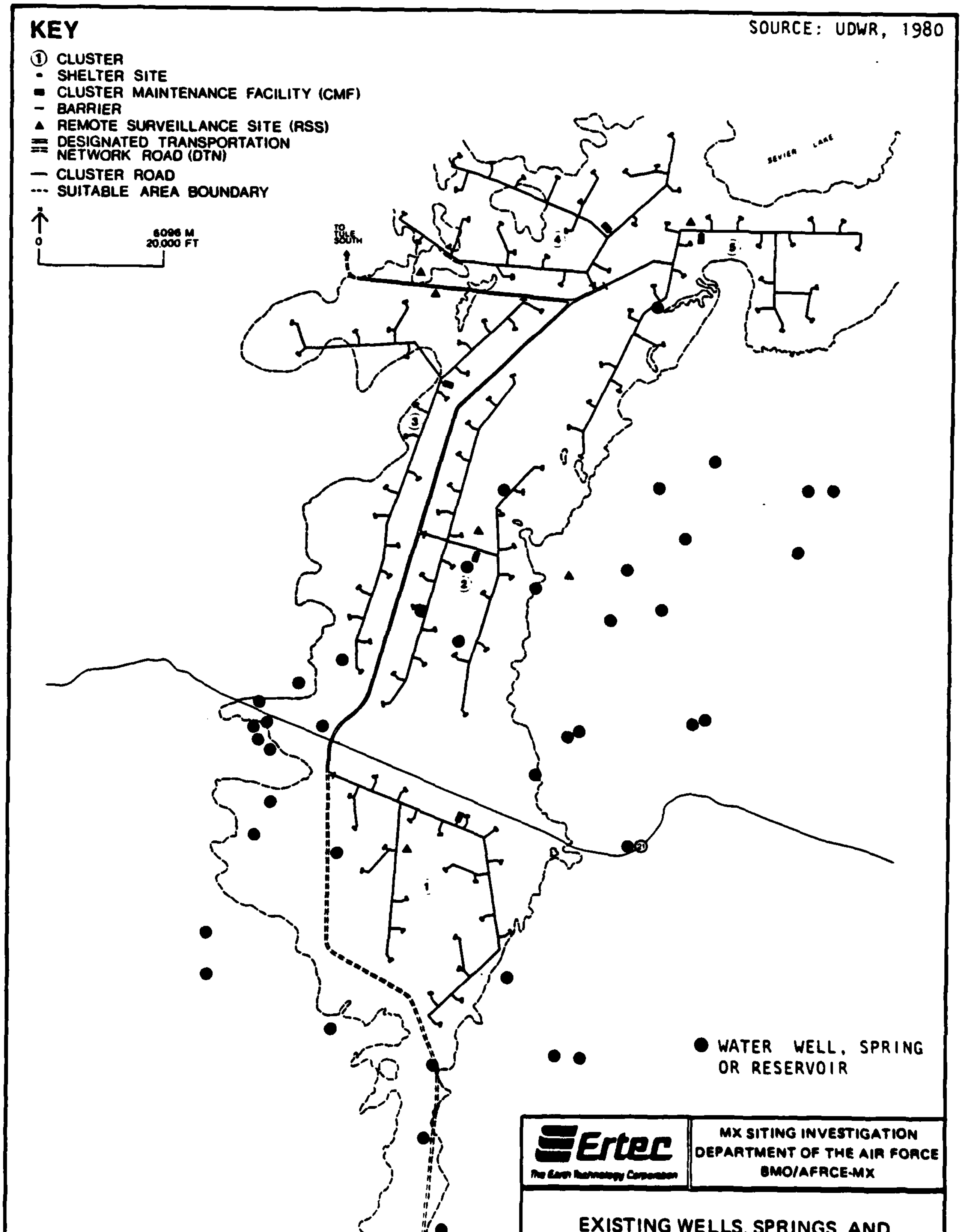
Wah Wah Valley is a closed drainage basin. Several small washes and arroyos, including the intermittent Willow and Quartz creeks, drain into the center of the valley where they join the large Wah Wah Wash, which drains into the playa, or Wah Wah Valley hardpan. Permanent water is found at the Wah Wah, Antelope, Kiln, and Squaw springs, in the Newhouse, Grover Wash, Dutchman, and Lawson Cove reservoirs, and in the aquaduct system from Wah Wah Spring (U.S. Department of Interior, 1978). A large number of water sources have been constructed in Wah Wah Valley to supply cattle and wildlife. Water sources are shown in Figure 4-1.

Ground water, if present, occurs at great depth and may be entirely absent beneath the slopes flanking the valley (Stephens, 1974). Observation wells drilled by Ertec Western in 1980 indicate water levels at 94 feet (29 m) near Sevier Lake to greater than 1100 feet (335 m) near the center of the valley. Table 4-1 shows the groundwater budget for the Wah Wah Valley drainage basin (Stephens, 1974).

4.1.3 Geology

Precambrian to Holocene rock outcrops occur in the Wah Wah drainage basin (Stephens, 1974). The valley consists primarily of alluvial soils, with sand, gravel, and boulders and central lacustrine deposits of clay and silt on the Wah Wah Valley hardpan.

The valley is part of an eastward-tilted fault block that lies between faults in the Wah Wah and San Francisco mountains.



EXISTING WELLS, SPRINGS, AND RESERVOIRS IN WAH WAH VALLEY

FIGURE 4-1

	Estimated quantity (acre-feet/year)
Recharge:	
From preciptation in drainage basin	7,000
Subsurface inflow from Pine Valley	3,000
Total	10,000
Discharge:	
Evapotranspiration from:	
Stream-channel alluvium	40
Wah Wah Springs discharge area	600
Flow and pumpage[b] from wells and springs from:	
Alluvium	52
Non-carbonate rocks	58
Carbonate rocks	800
Total	1,500

(a) Source: adopted from Stephens, 1974.

(b) Quantities are estimated total discharge. Includes an estimated 300 acre-feet used for irrigation, stock watering, and wildlife; the rest is ultimately lost by evapotranspiration.

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GROUNDWATER RECHARGE AND DISCHARGE IN THE WAH WAH VALLEY DRAINAGE BASIN

TABLE 4-1

Igneous intrusive rocks, Paleozoic limestones, and dolomite outcrops occur in the mountains surrounding Wah Wah Valley and are found in the alluvium on the valley floor (Stephens, 1974). Geology of hydrographic area 54, which contains Wah Wah Valley, is shown in Figure 4-2.

4.1.4 Climate

Climatological data from Wah Wah Ranch, located in central Wah Wah Valley, is shown in Table 4-2. Wah Wah Valley is typical of the cold northern intermountain valleys; its winter temperature regularly drops below freezing (Cronquist et al., 1972). Temperatures in January, the coldest month, average 28.7°F, and temperatures in July, the hottest month, average 76.2°F (Stephens, 1974).

Annual precipitation at the Wah Wah Ranch averages 6.8 inches (17 cm). At the edges of the valley, annual rainfall averages 10 inches (25 cm).

4.2 BIOTIC ENVIRONMENT: DATA REVIEW

4.2.1 Vegetation Types

Most of Wah Wah Valley has vegetation typical of the shadscale zone, which has been discussed in Section 3.2.1. Along the edges of the valley, a pinyon-juniper woodland extends from the mountains on both sides of the valley onto the bajadas. A large section of the valley is privately owned, and portions are under cultivation.

KEY:

Qay - STREAM-CHANNEL ALLUVIUM

Qas - ALLUVIUM

Qag - ALLUVIUM (includes some clay and silt)

Qlc - LACUSTRINE DEPOSITS

Qlt - LACUSTRINE DEPOSITS

Qts - SPRING DEPOSITS

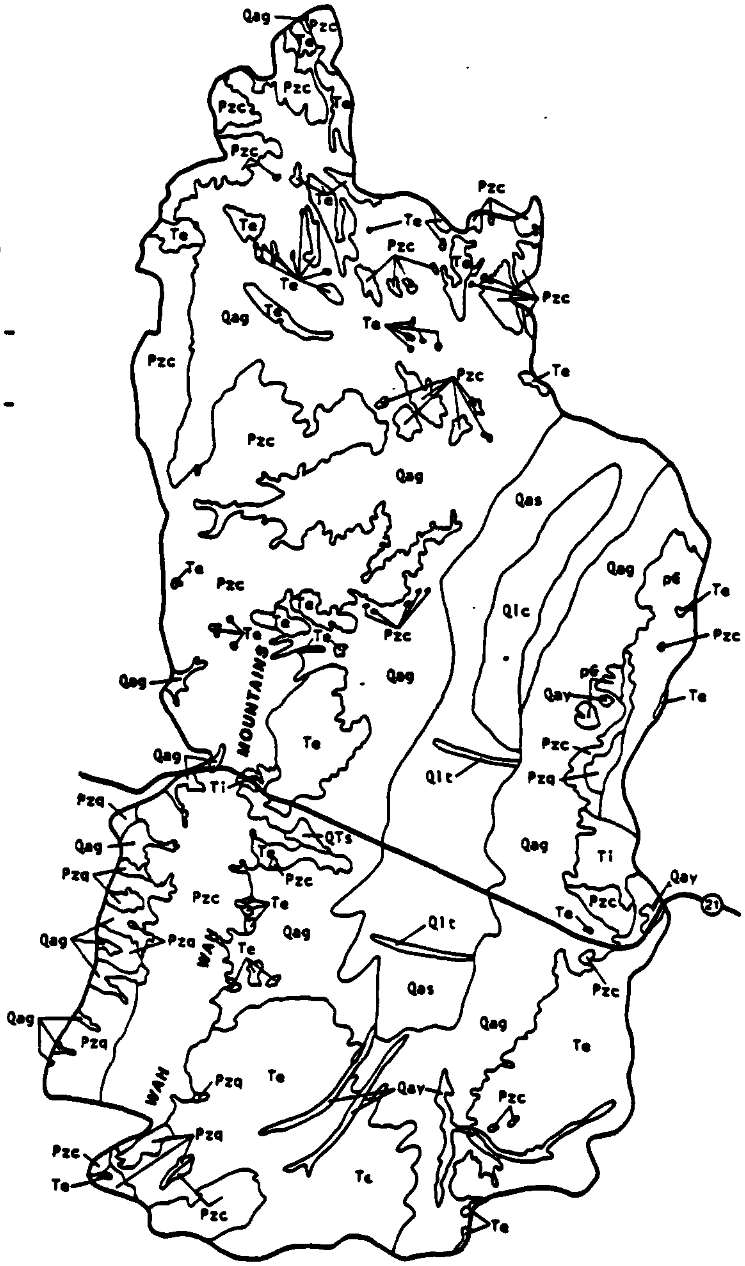
Te - EXTRUSIVE IGNEOUS ROCKS

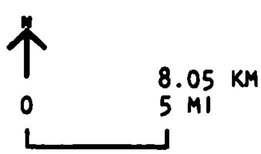
Ti - INTRUSIVE IGNEOUS ROCKS

Pzc - SEDIMENTARY AND METASEDIMENTARY CARBONATE ROCKS

Pzq - SEDIMENTARY AND METASEDIMENTARY QUARTZITIC ROCKS

pC - METASEDIMENTARY ROCKS UNDIFFERENTIATED





SOURCE: STATE OF UTAH DEPT. OF NATURAL RESOURCES 1974 TECHNICAL PUBLICATION

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GEOLOGY OF HYDROGRAPHIC AREA 54

FIGURE 4-2

Month	Average Temperature (°F)	Average Precipitation (in.)
January	28.7	0.26
February	34.6	0.40
March	40.5	0.52
April	47.8	0.65
May	58.0	0.58
June	67.7	0.48
July	76.2	0.60
August	74.0	1.08
September	63.7	0.61
October	51.8	0.67
November	38.3	0.50
December	29.6	0.34
Annual average	50.9	6.69[b]
Maximum/minimum		
Period of record[c]	106/-27	--
Annual	--	10.11/3.55
Monthly	--	2.31/0.00

(a) Source: Stephens, 1974.

(b) Sum of monthly averages. Average annual precipitation for 17 complete years of record (January 1956-December 1972) is 6.80 inches.

(c) September 1955 - December 1972.

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SELECTED CLIMATOLOGIC DATA FROM WAH WAH RANCH

TABLE 4-2

4.2.2 Threatened, Endangered, and Sensitive Plant Species

Several rare plant species are known from Wah Wah Valley (Welsh and Neese, 1980). These are listed either as Taxa Currently Under Review in the Federal Register or as priority species by the Utah Native Plant Society (UNPS). However, all of these fall outside of the suitable area boundary. The UNPS priority designations and listing are given in Appendix B.

There are three populations of Sclerocactus pubispinus known from Wah Wah Valley. Populations are located at elevations between 5100 and 6000 feet (1569 and 1846 m) and range from 1 to 57 individuals. It is a species Currently Under Review (Category 1) and is also listed as a High Priority in species by the UNPS.

There are four populations of Penstemon nanus known from the valley. All contain over 100 individuals and are located at elevations between 5500 and 6400 feet (1692 and 1969 m). This species is Currently Under Review (Category 2) and is listed as a Medium Priority species by the UNPS.

There is one population of Cymopterus basalticus known from the valley. It contains over 200 individuals and is located at an elevation of 5700 feet (1754 m). It is a species Currently Under Review (Category 2).

There is one population of 200 individuals of Eriogonum ammophilum known from an elevation of approximately 6000 feet (1846 m). This species is Currently Under Review (Category 1).

There is one population of four individuals of Coryphantha vivipara known from an elevation of 5400 feet (1662 m). This is a species Currently Under Review (Category 2).

There is one population of more than 100 individuals of Lepidium ostleri known from an elevation of approximately 6700 feet (2062 m). It is Currently Under Review (Category 1) and is listed as a High Priority species by the UNPS.

There is one population of 43 individuals of Trifolium andersonii var. friscanum known from an elevation of 6800 feet (2092 m). This species is Currently Under Review (Category 1) and is listed as a High Priority species by the UNPS.

Location of the species discussed above are shown in Figure 4-3.

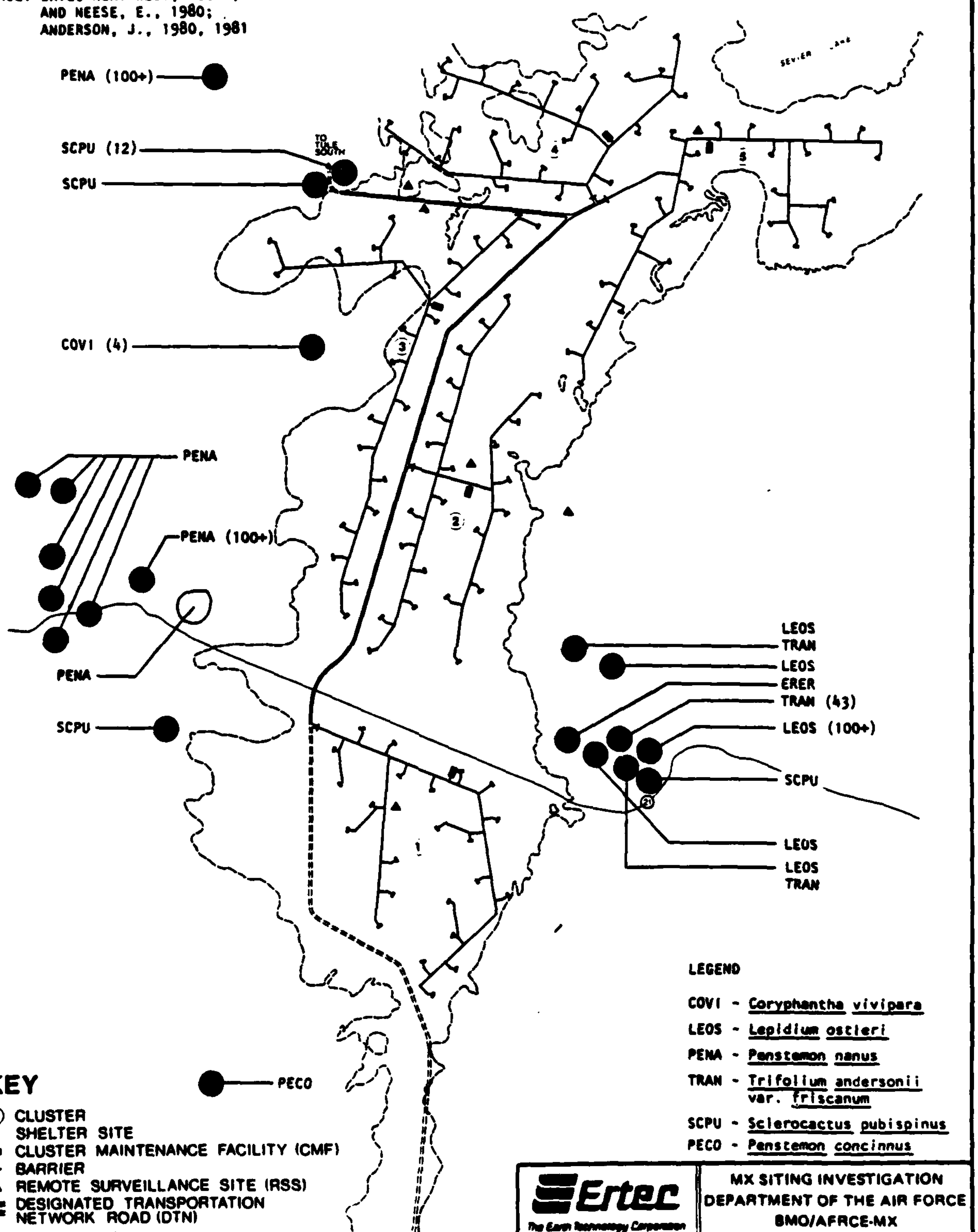
4.2.3 Threatened and Endangered Wildlife Species

Portions of Wah Wah Valley lie in a bald eagle (Haliaeetus leucocephalus) winter use area. The following portions of the MX system lie within these areas: all of Cluster 1; Sites 8-23 of Cluster 5; all of Cluster 2, except for Sites 10 through 14, 17, and 18; Sites 1 through 6 of Cluster 3; and Site 23 of Cluster 4. The location of this winter use range, as identified by the Utah DWR, is shown in Figure 4-4.

4.2.4 Other Wildlife Species of Concern in Wah Wah Valley

Wildlife present in Wah Wah Valley include pronghorn antelope, mule deer, kit fox, and raptors. Background information on these species has been discussed previously in Section 3.2.5.

SOURCE: ERTEC NORTHWEST; WELSH, S.L. AND NEESE, E., 1980; ANDERSON, J., 1980, 1981



LEGEND

COVI - Coryphantha vivipara
LEOS - Lepidium ostleri
PENA - Penstemon nanus
TRAN - Trifolium andersonii var. friscanum
SCPU - Sclerocactus pubispinus
PECO - Penstemon concinnus

KEY

- ① CLUSTER
- • SHELTER SITE
- ▬ CLUSTER MAINTENANCE FACILITY (CMF)
- – BARRIER
- ▲ REMOTE SURVEILLANCE SITE (RSS)
- ═ DESIGNATED TRANSPORTATION NETWORK ROAD (DTN)
- — CLUSTER ROAD
- --- SUITABLE AREA BOUNDARY

0 — 6096 M / 20,000 FT

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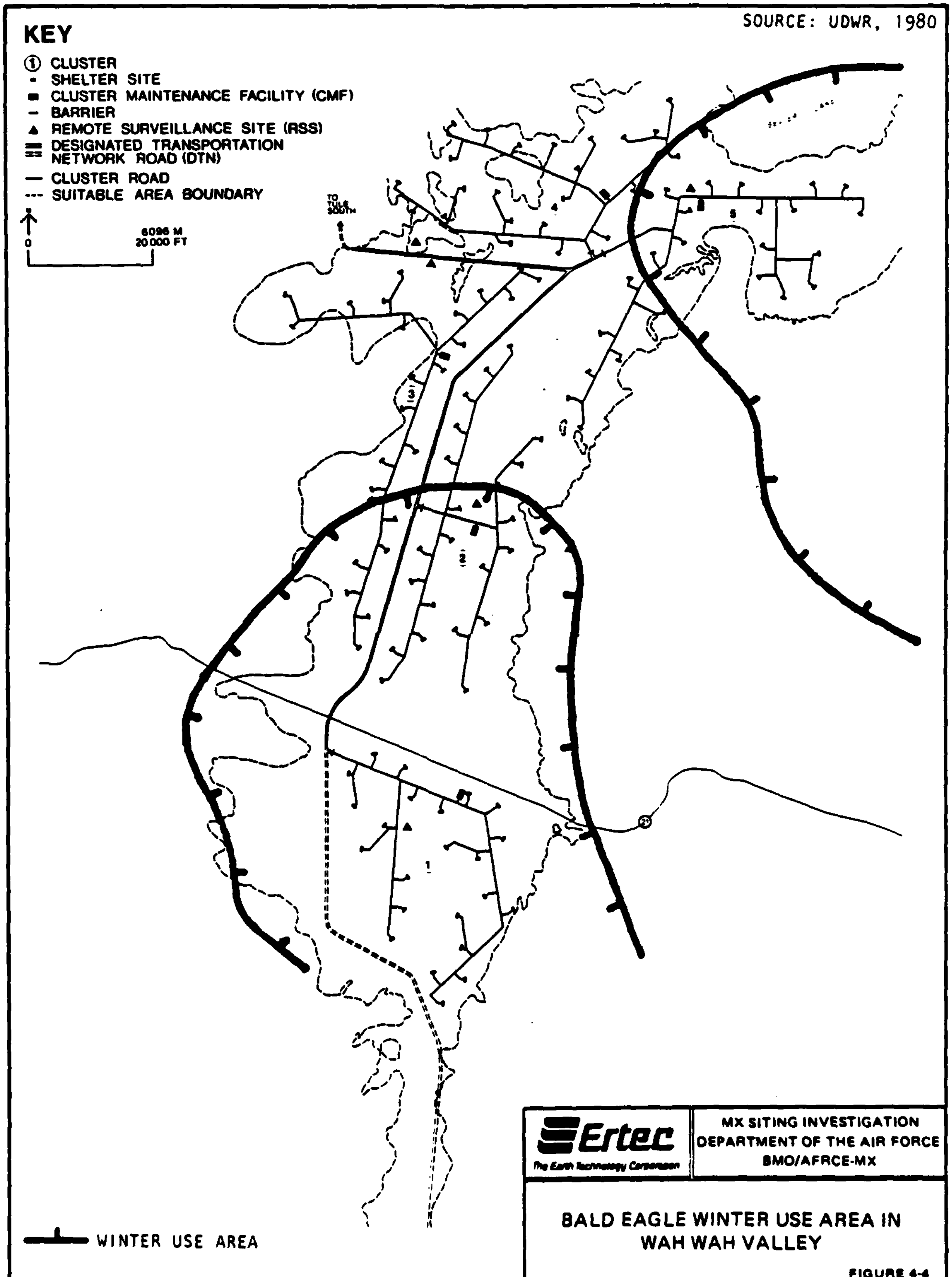
KNOWN LOCATIONS OF PLANT SPECIES CURRENTLY UNDER REVIEW

FIGURE 4-3



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BALD EAGLE WINTER USE AREA IN WAH WAH VALLEY

FIGURE 4-4

Pronghorn antelope habitat is of special interest throughout Wah Wah Valley. The valley floor and the lower bajadas are the primary range area. A key habitat, identified by the Utah DWR (1980), is located along the western edge of Cluster 1.

Mule deer habitat is located mainly in the mountains surrounding the valley, but extends onto the valley floor in Cluster 5, with some roads and shelter sites lying within the range. Ranges for mule deer and antelope in Wah Wah Valley are shown in Figure 4.5.

Prairie falcon, golden eagle, and ferriginous hawk nests are located on the edges of the valley adjacent to the study area. Rodents from the valley floor comprise a large portion of the raptor diets. The valley is also part of a major peregrine falcon and bald eagle migration route. The general locations of known raptor nests are shown in Figure 4-6.

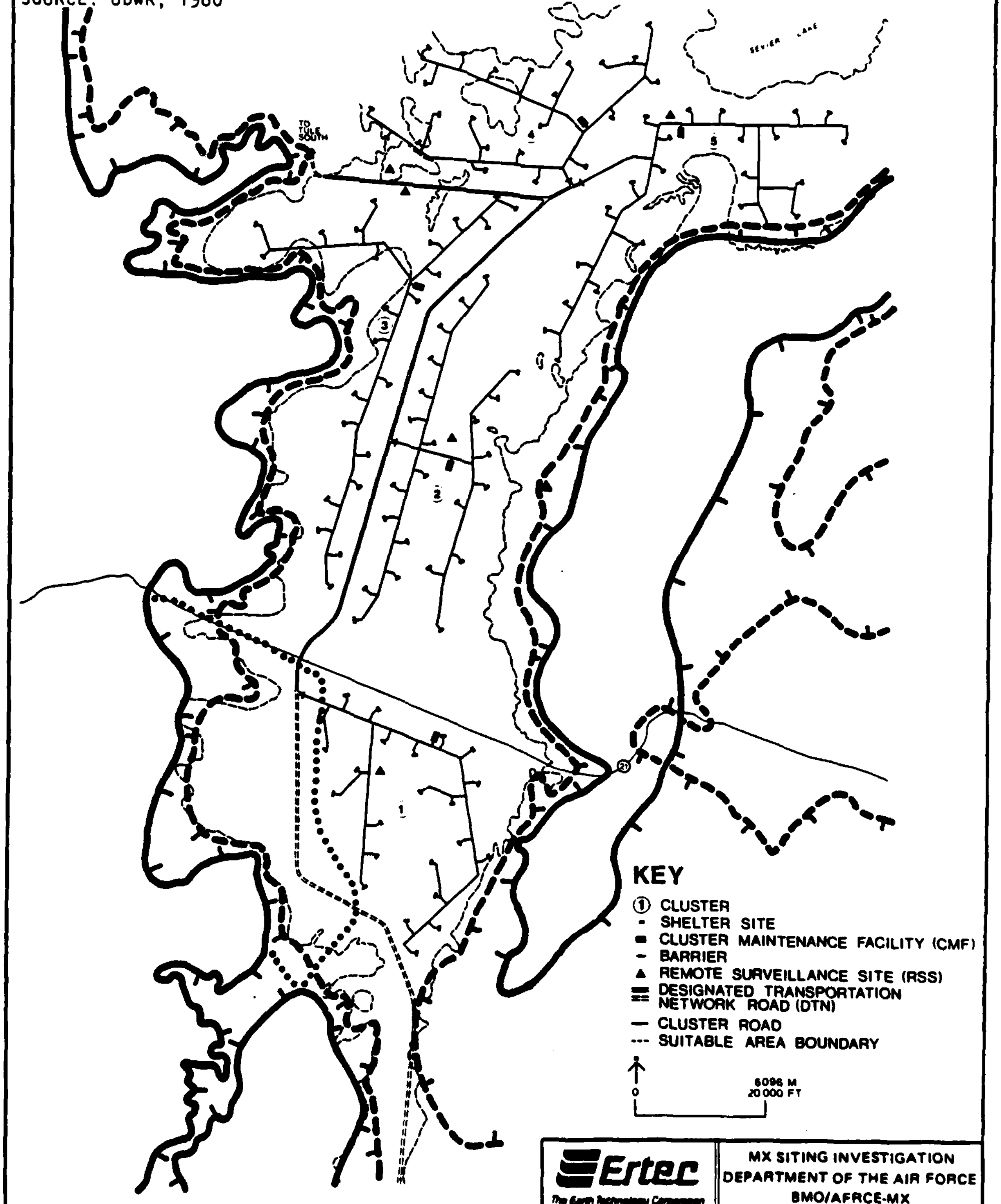
4.3 FIELD SURVEY RESULTS

4.3.1 Overview of Plant Communities

Xerophytic plant communities in desert regions usually include three basic plant types: ephemerals (annuals); succulent perennials; and non-succulent perennials that have evolved drought-resistant adaptions (Daubenmire, 1974).

In Wah Wah Valley, xerophytic shrubs, or shrubs and perennial grasses, are the dominant plants. Dominance was determined based on the percent cover of each species. Annuals may comprise a large portion of the Wah Wah Valley plant community,

SOURCE: UDWR, 1980



UPPER LIMITS PRONGHORN ANTELOPE HABITAT

KEY PRONGHORN ANTELOPE HABITAT

LOWER LIMITS MULE DEER HABITAT

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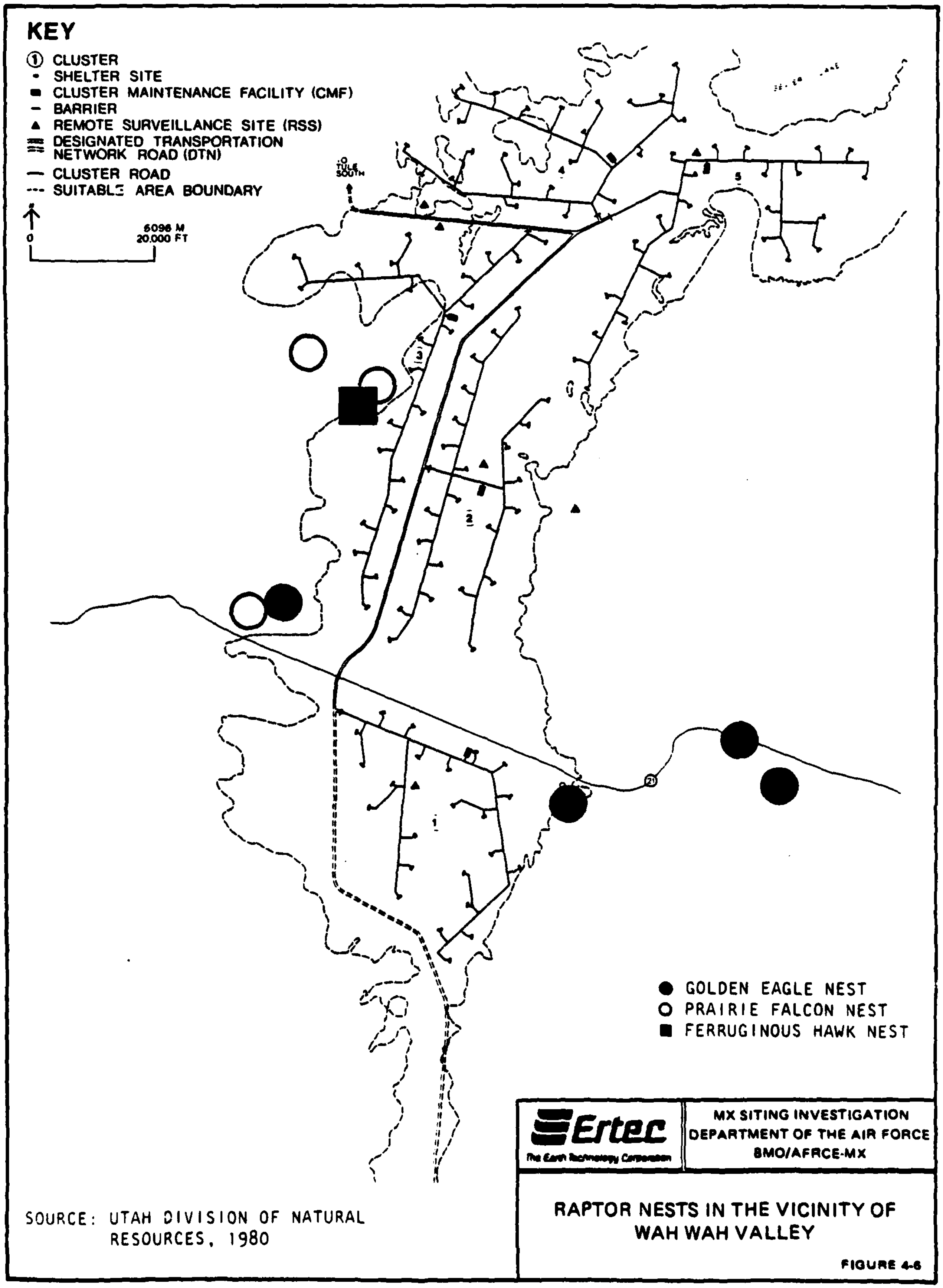
ANTELOPE AND MULE DEER RANGE IN WAH WAH VALLEY

FIGURE 4-5



SOURCE: UTAH DIVISION OF NATURAL RESOURCES, 1980

RAPTOR NESTS IN THE VICINITY OF WAH WAH VALLEY

FIGURE 4-6

especially in the spring and early summer months. However, because the field survey was made during winter, annual species were not included in the determination of percent cover. Despite the time of year, some annual species were noted, but proper identification and determination of range extension was not always possible.

Wah Wah Valley succulents were represented by the following members of the family Cactaceae: Echinocereus engelmanii, Echinocereus sp., Opuntia erinacea, Opuntia sp., Sclerocactus pubispinus, Sclerocactus sp., and Coryphantha vivipara. These individuals were scattered and comprised less than 1 percent of the cover within the study areas.

The data obtained from approximately 250 transects made on approximately 130 facility sites clearly indicate the dominance of perennial shrubs and/or grasses at the time of the study. Percent perennial cover on shelter sites in Wah Wah Valley averaged approximately 16.0 percent. Table 4.3 shows the percent perennial cover averaged from both transects at each shelter site. Cover ranged from a low of 2.1 percent on Site 1/3 to a high of 37.1 percent on Site 2/23.

A comparison of the range and average cover in each cluster is summarized in Table 4-4. Because facility locations were selected for specific geologic and topographic conditions, the results obtained on the shelter and CMF sites cannot be considered a random sample for the valley. The playa, for

Shelter Site	Cluster 1	2	3	4	5
1	5.7	17.2	10.9	20.5	28.9
2	6.7	10.6	20.2	21.7	18.8
3	2.1	19.0	20.1	13.8	19.2
4	15.7	19.0	21.3	16.6	16.4
5	5.3	15.3	27.5	14.4	20.1
6	3.3	14.2	13.2	2.8	15.2
7	9.7	9.3	20.0	11.4	10.5
8	29.4	23.8	16.9	16.9	10.7
9	23.9	25.8	15.3	18.7	11.5
10	7.5	18.7	9.5	14.9	16.3
11	4.8	14.6	16.0	7.8	16.6
12	10.3	17.0	21.0	11.3	15.0
13	28.5	14.9	21.3	14.9	4.8
14	10.1	12.7	17.8	21.5	17.6
15	11.5	24.2	23.1	16.5	22.4
16	14.3	21.5	17.2	20.4	16.5
17	26.3	15.8	10.8	21.6	21.6
18	16.7	19.7	12.0	11.2	13.9
19	18.9	10.1	13.4	12.9	13.2
20	25.2	8.2	21.0	12.6	8.8
21	18.6	14.4	21.1	17.6	6.9
22	29.8	9.2	15.0	16.3	11.1
23	24.5	37.1	21.3	17.9	4.6

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AVERAGE PERCENT PERENNIAL COVER
IN WAH WAH VALLEY SHELTER SITES

TABLE 4-3

	Cluster				
	1	2	3	4	5
High	29.8	37.1	27.5	21.7	28.9
Low	2.1	9.2	9.5	2.8	4.6
Average	15.3	17.1	17.6	15.4	14.8

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RANGE AND AVERAGE PERCENT PERENNIAL COVER BY CLUSTER IN WAH WAH VALLEY SHELTER SITES

TABLE 4-4

example, was devoid of vegetation. Washes, rock outcrops, and other features that were avoided in the placement of shelter sites are likely to differ from the shelter sites in both plant composition and percent cover.

All coverage and density data obtained in the transects is shown in Appendix E. An examination of the density and coverage data reveals that these measurements do not always correlate. Dominance determined by aerial coverage (percent cover) may differ significantly from dominance determined by number of individuals (density). Dominance in a community may be based upon either measurement. Strickler and Sterns (1963) define an individual as the aerial parts of a single root system. Due to vegetative propagation, a single individual cannot always be easily determined. Complications also arise because what appears to be a multiple-stem shrub above ground, if excavated, may actually be discovered to be two or more plants with individual root systems. Due to this inherent difficulty with density, percent cover was used to define the dominant and sub-dominant plant species in each biological survey area.

Dominant plant species were determined from transect results. Three major vegetation zones and one subgroup are present in Wah Wah Valley: (1) shadscale (Atriplex) communities, grasslands, and a subgroup of the shadscale communities; (2) sagebrush (Artemisia) communities; and (3) pinyon-juniper (Pinus-Juniperus) communities. Of these zones, shadscale is by far the most common, having 56 different dominant/subdominant associations that cover an estimated 143,636 acres (58,129 ha) or approximately 87.8 percent of the study area. Dominant/subdominant associations and their acreage within the study area are summarized in Table 4-5.

Twenty-one families of plants were observed on Wah Wah Valley facility sites. The species are listed in Table 4-6.

4.3.2 Threatened and Endangered Species

No plants Currently Listed in the Federal Register were observed in the valley. However, some plants listed as being Currently Under Review were found on shelter sites in Wah Wah Valley. Their locations are shown in Figure 4-7.

Sclerocactus pubispinus is federally listed as a Taxon Currently Under Review (Category 1); it is also considered a High Priority species by the Utah Native Plant Society. It was found on Sites 2/5, 5/12, 5/13, and CMF5.

Coryphantha vivipara, federally listed as a Taxon Currently Under Review (Category 2), was also observed in several locations. It is thought to be variety *rosea*, although positive identification was not possible because of the lack of flowers.

Other plants found in the valley that may be species Currently Listed or Currently Under Review, but which could not be positively identified as to species or variety due to the winter survey, include *Gutierrezia sarothrae*, *Machaeranthera canescens*, *Machaeranthera* sp., *Townsendia* sp., *Cryptantha* sp., *Lepidium*

Community	Type Number(a)	Dominant/ Subdominant Association(b)	Acreage(c)
Shadscale (Atriplex) communities	A1	Atco/Stco	162
	A2	Atco/Arar	817
	A3	Atco/Arsp	9,686
	A4	Atco/Orhy	9,083
	A5	Atco/Koam	3,264
	A6	Atco/Chgr	8,860
	A7	Atco/Chvi	990
	A8	Atco/Epne	1,509
	A9	Atco/Spco	1,706
	A10	Atco/Hija	6,986
	A11	Atco/Cela	5,137
	A12	Atco/Tegl	2,331
	A13	Tegl/Ch	594
	A14	Tegl/Epne	2,896
	A15	Tegl/Atco	5,846
	A16	Tegl/Hija	687
	A17	Hija/Gusa	3,048
	A18	Hija/Chgr	3,981
	A19	Hija/Atco	7,288
	A20	Hija/Epne	2,113
	A21	Hija/Arno	1,598
	A22	Hija/Tegl	524
	A23	Chgr/Epne	2,665
	A24	Chgr/Atco	3,131
	A25	Chgr/Hija	1,096
	A26	Chgr/Tegl	3,435
	A27	Chgr/Cela	9,661
	A28	Chvi/Orhy	4,119
	A29	Chvi/Tegl	3,062
	A30	Chvi/Gusa	129
	A31	Chvi/Hija	2,016
	A32	Chvi/Cela	2,935
	A33	Chna/Arpu	532
	A34	Chna/Epne	611
	A36	Epne/Chgr	5,571
	A37	Epne/Tegl	1,929
	A38	Epne	1,880

(a) Types mapped on Figures 4-23 through 4-27.
(b) Determined from coverage data on transects. Key to names on page 4-21.
(c) Determined by planimetry and aerial photo interpretation.

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SUMMARY OF COMMUNITY TYPES AND DOMINANT/SUBDOMINANT ASSOCIATIONS IN WAH WAH VALLEY

 TABLE 4-6

Community	Type Number[a]	Dominant/ Subdominant Association[b]	Acreage[c]
Shadscale (*Atriplex*) communities (cont.)	A40	Cela/Tegl	138
	A41	Cela/Atco	1,833
	A42	Cela/Chgr	331
	A43	Cela/Hija	7,056
	A44	Cela/Orhy	4,769
	A45	Chgr/Suto	159
	A46	Chgr/Orhy	1,962
	A47	Grsp/Atco	1,109
	A48	Koam	306
	A49	Lyan/Hija	595
	A50	Tetra/Orhy	1,245
	A51	Tetra/Arar	109
	A52	Hija/Koam	519
	A54	Atca/Chvi	814
	A55	Hija/Cela	433
	A56	Epne/Hija	380
			143,636
Grasslands (Subgroup of *Atriplex* communities)	B1	Orhy/Hija	222
	B2	Hija/Orhy	1,457
			1,679
Sagebrush (*Artemisia*) communities	C1	Arno/Hija	677
	C2	Arar/Orhy	1,758
	C3	Arar/Sihy	579
	C4	Artr/Hija	1,800
	C5	Artr/Chvi	2,524
	C6	Artr/Orhy	1,569
	C7	Epne/Arar	2,777
	C8	Artr	856
			12,540
Pinyon-Juniper (*Pinus-Juniperus*) communities	D1	Juos/Arar	138
	D2	Juos/Artr	612
			750
Playa	E1	(No vegetation)	4,987
			4,987
	TOTAL STUDY AREA ACREAGE		163,592

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SUMMARY OF COMMUNITY TYPES AND DOMINANT/SUBDOMINANT ASSOCIATIONS IN WAH WAH VALLEY

PAGE 2 OF 3 TABLE 4-6

Symbol	Scientific Name	Common Name
Arar	Artemisia arbuscula	low sagebrush
Arno	Artemisia nova	black sagebrush
Arpu	Aristida purpurea	purple threeawn grass
Arsp	Artemisia spinescens	bud sagebrush
Artr	Artemisia tridentata	big sagebrush
Atca	Atriplex canescens	four-wing saltbrush
Atco	Atriplex confertifolia	shadscale
Cela	Ceratoides lanata	whitesage (winterfat)
Ch	Chrysothamnus sp.	rabbitbrush
Chgr	Chrysothamnus greenei	Green's rabbitbrush
Chna	Chrysothamnus nauseosus	rubber rabbitbrush
Chvi	Chrysothamnus viscidiflorus	Douglas rabbitbrush
Epne	Ephedra nevadensis	Mormon tea
Grsp	Grayia spinosa	spiny hopsage
Gusa	Gutierrezia sarothrae	broom snakeweed
Hija	Hilaria jamesii	galleta grass
Juos	Juniperus osteosperma	Utah juniper
Koam	Kochia americana	green molly
Lyan	Lycium andersonii	Anderson wolfberry
Orhy	Oryzopsis hymenoides	Indian ricegrass
Sihy	Sitanion hystrix	squirreltail grass
Spco	Sporobolus contractus	spike dropseed
Stco	Stipa comata	needle-and-thread grass
Suto	Suaeda torreyana	Torrey seepweed
Tegl	Tetradymia glabrata	smooth horsebrush
Tetra	Tetradymia sp.	horsebrush

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SUMMARY OF COMMUNITY TYPES AND DOMINANT/SUBDOMINANT ASSOCIATIONS IN WAH WAH VALLEY

TABLE 4-5

AGAVACEAE
- *Yucca baccata*
- *Yucca* sp.

ASTERACEAE
- *Acamptopappus* sp.
- *Ambrosia acanthiacarpa*
- *Ambrosia* sp.
- *Artemisia nova*
- *Artemisia spinescens*
- *Artemisia tridentata*
- *Artemisia* sp.
- *Chaenactis* sp.
- *Chrysothamnus greenei*
- *Chrysothamnus nauseosus*
- *Chrysothamnus nauseosus* ssp. *bigelovii*
- *Chrysothamnus nauseosus* ssp. *turbinatus*
- *Chrysothamnus viscidiflorus*
- *Gutierrezia microcephala*
- *Gutierrezia sarothraeflorus*
- *Gutierrezia* sp.
- *Iva axillaris*
- *Lactuca* sp.
- *Lygodesmia* sp.
- *Machaeranthera canescens*
- *Machaeranthera* sp.
- *Stephanomeria* sp.
- *Tetradymia axillaris*
- *Tetradymia glabrata*
- *Tetradymia spinosa*
- *Tetradymia* sp.
- *Townsendia* sp.

BORAGINACEAE
- *Cryptantha* sp.
- *Lappula* sp.

BRASSICACEAE
- *Caulanthus pilosus*
- *Descurainia pinnata*
- *Descurainia* sp.
- *Lepidium montanum*
- *Lepidium montanum*

BRASSICACEAE (cont.)
- *Lepidium* sp.
- *Sisymbrium altissimum*
- *Sisymbrium* sp.
- *Stanleya pinnata*
- *Stanleya* sp.
- *Streptanthus cordatus*
- Unidentified mustard

CACTACEAE
- *Coryphantha vivipara*
- *Echinocereus engelmannii*
- *Opuntia erinacea*
- *Opuntia* sp.
- *Sclerocactus pubispinus*
- *Sclerocactus* sp.

CHENOPODIACEAE
- *Atriplex canescens*
- *Atriplex confertifolia*
- *Ceratoides lanata*
- *Grayia spinosa*
- *Halogeton glomeratus*
- *Kochia americana*
- *Salsola iberica*
- *Salsola* sp.
- *Suaeda torreyana*
- *Suaeda* sp.

EPHEDRACEAE
- *Ephedra nevadensis*

EUPHORBIACEAE
- *Euphorbia* sp.

FABACEAE
- *Astragalus lentiginosus*
- *Astragalus* sp.

GERANIACEAE
- *Erodium* sp.

LOASACEAE
- *Mentzelia* sp.

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PLANT SPECIES OBSERVED ON FACILITIES SITES IN WAH WAH VALLEY

PAGE 1 OF 2 TABLE 4-6

MALVACEAE
- Sphaeralcea grossulariifolia
- Sphaeralcea sp.

ONAGRACEAE
- Oenothera sp.

OROBANCHACEAE
- Orobanche sp.

POACEAE
- Agropyron sp.
- Aristida purpurea
- Bromus rubens
- Bromus tectorum
- Distichlis spicata
- Erioneuron sp.
- Hilaria jamesii
- Oryzopsis hymenoides
- Poa sp.
- Sitanion hystrix
- Sporobolus contractus
- Sporobolus cryptandrus
- Sporobolus sp.
- Vulpia octoflora

POLEMONIACEAE
- Gilia sp.
- Leptodactylon pungens
- Leptodactylon sp.

POLYGONACEAE
- Eriogonum caespitosum
- Eriogonum cernuum
- Eriogonum deflexum
- Eriogonum microthecum
- Eriogonum sp.

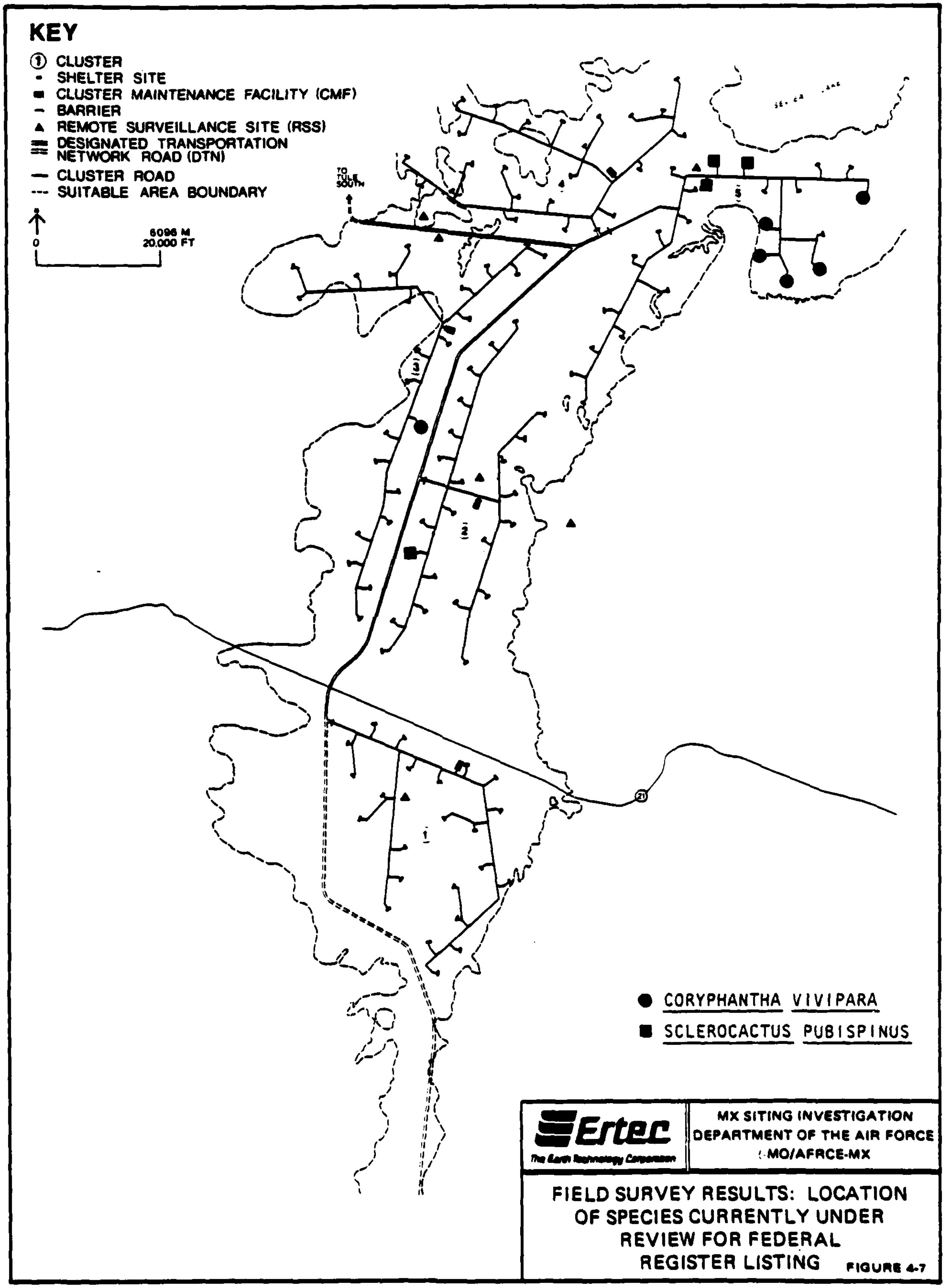
ROSACEAE
- Prunus fasciculata

SALICACEAE
- Salix sp.

SCROPHULARIACEAE
- Penstemon sp.

SOLANACEAE
- Lycium andersonii

PLANT SPECIES OBSERVED ON FACILITIES SITES IN WAH WAH VALLEY



FIELD SURVEY RESULTS: LOCATION OF SPECIES CURRENTLY UNDER REVIEW FOR FEDERAL REGISTER LISTING

FIGURE 4-7

montanum, _Lepidium_ sp., _Opuntia_ sp., _Sclerocactus_ sp., _Astragalus lentiginosus_, _Astragalus_ sp., _Mentzelia_ sp., _Sphaeralcea_ sp., _Oenothera_ sp., _Gilia_ sp., _Eriogonum_ sp., and _Penstemon_ sp. _Echinocereus engelmannii_ was also observed, but it was not the endangered variety _purpureus_.

4.3.3 Overview of Wildlife

The influence of the desert environment on wildlife distribution and population trends is discussed in Section 3.3.3. This section presents an overview of the major wildlife species observed on shelter sites during the field survey. A cluster-by-cluster discussion is given in Section 4.3.5.

The distribution of many wildlife species in Wah Wah Valley was determined from such signs as bones, tracks, and scat. Active and inactive mammal and bird burrows were also present throughout the valley, and in some cases it was possible to identify below-ground inhabitants by burrow design and construction. No trapping was done in Wah Wah Valley because the resource agencies consulted felt that, due to the season, few animals would be captured.

Table 4-7 lists the wildlife species that were either observed directly or through sign in Wah Wah Valley. Many species are nocturnal, and animal activity is relatively low during the winter season. In addition, shelter sites had previously been selected for particular geological and topographical characteristics; as a result, areas such as washes, cliffs, and other

Pronghorn antelope (Antilocapra americana)
Coyote (Canis latrans)
Kit fox (Vulpes macrotis)
Badger (Taxidia taxus)
Black-tailed jackrabbit (Lepus californicus)
Skunk (unknown sp.)
Pocket gopher (Thomomys sp.)
Desert cottontail (Sylvilagus audubonii)
Kangaroo rat (Dipodomys sp.)
Antelope ground squirrel (Ammospermophilus sp.)
Mouse (unknown sp.)
Horned Larks (Eremophila alpestris)
Western meadowlark (Sturnella neglecta)
Raven (Corvus corax)
Northern Harrier (Circus cyaneus)
American kestrel (Falco sparverius)
Sharp-tailed grouse (Pedioecetes phasianellus)
Prairie falcon (Falco mexicanus)
Bald eagle (Haliacetus leucocephalus)
Snake sign (unknown sp.)
Side-blotched lizard (Uta stansturiana)

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WILDLIFE AND WILDLIFE SIGN OBSERVED DURING THE FIELD SURVEY IN WAH WAH VALLEY

TABLE 4-7

formations that provide diverse habitats were avoided. Consequently, there was also pre-selection for animals during initial site selection. Therefore, animals observed during the survey should not be considered representative of all species that inhabit the valley. A list of mammal species expected to occur in the general vicinity is provided in Appendix F.

4.3.3.1 Small Mammals

Few direct sightings of rodents were recorded; rodents are primarily nocturnal, and rodent activity is minimal during the winter season (Beatley, 1969b; Van DeGraaff and Bulda, 1973). Black-tailed jackrabbits (*Lepus californicus*) were observed on 42 sites throughout the valley, and desert cottontail (*Sylvilagus audubonii*) were observed on three sites. Sightings occurred mainly in the northern portion of the study area, but sign was common in both northern and southern portions of the valley. Rodents, rabbits, and hares form the prey base for many carnivors and raptors. Distribution of rabbits and rabbit sign is shown in Figures 4-8 and 4-9.

Pocket gopher (*Thomomys* sp.) sign was common throughout most of the valley, although sign was limited to only 4 sites in Cluster 4. Ground squirrel sign was present at 16 sites, but 50 percent of the sign was observed in Cluster 5. Gopher and ground squirrel sign are shown in Figures 4-10 and 4-11.

Kangaroo rat sign was observed in 21 locations, 67 percent of which were in Cluster 5. Distribution is shown in Figure 4-12.

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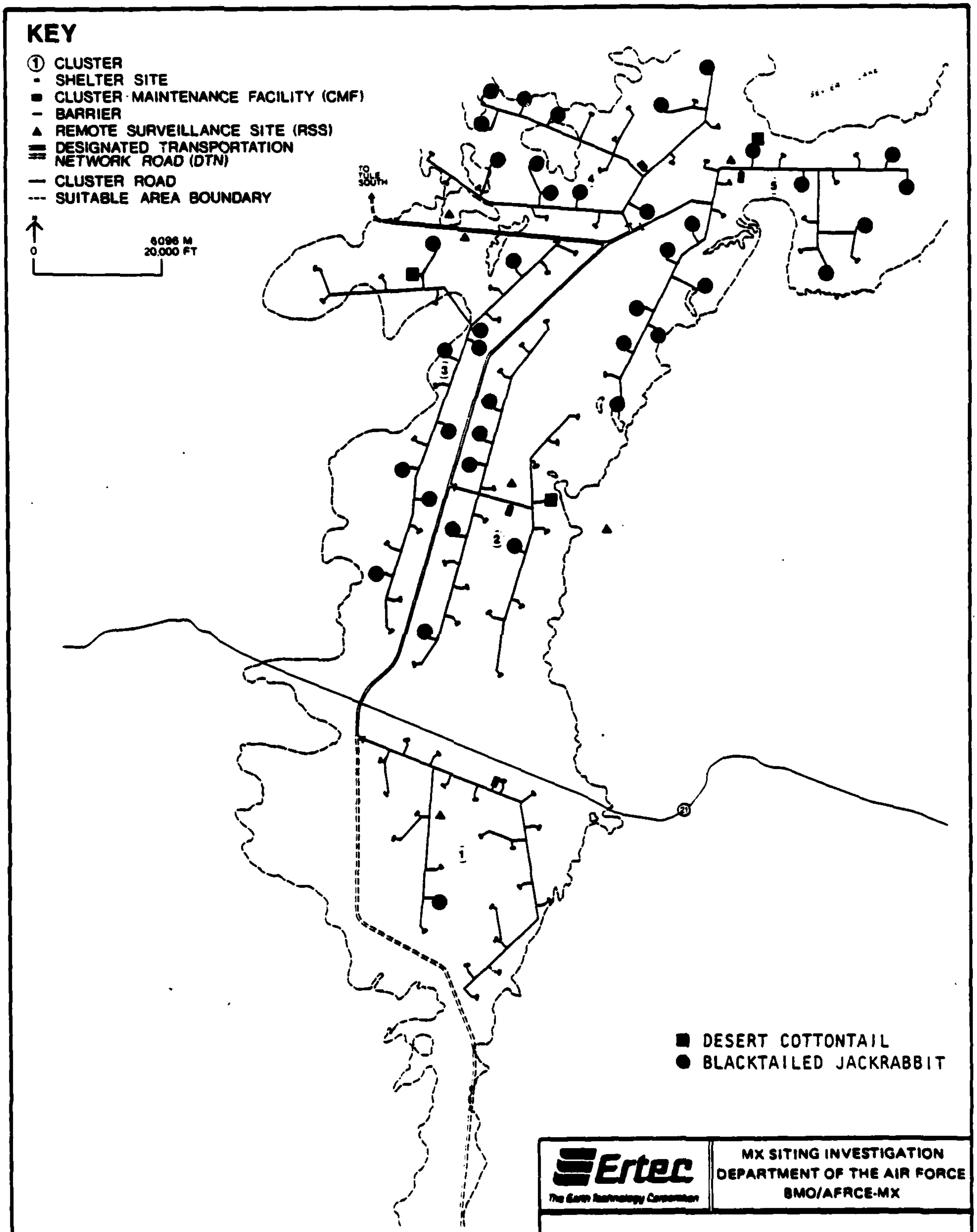

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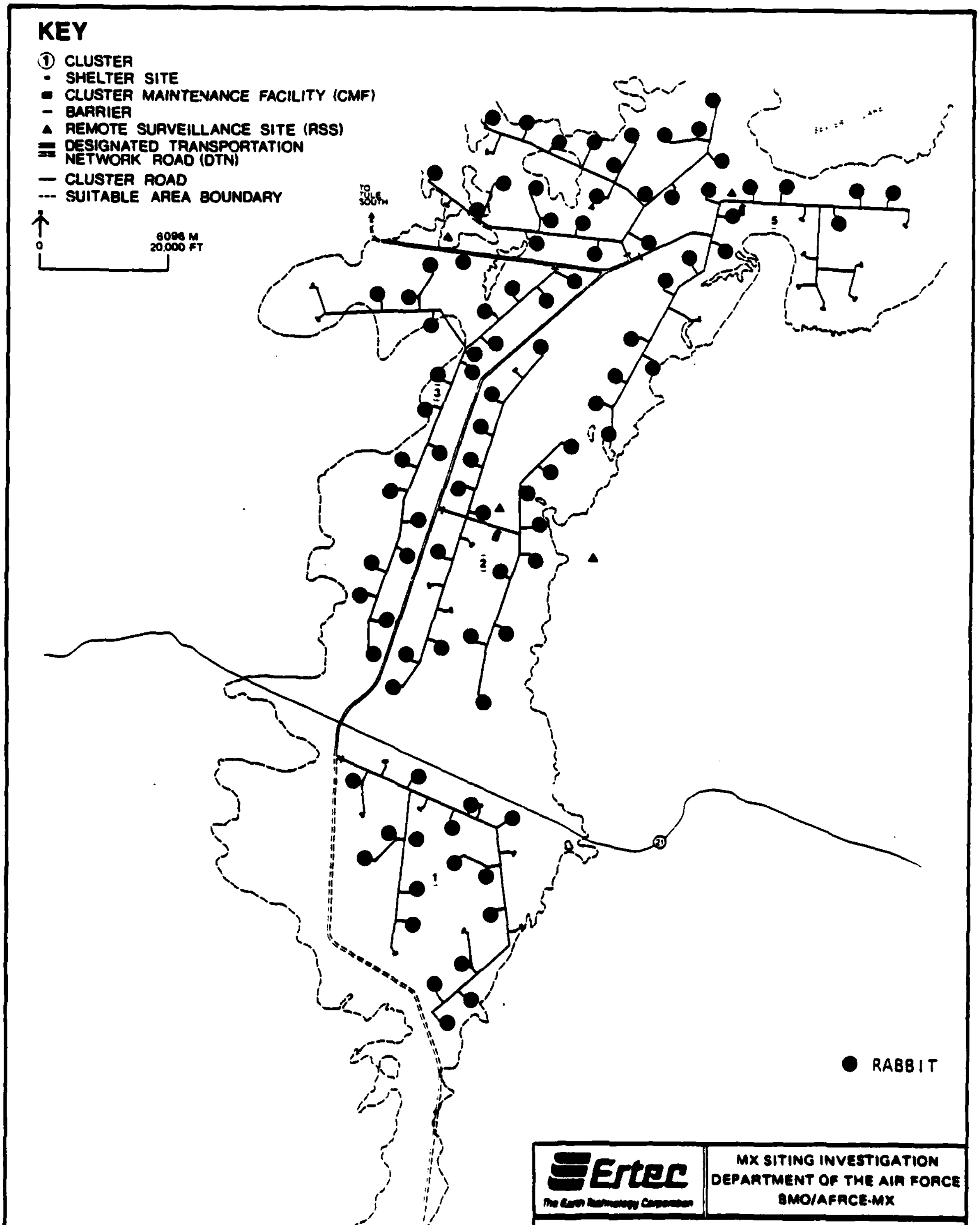
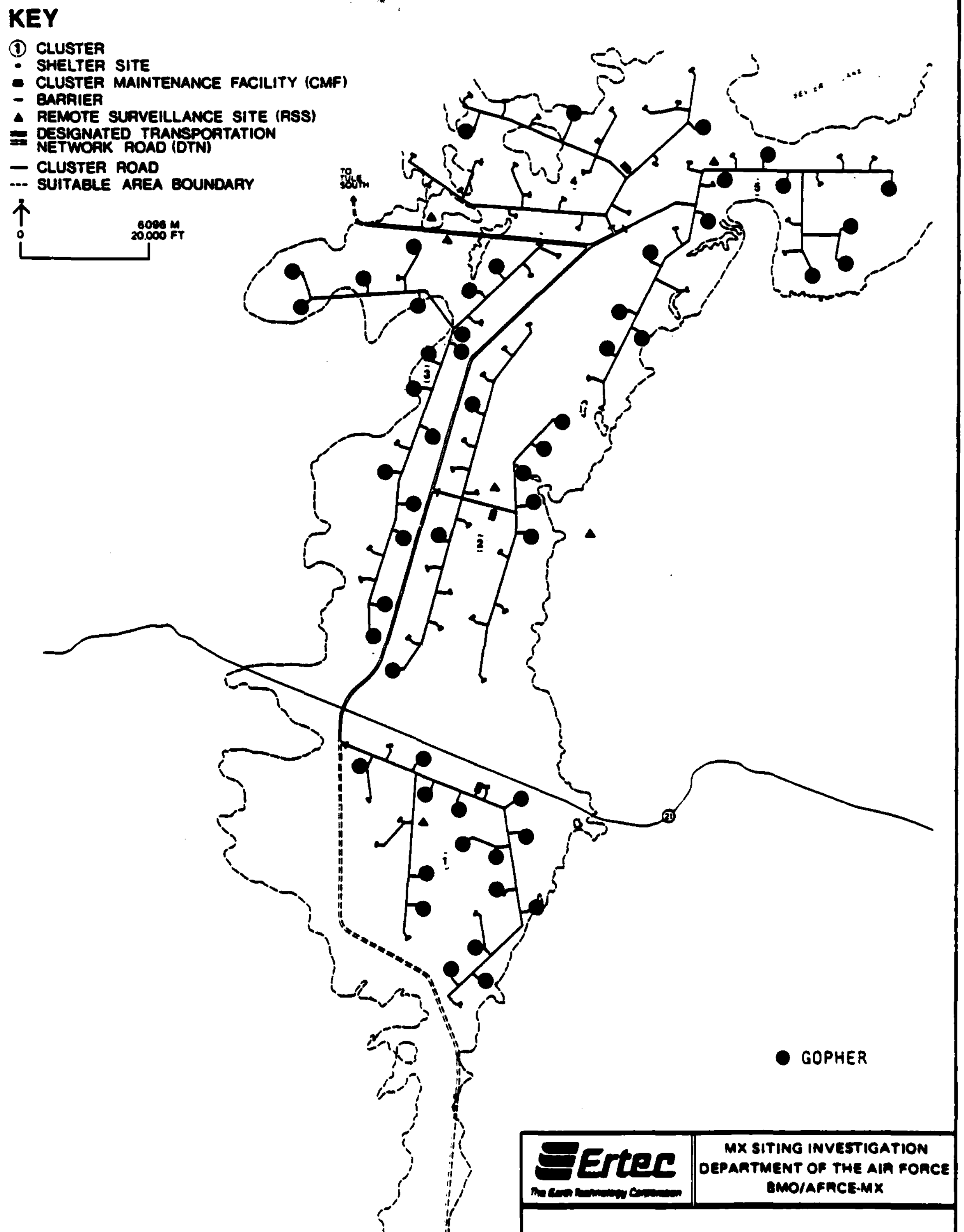
FIELD SURVEY RESULTS: BLACK-TAILED JACKRABBIT AND COTTONTAIL RABBIT SIGHTINGS

FIGURE 4-8



FIELD SURVEY RESULTS:
RABBIT SIGN

FIGURE 4-8



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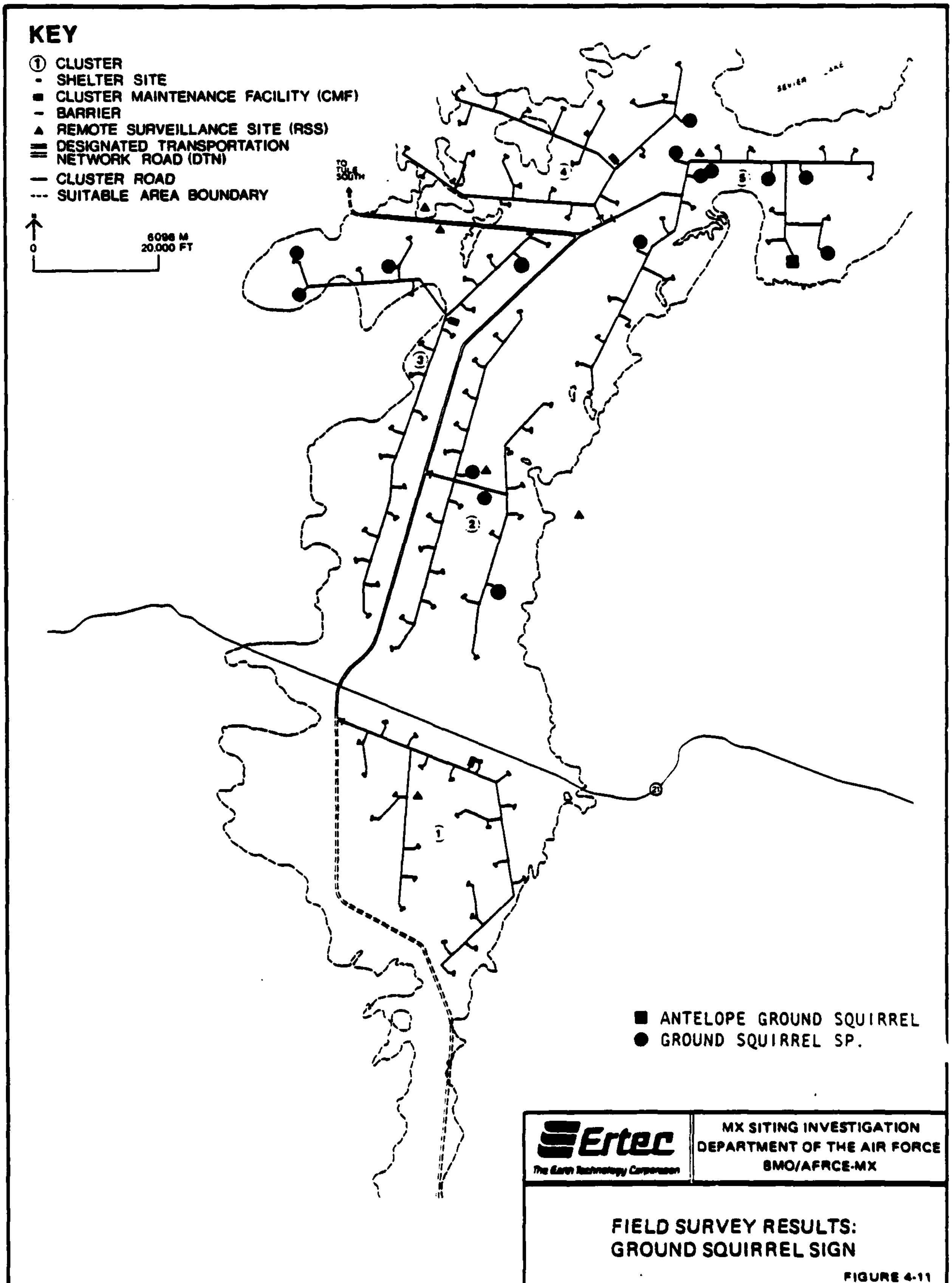
FIELD SURVEY RESULTS:
GOPHER SIGN AND SIGHTINGS

FIGURE 4-10



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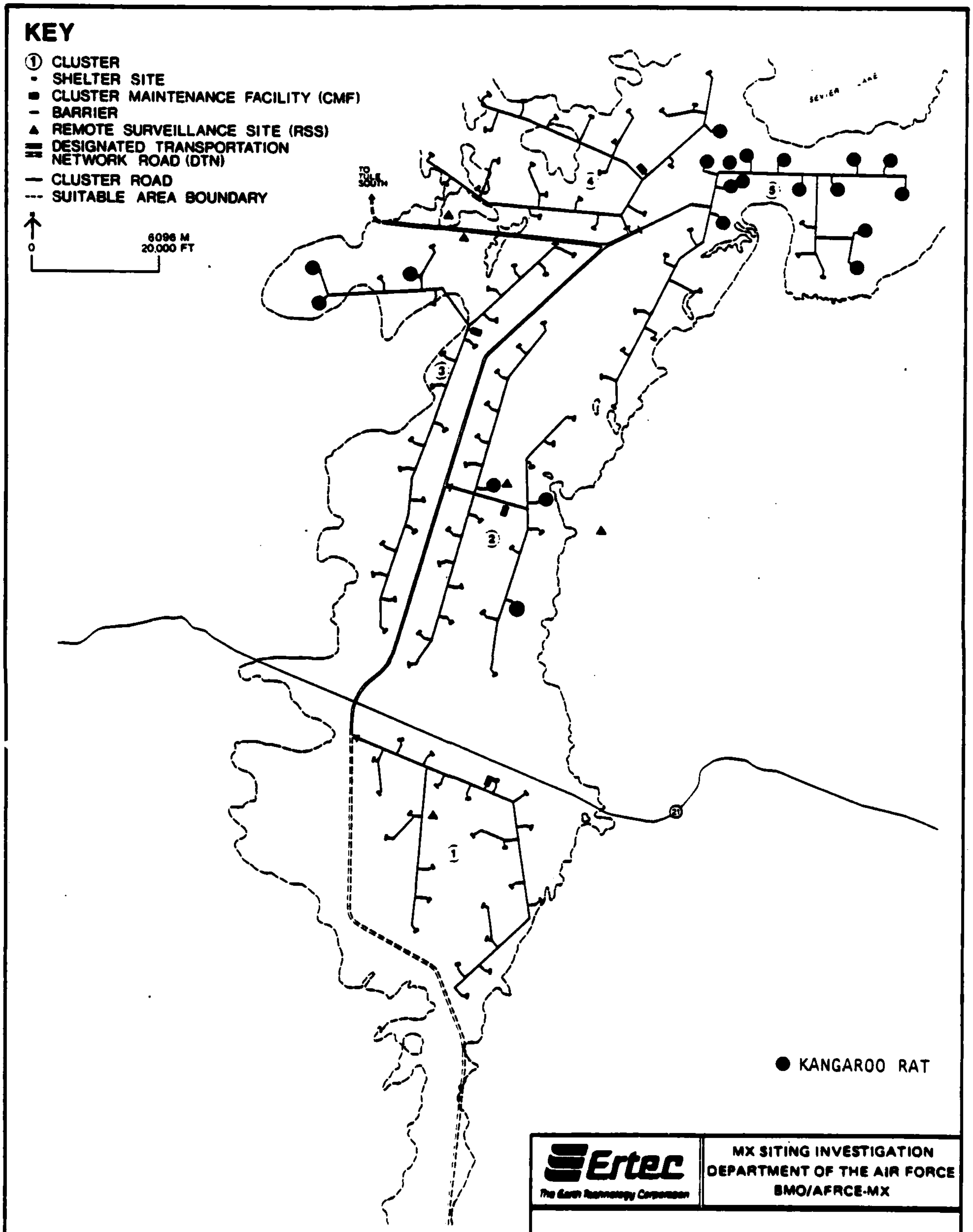
FIELD SURVEY RESULTS:
GROUND SQUIRREL SIGN

FIGURE 4-11



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FIELD SURVEY RESULTS:
KANGAROO RAT SIGN

FIGURE 4-12

4.3.3.2 Large Mammals

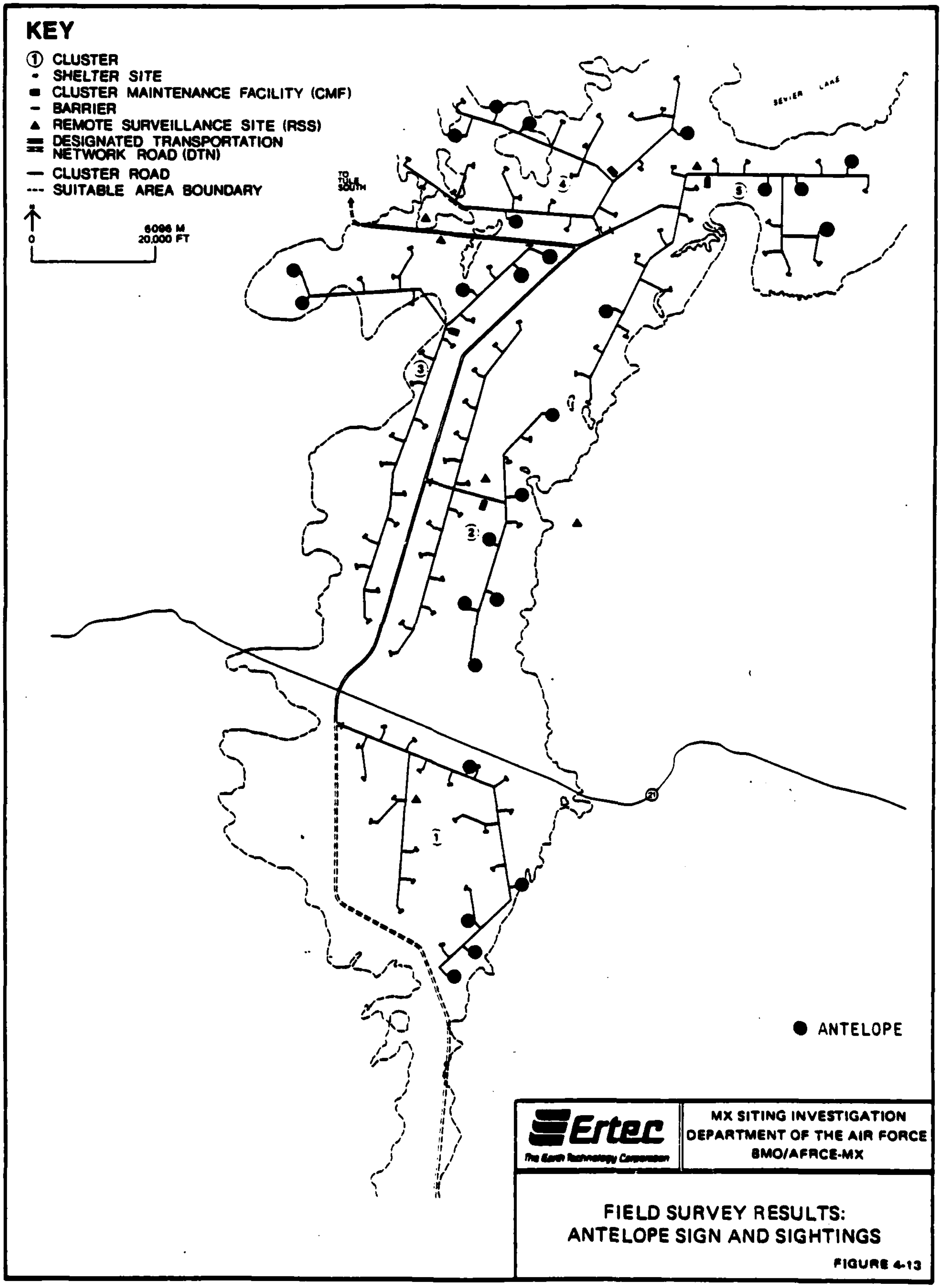
Pronghorn antelope (Antilocapra americana) sign was observed on 5 sites in Cluster 1; 6 sites in Cluster 2; 5 sites in Cluster 3; 5 sites in Cluster 4; and 6 sites in Cluster 5. The signs indicate usage of the entire length of the valley floor along the eastern side, as shown in Figure 4-13.

Coyote (Canis latrans) sign was heavy in all clusters except Cluster 1. This may be due to the fact that Cluster 1 appeared to contain fewer rodents than other areas. Sheep were seen in the Cluster 1 area at the time of the survey; thus, it is possible that ranchers had driven the coyotes from the area. Distribution of coyote sign is shown on Figure 4-14.

A study in Tooele County, Utah, indicates a population of one kit fox per every 3.6 square miles (Egoscue, 1956). Concentration of kit fox within Wah Wah Valley appears to be more dense, as kit fox (Vulpes macrotis) sign or dens were found on 53 sites, or approximately 40 percent of the facility sites surveyed. Cluster 5 appeared to support the most kit fox; Cluster 4 contained the least. Distribution of kit fox sign is shown on Figure 4-15.

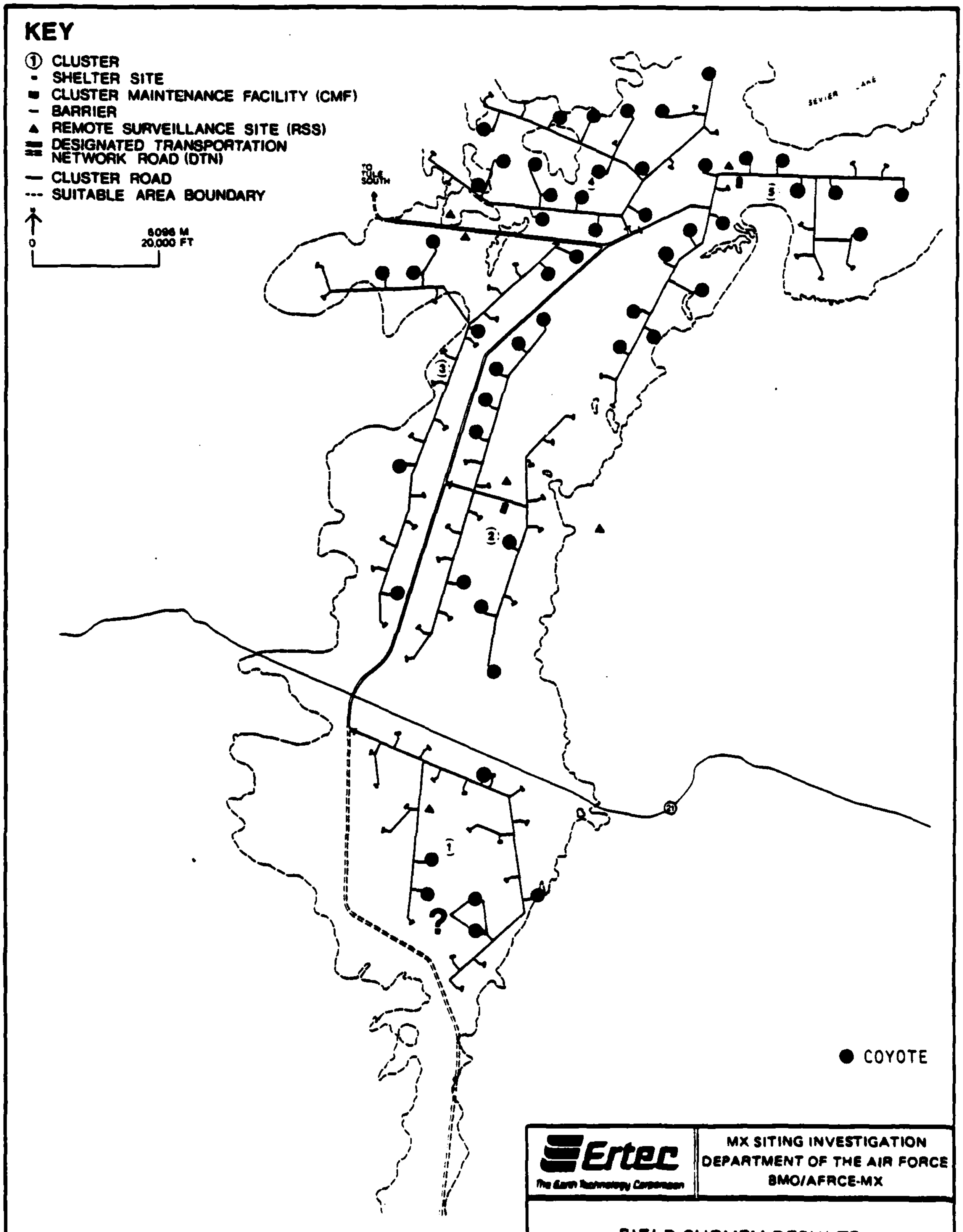
One badger (Taxidea taxus) was observed in its den on Resiting 3/22. Badger sign was observed fairly equally dispersed, and present on 23 facilities. Distribution of badger sign is shown on Figure 4-16.

Burrows thought to be skunk dens were observed on 4 sites, but it was not possible to determine whether these were spotted or



FIELD SURVEY RESULTS:
ANTELOPE SIGN AND SIGHTINGS

FIGURE 4-13



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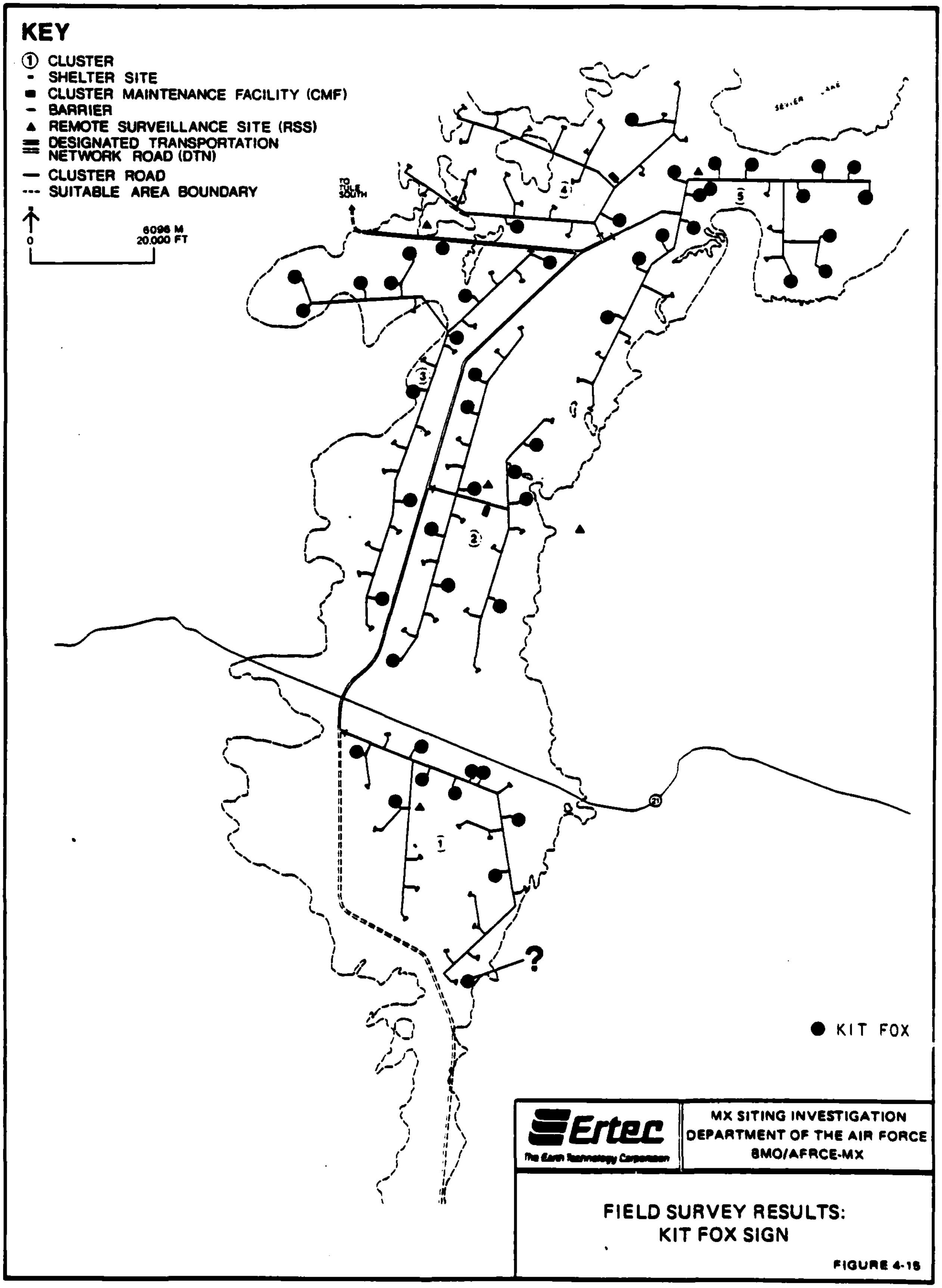
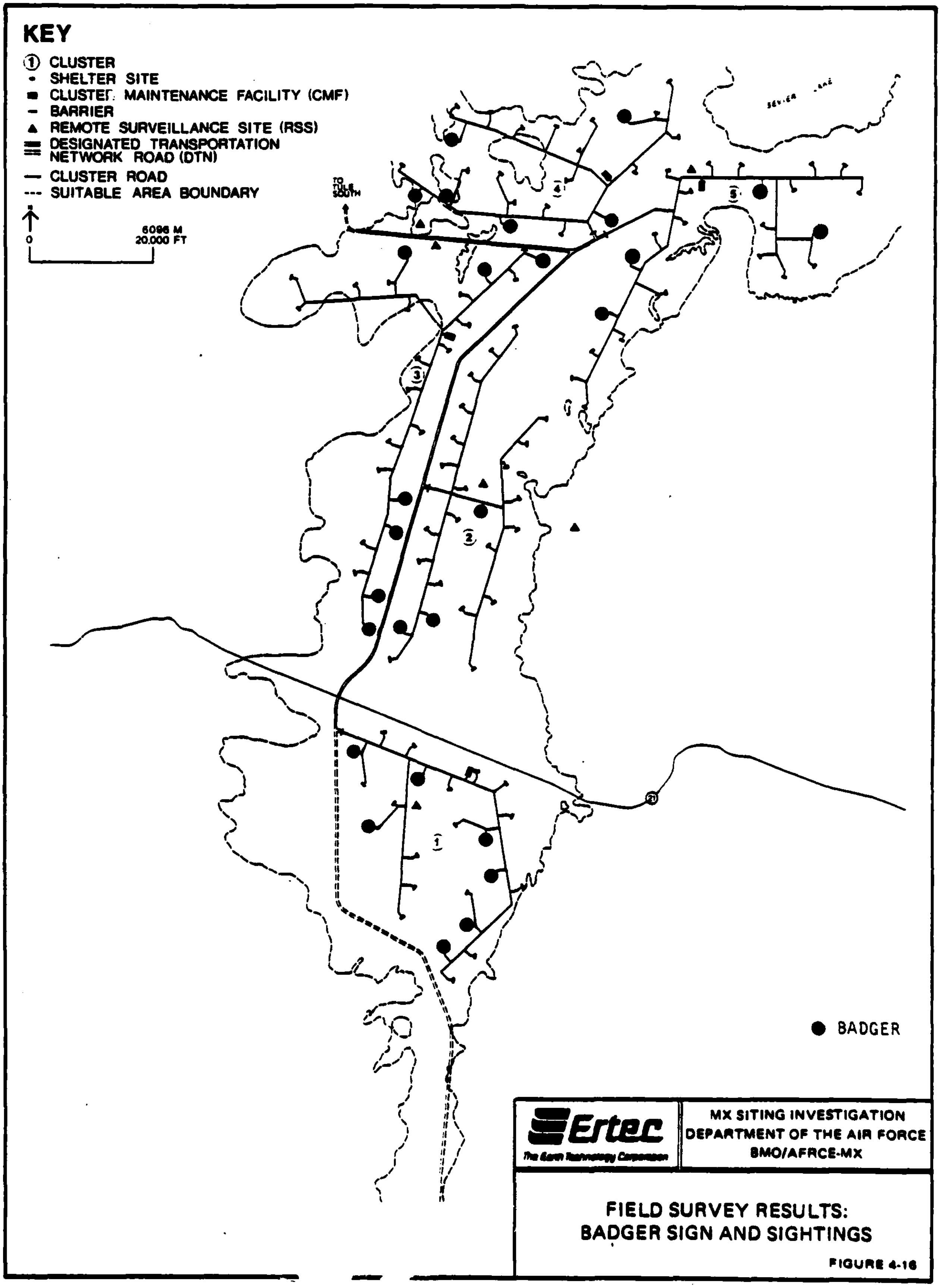
FIELD SURVEY RESULTS:
COYOTE SIGN

FIGURE 4-14



FIELD SURVEY RESULTS:
KIT FOX SIGN

FIGURE 4-15



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FIELD SURVEY RESULTS:
BADGER SIGN AND SIGHTINGS

FIGURE 4-16

striped skunk dens. Large mammal burrows observed frequently throughout the valley indicate the presence of other, unidentified, burrowing species.

4.3.3.3 Birds

The horned lark (Eremophila alpestris) was the most frequently seen bird in Wah Wah Valley. This is the only lark native to North America. It inhabits open country, especially sage flats. Nests are built in depressions on the ground, and food consists mainly of seeds and insects (Peterson, 1961). Ravens (Corvus corax) were also frequently observed; they were noted at 22 sites throughout the valley.

Several types of raptors were observed on the facilities sites during the survey. Northern harriers (Circus cyaneus) were seen on Sites 1/17 and 5/13. This species hunts rodents and small birds in open country (Peterson, 1961). An American kestrel (Falco sparverius) was seen at Site 2/19, and a bald eagle (Haliaeetus leucocephalus) was seen near Site 5/22. A prairie falcon (Falco mexicanus) was seen near Site 2/2. These raptors depend upon the rodent populations in the valley.

A possible sharp-tailed grouse (Pedioecetes phasianellus) roosting area was found at Site 2/3. This bird is not known from the study area, and the site may be a range extension for the grouse. It is further described in Section 4.3.5.2.

One western meadowlark (Sturnella neglecta) was observed at CMF 5.

The distribution of bird sightings is shown in Figures 4-17 through 4-19. The sightings do not completely represent the number of individuals or species present in the valley. Surveys conducted during nesting or migration season would undoubtedly result in a greater number of bird sightings. A list of birds expected to occur in the general vicinity is given in Appendix F.

4.3.3.4 Reptiles

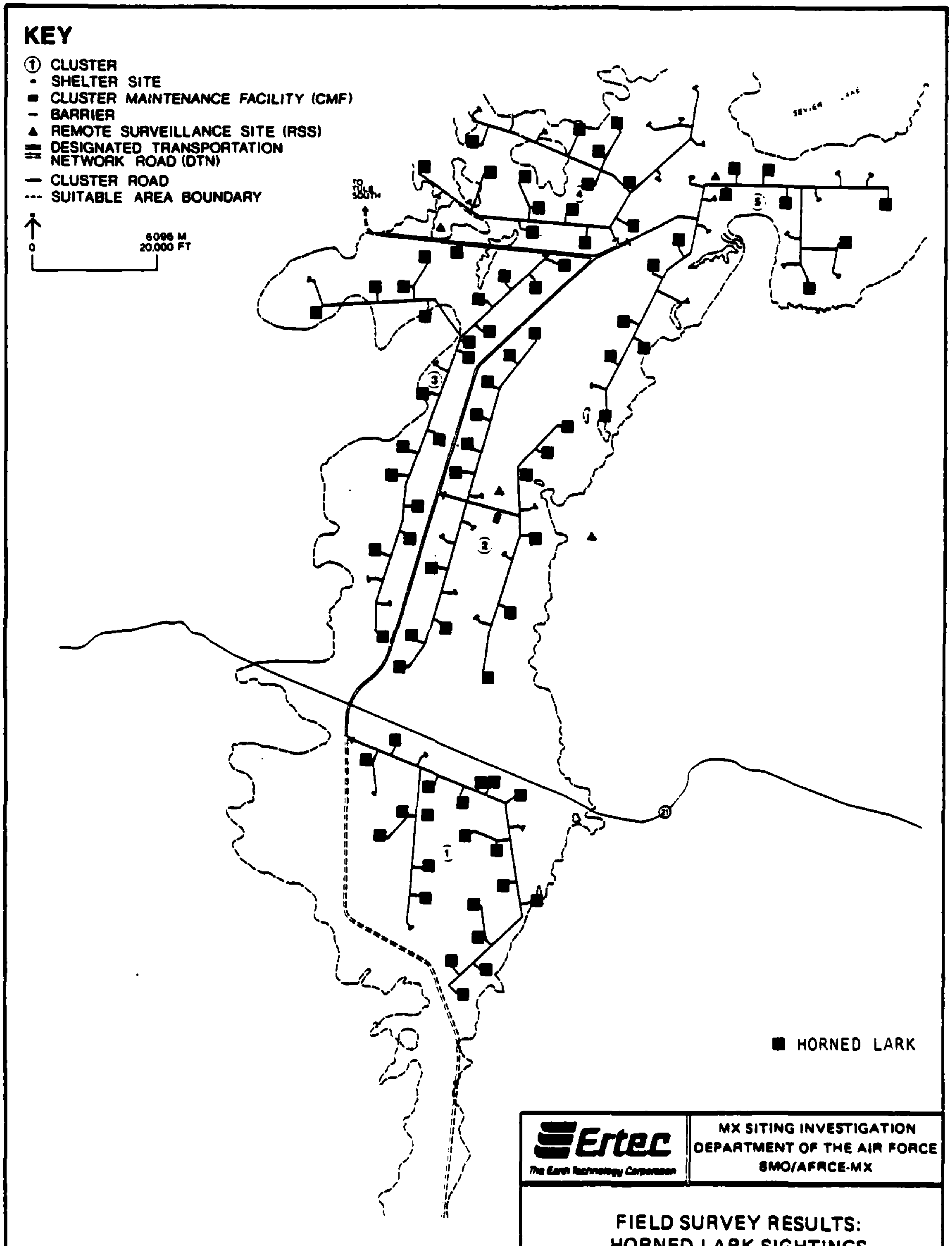
Few reptiles were seen, because most reptiles are hibernating during the winter when the survey was conducted. Northern side-blotched lizards (*Uta stansburiana*) were seen on a number of sites and in all clusters. This species is unusual in that it is active all year around when the weather permits (Stebbins, 1966).

A snake skin, thought to be from a racer or whipsnake, was found on Site 3/8.

These sitings do not completely represent the numbers or species of reptiles present in Wah Wah Valley. Warm weather surveys would result in a greater number of reptile sightings.

4.3.4 Overview of Disturbance Factors

A large amount of man-induced disturbance was observed in the valley during the field survey. The majority of disturbance was caused by grazing, off-road driving, and mining or construction activities. Disturbance often results in the invasion of the



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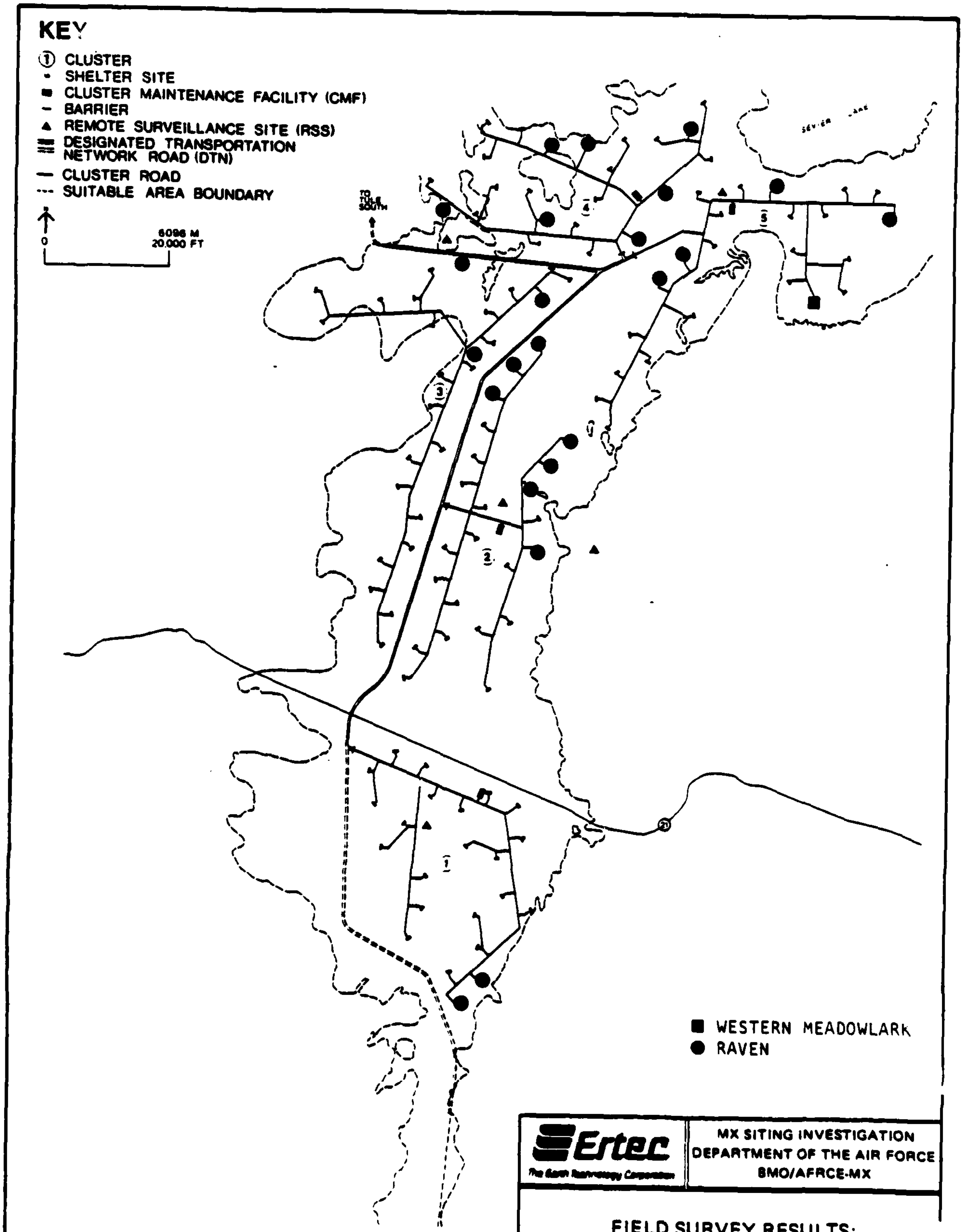
FIELD SURVEY RESULTS:
HORNED LARK SIGHTINGS

FIGURE 4-17



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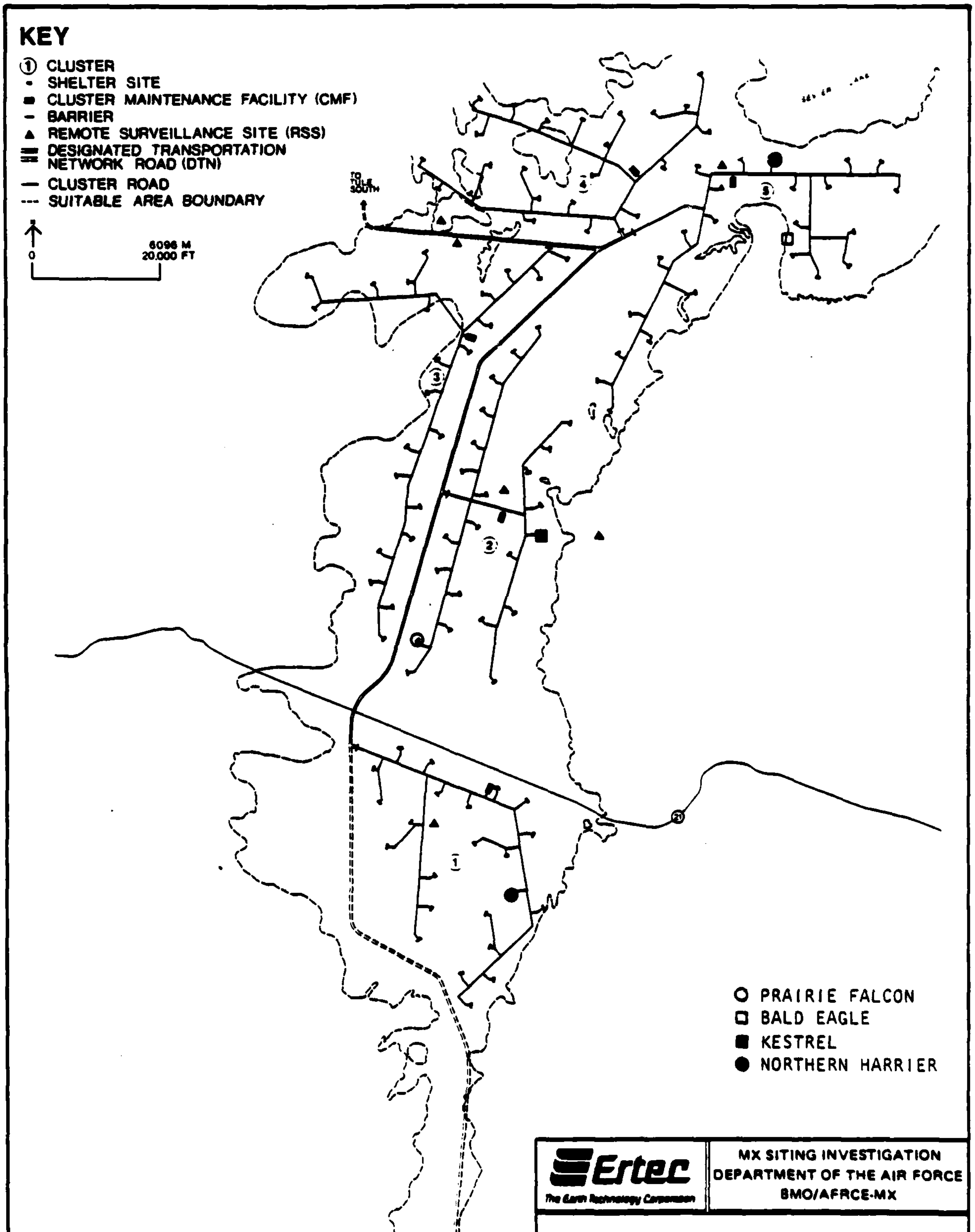
FIELD SURVEY RESULTS:
RAVEN AND MEADOWLARK SIGHTINGS

FIGURE 4-18



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FIELD SURVEY RESULTS:
RAPTOR SIGHTINGS

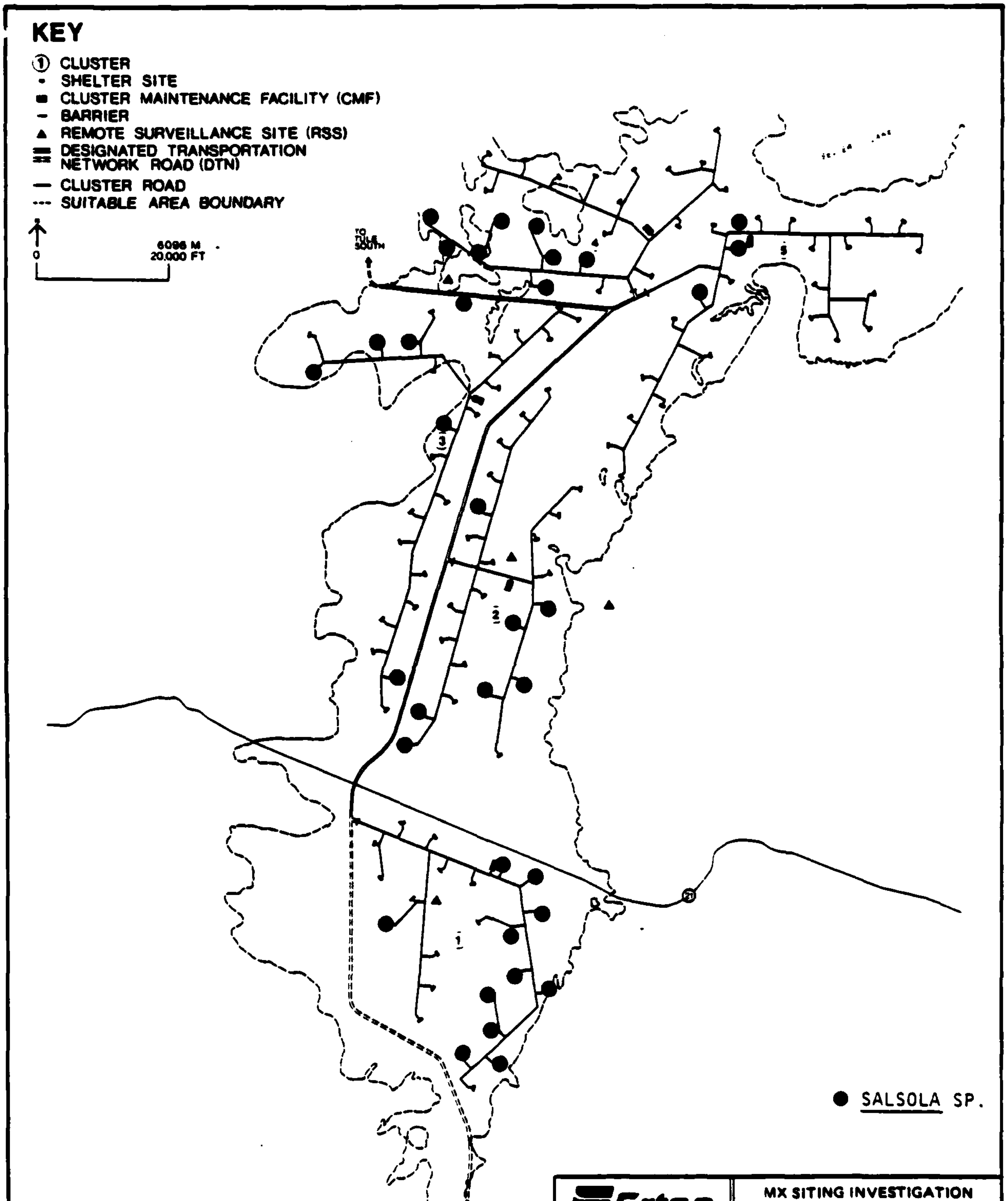
FIGURE 4-19

area by undesirable introduced weeds such as _Halogeton glomeratus_ and _Salsola iberica_. These plants invade areas where soil has been disturbed or native plant cover has been degraded; thus, their abundance is generally inversely proportional to the naturalness of the valley. In areas where grazing occurs, they also present problems for livestock.

Halogeton has gained a large foothold in the valley; it was present on 67 percent of the sites surveyed. Halogeton is toxic, and a number of sheep deaths caused by its consumption have been reported. Cattle apparently dislike its taste and consume it only in small amounts. While sublethal effects may occur, no cattle deaths have been attributed to it (HDR, 1980).

Overgrazing contributes to the spread of halogeton, which, in turn, decreases the value of the area for grazing. This is discussed further in Section 5.0.

Salsola, another introduced weed, is sometimes cut and cured as a poor substitute for hay. When eaten in considerable quantities in its green condition, it tends to cause severe scours in weak or young animals (Hitchcock et al., 1964). Salsola was observed on 28 percent of the shelter sites scattered throughout the valley. It was more widely distributed in the southeastern and northwestern portions of the study area, with the least amount in Cluster 5. Distribution of halogeton and salsola are shown in Figures 4-20 and 4-21.



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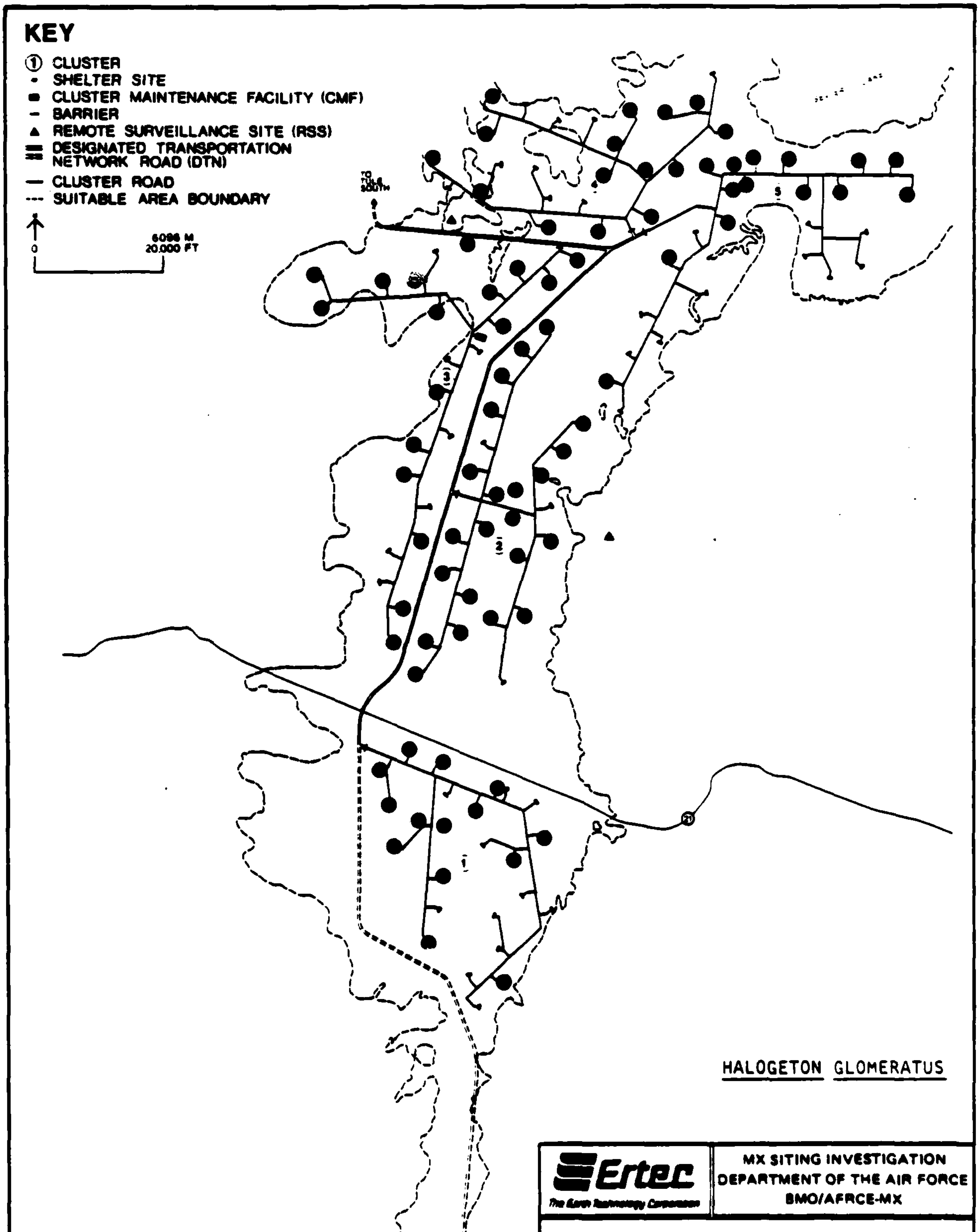
FIELD SURVEY RESULTS:
DISTRIBUTION OF SALSOLA

FIGURE 4-20



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FIELD SURVEY RESULTS:
DISTRIBUTION OF HALOGETON

FIGURE 4-21

The majority of the valley showed evidence of cattle grazing. Sign in Clusters 4 and 5 was relatively infrequent, but there was evidence of heavy cattle usage at nearly every site in Clusters 1 through 3. Approximately 58 percent of the sites in the valley showed evidence of cattle. Evidence of sheep grazing was also pronounced but was more evenly distributed over the valley. Approximately 44 percent of the sites showed evidence of sheep usage. Distribution of sheep and cattle sign is shown in Figures 4-22 and 4-23.

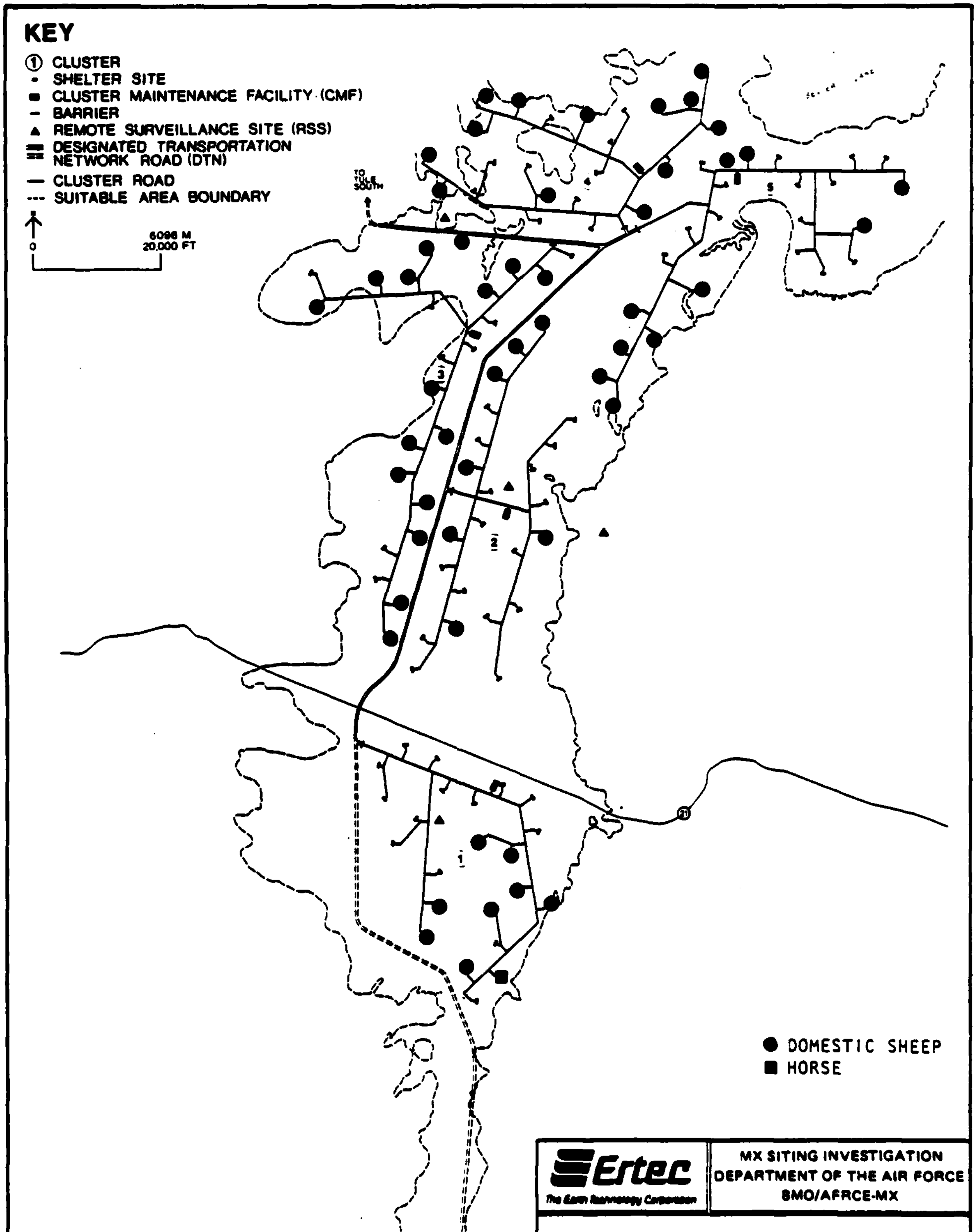
Areas impacted by salsola seem to be correlated with areas impacted by grazing. Distribution of halogeton was so widespread in the valley that no correlation could be observed.

Off-road driving also disturbs soils and vegetation, allowing colonization by undesirable plants. Off-road driving was one of the primary disturbance factors noted throughout the study area. It was sometimes difficult to determine whether the disturbance noted at a site was the result of shelter monuments placement or the result of other previous disturbance. Due to the likelihood of survey-related damage, the disturbance as recorded from the survey sites may be greater than would be expected in other locations in the valley.

4.3.5 Results of Cluster Surveys

4.3.5.1 Summary of Conditions in Cluster 1

a. Abiotic Conditions: The legal descriptions of Cluster 1 sites are given in Appendix D. Elevations range from 4926



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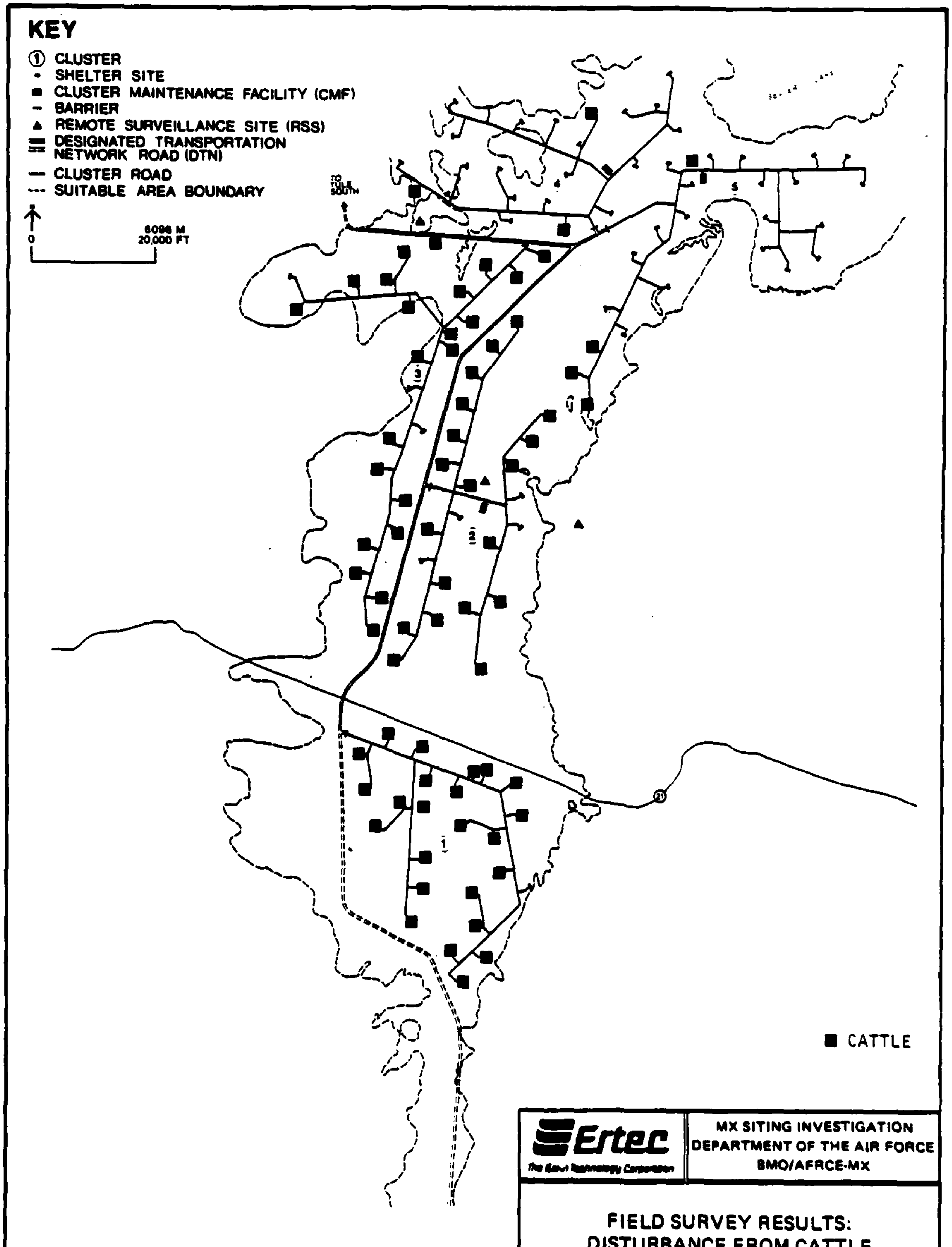
FIELD SURVEY RESULTS:
DISTURBANCE BY SHEEP AND HORSES

FIGURE 4-22



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FIELD SURVEY RESULTS:
DISTURBANCE FROM CATTLE

FIGURE 4-23

to 5972 feet (1516 to 1838 m), and sites are located mainly on slopes of approximately three degrees. The soil is alluvial, dominated by silt mixed with varying amounts of gravel and sand. Abiotic conditions within the cluster are summarized in Table 4-8.

b. Disturbance: This cluster is used for grazing by sheep and cattle from the Wah Wah Ranch. Sheep were present during the survey period, and sheep or sheep sign were visible on eight survey sites. Cattle sign was present on 22 of the 23 shelter sites. Most plants were grazed to the ground, and such invasive plant species as *Salsola iberica*, *Bromus tectorum*, and *Halogeton glomeratus* were found on nearly every site in the cluster. Evidence of off-road driving was also observed throughout the cluster.

c. Threatened and Endangered Plant Species: A number of plants were observed within the cluster that may possibly be species either Currently Listed or Currently Under Review in the Federal Register. These include *Townsendia* sp., *Opuntia* sp., *Astragalus* sp., and *Eriogonum* sp. The lack of flowers or other reproductive structures during the season of the survey prevented positive identification of the species. *Astragalus lentiginosus* was also observed, but the variety could not be determined at this time of year. It is unlikely that many of these are listed species, because many of the rare, threatened, or endangered individuals are located in specific habitats not found in the study area, and many are known only from outside Utah.

Factor	Shelter Site 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS1	Resiting 21
Elevation (feet)	5972	5019	4926	4936	5044	5110	5143	5228	5322	4987	5015	5000	5128	5170	5140	5076	5220	5460	5295	5225	5394	5305	5395	4998	5033	5405
Soil Texture(a)																										
Coarse gravel	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	X	X
Fine gravel	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	X	
Coarse sand	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	X	
Fine sand	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	X	X
Silt	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	1	1
Clay	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	X	
Disturbance(a)																										
Off-road vehicles	2	2	2	2	2	2	2	3	2	2	3	2	2	2	2	2	2	2	3	2	2	2	2	2	2	
Erosion	3		3					2	3		2				3				2	3		3				
Grazing	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Overall Intensity of Disturbance(b)	H	H	H	H	H	H	H	M	M	H	H	H	M	M	M	M	L	L	M	L	M	M	H	H	H	

(a) 1-Highest relative importance/impact; 2-lesser relative importance/impact; 3-lowest relative importance/impact.
X-Indicates presence

(b) H-High; M-Moderate; L-Low

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SUMMARY OF ABIOTIC FACTORS ON CLUSTER 1 SITES

TABLE 4-8

d. Vegetation: Cluster 1 lies in the southern end of Wah Wah Valley. This area is slightly higher than the more northerly clusters and contains better grazing land; Ceratoides lanata was found at every shelter site, although it was heavily grazed. Other shrubs found throughout the cluster included Chrysothamnus greenei and, to a lesser extent, Ephedra nevadensis. Atriplex confertifolia was found in the northwestern corner of the cluster, and scattered Artemisia spp. were found at the edges of the cluster. Sphaeralcea grossulariifolia and the grasses, Hilaria jamesii and Oryzopsis hymenoides, were found throughout the cluster. Scattered individuals of Sporobolus cryptandrus were also present. Vegetation diversity was very low due to the intensive grazing in the area.

Perennial cover in Cluster 1 ranged from 3.3 to 29.8 percent and averaged 15.3 percent. The plant species observed in Cluster 1 are summarized in Table 4-9, and distribution of the dominant associations are shown in Figure 4-24.

e. Wildlife: Wildlife observations in Cluster 1 are summarized in Table 4-10. A large number of rabbit pellets, gopher sign, and badger diggings were seen throughout the cluster. Kit fox dens were seen on nine survey sites; at least three were active dens. Coyote sign was also common. Evidence of pronghorn antelope use was seen on five sites in the southeastern portion of the cluster. A northern harrier was seen at Site 17. Other birds included horned larks, observed on nearly every site, and ravens, seen in two locations. Large and small burrows

Species	Shelter Site 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMP	RSS	Resiting 21
ASTERACEAE (COMPOSITAE)																										
Artemisia nova																		X			X					
Artemisia spinescens		X												X												
Artemisia tridentata																							X			
Chrysothamnus greenei						X	X	X	X	X			X	X	X		X	X	X	X	X	X	X			
Chrysothamnus nauseous			X								X				X											
Lygodesmia sp.																					X					
Tetradymia glabrata															X											
Townsendia sp.									X																	
BRASSICACEAE (CRUCIFERAE)																										
Descurainia sp.	X						X																			
CACTACEAE																										
Opuntia sp.						X		X	X	X	X		X	X	X		X	X		X						
CHENOPODIACEAE																										
Atriplex canescens							X							X	X				X							
Atriplex confertifolia	X	X	X	X						X	X			X												
Ceratoides lanata	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Grayia spinosa									X									X		X						
Halogeton glomeratus	X	X	X	X	X	X	X		X	X	X			X	X									X	X	X
Kochia americana			X	X																						
Salsola iberica						X							X						X							X
Salsola sp.												X		X	X		X	X		X		X				

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PLANT SPECIES OBSERVED ON CLUSTER 1 SITES

TABLE 4-9

Species	Shelter Site 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS	Resiting 21
EPHEDRACEAE																										
Ephedra nevadensis						X		X	X				X	X	X		X		X		X		X			X
FABACEAE (LEGUMINOSAE)																										
Astragalus lentiginosus																					X					
Astragalus sp.									X				X				X		X			X	X			
MALVACEAE																										
Sphaeralcea grossulariifolia		X				X	X	X	X		X	X	X	X	X	X	X		X	X	X	X	X		X	
POACEAE (GRAMINAE)																										
Aristida purpurea																							X			
Bromus tectorum		X		X	X	X		X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Hilaria jamesii	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Oryzopsis hymenoides	X	X		X	X		X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Sitanion hystrix			X										X					X				X				
Sporobolus contractus															X		X		X							
Sporobolus cryptandrus			X					X			X		X		X		X	X	X	X	X					
POLEMONIACEAE																										
Leptodactylon sp.																						X				
POLYGONACEAE																										
Eriogonum caespitosum							X																			
Eriogonum sp.												X										X				

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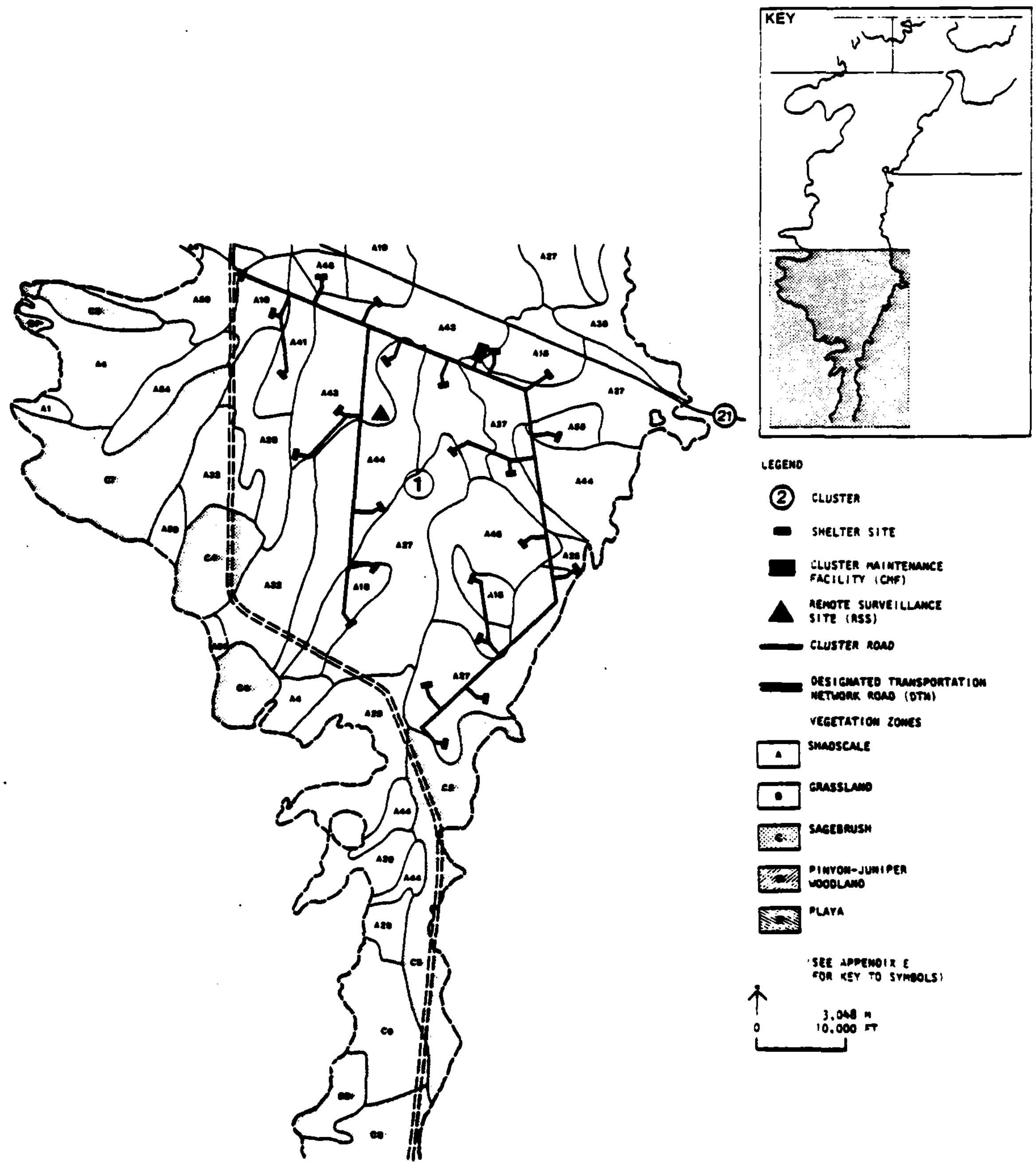
PLANT SPECIES OBSERVED ON CLUSTER 1 SITES

TABLE 4-9



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DOMINANT/SUBDOMINANT VEGETATION ASSOCIATIONS IN CLUSTER 1

FIGURE 4-24

Species	Shelter Site 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS	Resiting 21
Mammals																										
Domestic sheep								X	X						X	X	X	X		X		X				
Domestic cattle	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X
Domestic horse																					X					
Antelope																		X	X		X		X	X		
Coyote							X	X										X	?	?				X		
Kit fox	X			X	X					X	X			X										X		
Active kit fox den										X		X					X						?			
Badger	X					X				X					X		X		X			X				
Blacktailed jackrabbit								1																		
Rabbit	X			X	X	X	X	X			X		X		X	X	X		X		X	X	X	X	X	
Skunk den																						?		?		
Pocket gopher	X			X			X	X		X	X		X	X	X	X	X	X	X		X	X				
Large mammal burrows		P	P	P	P				P	P		P				P		P	P			P				
Small mammal burrows	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Birds																										
Horned larks	P		P		P	P	P	P		P	P	P	P		P	P	P	P	P	P	P	P	P	P	P	
Raven																					1		1			
Northern harrier																	1									

Number = Actual sightings; P = Present but not counted; X = sign observed.

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ANIMALS AND ANIMAL SIGN OBSERVED ON CLUSTER 1 SITES

TABLE 4-10

scattered throughout the cluster indicated the presence of additional, unidentified burrowing species.

4.3.5.2 Summary of Conditions in Cluster 2

a. Abiotic Conditions: The legal descriptions of Cluster 2 sites are given in Appendix D. Elevations range from 4650 to 4840 feet (1431 to 1489 m), and sites are located on slopes of approximately three degrees. The soil is alluvial, dominated by silt intermixed with varying amounts of gravel and sand. Abiotic conditions within the cluster are summarized in Table 4-11.

b. Disturbance: Disturbance in Cluster 2 was considered to be moderate and caused primarily by cattle and sheep grazing. Off-road driving was the primary disturbance in three sites, and erosion was the most noticeable disturbance in seven sites. The invasive species *Bromus tectorum* and *Halogeton glomeratus* were common within the cluster.

c. Threatened or Endangered Plant Species: *Sclerocactus pubispinus* was found at Site 5 in Cluster 2. This plant is listed as Currently Under Review (Category 1) in the Federal Register. It is also listed as High Priority by the UNPS.

A number of other plants were observed within the cluster that may possibly be species either Currently Listed or Currently Under Review in the Federal Register. These include *Machaeranthera* sp., *Townsendia* sp., *Cryptantha* sp., *Echinocereus* sp., *Opuntia* sp., *Sclerocactus* sp., *Astragalus* sp., *Mentzelia* sp., *Sphaeralcea* sp., and *Eriogonum* sp. Lack of flowers or other

Factor	Shelter Site																									Resitings		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS	16	19	21
Elevation (feet)	4832	4790	4780	4749	4755	4760	4700	4670	4738	4680	4652	4657	4666	4650	4750	4652	4658	4695	4780	4705	4755	4765	4840	4680	4661	4652	4775	4745
Soil Texture(a)																												
Rocks					X																							
Coarse gravel	X			X		X	X	X		X	X	X		X	1		X	X		X	X	X				X		X
Fine gravel	X			X		X				X	X	X			X		X	X		X	X	X				X	X	
Coarse sand	X			X		X	X		X	X	X	X	X				X	X		X	X	X		X		X	1	X
Fine sand	1		X	X		X		X	X	X	X	X	X		X	X	X	X	X	X		X	1	X	X	X	X	1
Silt	X	1	1	1	1	1	1	1	1		1	1	1	1		1	1	1	1	1	1	1	X	1	1	1		
Clay	X	X	X	X	X	X			X		X	X	X	X		X	X	X	X	X						X		
Disturbance(a)																												
Off-road vehicles	2	2		2		3			3	3	2	2	2	1	1	2	2	2		3	2	2			1			
Erosion			1			2		1	2	2	1		1	2					2	1	3	1		1	3			
Grazing	1	1	2	1	1	1	1	2	1	1	3	1	3	3		1	1	1	1	2	1	3	1		2			
Overall Intensity of Disturbance(b)	M	H	M	M	H	M	H	M	M	L	M	L	M	M	L	L	L	L	H	M	M	M	L	L	M	L	H	M

(a) 1-Highest relative importance/impact; 2-lesser relative importance/impact; 3-lowest relative importance/impact.
X-Indicates presence
(b) H-High; M-Moderate; L-Low

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SUMMARY OF ABIOTIC FACTORS ON CLUSTER 2 SITES

TABLE 4-11

reproductive structures during the season of the survey prevented positive identification of these species. Gutierrezia sarothrae and Astragalus lentiginosus were also observed, but the variety could not be determined at this time of year. It is not likely that many of these may be listed species, because many of the rare, threatened, or endangered individuals are located in specific habitats not found within the study area, and many are known only from outside Utah.

d. Vegetation: The vegetation in Cluster 2 is fairly typical of shadscale zone communities (see Section 3.2.1), except that grazing has reduced the numbers of some species normally found with shadscale, such as Cryptantha sp. and Descurainia sp. Shrubs found on Cluster 2 shelter sites included Artemisia spinescens, Chrysothamnus greenei, Gutierrezia sarothrae, Tetradymia glabrata, Tetradymia spinosa, and Ceratoides lanata. A number of cacti were present within Cluster 2, including Opuntia spp., Sclerocactus sp., and Echinocereus sp. Indian ricegrass, (Oryzopsis hymenoides), squirreltail grass (Sitanion hystrix), and galleta grass (Hilaria jamesii) were the most common grasses in the cluster.

Perennial cover in Cluster 2 ranged from 9.2 to 37.1 percent, and averaged 17.1 percent. The plant species observed are summarized in Table 4-12, and distribution of the dominant species is mapped in Figure 4-25.

e. Wildlife: Wildlife observations in Cluster 2 are summarized in Table 4-13. Rabbit and pocket gopher sign were common

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMP	RSS	Resitings 19	Resitings 21
AGAVACEAE																											
Yucca sp.																			X								
ASTERACEAE (COMPOSITAE)																											
Artemisia spinescens	X		X	X	X	X		X	X			X	X	X		X	X			X		X					
Chrysothamnus greenei	X								X		X	X				X	X	X		X							
Chrysothamnus nauseous																				X		X					
Chrysothamnus greenei x viscidiflorus											X				X							X	X				X
Chrysothamnus sp.										X																	
Gutierrezia sarothrae						X		X							X			X	X							X	X
Lactuca sp.	X?																										
Lygodesmia sp.																			X?								
Machaeranthera canescens																					X						
Machaeranthera sp.										X	X																
Tetradymia axillaris					X										X												
Tetradymia glabrata								X		X	X	X			X	X				X		X					
Tetradymia spinosa	X							X	X		X	X				X	X	X				X					
Townsendia sp.	X		X	X													X	X									X
BORAGINACEAE																											
Cryptantha sp.									X			X			X												
Lappula									X			X															
BRASSICACEAE (CRUCIFERAE)																											
Descurainia sp.				X	X		X	X																X			
Lepidium montanum				X	X		X	X	X		X	X				X	X	X									
Sisymbrium altissimum							X																				
Stanleya pinnata					X			X																			
Stanleya sp.											X																
Unknown mustard																									X		

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PLANT SPECIES OBSERVED ON CLUSTER 2 SITES

TABLE 4-12

	Shelter Site																								Resitings	
Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS	19	21
CACTACEAE																											
Echinocereus sp.																			X								
Opuntia erinacea					X										X												
Opuntia sp.			X	X		X											X	X	X			X	X				
Sclerocactus pubispinus					X																						
Sclerocactus sp.														X													
CHENOPODIACEAE																											
Atriplex canescens										X	X				X							X	X				X
Atriplex confertifolia	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	
Ceratoides lanata	X	X	X	X	X	X	X	X			X	X	X		X	X	X	X	X		X	X	X				X
Grayia spinosa															X												
Halogeton glomeratus	X	X	X	X	X	X	X	X	X		X	X	X	X		X	X	X		X	X	X		X	X		X
Kochia americana	X	X			X		X		X					X		X					X	X		X	X		
Salsola iberica																			X		X	X					X
Salsola sp.	X	X								X										X							
EPHEDRACEAE																											
Ephedra nevadensis					X				X	X					X				X								
FABACEAE (LEGUMINOSAE)																											
Astragalus lentiginosus																											X
Astragalus sp.											X																
LOASACEAE																											
Mentzelia sp.																		X									
MALVACEAE																											
Sphaeralcea grossulariifolia			X					X	X	X		X			X		X			X	X	X	X				X
Sphaeralcea sp.													X	X													

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PLANT SPECIES OBSERVED ON CLUSTER 2 SITES

TABLE 4-12

Species	Shelter Site 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMP	RSS	Resitings 19	21
POACEAE (GRAMINAE)																											
Aristida purpurea															X												
Bromus tectorum			X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X			X		X	X		X
Hilaria jamesii	X		X	X		X		X	X		X		X		X		X	X	X		X	X	X			X	X
Oryzopsis hymenoides	X		X						X			X	X		X		X	X	X		X	X	X				X
Sitanion hystrix			X		X	X		X		X							X	X	X		X	X					
Sporobolus contractus															X												
Sporobolus cryptandrus																			X								
Sporobolus sp.			X																								
POLEMONIACEAE																											
Leptodactylon sp.											X																
POLYGONACEAE																											
Eriogonum cernuum			X																								
Eriogonum deflexum				X	X	X																					X
Eriogonum sp.	X									X	X	X															
SALICACEAE																											
Salix sp.																				X							
SOLANACEAE																											
Lycium andersonii																						X					
Unidentified perennial grass																					X						

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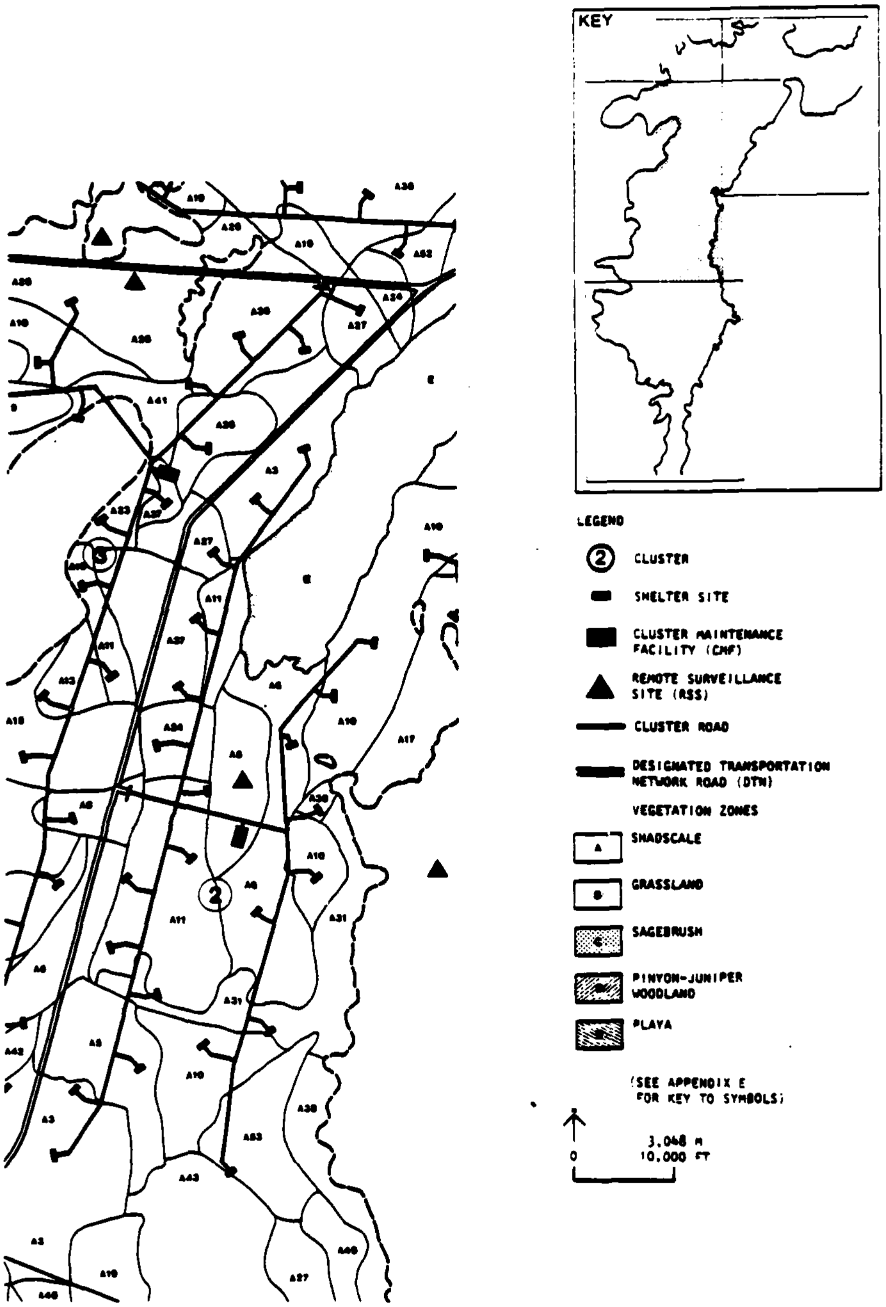
PLANT SPECIES OBSERVED ON CLUSTER 2 SITES

TABLE 4-12



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DOMINANT/SUBDOMINANT VEGETATION ASSOCIATIONS IN CLUSTER 2

FIGURE 4-25

Species	Shelter Site																							Resitings				
	1	2	3	4	5(a)	6	7(a)	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMP	RSS	16	19	21
<u>Mammals</u>																												
Domestic sheep			X			X			X			X	X	X					X								X	X
Domestic cattle	X	X	X	X		X		X	X	X	X	X	X	X		X	X	X		X	X	X	X					X
Antelope															X			X		X	X	X	X					
Coyote				X						X	X	X	X	X						X		X	X					
Kit fox	X			X		X		X			X				X	X	X				X					X		X
Active kit fox den												1																
Badger		X	X																					X				
Black-tailed jackrabbit		1				1			1	3	2									2								
Desert cottontail														X														
Rabbit	X	X	X			X		X	X	X	X	X		X	X	X	X	X	X	X	X	X	X			X		X
Kangaroo rat																												
(active burrows/sign)								3							2													X
Ground squirrel								X																X				X
Pocket gopher	X					X					X				X	X	X	X	X									
Mouse															X													
Large mammal burrows			X	X																		X						
Small mammal burrows	P	P	P	P		P			P	P	P	P	P	P	P	P	P	P		P	P	P	P					P
<u>Birds</u>																												
Horned larks	P	P	P		P				P	P	P	P	P	P		P	P	P	P				P			P		P
Raven												1	1	2		2	1	1	1									
Sharp-tailed grouse			X																									
American kestrel																			1									
Prairie falcon		1																										
<u>Reptiles</u>																												
Side-blotched lizard																										X		

Number = Actual sightings; P = Present but not counted; X = sign observed.
(a) Data lacking.

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ANIMALS AND ANIMAL SIGN OBSERVED ON CLUSTER 2 SITES

TABLE 4-13

throughout the cluster, and 10 black-tailed jackrabbits were seen, mostly along the main road. Kit fox dens, at least one of which was active, were seen at 10 sites. Pronghorn antelope sign was observed in six sites in the eastern portion of the cluster, and some was fairly fresh at the time of the survey (January 1981). Coyote sign was observed on nine sites, and kangaroo rat burrows were observed on two sites. Horned larks were ubiquitous, and ravens were observed at seven sites. A prairie falcon was seen in flight near Site 2, and an American kestrel was observed at Site 19 close to the valley edge.

Badger, desert cottontail, ground squirrel, and mouse sign were seen occasionally. Large and small mammal burrows throughout the cluster indicated the present of other, unidentified, burrowing species. On Site 3, there was a circular area that contained numerous bird feces and regurgitated pellets of vegetable matter and gravel. The area appeared to be a typical gallinaceous bird roosting area, and, as no sagebrush was present in the vicinity, it was tentatively identified as a sharp-tailed grouse (Pedioecetes phasianellus) roost area. Because sharp-tailed grouse are not known from southwestern Utah, this site might merit additional investigation.

4.3.5.3 Summary of Conditions in Cluster 3

a. Abiotic Conditions: The legal descriptions of Cluster 3 sites are given in Appendix D. Elevations range from 4685 to 5265 feet (1442 to 1620 m), and the sites are located on slopes of approximately three degrees. The soil is alluvial, dominated by silt intermixed with gravel and sand. Abiotic conditions within the cluster are summarized in Table 4-14.

b. Disturbance: Low to moderate disturbance was observed on all shelter sites except for two in Lawson Cove, where grazing impacts were high. Grazing was the primary cause of disturbance throughout most of the cluster, but off-road vehicle damage and erosion were the most evident causes of disturbance at seven sites. *Bromus tectorum* and *Halogeton glomeratus*, plant species indicative of disturbance, were present throughout the cluster area.

c. Threatened or Endangered Plant Species: *Coryphantha vivipara* was observed on Site 9. The variety is thought to be *rosea*, although the season of the survey prevented positive identification. This variety is listed as a Currently Under Review (Category 2) species.

A number of other plants were observed within the cluster that may possibly be species either Currently Listed or Currently Under Review in the Federal Register. These include *Gutierrezia* sp., *Machaeranthera* sp., *Townsendia* sp., *Cryptantha* sp., *Lepidium* sp., *Echinocereus* sp., *Opuntia* sp., *Sclerocactus* sp., *Astragalus* sp., *Mentzelia* sp., *Sphaeralcea* sp., *Oenothera* sp., *Eriogonum* sp., and *Penstemon* sp. Lack of flowers or other reproductive structures during the season of the survey prevented positive identification of these species or varieties. *Gutierrezia sarothrae*, *Machaeranthera canescens*, *Lepidium*

Factor	Shelter Site																									Resitings				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS3	14	15	16	17	22
Elevation (feet)	4827	4836	4940	4953	4848	4846	4985	4950	4790	4755	4748	4710	4716	4760	4745	4685	—	4850	4910	4915	5015	—	4910	4735	4870	4760	5221	—	5145	5265
Soil Texture[a]																														
Rocks																			1			1	1							
Coarse gravel	X	X	X	X		X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
Fine gravel	X	X	X	X		X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
Coarse sand	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X			X	X	X	X		X	X
Fine sand	X	X	X	X	X	X		X	X	X	1	X	X	1	1	X	X	X		1	X			1	X	X	X		X	X
Silt	1	1	1	1	1	1	1	1	1	1		1	1	X	X	1	1	1		X	1				1	1	1	1	1	1
Clay	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X	X			X				X	X			X	X
Disturbance[a]																														
Off-road vehicles	2	2	3	2	3	2	2	1	3	2	2	1	2	2	2	2	1	2		2	2			1	1	3	2		2	2
Erosion	3	3	2	3	2	3	3	3	2				1				2	1					2			2			3	
Grazing	1	1	1	1	1	1	1	2	1	1	1	2	3	1	1	1		3	1	1	1	1	1	2	2	1	1	1	1	1
Overall Intensity of Disturbance(b)	M	M	L	L	M	L	M	L	M	L	L	L	M	M	M	M	M	M	H	L	M	H	M	L	L	M	L	L	M	M

(a) 1-Highest relative importance/impact; 2-lesser relative importance/impact; 3-lowest relative importance/impact.
X-Indicates presence
(b) H-High; M-Moderate; L-Low

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SUMMARY OF ABIOTIC FACTORS ON CLUSTER 3 SITES

TABLE 4-14

montanum, and Eriogonum microthecum were also present, but the variety could not be determined at this time of year. It is not likely that many of these are listed species, because many of the rare, threatened, or endangered individuals are located in specific habits not found in the study area, and many are known only from outside Utah.

d. Vegetation: Cluster 3 contained the widest variety of plant species of any cluster in Wah Wah Valley. The vegetation is predominately typical of the shadscale zone, and shadscale (*Atriplex confertifolia*) was present on all shelter sites except 3. Several sites were dominated by rabbitbush (*Chrysothamnus greenei*). Winterfat (*Ceratoides lanata*) and bud sagebrush (*Artemisia spinescens*), typical shrubs of the shadscale vegetation zone, were found throughout the cluster. Common grasses included *Bromus tectorum*, *Hilaria jamesii*, *Oryzopsis hymenoides*, and *Sitanion hystrix*. The shrubs *Ephedra nevadensis*, *Tetradymia glabrata*, *T. spinosa*; the perennials *Lepidium montanum* and *Eriogonum* spp.; and annual species of *Sphaeralcea* were also scattered throughout the cluster.

Perennial cover in Cluster 3 ranged from 10 percent to 28 percent, and averaged 18 percent. The plant species observed in the cluster are summarized in Table 4-15, and distribution of the dominant associations is mapped in Figure 4-26.

e. Wildlife: Wildlife observations in Cluster 3 are summarized in Table 4-16. Common wildlife throughout the cluster

	Shelter Site																									Resitings				
Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMP	RSS	14	15	16	17	22
AGAVACEAE																														
Yucca sp.			X																											
ASTERACEAE (COMPOSITAE)																														
Acamptopappus sp.																			X											
Artemisia nova							X															X	X				X			
Artemisia spinescens			X	X			X	X	X		X		X	X		X	X	X	X			X	X			X		X	X	X
Chrysothamnus greenei	X	X		X		X				X	X		X	X	X	X	X			X										
Chrysothamnus nauseosus				X		X																								
Chrysothamnus viscidiflorus					X					X												X	X						X	
Chrysothamnus viscidiflorus greenei	X																			X										
Chrysothamnus sp.			X				X	X	X		X	X									X			X		X	X			X
Gutierrezia sarothrae			X	X		X	X		X		X	X	X										X							X
Gutierrezia sp.											X																			
Machaeranthera canescens						X															X	X	X							
Machaeranthera sp.											X	X														X				X
Tetradymia axillaris																							X							
Tetradymia glabrata		X	X	X		X	X	X			X	X	X		X					X	X						X			X
Tetradymia spinosa		X	X	X	X	X		X									X		X			X	X			X	X	X		X
Townsendia sp.			X	X	X	X		X	X					X				X									X	X		
BORAGINACEAE																														
Cryptantha sp.								X		X		X	X			X														X
Lappula sp.								X	X		X		X			X	X	X			X				X					
BRASSICACEAE (CRUCIFERAE)																														
Caulanthus pilosus							X	X											X				X		X					
Descurainia sp.																							X							
Lepidium montanum	X	X		X		X	X	X	X				X	X		X	X		X		X	X	X		X	X		X		

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PLANT SPECIES OBSERVED ON CLUSTER 3 SITES

 TABLE 4-15

	Shelter Site																								Resitings				
Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS	14	15	16	17	22
BRASSICACEAE (CRUCIFERAE) (Cont.)																														
Lepidium sp.				X																										
Stanleya pinnata													X																	
Stanleya sp.												X																		
Unknown (*Sisymbrium* or *Descurainia* sp.)	X																													
CACTACEAE																														
Coryphantha vivipara									X																					
Echinocereus sp.			X																											
Opuntia erinacea																			X			X	X							
Opuntia sp.			X	X		X	X														X					X	X	X		X
Sclerocactus sp.								X																						
CHENOPODIACEAE																														
Atriplex canescens	X			X		X									X									X						
Atriplex confertifolia		X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X
Ceratoides lanata	X	X		X	X	X	X	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
Grayia spinosa			X	X																										
Halogeton glomeratus	X	X		X			X	X		X			X	X	X	X	X	X	X		X	X	X		X	X	X			
Kochia americana										X				X			X													
Salsola iberica																			X			X								
Salsola sp.		X									X										X				X					X
EPHEDRACEAE																														
Ephedra nevadensis			X	X		X	X	X			X	X	X		X	X					X	X	X	X		X	X			X
Ephedra viridis			X																											
EUPHORBIACEAE																														
Euphorbia sp.													X																	
FABACEAE (LEGUMINOSAE)																														
Astragalus sp.			X	X		X	X	X			X			X							X			X			X			

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PLANT SPECIES OBSERVED ON CLUSTER 3 SITES

PAGE 2 OF 4 TABLE 4-15

	Shelter Site																									Resitings				
Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS	14	15	16	17	22
GERANIACEAE																														
Erodium sp.			X																											
LOASACEAE																														
Mentzelia sp.	X	X																												
MALVACEAE																														
Sphaeralcea grossulariifolia			X	X				X	X	X	X						X			X					X			X		
Sphaeralcea sp.							X						X	X			X		X			X	X			X				
ONAGRACEAE																														
Oenothera sp.			X																											
OROBANCHACEAE																														
Orobanche sp.																		X												
POACEAE (GRAMINAE)																														
Aristida purpurea			X				X	X																						
Bromus rubens																						X	X							
Bromus tectorum		X	X	X		X	X	X	X	X	X			X	X	X	X	X	X		X	X	X		X		X	X		X
Distichlis spicata													X																	
Erioneuron sp.			X																											
Hilaria jamesii			X	X		X	X	X	X	X	X	X				X		X	X	X	X	X	X			X	X	X	X	
Oryzopsis hymenoides	X		X	X	X	X	X	X	X	X	X		X	X		X	X		X	X	X	X	X		X	X	X	X	X	X
Poa sp.																							X							
Sitanion hystrix			X	X	X		X		X				X		X		X		X			X	X	X			X	X		X
Sporobolus contractus																						X	X							
Sporobolus cryptandrus							X		X													X	X						X	X

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PLANT SPECIES OBSERVED ON
CLUSTER 3 SITES

TABLE 4-15

Species	Shelter Site 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS	Resitings 14	15	16	17	22
POLEMONIACEAE																														
Leptodactylon sp.			X				X	X	X			X	X		X	X								X						
POLYGALACEAE																														
Eriogonum cernuum					X																									
Eriogonum deflexum					X																									
Eriogonum microthecum							X	X																						
Eriogonum sp.		X		X			X			X	X	X	X	X			X	X						X		X	X			
SCROPHULARIACEAE																														
Penstemon sp.										X																				

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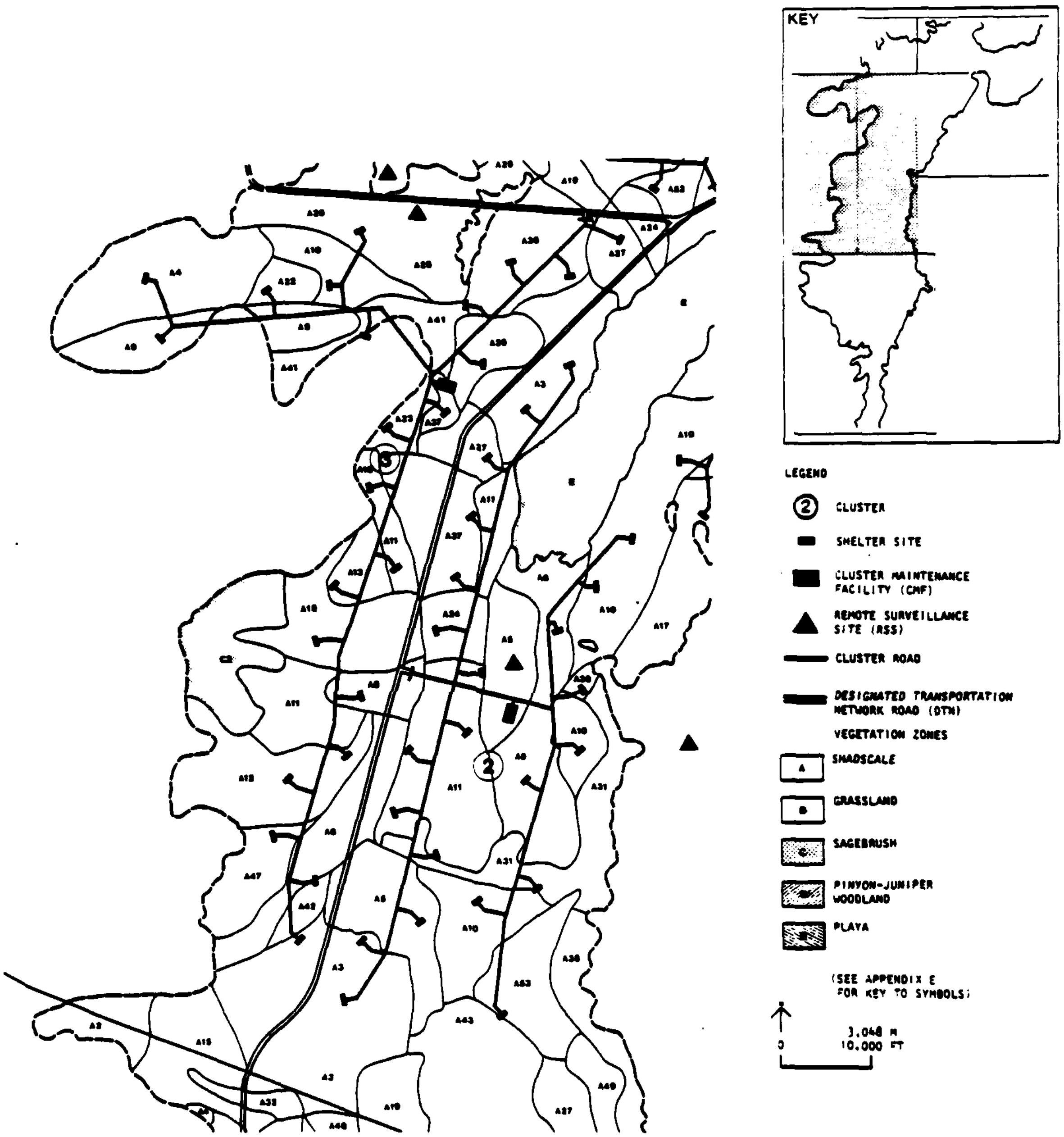
PLANT SPECIES OBSERVED ON CLUSTER 3 SITES

TABLE 4-15



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DOMINANT/SUBDOMINANT VEGETATION ASSOCIATIONS IN CLUSTER 3

FIGURE 4-26

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMP	RSS	Resitings 14	Resitings 15	Resitings 16	Resitings 22
Mammals																													
Domestic sheep	X	X			X	X	X	X	X	X				X	X	X			X	X					X	X	X	X	X
Domestic cattle	X	X	X	X	X	X	X	X			X	X	X	X	X	X		X	X	X	X			X	X	X			X
Antelope														X		X						X	X					X	
Coyote		X					X									X	X		X	X	X			X					
Kit fox		X				X				X				X			X		X	X	X	X	X	X	X				
Inactive kit fox den																										X			
Badger																													1
Badger	X	X			X	X									X					X									
Black-tailed jackrabbit			1			1	2		1		5	1			1					2				4					
Desert cottontail																			X										
Rabbit	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X		X	X
Kangaroo rat																			X			X	X						
Ground squirrel																			X			X	X						
Skunk	?																											X	
Pocket gopher	X	X			X	X	X		X	X	X	X		X	X		X	X		X	X	X	X	X	X		X		
Mouse																			X										
Large mammal burrows				X		X																							
Small mammal burrows	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X	X	X	X	X	X
Birds																													
Horned larks	P			P	P	P	P	P	P	P		P	P	P	P	P	P	P	P	P	P			P	P	P			P
Raven																3								1					
Reptiles																													
Snake								X																					
Side-blotched lizard																											19	15	

X - Sign
P - Present but not counted.
Number - Actual sightings

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ANIMALS AND ANIMAL SIGN OBSERVED ON CLUSTER 3 SITES

TABLE 4-16

included black-tailed jackrabbits and horned larks. Gopher mounds and unidentified small mammal burrows were found throughout the cluster. Kit fox sign was observed in 12 sites throughout the cluster and at every site within the Lawson Cove area. Pronghorn antelope sign was seen at four sites in the Lawson Cove area. The cove also contained the only mouse, ground squirrel, and kangaroo rat signs seen in the cluster. Shelter Site 8 contained a snakeskin thought to be that of a whipsnake or racer. Badger sign was seen at six sites. Four ravens and a possible skunk den were also present.

4.3.5.4 Summary of Conditions in Cluster 4

a. Abiotic Conditions: The legal descriptions of Cluster 4 sites are given in Appendix D. Elevations range from 4603 to 5775 feet (1416 to 1777 m), and the sites are located on slopes of approximately three degrees. The soil is alluvial, dominated by fine sand silt intermixed with coarser sand and gravel. Abiotic conditions within the cluster are summarized in Table 4-17.

b. Disturbance: Disturbance in Cluster 4 was considered low to moderate on most sites. High levels of disturbance due to stock grazing were observed at Shelter Sites 12 and 20. Most shelter sites were more disturbed by off-road driving than by grazing. Erosion was evident at eight sites, primarily at the edges of the valley and along roads. Plant species indicative of disturbance, such as *Salsola iberica*, *Halogeton glomeratus*, and *Bromus tectorum* were scattered throughout the cluster.

Factor	Shelter Site 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	Resitings 14	17
Elevation (feet)	5025	4965	4915	4890	4770	4785	4870	4750	4680	4655	4748	5775	4771	4840	4920	5020	4935	4990	4610		4625	4730	4603	4650	4850	4935
Soil Texture(a)																										
Coarse gravel	X	X	X	X	1		X	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X	X	X
Fine gravel	X	X	X	X	X		X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X
Coarse sand	X	X		X		X	X	X	X	X	X	X	X		X	X	X		X		X	X	X	X	X	X
Fine sand	X	X		1	X	1	1	1	X	1	X	X	X		1	X	X	X	X		1	1	1	X	X	X
Silt	1	1	1		X				1		1	1	1	1		1	1	1	1	X	X		X	1	1	1
Clay	X	X	X		X				X	X	X	X	X	X		X	X	X	X		X		X	X	X	X
Disturbance(a)																										
Off-road vehicles		1	1	1	1	1	1	1	2	2	1	2	3	1	1	1	1	1	1		2	1	1	1	1	1
Erosion	2									3			2			2	2				3		3	2	2	2
Grazing	1	2	2						1	1		1	1	2				2	2	1	1	2	2			3
Campsite													4													
Overall Intensity of Disturbance(b)	L	L	L	L	M	L	L	L	L	M	L	H	L	L	L	L	L	M	M	H	L	L	L	L	L	L

(a) 1-Highest relative importance/impact; 2-lesser relative importance/impact; 3-lowest relative importance/impact.
X-Indicates presence
(b) H-High; M-Moderate; L-Low

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SUMMARY OF ABIOTIC FACTORS ON CLUSTER 4 SITES

TABLE 4-17

c. Threatened or Endangered Plant Species: A number of plants were observed within the cluster that may possibly be species either Currently Listed or Currently Under Review in the Federal Register. These include *Machaeranthera* sp., *Cryptantha* sp., *Opuntia* sp., *Astragalus* sp., *Mentzelia* sp., *Sphaeralcea* sp., and *Eriogonum* sp. Lack of flowers or other reproductive structures during the season of the survey prevented positive identification of these species. *Gutierrezia sarothrae*, *Machaeranthera canescens*, *Lepidium montanum*, and *Astragalus lentiginosus* were also observed, but, for the same reason, the variety could not be determined at this time of year. It is not likely that many of these are listed species because many of the rare, threatened, or endangered individuals are located in specific habitats not present in the study area, and many are known only from outside Utah.

d. Vegetation: Vegetation in Cluster 4 is typical of various shadscale zone communities. Shrubs found throughout the area include *Chrysothamnus greenei*, *Tetradymia glabrata*, *Atriplex confertifolia*, *Ceratoides lanata*, and *Ephedra nevadensis*. *Artemisia spinescens* was frequent, especially along the edge of the valley. A species of *Opuntia* was the only cactus found in the cluster. The only frequently encountered grasses were *Hilaria jamesii* and *Oryzopsis hymenoides*. Perennial cover ranged from 3 to 22 percent, and averaged 15 percent.

The plant species observed in Cluster 4 are summarized in Table 4-18, and distribution of the dominant associations is mapped in Figure 4-27.

	Shelter Site																							Resitings	
Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMP	14	17
AGAVACEAE																										
Yucca sp.														X												
ASTERACEAE (COMPOSITAE)																										
Ambrosia acanthicarpa				X		X		X														X				
Artemisia nova	X									X									X					X		
Artemisia spinescens	X	X			X				X			X	X			X	X		X	X					X	
Artemisia sp.														X												
Chaenactis sp.	X		X		X																					
Chrysothamnus greenei		X		X		X	X	X	X		X	X	X	X	X		X	X	X		X	X	X	X	X	X
Chrysothamnus nauseosus	X																X					X				
Chrysothamnus viscidiflorus			X							X						X				X						
Gutierrezia microcephala														X							X					
Gutierrezia sarothrae	X	X	X						X					X						X				X		
Machraeranthera canescens																					X					
Machaeranthera sp.		X						X																		
Stephanomeria sp.														X				X								
Tetradymia glabrata		X	X		X	X	X	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	
Tetradymia spinosa	X				X				X		X	X		X												
Townsendia sp.		X			X																					
BORAGINACEAE																										
Cryptantha sp.	X												X							X						
Lappula sp.	X		X		X				X		X		X				X					X				
BRASSICACEAE (CRUCIFERAE)																										
Caulanthus pilosus					X								X				X									
Lepidium montanum	X				X				X				X	X			X	X	X	X	X	X	X			X
Stanleya pinnata																							X			
Stanleya sp.																			X							

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PLANT SPECIES OBSERVED ON CLUSTER 4 SITES

TABLE 4-18

Species	Shelter Site 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	Resitings 14	17
CACTACEAE																										
Opuntia sp.							X		X						X						X	X			X	
CHENOPODIACEAE																										
Atriplex canescens										X				X			X	X				X	X			
Atriplex confertifolia	X	X	X		X				X	X	X	X	X						X	X	X	X	X	X		
Ceratoides lanata	X	X	X		X				X		X			X	X	X	X	X	X	X	X	X	X		X	X
Halogeton glomeratus	X		X		X				X	X	X	X	X				X	X	X	X	X	X		X		X
Kochia americana									X			X	X				X				X			X		
Salsola iberica					X															X						
Salsola sp.	X	X	X	X		X	X	X							X	X	X	X				X			X	
Suaeda sp.																					X					
EPHEDRACEAE																										
Ephedra nevadensis	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
EUPHORIBIACEAE																										
Euphorbia sp.																								X		
FABACEAE (LEGUMINOSAE)																										
Atragalus lentiginosus														X												
Astragalus sp.						X								X							X				X	
LOASACEAE																										
Mentzelia sp.		X												X			X									
MALVACEAE																										
Sphaeralcea grossulariifolia		X								X				X		X			X	X					X	
Sphaeralcea sp.														X		X					X				X	

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PLANT SPECIES OBSERVED ON CLUSTER 4 SITES

TABLE 4-18

	Shelter Site																								Resitings	
Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	14	17
POACEAE (GRAMINAE)																										
Aristida purpurea			X		X																					
Bromus tectorum	X	X	X		X				X				X	X					X	X						
Distichlis spicata										X																
Hilaria jamesii	X	X	X		X		X		X		X	X	X	X	X	X	X	X		X	X	X	X		X	X
Oryzopsis hymenoides		X			X		X		X	X	X		X	X	X	X	X	X	X	X	X		X		X	X
Sitanion hystrix			X							X			X							X						
Sporobolus cryptandrus			X																							
POLEMONIACEAE																										
Gilia sp.					X			X					X													
Leptodactylon pungens																				X						
Leptodactylon sp.			X					X		X				X	X	X	X				X		X			
POLYGONACEAE																										
Eriogonum caespitosum																				X						
Eriogonum sp.					X				X	X	X			X			X	X			X		X		X	
ROSACEAE																										
Prunus fasciculata	X																									
SOLANACEAE																										
Lycium andersonii																X										

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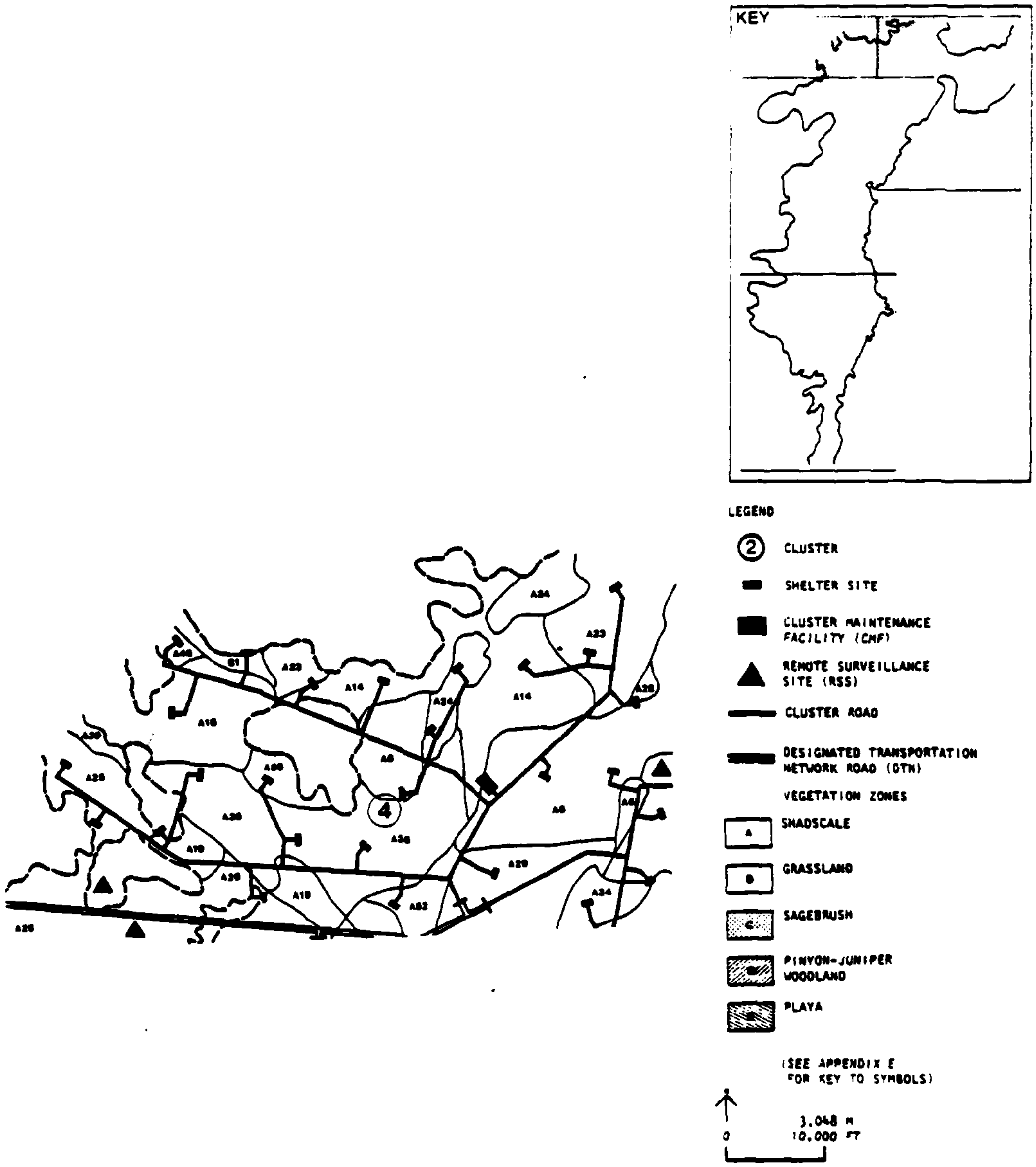
PLANT SPECIES OBSERVED ON CLUSTER 4 SITES

TABLE 4-18



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DOMINANT/SUBDOMINANT VEGETATION ASSOCIATIONS IN CLUSTER 4

FIGURE 4-27

e. Wildlife: Wildlife observations in Cluster 4 are summarized in Table 4-19. Common wildlife throughout the cluster included black-tailed jackrabbits, coyotes, and horned larks. Antelope sign was found at five sites, three of which were adjacent to the Black Hills, west of Sevier Lake. Kit fox sign was seen at three widely scattered sites. One or two ravens were seen at seven sites. Site 20 near Sevier Lake contained the only kangaroo rat, ground squirrel, and mouse sign in the cluster. Gopher sign was seen at two sites, and badger sign was seen at six sites. Small mammal burrows were ubiquitous.

4.3.5.5 Summary of Conditions in Cluster 5

a. Abiotic Conditions: The legal descriptions of Cluster 5 sites are given in Appendix D. Elevations range from 4565 to 5776 feet (1405 to 1777 m), and the sites are located on slopes of approximately three degrees. The soil is alluvial, consisting of sand and silt with intermixed gravel. Abiotic conditions within the cluster are summarized in Table 4-20.

b. Disturbance: Disturbance in Cluster 5 was considered low to moderate, except in Shelter Sites 6, 20, 21, and 23. At these sites, heavy grazing has resulted in considerable damage to vegetation and soils. Nearly all sites showed some evidence of grazing, and off-road vehicle usage was noted throughout the cluster except on the northern edge. Plant species indicative of disturbance, such as *Halogeton glomeratus* and *Bromus tectorum*, were found on most sites.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMP	Resitings 14	Resitings 17
Mammals																										
Domestic sheep	X	X				X				X				X		X		X	X	X	X	X	X			X
Domestic cattle		X							X				X													
Antelope					X										X	X	X			X						
Coyote			X	X	X	X	X	X	X	X	X		X	X	X		X					X	X	X		
Kit fox					X					X												X				
Badger		X	X		X					X							X					X				
Black-tailed jackrabbit				1		2	3	1		4					3	2		1	1			8	1			
Rabbit	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X
Kangaroo rat																				X						
Ground squirrel																				X						
Pocket gopher																	X			X					X	X
Mouse																				X						
Small mammal burrows	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	X	X
Birds																										
Horned larks	P			P	P	P	P	P	P	P	P	P	P	P		P	P	P	P					P	P	P
Raven		2				1				2				1	1				2		1					
Reptiles																										
Side-blotched lizard																									P	

X - Sign.
P - Present but not counted.
Number - Actual sightings.

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ANIMALS AND ANIMAL SIGN OBSERVED ON CLUSTER 4 SITES

TABLE 4-19

c. Threatened or Endangered Plant Species: *Sclerocactus pubispinus* is found on Sites 12, 13, and CMF 5. This plant is listed in the Federal Register as Currently Under Review (Category 1). *Coryphantha vivipara* was found on Sites 18, 19, 21, 22, and 23. It is thought to be variety *rosea*, although lack of flowers precluded positive identification.

A number of plants were observed within the cluster that may possibly be in the Federal Register as species Currently Listed or Currently Under Review. These include *Gutierrezia* sp., *Townsendia* sp., *Cryptantha* sp., *Opuntia* sp., *Astragalus* sp., *Mentzelia* sp., *Sphaeralcea* sp., *Gilia* sp., and *Eriogonum* sp. The lack of flowers or other reproductive structures during the season of the survey prevented positive identification of these species. *Gutierrezia sarothrae*, *Lepidium montanum*, and *Machaeranthera canescens* were also observed, but the variety could not be determined at this time of year. *Echinocereus engelmannii* was also present, but it was not the endangered variety *purpureus*.

It is not likely that many of these may be listed species, because many of the rare, threatened, or endangered individuals are located in specific habitats not found in the study area, and many are known only from outside Utah.

d. Vegetation: The Cluster 5 vegetation communities are typical of the shadscale zone. *Atriplex confertifolia* was present on all but Site 8. Transect data (Appendix E) show a variety of plant species dominant at various sites. Artemisia spinescens and Artemisia nova were often found with Hilaria jamesii or in combination with Atriplex confertifolia. Other shrubs found regularly throughout the valley included Ceratoides lanata, Ephedra nevadensis, Chrysothamnus viscidiflorus, other Chrysothamnus species, and Tetradymia glabrata. Cactus were comparatively abundant in Cluster 5, and several species were found; only Sites 5, 7, 8, 11, and 17, all near the middle of the valley floor, contained no cactus. Sites near the hills contained more, and Sites 19 through 23 contained two or more species of cactus on each site. Grasses included Aristida purpurea, Bromus tectorum, Hilaria jamesii, Oryzopsis hymenoides, and Sitanion hystrix.

Perennial cover in Cluster 5 ranged from 5 to 29 percent, and averaged 15 percent. The plant species observed in Cluster 5 are summarized in Table 4-21, and distribution of the dominant associations is mapped in Figure 4-28.

e. Wildlife: Wildlife observations in Cluster 5 are summarized in Table 4-22. Common wildlife throughout the cluster included black-tailed jackrabbits, coyotes, kit fox, and pocket gophers. A bald eagle was seen between sites 19 and 22. A herd of 15 pronghorn antelope was observed near Site 15, and antelope sign was noted at four sites, all but one of which were located in the northeastern portion of Cluster 5. Kangaroo rat sign and ground squirrel sign were found mainly in the northern portion of the cluster. Small mammal burrows scattered through-

	Shelter Site																									Resitings[c]									
Factor	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMP	RS84	1	5	7	8	12	13	14	18	20	23
Elevation (feet)	4952	4705	4718	4815	4655	4885	4685	4715	4720	4660	4583	4575	4680	4690	4590	4590	4605	4705	4824	4825	5010	5005	5090	4640	4590	4950	4655	4648	4722	4571	4565	4683	4760	5776	5095
Soil Texture[a]																																			
Rocks																																			X
Coarse gravel	X	X	X	X	X	X	X			X	X	X	X	X	X		X		X	X	X	X			X	X	X	X	X	–	X	X	X	X	X
Fine gravel	X	X	X		X	X	X								X		X		X			X				X	X	X	X	–	X	X	X	X	
Coarse sand	X	X	X	X	X	X	X	X	X						1	X	X	1	X			X	X			X	X	X	X	–	X	X	X	X	1
Fine sand	1	X	X	X	X	X	1	1	X	X			X			X	1	X	X	1		X	X	X		X	1	X	1	–	X	X	X	X	X
Silt	X	1	1	1	1	1			1	1	1	1	1	1		1			1		1	1	1	1	1	1	X	1	X		1	1	1	1	
Clay	X	X	X		X	X					X								X			X				X	X	X	X	–	X	X	X	X	
Disturbance[a]																																			
Off-road vehicles	3	3	2	2	3	2		1	2							1			3	2	2	3	2	2		2	1	1	1	1	1	1	2	1	
Erosion	1	2			1	3	1	2	3	2			1				1	1	2			2		3							2			2	
Grazing	2	1	1	1	2	1			1	1	1	1	2	1	1	2		2	1	1	1	1	1	1	1	1				2			1	3	1
Overall Intensity of Disturbance(b)	L	M	M	M	M	H	L	L	M	M	M	L	L	M	L	M	L	M	M	H	H	M	H	M	L	L	L	L	L	L	L	L	L	L	H

(a) 1-Highest relative importance/impact; 2-lesser relative importance/impact; 3-lowest relative importance/impact.
X-Indicates presence
(b) H-High; M-Moderate; L-Low
(c) Sites 1 and 12 resurveyed but not resited; sites 19 and 22 resited, but data identical to original shelter site.

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SUMMARY OF ABIOTIC FACTORS ON CLUSTER 5 SITES

TABLE 4-20

Factor	Original Sites 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMP	RSS	Resitings(a) 1	5	7	8	12	13	14	18	20	22
AGAVACEAE																																			
Yucca baccata														X																					
Yucca sp.	X					X																													
ASTERACEAE (COMPOSITAE)																																			
Acamptopappus sp.															X	X																			
Ambrosia acanthicarpa								X																											
Ambrosia sp.																													X						
Artemisia nova	X	X			X	X	X		X													X					X	X							
Artemisia spinescens			X		X				X	X	X	X	X	X	X	X	X	X						X	X					X	X				
Artemisia tridentata																		X		X			X												
Chrysothamnus greenei		X			X			X											X			X					X	X	X						
Chrysothamnus nauseosus ssp. bigelovii								X																											
Chrysothamnus nauseosus ssp. turbinatus																													X						
Chrysothamnus nauseosus								X										X					X										X		
Chrysothamnus viscidiflorus			X?	X		X	X		X	X	X	X	X			X	X	X		X	X			X											
Chrysothamnus sp.			X																			X													
Gutierrezia sarothrae	X	X		X			X	X?	X			X	X	X	X	X		X					X	X	X		X				X				
Gutierrezia sp.			X			X															X	X											X		
Iva axillaris														X																					
Lygodesmia sp.				X																															
Machaeranthera canescens																									X										
Machaeranthera sp.										X		X												X											
Tetradymia axillaris		X	X	X			X		X				X	X										X	X			X		X					
Tetradymia glabrata	X	X	X	X	X	X			X		X	X		X		X	X	X	X	X	X	X					X						X		
Tetradymia spinosa x axillaris																			X																
Tetradymia spinosa					X				X	X	X	X	X	X	X	X					X			X	X						X				

(a) Sites 1 and 12 resurveyed but not resited. Sites 19 and 22 resited but not shown. Data identical to sites 19 and 22 above.

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PLANT SPECIES OBSERVED ON CLUSTER 5 SITES

PAGE 1 OF 4

TABLE 4-21

Factor	Original Sites 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMP	RSS	Resitings[(a)] 1	5	7	8	12	13	14	18	20	23
Tetradymia sp.	X?																																		
Townsendia sp.			X																																
BORAGINACEAE																																			
Cryptantha sp.							X					X						X							X										
BRASSICACEAE (CRUCIFERAE)																																			
Caulanthus pilosus																		X																	
Descurainia pinnata												X																							
Descurainia sp.									X	X	X		X	X							X			X											
Lepidium montanum			X		X		X		X	X	X	X	X	X	X	X	X	X						X	X		X				1X				
Lepidium sp.								X																											
Sisymbrium altissimum														X	X	X				X	X		X												
Sisymbrium sp.																								X											
Stanleya pinnata							X		X			X						X							X										
Streptanthus cordatus																		X		X	X														
CACTACEAE																																			
Coryphantha vivipara																			X		X	X											X		X
Echinocereus engelmannii	X			X		X														X		X	X												
Opuntia erinacea									X	X				X	X	X				X	X		X												
Opuntia sp.	X	X	X	X		X													X			X										X	X	X	
Sclerocactus pubispinus												X	X											X											
CHENOPODIACEAE																																			
Atriplex canescens		X	X															X	X										X						
Atriplex confertifolia	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X	X	X	X	X
Ceratoides lanata	X	X	X		X	X	X		X	X		X	X	X	X	X	X	X	X	X	X	X		X				X			X	X		X	

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PLANT SPECIES OBSERVED ON CLUSTER 5 SITES

TABLE 4-21

Factor	Original Sites 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	RSS	Resitings(a) 1	5	7	8	12	13	14	18	20	23
Grayia spinosa																		X	X			X													
Halogeton glomeratus		X					X		X	X	X	X	X	X	X	X	X	X						X	X		X				X	X			
Kochia americana		X									X	X	X											X	X					X	X				
Salsola iberica										X															X										
Salsola sp.								X																					X						
Suaeda torreyana		X																																	
EPHEDRACEAE																																			
Ephedra nevadensis	X	X	X	X	X	X	X	X	X			X	X	X				X	X		X	X	X				X		X				X	X	X
FABACEAE (LEGUMINOSAE)																																			
Astragalus sp.																			X																
LOASACEAE																																			
Mentzelia sp.															X																				
MALVACEAE																																			
Sphaeralcea grossulariifolia	X		X						X	X		X	X		X	X	X	X	X	X	X	X		X	X						X	X			
Sphaeralcea sp.																																	X		
POACEAE (GRAMINAE)																																			
Agropyron sp.								X																											
Aristida purpurea		X						X						X	X	X		X		X	X		X												
Bromus tectorum	X	X		X		X			X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X						X	X	X	X	X
Hilaria jamesii	X	X	X	X		X	X	X	X	X		X	X	X	X	X		X	X	X	X	X	X	X	X		X	X			X	X	X	X	
Oryzopsis hymenoides		X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X		X		X				X	X	X	X	

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PLANT SPECIES OBSERVED ON CLUSTER 5 SITES

TABLE 4-21

	Original Sites																									Resitings[a]									
Factor	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMF	HSS	1	5	7	8	12	13	14	18	20	23
Sitanion hystrix	X					X			X	X		X	X		X	X		X		X	X		X	X	X						X				
Sporobolus contractus															X																				
Sporobolus cryptandrus																			X			X												X	
Vulpia octoflora									X																										
POLEMONIACEAE																																			
Gilia sp.							X																	X											
Leptodactylon pungens							X											X																	
Leptodactylon sp.			X		X									X													X	X							
POLYGONACEAE																																			
Eriogonum deflexum							X		X	X		X												X							X				
Eriogonum sp.		X	X		X		X						X	X				X						X			X	X							
SOLANACEAE																																			
Lycium andersonii							X																												

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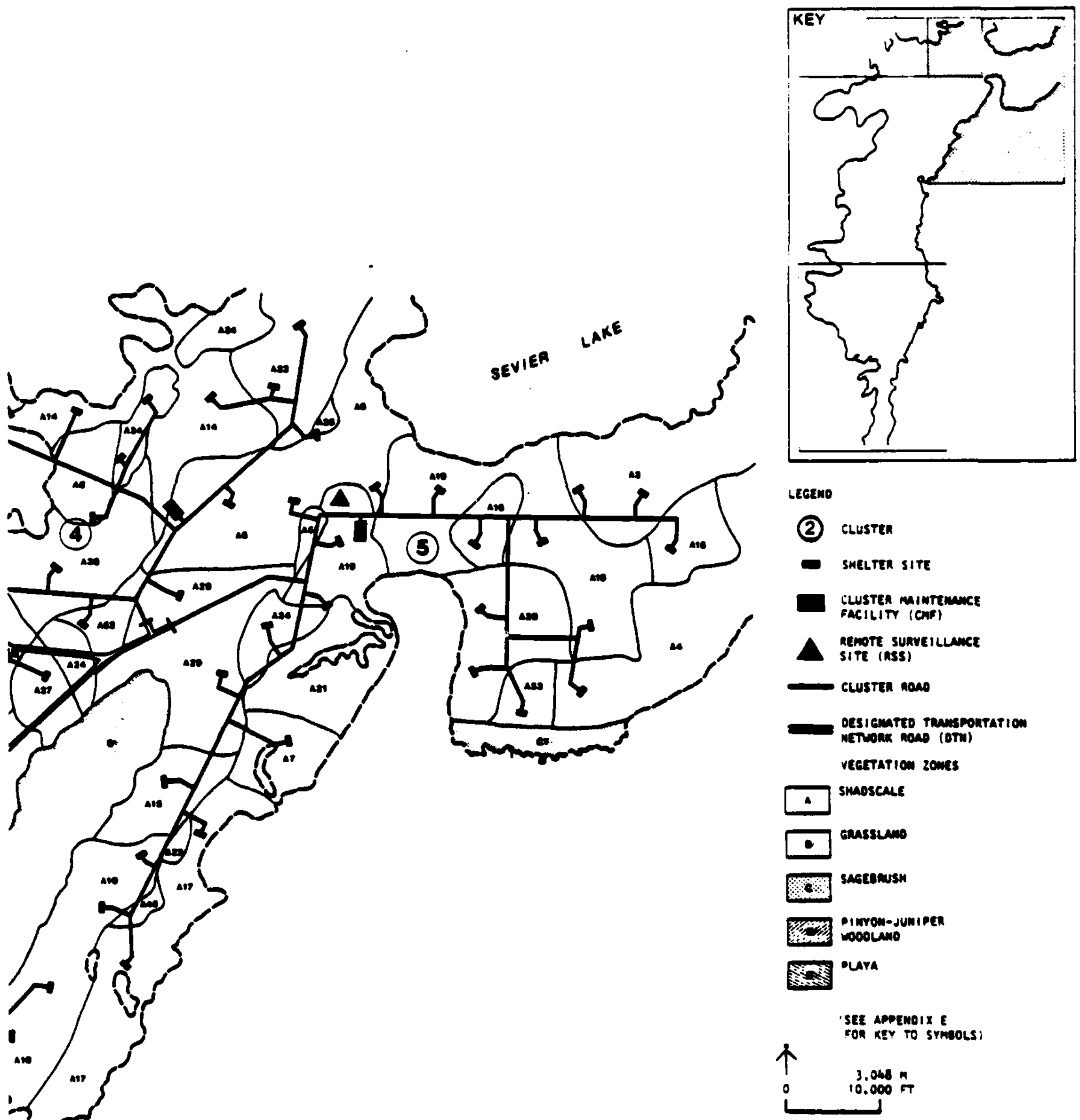
PLANT SPECIES OBSERVED ON CLUSTER 5 SITES

TABLE 4-21



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DOMINANT/SUBDOMINANT VEGETATION ASSOCIATIONS IN CLUSTER 5

FIGURE 4-28

Species	Shelter Site																								Resitings(a)									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	CMP5	RSS4	5/1	5/5	5/7	5/8	5/12	5/13	5/14	5/18	5/20	5/23
Mammals																																			
Domestic sheep	X	X	X	X	X	X																			X					X			X	X	
Cattle	X	X	X																						X	X									
Antelope					X									X	X*		X										X**							X	
Coyote			X	X	X	X		X	X		X	X	X		X			X		X								X	X			X			
Kit fox					X		X	X	X	X	X	X	X		X	X	X			X	X		X	X											
Inactive kit fox den																																	X		
Badger					X																						X	X				X		X	
Black-tailed jackrabbit			1	1	1	1		7				1		5			2	2					1			1		1	2				1	1	
Desert cottontail												X																							
Rabbit	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X									X	X	X	X	X	X		X	X	
Kangaroo rat									X	X	X	X	X	X	X	X	X	X		X	X			X	X										
Antelope ground squirrel																							X		X										
Ground squirrel							X			X	X			X	X						X			X											
Pocket gopher			X	X	X		X		X				X	X						X	X		X	X								X	X	X	
Mouse														X																					
Large mammal burrows		P																																	
Small mammal burrows	P	P	P	P	P	P		P	P	P	P	P	P		P	P		P						P		P	P	P	P	P	P	P	P	P	
Birds																																			
Horned larks	P		P	P				P										P					P	P		P	P	P		P	P	P	P	P	
Raven							1	1																							1		1		
Western meadowlark																								1											
Bald eagle																						1													
Northern harrier																															P				
Reptiles																																			
Side-blotched lizard																										3	5	2				2	6	5	

Number = Actual sightings; P = Present but not counted; X = sign observed.

* Fifteen pronghorns seen near site.

** Fresh-approximately 20-25 sets of antelope tracks

(a) Sites 1 and 12 resurveyed but not resited. Sites 19 and 22 resited, b… data identical to original sites.

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ANIMALS AND ANIMAL SIGN OBSERVED ON CLUSTER 5 SITES

TABLE 4-22

out the cluster indicate the presence of other, unidentified, burrowing species.

4.4 RESITINGS IN WAH WAH VALLEY

The methodology and rationale for resitings is discussed in Section 3.4 in conjunction with Pine Valley resitings.

Twenty-two shelters were resited in Wah Wah Valley mainly because of conflicts with layout or geotechnical criteria. Shelters resited and the reasons for their resitings are listed in Table 4-23.

In general it was possible to relocate a site within 400 feet (124 m) from its original location and avoid the problem on the original site. In many cases, a resiting overlapped part of the original area; data obtained from the resiting is therefore often similar to data obtained from the original site. In some cases, because of the proximity of the original site and the resiting, additional transects were not necessary. The data from the resited locations have been incorporated into the appropriate cluster to help provide an overview of the area. Transect data are given in Appendix E.

No federally threatened or endangered species are expected to be directly impacted by the project in Wah Wah Valley. Plant species listed as Currently Under Review were treated as candidate species for federal listing, and mitigation by avoidance would have been instigated if the field survey had encountered a large group of individuals. When a number of possible candidate species were observed, recognized authorities were consulted.

SITE NUMBER	REASON FOR RESITING	SITE NUMBER	REASON FOR RESITING
SS 1/21	Wash	SS 4/3	Criteria
SS 1/22	Criteria	SS 4/14	Bedrock
SS 2/16	Playa	SS 4/17	Wash
SS 2/19	Wash	SS 5/5	Cultural Resource
SS 2/21	Wash	SS 5/7	Cultural Resource
SS 3/14	Criteria	SS 5/8	Geomorphology
SS 3/15	Criteria	SS 5/13	Geomorphology
SS 3/16	Criteria	SS 5/14	Wash
SS 3/17	Criteria	SS 5/18	Topography
SS 3/22	Criteria	SS 5/19	Wash
SS 3/23	Criteria	SS 5/20	Geomorphology
SS 4/1	Criteria	SS 5/22	Wash
SS 4/2	Criteria	SS 5/23	Wash

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FACILITY RESITINGS IN
WAH WAH VALLEY

TABLE 4-23

It was decided that mitigation by relocation of facilities was unnecessary when only scattered individuals were affected.

A number of populations that may be listed species were observed within the valley, but because of the season of the survey, species identification was not possible. It was decided not to resite until surveys could be made in the spring to allow positive species identification. If the species are later determined to be Currently Listed or Currently Under Review, resighting will be considered depending upon the status and numbers of the population.

5.0 SUMMARY OF POTENTIAL IMPACTS AND MITIGATION MEASURES

5.1 POTENTIAL IMPACTS

At the request of the BLM, a summary of the potential impacts of construction and operation of the MX system in the IOC valleys has been included in this report. The summary is based on the Deployment Area Selection and Land Withdrawal/Acquisition DEIS (HDR, 1980a), supplemented with additional material where appropriate. Measures designed to mitigate many of these impacts are described in the following section.

The Pine and Wah Wah Valleys study area encompasses approximately 324,300 acres (131,242 ha); construction will directly disturb approximately 4900 acres (1983 ha), or approximately two percent of the study area. However, the MX system must be viewed as a whole, rather than as numerous scattered facilities, because the DTN and cluster roads will result in increased accessibility and presence of the system will cause indirect biological impacts affecting the entire valley. Likewise, because MX deployment will affect many valleys in addition to Pine and Wah Wah, the whole system should be taken into account when evaluating effects. Impacts on a population in one valley may be of little consequence if many nearby valleys support additional populations; if populations in the other areas are also affected by the project, however, then that single valley population assumes greater importance.

Because shelter sites were selected for particular geotechnical characteristics, the species that require these same characteristics for habitat will tend to be impacted at all facility sites within a valley. Effects on some species prefering this habitat may be considerable, especially for the larger, more mobile, and more visible animals such as game species or other animals that require a large range. The extent of the effects will be influenced by the construction approach and mitigation measures adopted by the Air Force.

Direct impacts to plants and wildlife will be caused mainly by destruction of a portion of the habitat due to construction or grading. Long-term indirect impacts are likely to be more damaging; however, they will also be more difficult to measure or observe. Indirect impacts include lowering of the water table due to increased water usage and increased access to the area through road construction. Possible effects of increased access would be numerous, including an increase in poaching, disturbance of nesting, breeding, or feeding cycles, reduction of prey populations, and increased off-road vehicle usage. Increased traffic may affect animal movements and cause increased mortalities as well. Specific impacts are discussed below.

5.1.1 Hydrology

Effects on existing hydrologic patterns in Pine and Wah Wah Valleys may include alteration of surface drainage patterns and percolation rates, effects on water quality, drawdown of the water table, and decrease in recharge and subsequent subsurface flow to down-gradient users. Construction of roads and shelters may result in water channelization and blockage of overland flow. Other effects of road construction include a possible increase in ponding, erosion, soil compaction, and flow concentration, all of which tend to alter surface water resources and decrease expected groundwater recharge and storage (HDR, 1980a).

Increased water usage or decreased recharge that result in a drawdown of the water table could severely inhibit biological processes in a region such as Pine and Wah Wah Valleys, where water is a limiting factor. Lowering the groundwater table may destroy or weaken vegetation communities in some areas.

Drainage diversions may cause both short- and long-term changes in vegetation. Concentration of flow may cause increased erosion, resulting in loss of vegetation. Recolonization by other, less desirable species, or species better able to tolerate the new conditions, may occur. Increased soil moisture in ponding areas may eventually result in establishment of new species that require higher moisture levels (Wallace and Romney, 1972).

5.1.2 Grazing

The development of the MX system in Pine and Wah Wah Valleys may impact grazing by altering or reducing existing grazing allotments, and it may lead to overgrazing due to an overall reduction in available grazing land. Other potential impacts include increased animal rustling, vandalism of stock facilities, and general disturbance of livestock.

Water sources are especially critical to continued cattle grazing. Because cattle need to graze in reasonable proximity to drinking water sources, loss of a water source may prevent the use of up to 50 square miles of grazing land (HDR, 1980a). The reduction of suitable grazing habitat may also result in overgrazing of other presently undisturbed areas.

5.1.3 Vegetation

Natural revegetation of disturbed desert lands is a very slow process (Wallace, et al., 1977). The National Academy of Sciences (1974) has estimated that the recovery of native vegetation in areas receiving less than 10 inches (25 cm) of annual precipitation will require from decades to centuries.

The greatest impact to the flora in Pine and Wah Wah Valleys will be habitat reduction through removal of vegetation and habitat degradation by invasion of introduced species in disturbed areas. Direct impacts will result from the construction of the shelter sites, cluster maintenance facilities, designated transportation network, and cluster roads. It is anticipated that construction will disturb 7.5 acres (3 ha) at each shelter for a total of 1725 acres (698 ha). Construction will disturb a 100-foot right-of-way for all roads or 727 acres (294 ha) for the approximately 60 miles (96 km) of DTN and 2424 acres (981 ha) for the 200 miles (320 km) of cluster roads. An additional amount of ground will also be disturbed for borrow pits and material transport roads.

Habitat directly impacted by construction of permanent facilities would thus total approximately 4900 acres (1983 ha), about 2 percent of the study area. Additional disturbance would be associated with temporary construction facilities. Indirect impacts, however, could affect a much greater area, and the extent of these impacts to both vegetation and wildlife is potentially high (HDR, 1980a).

Changes in grazing patterns will affect vegetation composition. The successional patterns in many Great Basin sagebrush and shadscale communities change significantly as a result of overgrazing (Holmgren and Hutchings, 1972; Young, et al., 1972). Many areas previously supporting distinctive plant associations now support similar, degraded vegetation as a result of grazing impacts. Grazing has often altered communities to the extent that the original composition is no longer discernable and the pattern of recovery is uncertain. This change is apparently related to modified plant-soil relationships, but the mechanisms are not well understood (Holmgren and Hutchings, 1972).

Shadscale (salt desert shrub) vegetation is the most common community in Pine and Wah Wah Valleys. It is highly variable and often unpredictable in terms of secondary succession patterns that follow disturbance.

Sagebrush communities are common in Pine Valley, especially in Cluster 5. In many sagebrush communities, grazing has reduced or eliminated the perennial grasses and changed the shrub composition. Shrubs least preferred for grazing have increased in dominance, while preferred forage species have become less common. Introduced annuals, including Russian thistle (<u>Salsola</u>

iberica), tumble mustard (Sisymbrium altissimum), and cheatgrass (Bromus tectorum), are now very widespread. They form such a complete understory in some degraded communities that reestablishment of native perennial grasses is often precluded and fire behavior and secondary succession are also altered (Young, et al., 1972; Young and Evans, 1973). Without additional disturbance, Russian thistle will be gradually replaced by sagebrush on many of the higher elevation sites (Holmgren and Hutchings, 1972).

The invasion of disturbed areas by Halogeton glomeratus, an introduced weed, may have a major impact on grazing in the valleys. Halogeton is toxic to livestock (Cronquist, et al., 1972), and it spreads rapidly in disturbed alkaline soil in low bajadas and lake plains. This species can become established in the alkali sink scrub on the periphery of the playa and in the shadscale scrub, which is by far the most common vegetation type throughout the valleys.

The successional characteristics and recovery potential of the alkali sink scrub vegetation are unknown. In the shadscale scrub, halogeton is gradually replaced by rabbitbrush, winterfat, or shadscale if disturbance is light (HDR, 1980a). If disturbance is severe or repeated, halogeton can alter the soil chemistry and exclude native vegetation (Cook and Stoddart, 1953). It has been speculated that halogeton may prevent native species reestablishment for over 50 years (Eckert and Kinsinger, 1960). Studies have suggested that the only effective control method is competition with perennial species (Cleaves and Taylor, 1979).

Disturbed areas on the coarse substrates of the bajadas will probably be invaded by Russian thistle (Salsola iberica). Russian thistle will be succeeded by tumble mustard (Sisymbrium altissimum), followed by tansy mustard (Descurainia spp.), and eventually by cheatgrass (Bromus tectorum) if disturbance is minimal and infrequent (HDR, 1980a). If disturbance is repeated, the successional sequence will revert back to Russian thistle, which may remain for 15 years or more (Stewart, et al., 1940).

Russian thistle tends to dominate cleared areas of Great Basin sagebrush when a seed source is available (Young and Evans, 1973). The successional pattern of a Great Basin sagebrush community involves an initial domination by either climax perennial grasses, root-sprouting shrubs, and perennial grasses such as squirreltail (Sitanion histrix) and Sandberg bluegrass (Poa sandbergii). In communities with a climax of perennial grasses, sagebrush normally becomes the dominant species in the area; when a high density of alien annual grasses becomes established, however, recurring fires may limit reestablishment of sagebrush (Young and Evans, 1973).

5.1.4 Wildlife

Construction activities will result in both direct and indirect impacts on wildlife. Wildlife burrows, dens, and habitat will be destroyed on sites where facilities are constructed. Wildlife may be affected by the presence of lighting at night or by increased noise and human activity. If poaching or indiscriminate shooting increases, populations of the larger or more visible species may be reduced in the valleys.

The ability of an individual to relocate depends on its mobility, habitat availability, and the carrying capacity of the undisturbed habitat. Small animals such as rodents, lizards, and snakes may lose their entire home range within a single cleared area. These species are less able to relocate than more mobile species.

The removal of food sources and habitats used by rodents and small birds will reduce the density of these species. While these species are not considered threatened or endangered, population reductions may, in turn, lead to a decline in density of raptors and other species which rely on them as forage. Many predators live in the mountains adjacent to Pine and Wah Wah valleys and enter the valleys to feed. Activity within the valleys may therefore affect ecosystems outside of the valleys themselves.

In desert habitats, where resources are limited, wildlife populations are especially dependent on small populations of plants. Desert ecosystems are particularly fragile because they contain many highly specialized organisms that cannot easily adapt to changing conditions. Thus, the loss as habitat in Pine and

Wah Wah valleys may result in a reduction of available food and protection for wildlife which is proportionally more significant in this environment than would be the case in other, less fragile, areas.

The successional pattern of wildlife in temporarily disturbed areas will generally follow plant succession. Animal species dependent upon specific narrow habitats, such as the sage grouse, which is dependent on sagebrush between October and April (Nevada DWR, 1977), will be heavily impacted by temporary disturbance of vegetation.

Construction activities may crush many reptiles and diurnal rodents as well as compact the soil, resulting in the death of nocturnal or hibernating animal species. The noise and activity from construction may interrupt movement, hibernation, nesting, breeding, or other activities, thus adversely affecting wildlife populations in the area. For example, mule deer may avoid their key winter area in the southern portion of Pine Valley. Recreational use of riparian areas near the valleys may prevent their use by bobcats or other wildlife. Migration routes and movements may also be affected by the road and shelter locations.

The MX system may adversely impact antelope populations in the southern portion of Pine Valley and the northern portino of Wah Wah Valley. Antelope kidding grounds, located in the pinyon-juniper areas along the valley sides, will probably be marginally affected, but antelope may also be subject to increased poaching and habitat disturbance in other parts of their range.

Wildlife destruction resulting from poaching and recreational shooting could be especially critical during construction periods. Raptors, game birds, some animals, and small mammals are all vulnerable to these activities. Impacts will be less severe during operation of the system. However, the additional roads will lead to increased accessibility and a higher volume of traffic. An increased number of animals will be killed by traffic. This may be particularly true of small birds, rodents, and reptiles which are attracted to roadsides (Cornett, 1980). Kit foxes, a protected species, are known to sit on paved roads at night, presumably to absorb radiated warmth (Egoscue, 1960). This behavior may lead to increased mortality after road construction in the valley. Roads will bring key use areas of mule deer and antelope within easier reach of vehicular traffic and hunters.

5.1.5 Vehicle Use

Both compaction and soil erosion are likely to result in changes in vegetative cover, species composition, and plant productivity. In arid areas, the damage to vegetation by off-road vehicles can be clearly observed; the resulting disturbance to soil characteristics and animals is less obvious (Stebbins, 1974; Bussack and Bury, 1974; Luckenbach, 1975). Due to the slow growth of desert vegetation, these effects may remain for years. If off-road use is sufficiently high, intense damage can be done to the desert in a matter of hours (Carter, 1974). Desert soils are also highly vulnerable to disruption (Webb, 1976; Eckert, et al., 1976), and compaction of soil can result in decreased soil permeability and water holding capacity (Davidson and Fox, 1974; Wilshire and Nakata, 1976). The full extent of damage may not be evident until years or even decades after the original disturbance (Wilshire and Nakata, 1976).

Construction equipment and off-road vehicles will compact the soil and change its structure, decreasing water infiltration and increasing runoff. Compaction also restricts root penetration and reduces soil aeration (Taylor and Ashcroft, 1972). Construction will reduce the vegetative cover and break desert pavement, allowing accelerated wind erosion. The results of erosion include loss of productive topsoil, exposure of root systems to desiccation and abrasion, and possible burial of downwind vegetation (Brady, 1974). Once begun, wind and water erosion will continue to impact the soils unless control measures are taken.

In dry areas, vehicle travel on unpaved roads and wind erosion in disturbed areas cause a significant amount of fugitive dust. Cement plants, aggregate quarries, and related activities will produce additional dust. The effect of dust on vegetation depends upon the plant species. Long-term exposure to dust may cause changes in species composition (Wood, 1976). Daubenmire (1974) has shown that deciduous plants are less affected by dust accumulation than evergreen species. Beatley (1965) has attributed the defoliation of creosote bushes (*Larrea divaricata*) to heavy dust covering. The amount of rainfall and the interval between rainfalls are also important factors. Vegetation in the vicinity of the dust sources is likely to be most heavily impacted.

The use of leaded fuel produces compounds which accumulate in roadside soils. The exhaust contains a highly soluble chromo-bromide that becomes incorporated into plants through foliar absorption (Hammond and Aronson, 1964). A study conducted on Highway 95 in southern Nevada showed lead content in plant foliage along the highway to be 10 times above normal (Romney, 1973). High concentrations of lead can impact plant growth in low phosphate soils and may possibly become concentrated in herbivores ingesting the plants. It is unknown whether these effects will be significant after construction of additional roads in Pine and Wah Wah Valleys.

5.2 MITIGATIONS

A number of mitigation measures for biological resources have been proposed in the Deployment Area Selection and Land Withdrawal/Acquisition DEIS. It is the policy of the U.S. Air Force to mitigate by avoidance wherever possible. Since it is impossible to avoid all biological species and habitats, a number of other mitigation measures have been proposed by the U.S. Air Force environmental impact statement that could reduce or eliminate many of the potential impacts described in the previous section.

One of the most important general mitigation measures may be the implementation of an education program for construction and operation workers to increase awareness of the fragility of the desert environment. More specific mitigation measures for wildlife, plants, and the abiotic environment are summarized below.

5.2.1 Abiotic Mitigations

The abiotic environment is closely interconnected with plant and animal life in Pine and wah Wah Valleys. Mitigation measures reducing the impact of the project on abiotic components will benefit both plant and wildlife species in the valleys. Planned control of fugitive dust during all phases of the project will decrease soil loss and minimize the effect on adjacent vegetation. Oiling or paving roads, consolidation of material transport to reduce traffic, enforcement of low speed limits on unpaved roads, use of prefabricated structures to decrease construction time, simulataneous installation of all structures within an area where possible, and prohibition of off-road driving are measures which will reduce generation of fugitive dust. Construction of roads and other structures to minimize the channelization of water and conform to the natural drainage as much as possible will also minimize impacts.

5.2.2 Grazing Mitigations

If grazing allotments are reduced by the proposed MX system in Pine and Wah Wah valleys, the number of cattle currently grazing there will have to be reduced, new range will need to be opened, or improvement in range management practices will be needed in order to make better use of existing range lands.

Recommendations of range biologists concerning available forage on a given parcel determine the number of cattle allowed to graze. A range is rated in terms of Animal-Unit-Months (AUM's). An AUM is defined as the amount of forage necessary to sustain on cow or five sheep for one month (U.S. Department of the Interior, 1980c). Improved management practices may increase the number of AUM's in a given area.

Cattle allowed to graze without controls will tend to overgraze a convenient area instead of moving to new forage areas. Construction of trails through timber to new forage areas and the salting of new areas both encourage use of more range.

Water sources are critical, since cattle will graze only a limited distance from water. On hilly land, water is even more important; cattle will graze 0.75 miles upslope from water on a 10 percent slope, but only 0.1 mile from water on a 60 percent slope (U.S. Department of Agriculture, 1965). Developing new water sources would open up lands presently not usable as range.

A pilot experimental stewardship program providing incentives for ranchers to use innovative management practices is to be implemented in the Tonopah Resource Area in 1981 (U.S. Department of Agriculture, 1965). The results of this program will help determine the effectiveness of various management practices.

A common current practice for creating new rangelands is the planting of crested wheatgrass (Agropyron desertorum) in areas previously containing sagebrush or juniper. Areas are burned, seeded, and closed off to prevent grazing until the plants are established. This may be a possible method of replacing grazing land lost due to project construction. However, this practice replaces existing communities which are of value to raptors, antelope, and other wildlife. The intrinsic values of this land must be carefully evaluated in terms of the ecosystem ecology, total available habitat, carrying capacity, and value to livestock, before this practice is implemented.

5.2.3 Wildlife Mitigations

Mitigation can minimize the destruction of wildlife species and their habitat if the project is carefully planned and if construction activity is regulated in conjunction with an environmental management plan. Such planning measures include avoiding activity within key winter range in the winter, and avoiding activity near watering areas during the summer when water is a critical factor. The purchase of grazing AUM's and retiring of grazing areas would also reduce competition for water and be beneficial to wildlife. Construction should be planned to reduce human activity, noise, and visibility of structures to the extent feasible.

Disturbance of existing water sources should be avoided and corridors allowing wildlife access should be retained where possible. Artificial water sources should be constructed to replace any existing water sources that will be affected. Their design should incorporate other factors essential to wildlife survival, such as escape and access routes and protective cover. Nesting platforms should be designed in conjunction with water sources to protect avian species.

Where grazing habitat is reduced, precautions should be taken to prevent domestic herds from overgrazing the remaining habitat and to prevent further loss of natural habitat. Precautions should be employed to minimize soil compaction caused by trampling and to reduce the destruction of burrowing and sessile species and their habitats.

One of the most severe impacts on wildlife can result from increased human activity, especially by construction workers and other transient personnel. An information-education program for people involved in construction and operation of the system and the prohibition of firearms will reduce wildlife impacts. A firearms restriction will reduce recreational shooting and poaching and, ideally, will eliminate random firearm use. This is perhaps the single most important mitigation for wildlife (HDR, 1980a). Funding of additional personnel to enforce game laws will also help reduce impacts (Ball, 1981).

5.2.4 Vegetation Mitigations

Loss of vegetation can be prevented by the implementation of construction plans that localize and minimize disturbance and that provide for revegetation of heavily disturbed areas where possible. Operation of construction equipment and off-road parking and driving should be restricted to the areas designated for construction disturbance.

Although limiting the extent of plant loss to reduce the need for revegetation is an important mitigation measure, artificial revegetation will be required in certain areas. Revegetation techniques differ for each vegetation type. Research has shown that seeding and transplanting of shrubs have often failed due to poor germination, poor growing conditions, grazing by rodents, and inadequate soil preparation (Graves, 1976). Difficulties in restoration may be encountered unless the plant stock, seed, or transplant material come from the immediate vicinity (Plummer, et al., 1955 and 1968).

Attempts at restoration must also consider abiotic factors. Disturbance that destroys soil characteristics may prevent restoration of vegetation since nutrient availability from the substrata is a limiting factor in desert regions (James and Jurinak, 1978). Timing is also an important factor, to prevent establishment of undesirable plants.

Factors such as soil salinity must also be considered in revegetation planning. Great Basin and Mojave perennial plant species have been tested for salt tolerance by growing seedlings and rooted cuttings on soils of increasing salinity (Romney, et al., 1972). Results show that different species have different tolerances to salinity: Atriplex canescens and Atriplex hymenelytra can survive very high salinity conditions; Ambrosia dumosa, Larrea divaricata, and Artemisia spinescens tolerate moderate salt levels; Artemisia tridentata and Artemisia spinescens are salt sensitive but not as highly sensitive as Coleogyne ramosissima, Dalea fremontii, Ephedra viridis, Grayia spinosa, and Lycium andersonii. Therefore, selection of appropriate native species for revegetation must consider the abiotic conditions of the area as well as the suitability of individual species.

Several pioneer species can grow in disturbed soil low in organic matter (El-Ghonemy, et al. b, 1980). The use of such pioneer species as Atriplex confertifolia can provide an important successional stage in the revegetation process.

Additional mitigation measures include the implementation of plans to prevent commercial exploitation or poaching of unique vegetation types such as cacti and yucca.

6.0 CONCLUSIONS

6.1 SURVEY RESULTS: SPECIES AND AREAS OF BIOLOGICAL CONCERN

A review of existing information revealed that no plant species designated as Taxa Currently Listed or as Taxa Currently Proposed in the Federal Register are known from the study areas. However, several species listed as Taxa Currently Under Review in the Federal Register or listed as priority species by the Utah Native Plant Society are known to occur in the valleys. These include:

Sclerocactus pubispinus	(Pine and Wah Wah valleys)
Penstemon nanus	(Pine and Wah Wah valleys)
Penstemon concinnus	(Pine Valley)
Sphaeralcea caespitosa	(Pine Valley)
Cymopterus basalticus	(Pine and Wah Wah valleys)
Cryptantha compacta	(Pine Valley)
Coryphantha vivipara	(Pine and Wah Wah valleys)
Eriogonum eremicum	(Pine Valley)
Eriogonum ammophilum	(Wah Wah Valley)
Lepidium ostleri	(Wah Wah Valley)
Trifolium andersonii var. *friscanum*	(Wah Wah Valley)

Many of these plants exist in populations of 200 or more. The majority of these populations typically occur along the edge of the valley or in the foothills, rather than on the valley floor, and would not be directly impacted by the facilities.

Results of the fall, 1980 field survey indicate that some of these species are also present within the study area. In Pine Valley, *Sclerocactus pubispinus*, a species Currently Under Review (Category 1), was found on sites 2/16, 3/6, 3/12, and 3/14. *Cryptantha compacta*, a species Currently Under Review (Category 1), was found on site 5/12, and was tentatively identified on site 3/6.

Corypantha vivipara, also a species Currently Under Review (Category 2), was observed on sites 3/6, 3/9, 3/12, 4/7, CMF4, and Resitings 4/7 and 4/10. It was thought to be variety rosea, but lack of flowers prevented positive identification.

In Wah Wah Valley, S. pubispinus was found on sites 2/5, 5/12, 5/13, and CMF5. C. vivipara was observed on sites 3/9, 5/19, 5/21, 5/22, and on Resitings 5/20 and 5/23.

A number of other plants were observed within the valleys that may be Currently Listed or Currently Under Review. These could not be identified to species or variety because of the condition of the plants during winter. These included:

Gutierrezia sarothrae	(Pine and Wah Wah valleys)
Gutierrezia sp.	(Wah Wah Valley)
Machaeranthera canescens	(Pine and Wah Wah valleys)
Townsendia sp.	(Pine and Wah Wah valleys)
Cryptantha sp.	(Pine and Wah Wah valleys)
Lepidium montanum	(Pine and Wah Wah valleys)
Lepidium sp.	(Pine and Wah Wah valleys)
Opuntia sp.	(Pine and Wah Wah valleys)
Sclerocactus sp.	(Pine and Wah Wah valleys)
Astragalus lentiginosus	(Pine and Wah Wah valleys)
Astragalus sp.	(Pine and Wah Wah valleys)
Mentzelia sp.	(Pine and Wah Wah valleys)
Sphaeralcea sp.	(Pine and Wah Wah valleys)
Oenothera sp.	(Pine and Wah Wah valleys)
Gilia sp.	(Pine and Wah Wah valleys)
Eriogonum sp.	(Pine and Wah Wah valleys)
Eriogonum microthecum	(Pine and Wah Wah valleys)
Penstemon sp.	(Pine and Wah Wah valleys)
Cymopterus sp.	(Pine Valley)
Brickellia sp.	(Pine Valley)
Enceliopsis sp.	(Pine Valley)
Senecio sp.	(Pine Valley)
Echinocereus sp.	(Pine Valley)
Arenaria sp.	(Pine Valley)
Phacelia sp.	(Pine Valley)
Camissonia sp.	(Pine Valley)
Phlox sp.	(Pine Valley)

It is unlikely that most of these individuals are species or varieties Currently Listed or Currently Under Review. Many rare, threatened, or endangered plants are known only from specific habitats not found in the study areas, or are known only from outside Utah. Because several species of plants could not be positively identified during the field survey, a spring survey was also completed. Results of the June 1981 survey will be presented in a supplement to this report.

Vegetation is especially diverse in Pine Valley Cluster 5. This cluster is located on the lower foothills of the Indian Peak area in the Needle Range, and its elevation is slightly higher than other portions of the study area. The diverse vegetation supports a large number of mammal and bird species, and it appears to be the most important area in the valley from the standpoint of biological resources.

The pronghorn antelope is considered one of the two most important game species in Utah and is protected by state law (Ball, 1981). Pine Valley supports the largest population of pronghorn antelope in the southwest Utah desert. According to the Utah Division of Wildlife Resources, a resident population containing a minimum of 400 animals is present in the valley. The valley contains seasonal habitat as well as key year-round habitat for fawning, watering, and wintering. The most important key habitat in Pine Valley is located along the perimeter of the study area in the higher benchlands (Utah Division of Wildlife Resources, 1980).

Antelope sign was found in all of the clusters, but it was most abundant in Cluster 5; 39 percent of the sign noted within the valley was located within this cluster.

Other mammals observed within Pine Valley include coyotes, kit foxes, rabbits, badgers, and a number of small rodent species. The greatest number of coyote and rabbit sign was observed in Cluster 5. Kit foxes and badgers preferred the more northern parts of the valley and were found primarily in clusters 1-4, although evidence of badgers was found at one site in Cluster 5.

The sage grouse is one of the two most important game species in Utah (Ball, 1981). Sage grouse sign was observed in eight locations in Pine Valley. Seven of these observations occurred in Cluster 5, and the eighth occurred on the perimeter of Cluster 1, adjacent to the wash separating Clusters 1 and 5. A presently active strutting ground composed of three separate strutting sites is located west of Pine Valley Road between shelter sites 5/11 and 5/13. It appears that the only known strutting ground in the valley as well as the majority of the sage grouse range lie within Cluster 5.

Mule deer are protected by state law as game species. Mule deer generally inhabit the higher benchland areas above the floor of Pine Valley. The majority of mule deer sign was observed along the western border of Cluster 5 and the eastern border of Cluster 4. More than 50 percent of the mule deer sign observed in the valley was located in Cluster 5.

The Utah prairie dog is currently listed as an endangered species by the U.S. Fish and Wildlife Service. Seven transplanted colonies are located in the southern portion of Pine Valley several miles south of the study area boundary. The facilities sites are not likely to directly affect these colonies. The relationship of the colonies to the DTN which enters the southern end of the valley was not considered in this study.

Cluster 3 in Pine Valley is also an important area. It lies adjacent to the eastern edge of the Wah Wah Mountains Wilderness Study Area and adjacent to the western edge of the Desert Range Experimental Farm. This cluster appeared to contain a much larger population of reptiles than the other clusters. A number of important reptiles including the Utah milksnake (*Lampropeltis triangulum taylori*) and the Utah mountain kingsnake (*Lampropeltis pyromelana infralabialis*) may inhabit this area and may be observed during a warm weather survey.

Compared to Pine Valley, Wah Wah Valley contains a lower diversity of both plants and wildlife. The southern end of the valley is heavily used for grazing, and wildlife sign and plant diversity are especially low in this portion of the valley.

The bald eagle is currently listed as an endangered species by the U.S. Fish and Wildlife Service. A large portion of Wah Wah Valley lies within a bald eagle winter use area. All of Cluster 1, most of Clusters 2 and 5, and portions of Cluster 3 and 4 lie within this area. Specific winter perching areas were not observed on-shelter sites, but these need to be located in order to determine their relationship to the shelter sites and the possible project impact on these birds. Only one bald eagle was sighted, near the southern portion of Cluster 5.

A number of raptor nests including those of the golden eagle, ferruginous hawk, and prairie falcon are located adjacent to the Wah Wah Valley study area; these birds depend upon the valley floor for hunting. In-depth studies of raptors, necessary for determining the actual use of the area and for estimating the indirect impacts on these birds, are lacking. A large proportion of raptor prey consists of small mammals. The number of small mammal populations is therefore one indication of whether or not an area provides suitable raptor habitat. Although an attempt was made to determine species presence, it was not within the scope of this project to evaluate small mammal populations in this manner.

The majority of the Wah Wah study area lies within antelope range. Antelope sign was observed to be fairly evenly distributed among the clusters, although sign tended to be located more on the eastern edge of the valley. A minimum of 83 animals are known in the valley (Utah Division of Wildlife Resources, 1980).

A small portion of Cluster 1 in Wah Wah Valley contains mule deer range; however, most of the facilities lie to the east of this range. No mule deer sign was observed on any of the sites in the valley.

Numerous rodents exist on the floor of Wah Wah Valley, and species distribution is often localized. The black-tailed jackrabbit was the most numerous of the small mammals. A few cottontail rabbits were also present. A large number of sightings were made in all clusters except Cluster 1, although rabbit sign was present on nearly every site surveyed. Gophers were also numerous and abundant in all clusters except Cluster 4. Antelope ground squirrel and kangaroo rats were observed only north of Route 21, and both species were concentrated mainly in Cluster 5. Kit fox and coyote sign were also numerous throughout the valley, and badgers were common. Few reptiles were sighted during the survey of Wah Wah Valley. This is primarily because many were in hibernation during the survey. A number of important reptiles including the Utah milksnake and mountain kingsnake may inhabit this area and may be observed during a warm weather survey.

Cluster 5 appears to be one of the most important areas in Wah Wah Valley. In addition to its importance for raptors and small mammals, it is also the most productive area for cactus; only 5 sites contained no cacti, and Sites 19 through 23, located near foothills, each contained two or more species.

6.2 EVALUATION OF PROCEDURES

6.2.1 Evaluation of General Approach

The IOC valleys were considered as test valleys to develop biological survey procedures for use in other MX deployment areas. During the IOC survey it became apparent that the project cannot be viewed as a series of discrete, non-interacting units for which mitigation can be accomplished on a site-by-site basis. Moving a shelter a few hundred feet may be sufficient to mitigate for a sessile organism, such as an endangered plant, but it is inadequate for the larger, motile members of the community whose critical habitat encompasses a large area. For example, a 1.8-mile (3 km) buffer zone is recommended around sage grouse strutting grounds and nesting areas (Day, 1980; Braun et al., 1977). Raptors may abandon their nests due to activity occurring as far as a quarter mile away (White, 1981). In cases such as these, minor movement of shelter sites is of little value, and elimination of the shelter site at that location may be the only effective mitigation.

One way to avoid this type of conflict is to consider species ranges, critical habitat requirements, and other factors in developing site layouts. While it would not be feasible to collect site-specific data for the shelter sites during layout, the IOC program has shown that it is possible to obtain data which describe the entire valley ecosystem. Information from the IOC survey indicates that the literature and data search may be used as a predictive tool to provide general information on species ranges and populations within a valley. Sufficient background data can be obtained from files of BLM and wildlife agencies to pinpoint most major biological conflicts expected to occur. This data can be used during the layout procedure to identify potential biological conflicts and suggest measures to mitigate impacts on migration routes, critical habitats, breeding grounds, and other significant areas for which resiting of individual shelters is insufficient. Such information may also be used to identify certain sites or regions within a valley study area which are highly unlikely to support important species or habitats and for which a 100 percent survey may not be necessary.

In addition to considering species and habitat on the valley floor in developing layouts, species in adjacent foothill and mountain areas should also be considered. For example, raptors nesting in mountains surrounding Pine and Wah Wah valleys use the valley floor for hunting. Mule deer that normally are not found on valley floors may seasonally migrate through the area.

Species other than those considered threatened, endangered, or protected should also be considered during the layout procedures. Without consideration of common species that have an important role in supporting the ecosystem, a valley ecosystem could become disrupted, adversely affecting many species including already threatened, endangered, or protected species, and may result in adding additional species to these categories.

Ideally, the entire MX system and MX project area should be considered in any evaluation of biological impacts, because the value of a particular resource is related to its overall abundance and distribution. One small population may have relatively little value if there are other large populations in the vicinity; it may assume greater importance as total numbers or range decrease.

Various parts of the MX project have a cumulative and interactive effect on species and habitats. Evaluating the MX system on a valley-by-valley basis is usually not sufficient to indicate the magnitude of impact on most species within any valley. Only when the effects on a species are known over its entire range can the total impact be evaluated. For this reason, it is desirable to consider large areas, as opposed to single valleys, during layout evaluation.

At the beginning of the IOC biological survey program, it was believed that survey data from one valley might be used as a predictive model for other valleys. On a species-specific level, this has not proven to be true; biological resources vary too greatly from area to area. Pine and Wah Wah valleys, although close geographically, are quite different biologically; also, they both differ substantially from Dry Lake Valley (Volume II Part I). In addition, a species of little consequence in one area may, under different environmental conditions, be of greater importance elsewhere.

6.2.2 Evaluation of Field Procedures

Field surveys tended to corroborate the data obtained from the literature, as well as provide specific, on-site information. Many of the MX valleys have never been given serious scientific study, and the MX field data will provide a great deal of new biological information that will further our understanding of these valley ecosystems.

General field procedures as described in Section 2.0 were found adequate, and no major changes are recommended at this time. A few minor changes, however, will help to increase efficiency during the field sessions.

The biological survey should be conducted in spring and summer whenever possible because most annual plant species are not in flower and, therefore, are not identifiable during fall and winter. Since many threatened and endangered species are annual plants, surveys made during non-flowering months cannot be considered complete. Even a year-round investigation might not be sufficient to inventory all plant species, because new individuals do not enter the system each year but are present only in years when rainfall is sufficient for germination and seedling survival (Wallace, et al., 1980; Beatley, 1970). One study in Rock Valley, Nevada, showed that only two years between 1963 and 1969 were actually conducive to new seedling establishment. Other annuals restrict germination to years with minimum precipitation levels.

Likewise, an inventory of wildlife over a single season will not be complete, because many animals migrate or hibernate during the fall and winter.

The survey itself produced some minimal, and for the most part unavoidable, damage to the valley. Field crews limited off-road travel as much as possible to avoid damage to existing vegetation, and they followed tracks of the surveyors to the sites

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4 of 6

whenever possible. It was necessary to drive into a new area in only a few instances when surveyors tracks could not be located.

The field survey has pointed out the need to clarify the guidelines for site relocation for biological resources. Relocation for a species listed as threatened or endangered may satisfy legal requirements, but relocation is often not legally required for game species and other sensitive, but not federally listed, plants and animals. Two endangered species may vary in their degree of "endangeredness." Moving a shelter site for one or two individuals may be justified for one species but not for another, and the distance of relocation necessary for mitigation may vary depending on the species.

For this reason, rigid criteria should be avoided in relocation procedures. Project impacts on each species need to be evaluated on a case-by-case basis. The role of the species in the ecosystem, the range and size of the population, its ability to adapt to change or move to other habitats, and its possible interactions with man should all be considered.

However, it would be desirable to establish a few basic resiting guidelines which are mutually agreeable to the Air Force, BLM, and all state and local agencies concerned. Biological concerns differ widely depending upon the species affected. To provide guidelines for relocation, state agency experts familiar with the species in question should be consulted to provide input concerning desirable avoidance distances and possible mitigation methods. If biological concerns and impacts are evaluated and incorporated early in the layout procedure, there would be little need for most major biological resitings involving "gray areas" such as impacts on game species ranges, important migration routes, or breeding areas. With adequate advance planning, biological conflicts discovered during the field survey will likely be sufficiently minor that shelter resiting will provide adequate mitigation. If the field survey encounters a biological conflict that cannot be mitigated by site relocation, an expert familiar with the species in question can be consulted, and the species can be dealt with on a case-by-case basis.

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APPENDIX A

82480 Federal Register / Vol. 45, No. 242 / Monday, December 15, 1980 / Proposed Rules

DEPARTMENT OF THE INTERIOR

50 CFR Part 17

Endangered and Threatened Wildlife and Plants; Review of Plant Taxa for Listing as Endangered or Threatened Species

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of review.

SUMMARY: The Service is issuing current lists of those plant taxa native to the U.S. being considered for listing as Endangered or Threatened under the Endangered Species Act of 1973, as amended (the Act). Such taxa should be considered in environmental planning. The present notice refines and updates three previous notices. A list is also provided of plant taxa which were previously under consideration for listing; but are presently presumed either extinct, not valid species, subspecies or varieties, or more abundant or widespread than previously believed and/or not subject to identifiable threats.

ADDRESSES: Interested persons or organizations are requested to submit comments to: Director (OES), U.S. Fish and Wildlife Service, Department of the Interior, Washington, D.C. 20240. Comments and materials relating to this notice are available for public inspection by appointment during normal business hours at the Service's Office of Endangered Species, Suite 500, 1000 North Glebe Road, Arlington, Virginia.

Information relating to particular plant taxa may be obtained from appropriate Service Regional Offices listed below:

Region 1—California, Hawaii, Idaho, Nevada, Oregon, Washington, and Pacific Trust Territories
Regional Director (ARD/FA), U.S. Fish and Wildlife Service, Suite 1692, Lloyd 500 Building, 500 NE. Multnomah Street, Portland, Oregon 97232, Telephone: 503/231-6131 (FTS: 8/429-6131)

Region 2—Arizona, New Mexico, Oklahoma, and Texas
Regional Director (ARD/FA), U.S. Fish and Wildlife Service, P.O. Box 1306, Albuquerque, New Mexico 87103, Telephone: 505/766-3972 (FTS: 8/474-3972)

Region 3—Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin
Regional Director (ARD/FA), U.S. Fish and Wildlife Service, Federal Building, Fort Snelling, Twin Cities, Minnesota 55111, Telephone: 612/725-3596 (FTS: 8/725-3596)

Region 4—Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Puerto Rico, and the Virgin Islands
Regional Director (ARD/FA), U.S. Fish and Wildlife Service, The Richard B. Russell Federal Building, 75 Spring Street, SW., Atlanta, Georgia 30303, Telephone 404/221-3583 (FTS: 8/242-3583)

Region 5—Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia
Regional Director (ARD/FA), U.S. Fish and Wildlife Service, Suite 700, One Gateway Center, Newton Corner, Massachusetts 02158, Telephone: 617/965-5100 ext. 316 (FTS: 8/829-9316, 7, 8)

Region 6— Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Utah, and Wyoming (Iowa and Missouri under Region 3 after October 1, 1980)
Regional Director (ARD/FA), U.S. Fish and Wildlife Service, P.O. Box 25486, Denver Federal Center, Denver, Colorado 80225, Telephone: 303/234-2496 (FTS: 8/234-2496)

Alaska Area—Area Director, U.S. Fish and Wildlife Service, 1101 E. Tudor Road, Anchorage, Alaska 99503, Telephone: 907/276-3800, (FTS: Seattle Operator: 8/399-0150; 907/276-3800)

FOR FURTHER INFORMATION CONTACT: John L. Spinks, Jr., Chief, Office of Endangered Species, U.S. Fish and Wildlife Service, Washington, D.C. 20240 (703/235-2771), or the appropriate Regional Office.

SUPPLEMENTARY INFORMATION:

Background

Recognizing a special need to focus on the conservation of Endangered and Threatened plants, which were first accorded the means for Federal protection therein, the Endangered Species Act of 1973 directed the Secretary of the Smithsonian Institution to prepare a report on Endangered and Threatened plant species and recommend necessary conservation measures. The Smithsonian report, published as House Document No. 94-51, included a list of more than 3,000 native taxa thought to be extinct, Threatened, or Endangered. The Service published a notice on July 1, 1975 (40 FR 27823) in which it announced that the Smithsonian report had been accepted as a petition under the terms of the Act, and that the taxa named in the report were being reviewed for possible inclusion in the list of Endangered and Threatened species. One previous notice of review, which named four plants, had been published in April 1975 (40 FR 17612) in response to a petition. Many of these taxa were subsequently proposed for addition to the list on June 16, 1976 (41 FR 24523). Later, in 1977 (42 FR 40823) a third notice involving one plant was published. Because of the provisions of a 2-year limit for proposed rules in the Endangered Species Act Amendments of 1978 (Pub. L. 95-632), the 1976 proposal was mandatorily withdrawn in November 1979. Official notice of this withdrawal appeared on December 10, 1979 (44 FR 70796). That notice indicated that withdrawal was required because of the expiration of the deadline for making such rules final and was not related to the conservation status of the taxa proposed therein. The present notice is intended to reflect the Service's current judgment of the probable status of all plant taxa that were included either in previous notices or the 1976 proposal, as well as other taxa concerning which information has become available more recently. Taxa are grouped in several categories, as described below, in order to accurately reflect the Service's present evaluation of their status.

Category 1

Taxa for which the Service presently has sufficient information on hand to support the biological appropriateness of their being listed as Endangered or Threatened species. Because of the large number of such species, and because of the necessity of gathering data concerning the environmental and economic impacts of listings and designations of Critical Habitats, it is anticipated that the development and publication of proposed and final rules concerning such species will require several years. In some cases, although adequate data are now available to the Service to support re-proposal of species originally included in the withdrawn 1976 proposal, such species cannot be proposed for listing pending the receipt of sufficient new information warranting such action, as required by Section 4(f)(5) of the Act. The requirement that such re-proposals be based on new information has been interpreted to mean that such information must have been developed subsequent to the withdrawal of the original proposal on November 10, 1979. The Service requests that new information on the species named in this notice be submitted as soon as possible and on a continuing basis.

Also included in this list are taxa whose status in the recent past is known, but which may have already become extinct. These retain a high priority for addition to the list, subject to confirmation of extant populations. Such possibly extinct species are indicated by an asterisk (*). Double asterisks (**) indicate taxa thought to be extinct in the wild, but known to be extant in cultivation.

Category 2

Taxa for which information now in the possession of the Service indicates the probable appropriateness of listing as Endangered or threatened, but for which sufficient information is not presently available to biologically support a proposed rule. Further biological research and field study will usually be necessary to determine the status of the taxa included in this category. It is hoped that this notice will encourage such research. Some taxa included in this category are of doubtful taxonomic validity and require further taxonomic research before their status can be clarified. The fact that many of these taxa have previously been proposed and withdrawn for procedural reasons largely reflects changes in informational standards applied to listing procedures in recent years. Additional information concerning these taxa, especially that resulting from recent investigations, is particularly sought by the Service.

Category 3

Taxa no longer being considered for listing as Endangered or Threatened. Such taxa are included in one of three sub-categories, depending on the reasons for removal from consideration.

3A. Taxa for which the Service has persuasive evidence of extinction. If rediscovered, however, such species might acquire high priority for listing. At this time, the best available information indicates that the taxa included in this category, or the habitats from which they were known, are in fact extinct or destroyed, respectively.

3B. Names that on the basis of current taxonomic understanding, usually as represented in published revisions and monographs, do not represent taxa meeting the Act's definition of "species." Such supposed taxa could be re-evaluated in the future on the basis of subsequent research.

3C. Taxa that have proven to be more abundant or widespread than was previously believed and/or those that are not subject to any identifiable threat. Should further research or changes in land use indicate significant decline in any of these taxa, they may be re-evaluated for possible inclusion in categories 1 or 2.

The plants listed in categories 1 and 2 may be considered candidates for addition to the list of Endangered and Threatened plants and, as such, consideration should be given them in environmental planning.

The Service hereby solicits information concerning the status of any of the species included in the present lists. Information is particularly sought:

1. indicating that a taxon would more properly be assigned to a category other than the one in which it appears;
2. providing new information regarding a plant previously proposed for listing and withdrawn because of the expiration of two years before a final listing action;
3. recommending an area as Critical Habitat for a candidate taxon or indicating why it would not be prudent to propose Critical Habitat for the taxon;
4. nominating for listing consideration a taxon not contained in the present lists;
5. documenting threats to any of the taxa listed;
6. indicating taxonomic revisions of any taxa included;
7. suggesting new or more appropriate common names for taxa;
8. noting errors in indicated distribution, etc.

The Service intends to consider all information received in response to this notice and to amend the contents of categories 1, 2, and 3 to reflect the current state of knowledge concerning affected plant taxa, and to indicate its intentions with regard to future listing actions. Such changes will be indicated by periodic notices in the Federal Register.

The following lists are arranged alphabetically by names of genera and species. Synonyms have been provided when necessary to avoid confusion. In some cases, taxa have been included which have not yet been formally described in the scientific literature. Such taxa are usually identified by a name followed by "sp. (ssp., var.) nov. ined." Known historical ranges are given by state for all included taxa.

Table 1 contains the name of all taxa presently on the list of Endangered plants. The left-hand column indicates status (E—Endangered, T—Threatened).

Table 2 contains the names of all taxa that have been proposed for listing under the Act, but for which final action has not yet been taken.

Table 3 lists all taxa in categories 1 and 2 (candidates), as explained above. The left-hand column indicates category.

Table 4 lists all taxa in category 3, with the left-hand column indicating sub-categories.

A list of genera (Table 5) is also provided, arranged by families, for cross referencing.

This notice was principally prepared by the Botany staff of the Service's Endangered Species Program in the Washington Office of Endangered species and the Service's Regional and Area Offices. The Service gratefully acknowledges the assistance of Dr. John Nagy of Brookhaven National Laboratory, Upton, New York, for extensive technical assistance in compiling the lists of taxa.

Dated: September 25, 1980.

Ronald E. Lamberton,

Acting Director, Fish and Wildlife Service.

BILLING CODE 4310-55-M

TABLE A-1

Taxa Currently Listed with Historic Distribution in Utah or Nevada

Taxon	Status*	Historic Distribution
Arctomecon humilis	E	UT
Astragalus perianus	T	UT
Astragalus yoder-williamsii	E	NV
Echinocereus englemannii var. *purpureus*	E	UT
Echinocereus triglochidiatus var. *inermis*	E	UT
Pediocactus sileri	E	UT
Phacelia argillacea	E	UT
Sclerocactus glaucus	T	UT
Sclerocactus wrightiae	E	UT

* T = Threatened; E = Endangered.

TABLE A-2

TAXA CURRENTLY PROPOSED AS EXPECTED IN UTAH AND NEVADA

-NONE-

TABLE A-3

Taxa Currently Under Review
With Historic Distributions in Utah or Nevada

Taxon	Category	Historic Distribution
Agave utahensis var. eborispina	2	NV
Agave utahensis var. nevadensis	2	NV
Allium passeyi	1	UT
Angelica scabrida	1	NV
Antennaria arcuata	2	NV
Aquilegia barnebyi	2	UT
Arabis sp./sp. Nov. Ined.	2	UT
Arabis sp./sp. Nov. Ined.	2	UT
Arctomecon californica	1	NV
Arctomecon merriamii	2	NV
Arenaria kingii var. rosea	1	NV
Arenaria stenomeres	1	NV
Asclepias cutleri	1	UT
Asclepias Eastwoodiana	2	NV
Asclepias ruthiae	1	UT
Asclepias welshii	1	UT
Asplenium andrewsii	2	UT
Astragalus ackermannii	2	NV
Astragalus aequalis	1	NV
Astragalus ampullarius	2	UT
Astragalus barnebyi	1	UT
Astragalus beatleyae	1	NV
Astragalus callithrix	2	NV, UT
Astragalus calycosus var. monophyllidius	1	NV
Astragalus chloodes	1	UT
Astragalus cimae var. cimae	2	NV
Astragalus consobrinus	2	UT
Astragalus convallarius var. finitimus	2	UT
Astragalus cottamii	1	UT
Astragalus cronquistii	1	UT
Astragalus desereticus	1	UT
Astragalus funereus	1	NV
Astragalus geyeri var. triquetrus	1	NV
Astragalus hamiltonii	1	UT
Astragalus harrisonii	1	UT
Astragalus henrimontanensis	2	UT
Astragalus iselyi	1	UT
Astragalus lentiginosus var. latus	2	NV

TABLE A-3 (Cont.)

Taxon	Category	Historic Distribution
Astragalus lentiginosus var. *micans*	1	NV
Astragalus lentiginosus var. *sesquimetralis*	1	NV
Astragalus lentiginosus var. *ursinus*	1	UT
Astragalus limnocharis	1	UT
Astragalus malacoides	2	UT
Astragalus mohavensis var. *hemigyrus*	1	NV
Astragalus montii	1	UT
Astragalus monumentalis	1	UT
Astragalus musimonum	2	NV
Astragalus oophorus var. *clokeyanus*	1	NV
Astragalus oophorus var. *lonchocalyx*	2	UT
Astragalus phoenix	1	NV
Astragalus porrectus	1	NV
Astragalus pseudiodanthus	2	NV
Astragalus pterocarpus	2	NV
Astragalus rafaelensis	1	UT
Astragalus robbinsii var. *occidentalis*	1	NV
Astragalus sabulosus	2	UT
Astragalus saurinus	2	UT
Astragalus serenoi var. *sordescens*	1	NV
Astragalus solitarius	2	NV
Astragalus sp.	2	UT
Astragalus sp./sp. Nov. Ined.	2	UT
Astragalus striatiflorus	1	UT
Astragalus tephrodes var. *eurylobus*	2	NV
Astragalus toquimanus	1	NV
Astragalus uncialis	1	NV
Astragalus wetherillii	2	UT
Astragalus welshii	2	UT
Brickellia knappiana	2	NV
Camissonia megalantha	2	NV, UT
Camissionia nevadensis	2	NV
Carex curatorum	2	UT
Castilleja aquariensis	1	UT
Castilleja parvula	1	UT
Castilleja revealii	1	UT
Castilleja salsuginosa	1	NV
Centaurium namophilum var. *namophilum/Ined.*	1	NV

TABLE A-3 (Cont.)

Taxon	Category	Historic Distribution
Cordylanthus tecopensis	2	NV
Coryphantha missouriensis var. marstonii	2	UT
Coryphantha vivipara var. rosea	2	NV, UT
Cryptantha barnebyi	1	UT
Cryptantha compacta	1	UT
Cryptantha elata	2	UT
Cryptantha hoffmannii	1	NV
Cryptantha insolita	1	NV
Cryptantha johnstonii	1	UT
Cryptantha jonesiana	1	UT
Cryptantha mensana	2	UT
Cryptantha ochroleuca	1	UT
Cryptantha semiglabra	2	UT
Cryptantha tumulosa	1	NV
Cuscuta warneri	1	UT
Cycladenia humilis var. jonesii	1	UT
Cymopterus basalticus	2	NV, UT
Cymopterus coulteri	1	UT
Cymopterus goodrichii	1	NV
Cymopterus higginsii	1	UT
Cymopterus minimus	1	UT
Cymopterus nivalis	2	NV
Cymopterus ripleyi var. saniculoides	2	NV
Dalea epica	2	UT
Draba arida	2	NV
Draba asprella var. zionensis	2	UT
Draba asterophora var. asterophora	2	NV
Draba crassifolia var. nevadensis	1	NV
Draba douglasii var. crockeri	2	NV
Draba jaegeri	1	NV
Draba maguirei var. burkei	2	UT
Draba maguirei var. maguirei	2	UT
Draba paucifructa	1	NV
Draba quadricostata	2	NV
Draba sobolifera	1	UT
Draba stenoloba var. ramosa	2	NV
Elodea nevadensis	1	NV
Enceliopsis nudicaulis var. corrugata	1	NV
Epilobium nevadense	1	NV, UT

TABLE A-3 (Cont.)

Taxon	Category	Historic Distribution
Erigeron cronquistii	1	UT
Erigeron kachinensis	2	UT
Erigeron latus	1	NV
Erigeron maguirei	1	UT
Erigeron mancus	1	UT
Erigeron ovinus	2	NV
Erigeron proselyticus	1	UT
Erigeron sionis	1	UT
Erigeron uncialis var. conjugans	2	NV
Eriogonum ammophilum	1	NV, UT
Eriogonum aretioides	1	UT
Eriogonum argophyllum	1	NV
Eriogonum bifurcatum	2	NV
Eriogonum clavellatum	2	UT
Eriogonum ocrymbosum var. davidsei	2	UT
Eriogonum corymbosum var. matthewsae	1	UT
Eriogonum cronquistii	2	UT
Eriogonum eremicum	2	UT
Eriogonum heermannii var. subracemosum	2	UT
Eriogonum holmgrenii	1	NV
Eriogonum humivagans	1	UT
Eriogonum jamesii var. rupicola	1	UT
Eriogonum lancifolium	2	UT
Eriogonum lemmonii	1	NV
Eriogonum lobbii var. robustum	1	NV
Eriogonum loganum	1	UT
Eriogonum microthecum var. johnstonii	1	CA*
Eriogonum microthecum var. panamintense	2	CA*
Eriogonum natum	1	UT
Eriogonum nummulare	2	UT
Eriogonum ostlundii	2	UT
Eriogonum ovalifolium var. Nov. Ined.	1	NV
Eriogonum panguicense var. alpestre	1	UT
Eriogonum smithii	1	UT
Eriogonum tumulosum	2	UT
Eriogonum viscidulum	1	NV
Ferocactus acanthodes var. acanthodes	2	NV
Festuca dasyclada	2	UT

* Species also found in study area; variety may or may not be the same.

TABLE A-3 (Cont.)

Taxon	Category	Historic Distribution
Forsellesia pungens var. glabra	2	NV
Frasera gypsicola	1	NV
Frasera pahutensis	1	NV
Fraxinum cuspidata var. macropetala	2	NV
Gaillardia flava	1	UT
Galium hilendiae ssp. kingstonense	1	NV
Gilia caespitosa	1	UT
Gilia nyensis	2	NV
Glaucocarpum suffrutescens	1	UT
Grindelia fraxino-pratensis	1	NV
Gutierrezia sarothrae var.pomariensis	2	UT
Hackelia ophiobia	1	NV
Hackelia sp./sp. Nov. Ined.	1	UT
Haplopappus alpinus	2	NV
Hedysarum boreale var. gremiale	2	UT
Hedysarum occidentale var. canone	1	UT
Heterotheca jonesii	1	UT
Ivesia cryptocaulis	1	NV
Ivesia eremica	1	NV
Lathyrus hitchcockianus	1	NV
Lepidium barnebyanum	1	UT
Lepidium montanum var. neeseae	1	UT
Lepidium montanum var. stellae	1	UT
Lepidium nanum	2	NV
Lepidium ostleri	1	UT
Lesquerella garrettii	1	UT
Lesquerella hitchcockii	2	NV
Lesquerella rubicundula	2	UT
Lesquerella tumulosa	1	UT
Lewisia maguirei	1	NV
Lomatium latilobum	2	UT
Lomatium minimum	1	UT
Lupinus jonesii	2	UT
Lupinus malacophyllus	2	NV
Machaeranthera canescens var. ziegleri	2	CA*
Machaeranthera kingii	1	UT
Mentzelia argillosa	1	UT
Mentzelia leucophylla	1	NV
Mertensia toyabensis	2	NV
Musineon lineare	1	UT

* Species also found in study area; varriety may or may not be the same.

TABLE A-3 (Cont.)

Taxon	Category	Historic Distribution
Najas caespitosa	2	UT
Oenothera sp./sp. Nov. Ined.	2	UT
Opuntia basilaris var. woodburyi	2	UT
Opuntia whipplei var. multigeniculata	2	NV, UT
Oryctes nevadensis	2	NV
Oxytheca watsonii	1	NV
Parrya rydbergii	1	UT
Pediocactus despainii	1	UT
Pediocactus winkleri	1	UT
Penstemon angustifolius var. vernalensis	2	UT
Penstemon arenarius	1	NV
Penstemon atwoodii	1	UT
Penstemon bicolor ssp. bicolor	1	NV
Penstemon bicolor ssp. roseus	1	NV
Penstemon bracteatus	1	UT
Penstemon compactus	2	UT
Penstemon concinnus	1	UT
Penstemon francisci-pennellii	1	NV
Penstemon fruticiformis ssp. amargosae	1	NV
Penstemon garrettii	2	UT
Penstemon goodrichii	2	UT
Penstemon grahamii	2	UT
Penstemon humilis var. obtusifolius	2	UT
Penstemon keckii	2	NV
Penstemon moriahensis	2	NV
Penstemon nanus	2	UT
Penstemon pahutensis	1	NV
Penstemon parvus	1	UT
Penstemon patricus	2	UT
Penstemon procerus var. modestus	1	NV
Penstemon pudicus	1	NV
Penstemon rubicundus	2	UT
Penstemon sp./sp. Nov. Ined.	2	UT
Penstemon thompsoniae ssp. jaegeri	2	NV
Penstemon tidestromii	1	UT
Penstemon wardii	1	UT
Phacelia anelsonii	2	NV, UT
Phacelia beatleyae	1	NV

TABLE A-3 (Cont.)

Taxon	Category	Historic Distribution
Phacelia cephalotes	2	UT
Phacelia glaberrima	1	NV
Phacelia howelliana	1	UT
Phacelia inconspicua	1	NV
Phacelia indecora	1	UT
Phacelia mammillarensis	2	UT
Phacelia nevadensis	2	NV
Phacelia parishii	2	NV
Phacelia utahensis	1	UT
Phaseolus supinus	1	UT
Phlox gladiformis	2	NV, UT
Polygala subspinosa var. heterorhynca	2	NV
Polygonum utahense	2	UT
Primula capillaris	1	NV
Primula maguirei	1	UT
Primula nevadensis	1	NV
Psoralea epipsila	2	UT
Psoralea pariensis	1	UT
Psorothamnus polyadenius var. jonesii	2	UT
Ranunculus acriformis var. aestivalis	1	UT
Rorippa subumbellata	1	NV
Sclerocactus polyancistrus	1	NV, UT
Sclerocactus pubispinus	1	NV, UT
Sclerocactus sp./sp. Nov. Ined.	2	UT
Selaginella utahensis	2	NV, UT
Senecio dimorphophyllus var. intermedius	2	UT
Silene clokeyi	1	NV
Silene petersonii var. minor	1	UT
Silene petersonii var. petersonii	1	UT
Sphaeralcea caespitosa	1	NV, UT
Sphaeralcea psoraloides	2	UT
Sphaeromeria compacta	1	NV
Sphaeromeria ruthiae	1	UT
Streptanthus oliganthus	1	NV
Synthyris ranunculina	1	NV
Talinum validulum	2	UT
Thelypodiopsis argillacea	1	UT
Thelypodium sagittatum var. ovalifolium	2	NV, UT

TABLE A-3 (Cont.)

Taxon	Category	Historic Distribution
Townsendia alipgena var. minima	2	UT
Townsendia aprica	1	UT
Townsendia jonesii var. tumulosa	1	NV
Townsendia sp./sp. Nov. Ined.	2	NV
Trifolium andersonii ssp. beatleyae	2	NV
Trifolium andersonii var. friscanum	1	UT
Trifolium lemmonii	1	NV
Viguiera soliceps	2	UT
Viola purpurea var. charlestonensis	2	NV, UT
Xylorhiza confertifolia	1	UT
Zigadenus vaginatus	2	NV, UT

APPENDIX B

APPENDIX B1

VERTEBRATE SPECIES OF HIGH INTEREST TO THE STATE OF UTAH

APPENDIX B-1
VERTEBRATE SPECIES OF HIGH INTEREST TO THE STATE OF UTAH

Common Name	Scientific Name
MAMMALS	
Mule deer	Odocoileus hemionus
Moose	Alces alces
Pronghorn antelope	Antilocapra americana
Bison	Bison bison
Mountain goat	Oreamnos americanus
Beaver	Castor canadensis
Moutain bighorn sheep	Ovis canadensis canadensis
Desert Bighorn sheep	Ovis canadensis nelsoni
Elk	Cervus canadensis
Badger	Taxidea taxus
Spotted skunk	Spilogale putorius
Striped skunk	Mephitis mephitis
Gray wolf	Canis lupus
Red fox	Vulpes fulva
Swift fox	Vulpes velox
Kit fox	Vulpes macrotis
Cougar	Felis concolor
Canada lynx	Lynx canadensis
Bobcat	Lynx rufus
Utah prairie dog	Cynomys parvidens
Richardson ground squirrel	Spermophilus richardsoni
Belding ground squirrel	Spermophilus beldingi
Thirteen-lined ground squirrel	Spermophilus tridecemlineatus
Spotted ground squirrel	Spermophilus spilosoma
Yellow pine chipmunk	Eutamius amoenus

Source: Utah Division of Wildlife Resources, 1980.

APPENDIX B-1 (Cont.)

Common Name	Scientific Name
Abert squirrel	Sciurus aberti navajo
Northern flying squirrel	Glaucomys sabrinus
Black bear	Ursus americanus
Grizzly bear	Ursus arctos
Raccoon	Procyon lotor
Marten	Martes americana
Fisher	Martes pennanti
Short-tailed weasel	Mustela erminea
Long-tail weasel	Mustela frenata
Wyoming Pocket Mouse	Perognathus fasciatus
Rock pocket mouse	Perognathus intermedius
Longtail pocket mouse	Perognathus formosus
Dark Kangaroo mouse	Microdipodops megacephalus
Desert kangaroo rat	Dipodomys deserti
Merriam's kangaroo rat	Dipodomys merriami
Cactus mouse	Peromyscus eremicus
Rock mouse	Peromyscus difficilis
Southern grasshopper mouse	Onychomys torridus
White-throat woodrat	Neotoma albigula
Stephen's wood rat	Neotoma stephensi
Mexican woodrat	Neotoma Mexicana
Mexican meadow mouse	Microtus mexicanus
Snowshoe hare	Lepus americanus
Mountain cottontail	Sylvilagus nuttalli
Desert cottontail	Sylvilagus auduboni
Pigmy cottontail	Sylvilagus idahoensis
Dwarf shew	Sorex nanus
Desert shew	Noriosorex crawfordi
Red bat	Lasiurus borealis

APPENDIX B-1 (Cont.)

Common Name	Scientific Name
Spotted bat	*Euderma maculata*
Mexican big-eared bat	*Plecotus phyllotis*
Big free-tailed bat	*Tadarida molossa*
Black-footed ferret	*Mustela nigripes*
Mink	*Mustela vison*
Wolverine	*Gulo luscus*

FISH

Kokanee	*Oncornynchus nerka*
Cutthroat trout	*Salmo clarki*
Rainbow trout	*Salmo gardneri*
Golden trout	*Salmo aqua bonita*
Brown trout	*Salmo trutta*
Lake trout	*Salvelinus namaycush*
Brook trout	*Salvelinus fontinalis*
Northern pike	*Esox lucius*
Bonneville cisco	*Presopium gemmiferum*
Mountain whitefish	*Prosopium williamsoni*
Arctic grayling	*Thymallus arcticus*
Bonytail chub	*Gila elegans*
Humpback chub	*Gila cypha*
Virgin River roundtail chub	*Gila robusta seminuda*
Leatherside chub	*Gila copei*
Colorado River squawfish	*Ptychocheilus lucius*
Lease chub	*Iotichthys phlegethontis*
Long nose dace	*Rhinichthys cataractae*
Virgin River spinedace	*Lepidomeda mollispinis mollispinis*

APPENDIX B-1 (Cont.)

Common Name	Scientific Name
Woundfin	Plagopterus argentissimus
Humpback sucker	Xyrauchen texanus
Channel catfish	Ictalurus punctatus
Black bullhead	Ictalurus melas
Rio Grande Killifish	Eundulus Zebrinus
White bass	Roccus chrysops
Bluegill	Lepomis macrochirus
Striped bass	Morone saxatilis
Largemouth bass	Micropterus salmoides
Smallmouth bass	Micropterus dolomieui
Black crappie	Pomoxis nigromaculatus
Yellow perch	Percha flavescens
Walleye	Stizostedion vetreum vitreum
Mottled sculpin	Cottus bairdi

AMPHIBIANS

Tiger salamander	Ambystoma tigrinum
Green frog	Rana clamitans
Bullfrog	Rana catesbeiana

REPTILES

Desert tortoise	Gopherus agassizi
Desert Iguana	Dipso saurus dorsalis
Chuckwalla	Sauromalus obesus
Gila monster	Heloderma suspectum

APPENDIX B-1 (Cont.)

Common Name	Scientific Name
Desert night lizard	*Xantusia vigilis*
Utah milk snake	*Lampropeltis triangulum gentilis*
Utah mountain kingsnake	*Lampropeltis pyromelena infralabialis*
Mojave rattlesnake	*Crotalus scutulatus scutulatus*
Speckled rattlesnake	*Crotalus mitchelli pyrrhus*
Sidewinder	*Crotalus cerastes cerastes*

BIRDS

Common Name	Scientific Name
Western grebe	*Aechmophorus occidentalis*
White pelican	*Pelecanus erythrorhynchos*
Double-crested cormorant	*Phalacrocolax avaitus*
Great blue heron	*Andea herodias*
White-faced ibis	*Plegadis chihi*
Whistling swan	*Olor columbianus*
Trumpeter swan	*Olor buccinator*
Black brant	*Branta nigricans*
White-fronted goose	*Anser albifrons*
Snow goose	*Chen caerulescens*
Ross' goose	*Chen rossii*
Fulous tree duck	*Dendrooygna bicolor*
Mallard	*Anas platyrhynchos*
Black duck	*Anas rubripes*
Gadwall	*Anas strepera*
Pintail	*Anas acuta*
Green-winged teal	*Anas crecca*

APPENDIX B-1 (Cont.)

Common Name	Scientific Name
Blue-winged teal	Anas discors
Cinnamon teal	Anas cyanoptera
European widgeon	Mareca penelope
American widgeon	Anas americana
Shoveler	Spatula ciypeata
Wood duck	Aix sponse
Redhead	Aythya americana
Ring-necked duck	Aythya collaris
Canvasback	Aythya valisineria
Greater scaup	Aythya marila
Lesser scaup	Aythya affinis
Common goldeneye	Bucephala clanqula
Barrow's goldeneye	Bucephala islandica
Bufflehead	Bucephala albeola
Old squaw	Clangula hyemalis
Harlequin duck	Histrionicus histrionicus
White-winged scoter	Melanitta deglandi
Surf scoter	Melanitta perspicillata
Ruddy duck	Oxyura jamaicensis
Hooded merganser	Mergus cucullatus
Common merganser	Mergus merganser
Red-breasted merganser	Mergus serrator
Turkey vulture	Cathartes aura
Goshawk	Accipiter gentilis
Sharp-shinned hawk	Accipiter striatus
Cooper's hawk	Accipiter cooperii
Red-tailed hawk	Buteo jamaicensis
Red-shouldered hawk	Buteo lineatus
Swainson's hawk	Buteo swainsoni

APPENDIX B-1 (Cont.)

Common Name	Scientific Name
Rough-legged hawk	Buteo lagopus
Ferruginous hawk	Buteo regalis
Golden eagle	Aguila chrysaetos
Bald eagle	Haliaeetus leucocephalus
Marsh hawk	Circus cyaneus
Osprey	Pandion haliaetus
Prairie falcon	Falco mexicanus
American peregrine falcon	Falco peregrinus anatum
Arctic peregrine falcon	Falco pelegrinus tundrius
Merlin	Falco columbarius
American kestrel	Falco sparverius
Blue grouse	Dendragapus obscurus
Ruffed grouse	Centrocercus urophasianus
White-tailed ptarmigan	Lagopus leucurus
Sharp-tailed grouse	Pedioecetes phasianellus
California quail	Lophortyx californicus
Gambel's quail	Lophortyx gambelii
Ring-necked pheasant	Phasianus colchicus pallaisi
White-winged pheasant	Phasianus colchicus bianchii
Chukar	Alectoris chukar
Hungarian partridge	Perdix perdix
Merriam's turkey	Meleagris gallapavo
Whopping crane	Grus americana
Sandhill crane	Grus canadensis
Virginia rail	Rallus limicola
Sora rail	Porzana carolina
Common gallinule	Gallinula chloropus
American coot	Fulio americana
Snowy plover	Choradlius alerandarinus

APPENDIX B-1 (Cont.)

Common Name	Scientific Name
Common snipe	*Capella gallinago*
Long-billed curlew	*Numenius americanus*
Willet	*Catoptrophorus semipalmatus*
Band-tailed pigeon	*Columba fasciata*
Mourning Dove	*Zenaida macroura*
Yellow-billed cuckoo	*Coccyzus americanus*
Roadrunner	*Geococcyx californianus*
Barn owl	*Tyto alba*
Screech owl	*Otus asio*
Flammulated owl	*Otus flammeolus*
Great-horned owl	*Bubo virginianus*
Pygmy owl	*Glaucidium gnoma*
Burrowing owl	*Speotyto cunicularia*
Spotted owl	*Strix occidentalis*
Long-eared owl	*Asio otus*
Short-eared owl	*Asio flammeus*
Saw-whet owl	*Aegolius acadicus*
Black swift	*Cypseloides niger*
Belted king fisher	*Megaceryle akyon*
Pileated woodpecker	*Dryocopus pileatus*
Lewis woodpecker	*Asyndesmus lewis*
Williamson's sapsucker	*Sphylapicus thryoideus*
Purple martin	*Progne subis*
Western bluebird	*Sialia mexicana*
Mountain bluebird	*Sialia corrucoides*
Grace's warbler	*Dendroica glaclae*
Scott's oriole	*Icterus parisorum*
Grasshopper sparrow	*Ammodramus savannarum*
Canada Goose	*Branta canadensis*

APPENDIX B-2

STATUS OF SELECTED NONGAME SPECIES IN UTAH

APPENDIX B-2

STATUS OF SELECTED NONGAME SPECIES IN UTAH

The state of Utah bases the classification below on the following definitions:

Extirpated: Any specied of animal that has disappeared as a part- or full-time resident since 1800. (Different from "extinct," which means total loss of the species in the world.)

Endangered: Any species, subspecies or subpopulation of animal which is threatened with extinction resulting from very low or declining numbers, alteration and/or reduction of habitat, detrimental environmental changes, or any combination of the above. Continued survival in this situation is unlikely without implementation of special measures.

Declining: Any species of animal which, although still occurring in numbers adequate for survival, has been greatly depleted and continues to decline. A management program, including protection or habitat manipulation, is needed to stop or reverse the decline.

Limited: Any species of animal occurring in limited areas and/or numbers due to a restricted or specialized habitat or at the perimeter of its historic range.

Status Questioned: Insufficient data available on which to base a reliable assessment as to status.

MAMMALS

Extirpated	
Grizzly Bear	*Ursus arctos*
Fisher	*Martes pennanti*
Endangered	
Utah Prairie Dog	*Cynomys parvidens*
Blackfooted ferret	*Mustela nigripes*
Wolf	*Canus lupus*
Under Investigation	
Bobcat	*Lynx rufus*

Source: Utah Division of Wildlife Resources, May 1980.

APPENDIX B-2 (Cont.)

Limited

Dwarf shrew	*Sorex nanus*
Desert shrew	*Notiosorex crawfordi*
Red bat	*Lasiurus borealis*
Mexican big-eared bat	*Plecotus phyllotis*
Spotted bat	*Euderma maculatum*
Big free-tailed bat	*Tadarida macrotis*
Abert squirrel (protected)	*Sciurus aberti navajo*
Belding ground squirrel	*Spermophilus beldingi*
Richardson ground squirrel	*Spermophilus richardsoni*
Thirteen-lined ground squirrel	*Spermophilus tridecemlineatus*
Spotted ground squirrel	*Spermophilus spilosoma*
Yellow pine chipmunk	*Eutamius amoenus*
Rock pocket mouse	*Perognathus intermedius*
Wyoming pocket mouse	*Perognathus fasciatus*
Merriam's kangaroo rat	*Dipodomys merriami*
Desert kangaroo rat	*Dipodomys deserti*
Cactus mouse	*Peromyscus eremicus*
Rock mouse	*Peromyscus difficilis*
Southern grasshopper mouse	*Onychomys torridus*
Stephen's Woodrat	*Neotoma stephensi*
Mexican Meadow Mouse	*Microtus mexicanus*
Wolverine	*Gulo gulo*
River otter	*Lutra canadensis*
Canada lynx (now protected)	*Lynx canadensis*

Status Questioned:

Northern flying squirrel	*Glaucomys sabrinus*
Longtail pocket mouse	*Perognathus formosus*
Dark kangaroo rat	*Microdipodops megacephalus*
Whitethroat woodrat	*Neotoma albigula*
Mexican woodrat	*Neotoma mexicana*
Red fox	*Vulpes fulva*
Kit fox (protected)	*Vulpes macrotis*
Swift fox	*Vulpes velox*
Racoon	*Procyon lotor*
Shortail weasel (Ermine)	*Mustela erminea*

BIRDS

(All Species in Utah Protected)

Extirpated:

California Condor	*Gymnogyps californianus*

Endangered: (Federal Classification)

American peregrine falcon	*Falco peregrinus anatum*
Bald eagle	*Haliaeetus leucocephalus*
Whooping crane	*Grus americana* (migrant only)

APPENDIX B-2 (Cont.)

Limited

White pelican	*Pelecanus erythrorhynchos*
Sandhill crane	*Grus canadensis*
Roadrunner	*Geococcyx californianus*
Spotted owl	*Strix occidentalis*

Status Questioned:

Western grebe	*Aechmophorus occidentalis*
Double-crested cormorant	*Phalacrocorax auritus*
Great blue heron	*Ardea herodias*
White-faced ibis	*Plegadis chihi*
Merlin (pigeon hawk)	*Falco columbaris*
Snowy plover	*Charadrius alexandrinus*
Long-billed curlew	*Numenius americanus*
Willet	*Catoptrophorus semipalmatus*
Yellow-billed Cuckoo	*Coccyzus americanus*
Belted kingfisher	*Megaceryle alcyon*
Pileated woodpecker	*Dryocopus pileatus*
Lewis woodpecker	*Asyndesmus lewis*
Purple martin	*Progne subis*
Western bluebird	*Sialia mexicana*
Mountain bluebird	*Sialia currucoides*
Grasshopper sparrow	*Ammodramus savannarum*

FISH

(All Species in Utah Protected)

Endangered: (Federal Classification)

Bonytail chub	*Gila elegans*
Colorado squawfish	*Ptychocheilus lucinus*
Humpback chub	*Gila cypha*
Woundfin	*Plegopterus argentissimus*

Threatened: (Federal Classification)

Zahantan cutthroat trout	*Salmo clarki henshawi*

Declining:

Razorback sucker	*Xyrauchen texanus*
Least chub	*Iotichthys phlegethontis*
Virgin river roundtail chub	*Gila robusta seminuda*
Virgin river spinedace	*Lepidomeda mollispinis*

Limited:

June sucker	*Chasmistes liorus*
Bear Lake whitefish	*Prosopium abyssicola*
Bear Lake sculpin	*Cottus extrensus*
Bonneville cicso	*Prosopium gemmiferum*
Bonneville whitefish	*Prosopium spilonotus*

APPENDIX B-2 (Cont.)

Status Questioned:

Rio Grande killifish	Fundulus zebrinus
Longnose dace	Rhinichthys cataractae

REPTILES AND AMPHIBIANS

(All Species in Utah Protected)

Declining:

Desert Tortoise (now rare and threatened)	Gopherus agassizi
Gila monster	Heloderma suspectum
Bullfrog	Rana catesbeiana

Limited:

Chuckwalla	Sauromalus obesus
Desert iguana	Dipsosaurus dorsalis
Desert night lizard	Xantusia vigilis
Utah milk snake	Lampropeltis triangulum gentilis
Utah mountain king snake	Lampropeltis pyromelena infralabialis
Sidewinder	Crotalus cerastes cerastes
Mojave rattlesnake	Crotalus scutulatus scutulatus
Speckled rattlesnake	Crotalus mitchelli pyrrhus
Green frog	Rana clamitans

Status Questioned:

Tiger salamander	Ambystoma tigrinum

APPENDIX B-3

UNPS Plant Listing

UTAH NATIVE PLANT SOCIETY LISTING

(UNPS Newsletter February, 1981)

The following species are considered of highest priority. Not only are they among the rarest of our species, but are believed subject to current threat or endangerement from various sources. Available funding in the endangered plant program should be directed toward achievement of earliest possible listing.

Priority

High 1. a. (sufficient data available for rule-making)

Asclepias welshii
Cryptantha barnebyi
Cryptantha compacta
Cryptantha ochroleuca
Cycladenia humilis
  var. jonesii
Erigeron kachinensis
Erigeron maguirei
Eriogonum ammophilum
Glaucocarpum suffrutescens
Lepidium barnebyanum
Lepidium ostleri
Lesquerella tumulosa
Primula maguirei
Townsendia aprica
Trifolium andersonii
  var. friscanum

b. (prompt additional study required)

Astragalus cronquistii
Astragalus harrisonii
Castilleja aquariensis
Cymopterus minimus
Erigeron conquistii
Erigeron proselyticus
Eriogonum loganum
Eriogonum natum
Gilia caespitosa
Heterotheca jonesii
Lepidium montanum
  var. neeseae
Pediocactus despainii
Pediocactus winkleri
Penstemon bracteatus
Penstemon wardii

Of nearly equal urgency is protection for species on the following list. They are of generally similar rarity. Potential threats may be slightly less immediate.

High 2.

Astragalus hamiltonii
Astragalus holmgreniorum
Astragalus iselyi
Astragalus lentiginosus
  var. ursinus
Astragalus uncialis
Castilleja revealii
Eriogonum corymbosum
  var. matthewsiae
Eriogonum humivagans
Lepidium montanum
  var. stellae
Najas caespitosus
Penstemon grahamii
Penstemon leptanthus
Penstemon navajoa
Phacelia indecora
Psoralea epipsila
Psorothamnus polyadenius
  var. jonesii
Ranunculus acriformis
  var. aestivalis
Sphaeralcea psoraloides
Sclerocactus pubispinus
Thelypodiopsis argillacea

Species on the following list are rare and at least potentially threatened. They should also be considered for listing. As work on highest priority species is accomplished, funding and effort should be directed to these rare plants.

Medium.

Allium passeyi
Astragalus chloodes
Astragalus sabulosus
Astragalus striatiflorus
Astragalus subcinereus
  var. basalticus
Cryptantha johnstonii
Castilleja parvula

Draba maguirei
var. burkei
Epilobium nevadense
Erigeron mancus
Erigeron sionis
Eriogonum aretioides
Eriogonum clavellatum
Eriogonum cronquistii
Eriogonum smithii
Hedysarum occidentale
var. canone
Hymenoxys depressa
Lygodesmia entrada
Machaeranthera kingii
Mentzelia argillosa
Musineon lineare
Penstemon compactus
Penstemon concinnus
Penstemon nanus
Phacelia utahensis
Senecio dimorphophyllus
Silene petersonii
var. minor
Sphaeromeria ruthiae

The following list includes species which are known to be rare or of very narrow distribution, and species for which additional information regarding rarity is needed. They may become imminently endangered if substantial portions of their habitat are altered or if population size decreases. Monitoring of populations and retention of the species on lists for possible future listing is recommended.

Low.

Angelica wheeleri
Aquilegia barnebyi
Astragalus ampullarius
Astragalus barnebyi
Astragalus consobrinus
Astragalus henrimontanensis
Astragalus malacoides
Astragalus monumentalis
Astragalus rafaelensis
Astragalus saurinus
Atriplex welshii
Cryptantha elata
Cryptantha grahamii
Cryptantha jonesiana
Cymopterus coulteri
Cymopterus higginsii
Draba asprella
var. zionensis
Draba sobolifera
Draba maguirei
var. maguirei
Eriogonum ephedroides
Eriogonum eremicum
Eriogonum jamesii
var. rupicola
Eriogonum nanum
Parrya rydbergii
Eriogonum panguicense
var. panguicense
Festuca dasyclada
Gaillardia flava
Heliomeris soliceps
Hymenoxys helenioides
Lesquerella rubicundula
Lomatium junceum
Lomatium minimum
Penstemon angustifolius
var. vernalensis
Penstemon atwoodii
Penstemon dolius
var. duchesnensis
Penstemon goodrichii
Penstemon parvus
Penstemon patricus
Penstemon tidestromii
Phacelia anelsonii
Psoralea pariensis
Silene petersonii
var. petersonii
Sphaeralcea caespitosa
Sphaeralcea leptophylla
var. janeae
Sphaeromeria capitata
Xylorhiza confertifolia

There are several rare or unusual species whose continued existence in the state may be in jeopardy but which are not candidate for Federal listing. They may have more extensive distribution elsewhere, or may have numerous widely scattered small populations. Suggested for inclusion in a Utah state sensitive list, in addition to ones listed above, are:

Achyronychia cooperi
Andropogon glomeratus
Asclepias cutleri
Astragalus barnebyi
Astragalus bodinii
Astragalus bryantii
Astragalus callithrix
Astragalus canadensis
var. canadensis
Astragalus cottamii
Astragalus desereticus
Astragalus diversifolius
Astragalus emoryanus
Astragalus eucosmus
Astragalus gilviflorus
Astragalus hallii
var. fallax
Astragalus jejunus
Astragalus limnocharis
Astragalus lutosus
Astragalus monumentalis
Astragalus nidularius
Astragalus pinonis
Astragalus rafaelensis
Atriplex hymenelytra
Atriplex welshii
Berberis fendleri
Betula utahensis
Botrychium boreale
Botrychium lanceolatum
Botrychium lunaria
Botrychium simplex
Buddleja utahensis
Camissonia megalantha
Carex leptalea
Carex microglochin
Coryphantha missouriensis
var. marstonii
Cryptantha longiflora
Cypripedium calceolus
var. parviflorum
Cypripedium fasciculatum
Dalea epica
Echinocactus polycephalus
var. xeranthemoides
Eriogonum grayii
Euphorbia nephradenia
Gaultheria humifusa
Gilia latifolia
Gilia tridactyla
Hedysarum boreale
var. gremiale
Kobresia simpliciuscula
Lepidium integrifolium
Lepidospartum latisquamum
Lesquerella garrettii
Leucocrinum montanum
Listera borealis
Lomatium latilobum
Mimulus eastwoodiae
Nymphaea odorata
Ostrya knowltonii
Penstemon petiolatus
Penstemon uintahensis
Portulaca mundula
Psorothamnus thompsonae
var. whitingii
Rubus neomexicanus
Yucca toftiae
Yucca schidigera
Zigadenus vaginatus

In addition to species listed above, there exist several newly discovered taxa that are very rare and may require protection. Descriptions of these new taxa are being prepared or have been accepted for publication. Consideration for federal listing of these species should await formal publication of their names and descriptions according to the rules of botanical nomenclature.

APPENDIX C

SAMPLE UNIT RECORD FORM

1. Sample Unit Number:________________ 2. Photo Number(s)________________
3. Map:________________________ 7. Location of Unit Within Section
4. Township____________________ N
5. Range_______________________
6. Section_____________________
8. Compass coordinate from the true point of beginning____________________
9. Elevation___________________
10. Date (MM/DD/YY)____________
11. Crew Leader/Recorder (Name)____
12. Other Crew Members____
13. General Survey Conditions (Circle one only): Good Average Poor
14. Describe General Survey Conditions:

15. Describe Method and Accuracy of Locating Sampling Unit:

16. Drainage (rank at least one)

Converging Diverging Braided Other (describe)

17. Distance to Nearest Permanent Water ___________m
18. Type (Circle one only): Spring Seep Lake Stream Other
19. Slope (rank at least one)
    ___ Level (0-3 degrees)
    ___ Gentle (3-8 degrees)
    ___ Moderate (8-16 degrees)
    ___ Steep (16-26 degrees)
    ___ Very Steep/Prec. (>26 degrees)

20. Aspect (rank at least one)
    ___North ___South
    ___Northeast ___Southwest
    ___East ___West
    ___Southeast ___Northwest
    ___None

21. Disturbance (rank at least one)

___Off-Road Vehicles

___Mining

___Other Construction

___Erosion

___Grazing

___Other Animal Disturbances

___Cultivated Agriculture

___Other

22. Intensity of Disturbance (Circle one)

High Moderate Low

23. Describe Disturbance

24. Percent perennial vegetation cover:

	% Cover dm	Vegetation Association	Density
Line 1			
Line 2			

25 Parental Soil Material (circle one only)

Residual

Colluvial

Alluvial

Glacial

Eolian

26. Soil Texture (rank the composition of the particles composing the soil)

___Course gravel 7.500 mm

___Fine gravel 2.000 mm

___Course sand 2.000 mm

___Fine sand .074 mm

___Silt .074-.005 mm

___Clay .005-.001 mm

27. Describe General Observations:

28. Vegetation (Major Plant Associations)

29. Wildlife - (Species list and numbers seen, animal sign, etc.)

30. DESCRIBE - Sensitive habitats for flora or fauna:

31. DESCRIBE - Sensitive, threatened, or endangered flora species:

32. DESCRIBE - Sensitive, threatened, or endangered fauna species:

SAMPLE UNIT RECORD FORM

VEGETATION TYPE__________________ SAMPLE UNIT #__________________

TRANSECT__________________ CREW LEADER__________________

PG.___ OF___ DATE__________________

Species	Cover (dm)	Total dm	Cover (%)	Relative Cover (%)	Number of Individuals	Density (%)	Relative Density(%)
TOTALS							

OTHER SPECIES ON SITE:

APPENDIX D

LOCATION DESCRIPTIONS

PINE VALLEY CLUSTER 1

Units:	Legal Descriptions			Maps		
Sample Unit No.	Twn	Range	Section	MX 1:9600	U.S.G.S.	
MX-5C-1/1	T26S,	R17W,	SW 1/4 and	#21	Wah Wah Summit	15'
			SE 1/4 Sec. 24			
MX-5C-1/1A*	T26S,	R17W,	SW 1/4 and	#21	Wah Wah Summit	15'
			SE 1/4 Sec. 21			
MX-5C-1/2	T26S,	R17W,	SE 1/4 Sec. 25	#21	Wah Wah Summit	15'
MX-5C-1/3	T26S,	R16W,	NW 1/4 Sec. 31	#21	Wah Wah Summit	15'
MX-5C-1/4	T27S,	R16W,	NW 1/4 and	#26	Lamerdorf Peak NW	7.5'
			SW 1/4 Sec. 6			
MX-5C-1/5	T27S,	R17W,	SW 1/4 and	#26	Lamerdorf Peak NW	7.5'
			SE 1/4 Sec. 1			
MX-5C-1/6	T27S,	R17W,	SW 1/4 Sec. 12	#26	Lamerdorf Peak NW	7.5'
MX-5C-1/7	T27S,	R17W,	NE 1/4 Sec. 14	#26	Lamerdorf Peak NW	7.5'
MX-5C-1/8	T27S,	R17W,	NE 1/4 Sec. 23	#26	Lamerdorf Peak NW	7.5'
MX-5C-1/9	T27S,	R17W,	SW 1/4 Sec. 23	#26	Lamerdorf Peak NW	7.5'
MX-5C-1/10	T27S,	R17W,	SE 1/4 Sec. 10	#25	Lamerdorf Peak NW	7.5'
			NE 1/4 Sec. 15			
MX-5C-1/11	T27S,	R17W,	SE 1/4 and	#25	Sawtooth Peak	7.5'
			NE 1/4 Sec. 9		Lamerdorf Peak NW	7.5'
MX-5C-1/12	T27S,	R17W,	SW 1/4 Sec. 22	#25	Lamerdorf Peak NW	7.5'
MX-5C-1/13	T27S,	R17W,	SW 1/4 Sec. 21	#25	Sawtooth Peak	7.5'
MX-5C-1/14	T27S,	R17W,	NW 1/4 Sec. 20	#25	Sawtooth Peak	7.5'
MX-5C-1/14A*	T27S,	R17W,	NW 1/4 Sec. 20	#25	Sawtooth Peak	7.5'
MX-5C-1/15	T27S,	R17W,	NW 1/4 and	#25	Sawtooth Peak	7.5'
			SW 1/4 Sec. 19			
MX-5C-1/16	T27S,	R17W,	SW 1/4 Sec. 26	#32	Lamerdorf Peak NW	7.5'
MX-5C-1/17	T27S,	R17W,	SW 1/4 Sec. 34	#31	Lamerdorf Peak NW	7.5'
MX-5C-1/18	T27S,	R17W,	NW 1/4 and	#31	Sawtooth Peak	7.5'
			NE 1/4 Sec. 33			
MX-5C-1/19	T28S,	R17W,	NW 1/4 and	#31	Lamerdorf Peak NW	7.5'
			SW 1/4 Sec. 3			
MX-5C-1/20	T28S,	R17W,	SW 1/4 Sec. 4	#31	Sawtooth Peak	7.5'
			NW 1/4 Sec. 9			
MX-5C-1/21	T28S,	R17W,	NW 1/4 Sec. 5	#31	Sawtooth Peak	7.5'
MX-5C-1/21A*	T28S,	R17W,	NW 1/4 Sec. 5	#31	Sawtooth Peak	7.5'
MX-5C-1/22	T28S,	R17W,	SE 1/4 Sec. 6	#31	Sawtooth Peak	7.5'
MX-5C-1/22A*	T28S,	R17W,	SE 1/4 Sec. 6	#31	Sawtooth Peak	7.5'
MX-5C-1/23	T28S,	R17W,	SE 1/4 Sec. 7	#31	Sawtooth Peak	7.5'

* Resiting

LOCATION DESCRIPTIONS
PINE VALLEY CLUSTER 2

Units:	Legal Descriptions			Maps		
Sample Unit No.	Twn	Range	Section	MX 1:9600	U.S.G.S.	
MX-5C-2/1	T26S,	R17W,	NE 1/4 Sec. 23	#21	Wah Wah Summit	15'
MX-5C-2/2	T26S,	R17W,	SE 1/4 Sec. 22	#20	Wah Wah Summit	15'
MX-5C-2/3	T26S,	R17W,	NW 1/4 Sec. 22	#20	Wah Wah Summit	15'
MX-5C-2/4	T26S,	R17W,	NW 1/4 Sec. 15	#20	Wah Wah Summit	15'
MX-5C-2/5	T26S,	R17W,	SW 1/4 Sec. 21	#20	Halfway Summit	7.5'
MX-5C-2/6	T26S,	R17W,	SW 1/4 Sec. 28	#20	Halfway Summit	7.5'
MX-5C-2/7	T26S,	R17W,	SE 1/4 Sec. 27	#20	Wah Wah Summit	7.5'
MX-5C-2/8	T26S,	R17W,	NE 1/4 Sec. 33	#20	Halfway Summit	7.5'
MX-5C-2/9	T26S,	R17W,	NE 1/4 Sec. 35	#21	Wah Wah Summit	15'
MX-5C-2/10	T27S,	R17W,	NE 1/4 Sec. 2	#26	Lamerdorf Peak NW	7.5'
MX-5C-2/11	T27S,	R17W,	NE 1/4 Sec. 4	#25	Sawtooth Peak	7.5'
MX-5C-2/12	T27S,	R17W,	SE 1/4 Sec. 3	#25	Lamerdorf Peak NW	7.5'
MX-5C-2/13	T27S,	R17W,	SW 1/4 Sec. 4	#25	Sawtooth Peak	7.5'
MX-5C-2/13A*	T27S,	R17W,	SW 1/4 Sec. 24	#25	Sawtooth Peak	7.5'
MX-5C-2/14	T27S,	R17W,	NW 1/4 Sec. 5	#25	Sawtooth Peak	7.5'
MX-5C-2/14A*	T27S,	R17W,	NW 1/4 and SW 1/4 Sec. 5	#25	Sawtooth Peak	7.5'
MX-5C-2/15	T27S,	R17W,	SW 1/4 Sec. 6	#25	Sawtooth Peak	7.5'
MX-5C-2/15A*	T27S,	R17W,	SW 1/4 Sec. 6 NW 1/4 Sec. 7	#25	Sawtooth Peak	7.5'
MX-5C-2/16	T26S,	R17W,	NW 1/4 Sec. 32	#20	Halfway Summit	7.5'
						7.5'
MX-5C-2/17	T26S,	R17W,	SW 1/4 Sec. 30	#20	Halfway Summit	7.5'
MX-5C-2/18	T26S,	R17W,	SW 1/4 Sec. 19	#20	Halfway Summit	7.5'
MX-5C-2/18A*	T26S,	R17W,	SW 1/4 Sec. 19	#20	Halfway Summit	7.5'
MX-5C-2/19	T26S,	R17W,	NW 1/4 Sec. 20	#15	Halfway Summit	7.5'
MX-5C-2/20	T26S,	R17W,	NW 1/4 Sec. 18	#20	Halfway Summit	7.5'
MX-5C-2/21	T26S,	R17W,	NW 1/4 Sec. 17	#20	Halfway Summit	7.5'
MX-5C-2/22	T26S,	R17W,	SW 1/4 Sec. 9	#15	Halfway Summit	7.5'
MX-5C-2/23	T26S,	R17W,	NE 1/4 Sec. 12	#14	Halfway Summit	7.5'

* Resiting

APPENDIX E

APPENDIX E-1

Key to Figures
3-25 through 3-29
and 4-23 through 4-27.

Symbols, and scientific and common names
for plant species in Pine Valley, UT .

Symbol	Scientific Name	Common Name
Agde	*Agropyron desertorum*	crested wheatgrass
Arar	*Artemisia arbuscula*	low sagebrush
Arsp	*Artemisia spinescens*	bud sagebrush
Artr	*Artemisia tridentata*	big sagebrush
Atco	*Atriplex confertifolia*	shadscale
Bogr	*Bouteloua gracilis*	blue grama
Cela	*Ceratoides lanata*	whitesage (winterfat)
Chgr	*Chrysothamnus greenei*	Greene's rabbitbrush
Chna	*Chrysothamnus nauseosus*	rubber rabbitbrush
Chvi	*Chrysothamnus viscidiflorus*	green rabbitbrush
Epne	*Ephedra nevadensis*	Mormon tea
Grsp	*Grayia spinosa*	spiny hopsage
Gumi	*Gutierrezia microcephala*	threadleaf snakeweed
Gusa	*Gutierrezia sarothrae*	broom snakeweed
Hija	*Hilaria jamesii*	galleta
Juos	*Juniperus osteosperma*	Utah juniper
Koam	*Kochia americana*	green molley
Lyan	*Lycium andersonii*	Anderson wolfberry
Orhy	*Oryzopsis hymenoides*	Indian ricegrass
Save	*Sarcobatus vermiculatus*	greasewood
Spco	*Sporobolus contractus*	spike dropseed
Spcr	*Sporobolus cryptandrus*	sand dropseed
Stco	*Stipa comata*	needle-and-thread grass

LEGEND

Vegetation Map: Pine Valley, Utah.

A

A1 Chgr/Orhy

A2 Hija/Chgr

A3 Epne/Atco

A4 Chgr/Hija

A5 Koam/Atco

A6 Hija/Arsp

A7 Spco/Atco

A8 Atco/Cela

A9 Koam/Hija

A10 Atco/Gusa

A11 Lyan/Koam

A12 Chgr/Cela

A13 Cela/Chgr

A14 Orhy/Chvi

A15 Chvi/Orhy

A16 Cela/Gusa

A17 Orhy/Cela

A18 Spcr/Atco

A19 Save/Atco

A20 Cela/Orhy

A21 Atco/Chgr

A22 Orhy/Atco

A23 Chvi/Epne

A24 Grsp/Chvi

A25 Grsp/Epne

A26 Atca/Orhy

A27 Gusa/Chgr

A28 Gusa/Spcr

A29 Orhy/Gusa

A30 Chvi/Cela

A31 Chgr/Bogr

A32 Cela/Atco

A33 Chgr/Epne

A34 Cela/Chvi

A35 Gusa/Bogr

A36 Chgr/Gusa

B

B1 Artr/Hija

B2 Arar/Chvi

B3 Chgr/Artr

B4 Artr/Chvi

B5 Artr/Grsp

B6 Artr ----

B7 Chna/Artr

B8 Arar/Stco

B9 Artr/Gusa

B10 Bogr/Artr

B11 Arno/Chvi

C

C1 Juos/Artr

C2 Juos/Arar

D

D1 Spco/Hija

D2 Hija/Orhy

D3 Spcr/Orhy

D4 Agde/Chvi

Symbols, and scientific and common names
for plant species in Wah Wah Valley, UT.

Symbol	Scientific Name	Common Name
Arar	Artemisia arbuscula	low sagebrush
Arno	Artemisia nova	black sagebrush
Arpu	Aristida purpurea	purple threeawn
Arsp	Artemisia spinescens	bud sagebrush
Artr	Artemisia tridentata	big sagebrush
Atca	Atriplex canescens	four-wing saltbush
Atco	Atriplex confertifolia	shadscale
Cela	Ceratoides lanata	whitesage (winterfat)
Ch	Chrysothamnus sp.	rabbitbrush
Chgr	Chrysothamnus greenei	Greene's rabbitbrush
Chna	Chrysothamnus nauseosus	rubber rabbitbrush
Chvi	Chrysothamnus viscidiflorus	green rabbitbrush
Epne	Ephedra nevadensis	Mormon tea
Grsp	Grayia spinosa	spiny hopsage
Gusa	Gutierrezia sarothrae	broom snakeweed
Hija	Hilaria jamesii	galleta
Juos	Juniperus osteosperma	Utah juniper
Koam	Kochia americana	green molley
Lyan	Lycium andersonii	Anderson wolfberry
Orhy	Oryzopsis hymenoides	Indian ricegrass
Sihy	Sitanion hystrix	squirreltail grass
Spco	Sporobolus contractus	spike dropseed
Stco	Stipa comata	needle-and-thread grass
Suto	Suaeda torreyana	torrey seepweed

LEGEND

Vegetation Map: Wah Wah Valley, Utah.

A

A1	Atco/Stco
A2	Atco/Arar
A3	Atco/Arsp
A4	Atco/Orhy
A5	Atco/Koam
A6	Atco/Chgr
A7	Atco/Chvi
A8	Atco/Epne
A9	Atco/Spco
A10	Atco/Hija
A11	Atco/Cela
A12	Atco/Tegl
A13	Tegl/Ch
A14	Tegl/Epne
A15	Tegl/Atco
A16	Tegl/Hija
A17	Hija/Gusa
A18	Hija/Chgr
A19	Hija/Atco
A20	Hija/Epne
A21	Hija/Arno
A22	Hija/Tegl
A23	Chgr/Epne
A24	Chgr/Atco
A25	Chgr/Hija
A26	Chgr/Tegl
A27	Chgr/Cela
A28	Chvi/Orhy
A29	Chvi/Tegl
A30	Chvi/Gusa
A31	Chvi/Hija
A32	Chvi/Cela
A33	Chna/Arpu
A34	Chna/Epne
~~A35~~	
A36	Epne/Chgr
A37	Epne/Tegl
A38	Epne
~~A39~~	
A40	Cela/Tegl
A41	Cela/Atco
A42	Cela/Chgr
A43	Cela/Hija
A44	Cela/Orhy

A45 Chgr/Suto

A46 Chgr/Orhy

A47 Grsp/Atco

A48 Koam

A49 Lyan/Hija

A50 Tetra/Orhy

A51 Tetra/Arar

A52 Hija/Koam

~~A53~~

A54 Atca/Chvi

A55 Hija/Cela

A56 Epne/Hija

B

B1 Orhy/Hija

B2 Hija/Orhy

C

C1 Arno/Hija

C2 Arar/Orhy

C3 Arar/Sihy

C4 Artr/Hija

C5 Artr/Chvi

C6 Artr/Orhy

C7 Epne/Arar

C8 Artr

D

D1 Juos/Arar

D2 Juos/Artr

E

E1 Playa

APPENDIX E-2

Transect Results

APPENDIX E-2

Species Key for Transect Data

The following tables contain data compiled from the transects made during the field survey. Shelter sites which were resited are placed at the end of the tables in a separate section, rather than being included with the original cluster data. These tables give total perennial cover, percent relative cover, density, and percent relative density for all perennial species that intercepted the transect line. Dominant and subdominant species are indicated by a (d) and (s) respectively, placed next to the species abbreviation.

Definitions of cover and density are as follows:

$$\text{total cover (\%)} = \frac{\text{total plant cover (dm)}}{\text{distance of transect (dm)}} \times 100$$

$$\text{relative cover (\%)} = \frac{\text{total cover of species A}}{\text{total plant cover (dm)}} \times 100$$

$$\text{density} = \frac{\text{number of plants of species A}}{\text{distance of transect (dm)}}$$

$$\text{relative density (\%)} = \frac{\text{number of plants of species A}}{\text{number of plants of all species}} \times 100$$

Species names are abbreviated, and indicated by the first two letters of the genus and species. The key to the abbreviations is as follows:

Species Key for Transect Data

AB	*Abronia* sp.
ARLO	*Aristida longiseta*
ARPV	*Aristida purpurea*
AR	*Aristida* sp.
ARNO	*Artemisia nova*
ARSP	*Artemisia spinescens*
ARTR	*Artemisia tridentata*
ASLE	*Astragalus lentiginosus*
AS	*Astragalus* sp.
ATBO	*Atriplex bonnevillensis*
ATCA	*Atriplex canescens*
ATCO	*Atriplex confertifolia*
ATSP	*Atriplex spinifera*
BOGR	*Bouteloua gracilis*
BR	*Brickellia* sp.
CAPI	*Caulanthus pilosus*
CELA	*Ceratoides lanata*
CHGR	*Chrysothamnus greenei*
CHNA	*Chrysothamnus nauseosus*
CHVI	*Chrysothamnus viscidiflorus*
CH	*Chrysothamnus* sp.
CR	*Cryptantha* sp.
DISP	*Distichlis spicata*
EPNE	*Ephedra nevadensis*
ERCO	*Erigeron concinus*
ERMI	*Eriogonum microthecum*
ER	*Eriogonum* sp.
GRSP	*Grayia spinosa*
GUSA	*Gutierrezia sarothrae*
GU	*Gutierrezia* sp.
HIJA	*Hilaria jamesii*
HO	*Hordeum* sp.
KOAM	*Kochia americana*
LEMO	*Lepidium montanum*
LEPU	*Leptodactylon pungens*
LE	*Leptodactylon* sp.
LEER	*Leucelene ericoides*
LYAN	*Lycium andersonii*
LY	*Lygodesmia* sp.

MACA	Machaeranthera canescens
OE	Oenothera sp.
OPER	Opuntia erinacea
OP	Opuntia sp.
ORHY	Oryzopsis hymenoides
PRFA	Prunus fasciculata
PR	Prunus sp.
SAVE	Sarcobatus vermiculatus
SIHY	Sitanion hysterix
SIJU	Sitanion jubatum
SPGR	Sphaeralcea grossulariifolia
SP	Sphaeralcea sp.
SPCO	Sporobolus contractus
SPCR	Sporobolus cryptandrus
STPI	Stanleya pinnata
STCO	Stipa comata
ST	Stipa sp.
SUTO	Suaeda torreyana
TEAX	Tetradymia axillaris
TEGL	Tetradymia glabrata
TESP	Tetradymia spinosa

TABLE E-1

PINE VALLEY
TRANSECT RESULTS
CLUSTER 1

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-1/1													
	CELA	20.5	4.1	54.2	12	2.4	27.9	9.5	1.9	6.2	6	1.2	1.9
	ATCA	0.2	0.0	0.5	1	0.2	2.3	0.9	0.2	0.6	1	0.2	0.3
	HIJA (d)	14.7	2.9	38.9	29	5.8	67.4	92.8	18.6	60.2	276	55.2	86.5
	ORHY (s)	2.4	0.5	6.4	1	0.2	2.3	46.7	9.3	30.3	31	6.2	9.7
	STCO							1.9	0.4	1.2	4	0.8	1.3
	CHVI							2.3	0.5	1.5	1	0.2	0.3
		37.8	7.5	100.0	43	8.6	99.9	154.1	30.9	100.0	319	63.8	100.0
MX-5-SS-1/2													
	CELA (d)	6.3	1.3	100.0	3	0.6	100.0	29.9	6.0	100.0	17	3.4	100.0
		6.3	1.3	100.0	3	0.6	100.0	29.9	6.0	100.0	17	3.4	100.0
MX-5-SS-1/3													
	AS	0.4	0.1	0.4	1	0.2	1.4						
	ORHY (d)	71.2	14.2	73.4	45	9.0	64.3	77.0	15.4	57.7	36	7.2	50.0
	CELA (s)	16.9	3.4	17.4	9	1.8	12.9	30.9	6.2	23.2	15	3.0	20.8
	ARLO	4.5	0.9	4.6	4	0.8	5.7	1.8	0.4	1.4	2	0.4	2.8
	HIJA	4.0	0.8	4.1	11	2.2	15.7	2.6	0.5	2.0	10	2.0	13.9
	ASLE							1.9	0.4	1.4	1	0.2	1.4
	CHVI							16.2	3.2	12.1	4	0.8	5.6
	SIHY							1.2	0.2	0.9	2	0.4	2.8
	SPCR							1.8	0.4	1.4	2	0.4	2.8
		97.0	19.4	99.9	70	14.0	100.0	133.4	26.7	100.1	72	14.4	100.1

TABLE E-1 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-1/4													
	HIJA (s)	7.2	1.4	82.8	7	1.4	77.8						
	CELA (d)	1.4	0.3	16.1	1	0.2	11.1	12.3	2.5	100.0	7	1.4	100.0
	ORHY	0.1	0.0	1.2	1	0.2	11.1						
		8.7	1.7	100.1	9	1.8	100.0	12.3	2.5	100.0	7	1.4	100.0
MX-5-SS-1/5													
	CELA (d)	62.4	12.5	86.2	31	6.2	83.8	75.2	15.0	58.4	54	10.8	65.1
	ORHY (s)	6.6	1.3	9.1	5	1.0	13.5	46.8	9.4	36.4	25	5.0	30.1
	CHVI	3.4	0.7	4.7	1	0.2	2.7	4.2	0.8	3.3	2	0.4	2.4
	ARSP							0.8	0.2	0.6	1	0.2	1.2
	SPCR							1.7	0.3	1.3	1	0.2	1.2
		72.4	14.5	100.0	37	7.4	100.0	128.7	25.7	100.0	83	16.6	100.0
MX-5-SS-1/6													
	ORHY	14.2	2.8	12.1	7	1.4	10.4						
	CHVI (s)	46.5	9.3	39.6	20	4.0	29.9	15.8	3.2	29.5	12	2.4	19.7
	CELA (d)	35.9	7.2	30.6	32	6.4	47.8	31.1	6.2	58.1	30	6.0	49.2
	ARSP	16.3	3.3	13.9	3	0.6	4.5						
	HIJA	1.3	0.3	1.1	1	0.2	1.5	6.6	1.3	12.3	19	3.8	31.2
	SPCR	3.0	0.6	2.6	3	0.6	4.5						
	SPGR	0.1	0.0	0.1	1	0.2	1.5						
		117.3	23.5	100.0	67	13.4	100.1	53.5	10.7	99.9	61	12.2	100.1
MX-5-SS-1/7													
	ORHY (s)	36.5	7.3	26.2	28	5.6	24.4	6.7	1.3	5.4	4	0.8	5.4
	CELA (d)	59.1	11.8	42.4	55	11.0	47.8	117.9	23.6	94.6	70	14.0	94.6
	CHVI	36.8	7.4	26.4	16	3.2	13.9						
	HIJA	6.3	1.3	4.5	15	3.0	13.0						
	SPGR	0.8	0.2	0.6	1	0.2	0.9						
		139.5	28.0	100.1	115	23.0	100.0	124.6	24.9	100.0	74	14.8	100.0

TABLE E-1 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-1/8													
	CHVI (d)	86.8	17.4	50.3	34	6.8	36.2	47.6	9.5	43.7	23	4.6	25.3
	CELA (s)	47.0	9.4	27.2	30	6.0	31.9	34.9	7.0	32.1	26	5.2	28.6
	ORHY	38.8	7.8	22.5	30	6.0	31.9	18.0	3.6	16.5	13	2.6	14.3
	HIJA							6.2	1.2	5.7	26	5.2	28.6
	SPGR							1.9	0.4	1.7	2	0.4	2.2
	SIHY							0.3	0.1	0.3	1	0.2	1.1
		172.6	34.6	100.0	94	18.8	100.0	108.9	21.8	100.0	91	18.2	100.1
MX-5-SS-1/9													
	HIJA	11.6	2.3	10.7	28	5.6	32.2	1.7	0.3	1.2	4	0.8	4.3
	CELA (d)	68.7	13.7	63.3	46	9.2	52.9	41.7	8.3	29.4	37	7.4	39.4
	CHVI (s)	25.2	5.0	23.[illegible]	10	2.0	11.5	75.1	15.0	52.9	35	7.0	37.2
	ORHY	3.0	0.6	2.8	2	0.4	2.3	22.1	4.4	15.6	17	3.4	18.1
	SPGR	0.1	0.0	0.1	1	0.2	1.2						
	SIHY							1.4	0.3	1.0	1	0.2	1.1
		108.6	21.6	100.1	87	17.4	100.1	142.0	28.3	100.1	94	18.8	100.1
MX-5-SS-1/10													
	CELA	10.1	2.0	8.9	17	3.4	18.1	4.1	0.8	3.2	7	1.4	8.6
	ORHY (s)	27.0	5.4	23.9	24	4.8	25.5	10.5	2.1	8.3	9	1.8	11.1
	CHVI (d)	74.8	15.0	66.1	52	10.4	55.3	100.9	20.2	79.3	60	12.0	74.1
	STCO	1.2	0.2	1.1	1	0.2	1.1						
	EPNE							10.7	2.1	8.4	4	0.8	4.9
	ASLE							1.0	0.2	0.8	1	0.2	1.2
		113.1	22.6	100.0	94	18.8	100.0	127.2	25.4	100.0	81	16.2	99.9

TABLE E-1 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-1/11													
	CHVI (d)	66.1	13.2	65.1	42	8.4	53.9	72.1	14.4	56.8	50	10.0	42.0
	ORHY (s)	18.1	3.6	17.8	18	3.6	23.1	28.6	5.7	22.5	34	6.8	28.6
	CELA	15.6	3.1	15.4	16	3.2	20.5	26.2	5.2	20.7	35	7.0	29.4
	SPCR	0.2	0.0	0.2	1	0.2	1.3						
	STCO	1.5	0.3	1.5	1	0.2	1.3						
		101.5	20.2	100.0	78	15.6	100.1	126.9	25.3	100.0	119	23.8	100.0
MX-5-SS-1/12													
	CHVI (d)	77.5	15.5	48.2	38	7.6	36.5	111.3	22.3	58.8	58	11.6	50.0
	ORHY (s)	42.4	8.5	26.4	33	6.6	31.7	40.7	8.1	21.5	32	6.4	27.6
	EPNE	10.0	2.0	6.2	3	0.6	2.9	15.8	3.2	8.4	4	0.8	3.5
	CELA	24.1	4.8	15.0	19	3.8	18.3	16.3	3.3	8.6	12	2.4	10.3
	HIJA	0.3	0.1	0.2	1	0.2	1.0	1.4	0.3	0.7	5	1.0	4.3
	STCO	6.4	1.3	4.0	10	2.0	9.6	2.7	0.5	1.4	2	0.4	1.7
	ASLE							1.0	0.2	0.5	3	0.6	2.6
		160.7	32.2	100.0	104	20.8	100.0	189.2	37.9	99.9	116	23.2	100.0
MX-5-SS-1/13													
	CHGR (d)	60.4	12.1	66.8	32	6.4	45.7	120.2	24.0	87.8	43	8.6	68.3
	CELA (s)	15.0	3.0	16.6	15	3.0	21.4	7.8	1.6	5.7	5	1.0	7.9
	ORHY	3.1	0.6	3.4	19	3.8	27.1	2.0	0.4	1.5	11	2.2	17.5
	GRSP	11.0	2.2	12.2	2	0.4	2.9	0.8	0.2	0.6	1	0.2	1.6
	ASLE	0.8	0.2	0.9	1	0.2	1.4	2.1	0.4	1.5	2	0.4	3.2
	SIJU	0.1	0.0	0.1	1	0.2	1.4						
	EPNE							4.0	0.8	2.9	1	0.2	1.6
		90.4	18.1	100.0	70	14.0	99.9	136.9	27.4	100.0	63	12.6	100.1

TABLE E-1 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-1/14	CHGR (d)	88.3	17.7	66.9	48	9.6	52.8	79.4	15.9	66.8	51	10.2	53.1
	ORHY	3.3	0.7	2.5	15	3.0	16.5	1.8	0.4	1.5	10	2.0	10.4
	BPNE	13.5	2.7	10.2	5	1.0	5.5	5.2	1.0	4.4	1	0.2	1.0
	CELA (s)	11.0	2.2	8.3	10	2.0	11.0	32.0	6.4	26.9	33	6.6	34.4
	ERMI	14.5	2.9	11.0	9	1.8	9.9						
	STCO	1.4	0.3	1.1	4	0.8	4.4						
	SPCR							0.4	0.1	0.3	1	0.2	1.0
		132.0	26.5	100.0	91	18.2	100.1	118.8	23.8	99.9	96	19.2	99.9
MX-5-SS-1/15	CHGR (d)	92.4	18.5	65.9	54	10.8	56.3	70.5	14.1	66.3	46	9.2	55.4
	CELA (s)	45.9	9.2	32.7	37	7.4	38.5	34.4	6.9	32.4	31	6.2	37.4
	ORHY	1.4	0.3	1.0	4	0.8	4.2	1.2	0.2	1.1	4	0.8	4.8
	SIJU	0.5	0.1	0.4	1	0.2	1.0	0.2	0.0	0.2	2	0.4	2.4
		140.2	28.1	100.0	96	19.2	100.0	106.3	21.2	100.0	83	16.6	100.0
MX-5-SS-1/16	CHGR (d)	135.5	27.1	92.3	57	11.4	79.2	142.0	28.4	94.6	73	14.6	79.4
	CELA (s)	10.3	2.1	7.0	7	1.4	9.7	6.9	1.4	4.6	8	1.6	8.7
	ORHY	1.0	0.2	0.7	8	1.6	11.1	1.0	0.2	0.7	9	1.8	9.8
	SPCR							0.1	0.0	0.1	1	0.2	1.1
	STCO							0.1	0.0	0.1	1	0.2	1.1
		146.8	29.4	100.0	72	14.4	100.0	150.1	30.0	100.1	92	18.4	100.1

TABLE E-1 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-1/17													
	CHVI (s)	72.1	14.4	47.7	26	5.2	21.3	24.8	5.0	16.4	12	2.4	4.1
	ORHY (d)	40.3	8.1	26.7	40	8.0	32.8	76.6	15.3	50.7	154	30.8	52.9
	STCO	22.5	4.5	14.9	22	4.4	18.0	7.8	1.6	5.2	9	1.8	3.1
	CELA	2.3	0.5	1.5	4	0.8	3.3	3.0	0.6	2.0	2	0.4	0.7
	BOGR	0.2	0.0	0.1	1	0.2	0.8	5.0	1.0	3.3	12	2.4	4.1
	ARLO	2.6	0.5	1.7	3	0.6	2.5	3.1	0.6	2.1	3	0.6	1.0
	HIJA	10.8	2.2	7.1	25	5.0	20.5	30.7	6.1	20.3	99	19.8	34.0
	SIHY	0.4	0.1	0.3	1	0.2	0.8						
		151.2	30.3	100.0	122	24.4	100.0	151.0	30.2	100.0	291	58.2	99.9
MX-5-SS-1/18													
	ORHY (s)	43.8	8.8	26.2	47	9.4	39.8	76.8	15.4	46.4	70	14.0	48.6
	CHVI (d)	110.4	22.1	66.1	54	10.8	45.8	62.9	12.6	38.0	34	6.8	23.6
	SIHY	0.7	0.1	0.4	1	0.2	0.9						
	CELA	8.8	1.8	5.3	13	2.6	11.0	25.4	5.1	15.4	39	7.8	27.1
	SPGR	0.8	0.2	0.5	1	0.2	0.9	0.4	0.1	0.2	1	0.2	0.7
	STCO	2.5	0.5	1.5	2	0.4	1.7						
		167.0	33.5	100.0	118	23.6	100.1	165.5	33.2	100.0	144	28.8	100.0
MX-5-SS-1/19													
	CHGR (d)	104.6	20.9	73.4	48	9.6	38.7	143.6	28.7	88.8	62	12.4	66.0
	CELA	1.2	0.2	0.8	1	0.2	0.8	10.3	2.1	6.4	11	2.2	11.7
	BOGR (s)	24.5	4.9	17.2	44	8.8	35.5						
	SIJU	6.8	1.4	4.8	7	1.4	5.7	1.5	0.3	0.9	4	0.8	4.3
	AR	1.4	0.3	1.0	3	0.6	2.4						
	ORHY	4.0	0.8	2.8	21	4.2	16.9	5.3	1.1	3.3	16	3.2	17.0
	GRSP							1.1	0.2	0.7	1	0.2	1.1
		142.5	28.5	100.0	124	24.8	100.0	161.8	32.4	100.1	94	18.8	100.0

TABLE E-1 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-1/20													
	CHVI (d)	84.4	16.9	49.3	44	8.8	35.5	141.2	28.2	89.1	91	18.2	89.2
	HIJA	9.1	1.8	5.3	29	5.8	23.4						
	GRSP	17.7	3.5	10.3	6	1.2	4.8						
	ARTR (s)	46.2	9.2	27.0	11	2.2	8.9						
	BOGR	4.7	0.9	2.8	26	5.2	21.0						
	ORHY	8.0	1.6	4.7	6	1.2	4.8	10.1	2.0	6.4	5	1.0	4.9
	SIHY	0.4	0.1	0.2	1	0.2	0.8	2.9	0.6	1.8	3	0.6	2.9
	CELA	0.6	0.1	0.4	1	0.2	0.8	2.3	0.5	1.5	2	0.4	2.0
	EPNE							2.0	0.4	1.3	1	0.2	1.0
		171.1	34.1	100.0	124	24.8	100.0	158.5	31.7	100.1	102	20.4	100.0
MX-5-SS-1/21													
	ARTR (s)	60.1	12.0	47.5	16	3.2	23.5						
	GRSP	14.6	2.9	11.6	6	1.2	8.8	3.6	0.7	2.1	1	0.2	1.0
	HIJA	5.3	1.1	4.2	14	2.8	20.6						
	CHVI	32.8	6.6	26.0	15	3.0	22.1						
	ORHY	2.3	0.5	1.8	6	1.2	8.8	2.9	0.6	1.7	3	0.6	3.0
	SPCR	1.6	0.3	1.3	2	0.4	2.9						
	CELA	9.2	1.8	7.3	8	1.6	11.8	38.0	7.6	22.5	38	7.6	38.4
	ARSP	0.4	0.1	0.3	1	0.2	1.5						
	CHGR (d)							124.7	24.9	73.7	57	11.4	57.6
		126.3	25.3	100.0	68	13.6	100.0	169.2	33.8	100.0	99	19.8	100.0

TABLE E-1 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-1/22													
	GRSP (d)	93.6	18.7	57.1	18	3.6	37.5	16.9	3.4	10.9	9	1.8	17.0
	CHVI (s)	20.4	4.1	12.5	6	1.2	12.5	72.0	14.4	46.5	26	5.2	49.1
	ARSP	25.2	5.0	15.4	14	2.8	29.2						
	ORHY							0.9	0.2	0.6	1	0.2	1.9
	SIJU	0.2	0.0	0.1	1	0.2	2.1						
	CELA	0.3	0.1	0.2	1	0.2	2.1	0.3	0.1	0.2	1	0.2	1.9
	CHGR	24.2	4.8	14.8	8	1.6	16.7						
	ARTR							64.3	12.9	41.5	13	2.6	24.5
	SIHY							0.6	0.1	0.4	3	0.6	5.7
		163.9	32.7	100.1	48	9.6	100.1	155.0	31.1	100.1	53	10.6	100.1
MX-5-SS-1/23													
	ARTR (d)	126.3	25.3	91.9	25	5.0	92.6	106.6	21.3	76.5	29	5.8	63.0
	CHVI (s)	11.2	2.2	8.2	2	0.4	7.4	32.2	6.4	23.1	16	3.2	34.8
	ASLE							0.5	0.1	0.4	1	0.2	2.2
		137.5	27.5	100.1	27	5.4	100.0	139.3	27.8	100.0	46	9.2	100.0

TABLE E-2

PINE VALLEY
TRANSECT RESULTS
CLUSTER 2

		Transect 1						Transect 2					
Sample Unit No.	Plant Species	Total Cover (dm)	Total Cover (%)	Rel. Cover (%)	No. of Plants	Density (#/100 dm)	Rel. Density (%)	Total Cover (dm)	Total Cover (%)	Rel. Cover (%)	No. of Plants	Density (#/100 dm)	Rel. Density (%)
MX-5-SS-2/1													
	CELA (d)	46.3	9.3	46.2	19	3.8	38.8	89.0	17.8	65.4	38	7.6	64.4
	ATCO (s)	45.3	9.1	45.2	22	4.4	44.9	33.4	6.7	24.5	11	2.2	18.6
	ORHY	8.6	1.7	8.6	8	1.6	16.3	13.7	2.7	10.1	10	2.0	17.0
		100.2	20.1	100.0	49	9.8	100.0	136.1	27.2	100.0	59	11.8	100.0
MX-5-SS-2/2													
	CELA (d)	71.2	14.2	96.9	46	9.2	93.9	No perennial vegetation found.					
	ATCO (s)	2.2	0.4	3.0	2	0.4	4.1						
	ORHY	0.1	0.0	0.1	1	0.2	2.0						
		73.5	14.6	100.0	49	9.8	100.0						
MX-5-SS-2/3													
	CELA (d)	88.3	17.7	92.9	53	10.6	93.0	26.2	5.2	28.6	24	4.8	32.4
	HIJA	1.1	0.2	1.2	3	0.6	5.3	4.6	0.9	5.0	23	4.6	31.1
	ATCO (s)	5.7	1.1	6.0	1	0.2	1.8	60.2	12.0	65.8	24	4.8	32.4
	ORHY							0.5	0.1	0.6	3	0.6	4.1
		95.1	19.0	100.1	57	11.4	100.1	91.5	18.2	100.0	74	14.8	100.0
MX-5-SS-2/4													
	ATCO (d)	46.7	9.3	40.0	16	3.2	11.3	39.6	7.9	33.3	13	2.6	18.3
	ORHY	12.0	2.4	10.3	7	1.4	4.9	20.4	4.1	17.2	17	3.4	23.9
	CELA (s)	19.8	4.0	16.9	20	4.0	14.1	32.3	6.5	27.2	25	5.0	35.2
	CHVI	3.3	0.7	2.8	3	0.6	2.1	13.4	2.7	11.3	3	0.6	4.2
	HIJA	35.1	7.0	30.0	96	19.2	67.6	2.9	0.6	2.4	8	1.6	11.3
	SPGR							6.9	1.4	5.8	4	0.8	5.6
	GRSP							3.3	0.7	2.8	1	0.2	1.4
		116.9	23.4	100.0	142	28.4	100.0	118.8	23.9	100.6	71	14.2	99.9

TABLE E-2 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-2/5													
	CHGR (d)	91.1	18.2	84.4	33	6.6	60.0	112.1	22.4	85.1	47	9.4	68.1
	CELA (s)	16.7	3.3	15.5	20	4.0	36.4	17.7	3.5	13.4	14	2.8	20.3
	ORHY	0.2	0.0	0.2	2	0.4	3.6	0.8	0.2	0.6	5	1.0	7.3
	HIJA							1.2	0.2	0.9	3	0.6	4.4
		108.0	21.5	100.1	55	11.0	100.0	131.8	26.3	100.0	69	13.8	100.1
MX-5-SS-2/6													
	CHGR (s)	41.7	8.3	60.9	14	2.8	24.1	8.2	1.6	11.8	2	0.4	2.9
	CELA (d)	21.1	4.2	30.8	19	3.8	32.8	55.2	11.0	79.5	34	6.8	50.0
	ORHY	3.9	0.8	5.7	21	4.2	36.2	5.2	1.0	7.5	28	5.6	41.2
	SPCR	1.8	0.4	2.6	4	0.8	6.9	0.7	0.1	1.0	3	0.6	4.4
	SIJU							0.1	0.0	0.1	1	0.2	1.5
		68.5	13.7	100.0	58	11.6	100.0	69.4	13.7	99.9	68	13.6	100.0
MX-5-SS-2/7													
	CHGR (d)	38.6	7.7	43.4	20	4.0	26.7	90.1	18.0	84.1	40	8.0	59.7
	CELA (s)	50.1	10.0	56.3	52	10.4	69.3	14.6	2.9	13.6	12	2.4	17.9
	ORHY	0.3	0.1	0.3	3	0.6	4.0	1.4	0.3	1.3	10	2.0	14.9
	STCO							0.3	0.1	0.3	1	0.2	1.5
	SPCR							0.5	0.1	0.5	1	0.2	1.5
	HIJA							0.3	0.1	0.3	3	0.6	4.5
		89.0	17.8	100.0	75	15.0	100.0	107.2	21.5	100.1	67	13.4	100.0

TABLE E-2 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover. (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover. (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-2/8													
	CELA	5.5	1.1	4.7	7	1.4	9.2	32.3	6.5	17.3	31	6.2	21.1
	SPCO	0.1	0.0	0.1	1	0.2	1.3	3.2	0.6	1.7	1	0.2	0.7
	ORHY (d)	52.9	10.6	45.2	33	6.6	43.4	108.5	21.7	58.1	92	18.4	62.6
	SPGR	3.0	0.6	2.6	1	0.2	1.3						
	CHVI (s)	55.6	11.1	47.5	34	6.8	44.7	34.7	6.9	18.6	12	2.4	8.2
	STCO							5.4	1.1	2.9	2	0.4	1.4
	HIJA							2.7	0.5	1.4	9	1.8	6.1
		117.1	23.4	100.1	76	15.2	99.9	186.8	37.3	100.0	147	29.4	100.1
MX-5-SS-2/9													
	CHVI (d)	82.5	16.5	65.0	36	7.2	54.6	6.0	1.2	9.1	41	8.2	27.9
	CELA	17.9	3.6	14.1	13	2.6	19.7	6.1	1.2	9.2	8	1.6	5.4
	ORHY (s)	26.6	5.3	20.9	17	3.4	25.8	33.8	6.8	51.2	44	8.8	29.9
	HIJA							14.0	2.8	21.2	48	9.6	32.7
	STCO							6.1	1.2	9.2	6	1.2	4.1
		127.0	25.4	100.0	66	13.2	100.1	66.0	13.2	99.9	147	29.4	100.0
MX-5-SS-2/10													
	ORHY (d)	93.2	18.6	94.9	55	11.0	94.8	69.1	13.8	64.2	64	12.8	84.2
	STCO	1.6	0.3	1.6	1	0.2	1.7	3.2	0.6	3.0	2	0.4	2.6
	CHVI (s)	3.4	0.7	3.5	2	0.4	3.5	35.4	7.1	32.9	10	2.0	13.2
		98.2	19.6	100.0	58	11.4	100.0	107.7	21.5	100.1	76	15.2	100.0

TABLE E-2 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-2/11													
	CHGR (d)	86.4	17.3	76.5	42	8.4	62.7	50.0	10.0	58.1	24	4.8	28.9
	CELA (s)	17.6	3.5	15.6	13	2.6	19.4	23.8	4.8	27.7	25	5.0	30.1
	ORHY	1.3	0.3	1.2	7	1.4	10.5	2.7	0.5	3.1	16	3.2	19.3
	EPNE	6.6	1.3	5.9	2	0.4	3.0	4.1	0.8	4.8	1	0.2	1.2
	STCO	0.6	0.1	0.5	2	0.4	3.0	4.6	0.9	5.4	13	2.6	15.7
	AS	0.4	0.1	0.4	1	0.2	1.5	0.2	0.0	0.2	1	0.2	1.2
	MACA							0.7	0.1	0.8	3	0.6	3.6
		112.9	22.6	100.1	67	13.4	100.1	86.1	17.1	100.1	83	16.6	100.0
MX-5-SS-2/12													
	CHVI (d)	88.8	17.8	58.8	39	7.8	53.4	90.1	18.0	63.4	39	7.8	37.5
	CELA	11.5	2.3	7.6	13	2.6	17.8	11.7	2.3	8.2	19	3.8	18.3
	ORHY (s)	22.6	4.5	15.0	18	3.6	24.7	39.1	7.8	27.5	44	8.8	42.3
	GRSP	28.1	5.6	18.6	3	0.6	4.1						
	STCO							0.7	0.1	0.5	1	0.2	1.0
	SPGR							0.6	0.1	0.4	1	0.2	1.0
		151.0	30.2	100.0	73	14.6	100.0	142.2	28.3	100.0	104	20.8	100.1
MX-5-SS-2/13													
	CHGR (d)	110.1	22.0	88.8	57	11.4	66.3	71.3	14.3	88.6	37	7.4	62.7
	ORHY	3.1	0.6	2.5	13	2.6	15.1	2.0	0.4	2.5	12	2.4	20.3
	CELA (s)	10.1	2.0	8.2	12	2.4	14.0	5.9	1.2	7.3	6	1.2	10.2
	MACA	0.4	0.1	0.3	2	0.4	2.3						
	SPCR	0.3	0.1	0.2	2	0.4	2.3	0.3	0.1	0.4	1	0.2	1.7
	STCO							1.0	0.2	1.2	3	0.6	5.1
		124.0	24.8	100.0	86	17.2	100.0	80.5	16.2	100.0	59	11.8	100.0

TABLE E-2 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-2/14													
	CHGR (d)	105.7	21.1	87.8	71	14.2	76.3	51.8	10.4	64.2	26	5.2	54.2
	ORHY	5.5	1.1	4.6	15	3.0	16.1	1.5	0.3	1.9	7	1.4	14.6
	CELA	3.8	0.8	3.2	4	0.8	4.3	2.1	0.4	2.6	4	0.8	8.3
	EPNE (s)	5.2	1.0	4.3	2	0.4	2.2	14.6	2.9	18.1	3	0.6	6.3
	HIJA	0.2	0.0	0.2	1	0.2	1.1						
	STCO							1.3	0.3	1.6	6	1.2	12.5
	ATCA							9.4	1.9	11.7	2	0.4	4.2
		120.4	24.0	100.1	93	18.6	100.0	80.7	16.2	100.1	48	9.6	100.1
MX-5-SS-2/15													
	CHGR (d)	93.8	18.8	80.5	52	10.4	60.5	101.0	20.2	93.1	60	12.0	71.4
	ORHY	3.4	0.7	2.9	19	3.8	22.1	4.8	1.0	4.4	19	3.8	22.6
	CELA (s)	9.6	1.9	8.2	10	2.0	11.6	2.5	0.5	2.3	4	0.8	4.8
	SPCR	0.3	0.1	0.3	1	0.2	1.2						
	EPNE	8.5	1.7	7.3	2	0.4	2.3						
	LEPU	0.9	0.2	0.8	1	0.2	1.2						
	SIJU	0.1	0.0	0.1	1	0.2	1.2	0.2	0.0	0.2	1	0.2	1.2
		116.6	23.4	100.1	86	17.2	100.1	108.5	21.7	100.0	84	16.8	100.0
MX-5-SS-2/16													
	ORHY (s)	22.4	4.5	31.8	50	10.0	56.2	11.2	2.2	20.1	34	6.8	54.0
	CELA (d)	30.7	6.1	43.6	27	5.4	30.3	20.8	4.2	37.3	14	2.8	22.2
	ATCO	12.0	2.4	17.1	4	0.8	4.5	21.2	4.2	38.1	8	1.6	12.7
	SPCR	4.3	0.9	6.1	6	1.2	6.7	1.3	0.3	2.3	4	0.8	6.4
	SIJU	1.0	0.2	1.4	2	0.4	2.2	0.2	0.0	0.4	1	0.2	1.6
	SPCO							1.0	0.2	1.8	2	0.4	3.2
		70.4	14.1	100.0	89	17.8	99.9	55.7	11.1	100.0	63	12.6	100.1

TABLE E-2 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-2/17													
	ATCO (d)	30.3	6.1	44.0	9	1.8	10.1	15.9	3.2	23.7	10	2.0	11.8
	ORHY	6.8	1.4	9.9	33	6.6	37.1	6.9	1.4	10.3	29	5.8	34.1
	CELA	8.9	1.8	12.9	9	1.8	10.1	15.5	3.1	23.1	12	2.4	14.1
	HIJA	4.8	1.0	7.0	16	3.2	18.0	5.5	1.1	8.2	11	2.2	12.9
	GUSA	2.4	0.5	3.5	2	0.4	2.3	2.5	0.5	3.7	3	0.6	3.5
	AR	0.4	0.1	0.6	3	0.6	3.4						
	SPGR	1.2	0.2	1.7	1	0.2	1.1	0.5	0.1	0.7	1	0.2	1.2
	SPCR	1.7	0.3	2.5	7	1.4	7.9	2.8	0.6	4.2	9	1.8	10.6
	CHGR (s)	12.1	2.4	17.6	8	1.6	9.0	14.3	2.9	21.3	8	1.6	9.4
	OP	0.3	0.1	0.4	1	0.2	1.1						
	STCO							0.2	0.0	0.3	1	0.2	1.2
	TEGL							3.1	0.6	4.6	1	0.2	1.2
		68.9	13.9	100.1	89	17.8	100.1	67.2	13.5	100.1	85	17.0	100.0
MX-5-SS-2/18													
	ORHY	3.5	0.7	2.8	15	3.0	16.7	7.6	1.5	8.2	31	6.2	35.2
	CELA (s)	61.1	12.2	48.4	47	9.4	52.2	28.1	5.6	30.2	21	4.2	23.9
	SIJU	0.4	0.1	0.3	2	0.4	2.2	0.7	0.1	0.8	3	0.6	3.4
	MACA	0.5	0.1	0.4	1	0.2	1.1						
	CHGR	15.3	3.1	12.1	5	1.0	5.6						
	ATCO (d)	43.9	8.8	34.8	16	3.2	17.8	49.0	9.8	52.6	18	3.6	20.5
	SPCR	0.5	0.1	0.4	3	0.6	3.3	1.1	0.2	1.2	2	0.4	2.3
	ARSP	1.0	0.2	0.8	1	0.2	1.1						
	HIJA							5.4	1.1	5.8	10	2.0	11.4
	STCO							0.2	0.0	0.2	1	0.2	1.1
	AR							1.0	0.2	1.1	2	0.4	2.3
		126.2	25.3	100.0	90	18.0	100.0	93.1	18.5	100.1	88	17.6	100.1

TABLE E-2 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-2/19													
	CELA (d)	45.6	9.1	43.1	35	7.0	50.7	57.3	11.5	57.3	47	9.4	59.5
	ATCO (s)	53.0	10.6	50.0	19	3.8	27.5	9.9	2.0	9.9	6	1.2	7.6
	MACA	0.2	0.0	0.2	1	0.0	1.4						
	ORHY	3.1	0.6	2.9	13	2.6	18.8	2.1	0.4	2.1	11	2.2	13.9
	CHGR	4.0	0.8	3.8	1	0.0	1.4	29.3	5.9	29.3	13	2.6	16.5
	ASLE							1.2	0.2	1.2	1	0.2	1.3
	AR							0.2	0.0	0.2	1	0.2	1.3
		105.9	21.1	100.0	69	13.4	99.8	100.0	20.0	100.0	79	15.8	100.1
MX-5-SS-2/20													
	CELA (s)	24.2	4.8	29.4	16	3.2	25.8	30.0	6.0	34.4	21	4.2	23.3
	ORHY	5.8	1.2	7.1	18	3.6	29.0	4.6	0.9	5.3	21	4.2	23.3
	ATCO (d)	46.0	9.2	56.0	16	3.2	25.8	25.9	5.2	29.7	11	2.2	12.2
	SIJU	2.0	0.4	2.4	4	0.8	6.5	1.1	0.2	1.3	4	0.8	4.4
	HIJA	3.3	0.7	4.0	6	1.2	9.7	18.3	3.7	21.0	26	5.2	28.9
	ASLE	0.9	0.2	1.1	2	0.4	3.2						
	AR							2.5	0.5	2.9	6	1.2	6.7
	GRSP							4.7	0.9	5.4	1	0.2	1.1
		82.2	16.5	100.0	62	12.4	100.0	87.1	17.4	100.0	90	18.0	99.9
MX-5-SS-2/21													
	CHGR (d)	44.3	8.9	48.0	15	3.0	23.1	70.3	14.1	62.0	[illegible]	3.8	35.9
	CELA (s)	43.2	8.6	46.8	35	7.0	53.9	41.1	8.2	36.2	26	5.2	49.1
	HIJA	4.2	0.8	4.6	11	2.2	16.9						
	ORHY	0.6	0.1	0.7	4	0.8	6.2	2.0	0.4	1.8	8	1.6	15.1
		92.3	18.4	100.1	65	13.0	100.1	113.4	22.7	100.0	53	10.6	100.1

TABLE E-2 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-2/22													
	CELA (s)	31.2	6.2	34.9	16	3.2	25.4	41.8	8.4	46.0	30	6.0	46.2
	ASLE	2.9	0.6	3.2	3	0.6	4.8						
	ATCO (d)	43.8	8.8	48.9	18	3.6	28.6	44.5	8.9	49.0	18	3.6	27.7
	ORHY	0.4	0.1	0.4	3	0.6	4.8	0.8	0.2	0.9	5	1.0	7.7
	AR	0.9	0.2	1.0	4	0.8	6.3	0.1	0.0	0.1	1	0.2	1.5
	HIJA	6.7	1.3	7.5	14	2.8	22.2	3.6	0.7	4.0	11	2.2	16.9
	MACA	0.9	0.2	1.0	3	0.6	4.8						
	TESP	1.2	0.2	1.3	1	0.2	1.6						
	TEGL	1.5	0.3	1.7	1	0.2	1.6						
		89.5	17.9	99.9	63	12.6	100.1	90.8	18.2	100.0	65	13.0	100.0
MX-5-SS-2/23													
	ATCO	26.0	5.2	28.2	10	2.0	15.4	11.0	2.2	11.6	6	1.2	12.3
	CELA (s)	37.4	7.5	40.5	26	5.2	40.0	11.3	2.3	11.9	9	1.8	18.4
	ORHY	3.0	0.6	3.3	13	2.6	20.0	1.2	0.2	1.3	5	1.0	10.2
	SPGR	0.5	0.1	0.5	1	0.2	1.5						
	CHGR (d)	25.4	5.1	27.5	15	3.0	23.1	68.7	13.7	72.3	28	5.6	57.1
	EPNE							2.8	0.6	3.0	1	0.2	2.0
		92.3	18.5	100.0	65	13.0	100.0	95.0	19.0	100.1	49	9.8	100.0

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TABLE E-3

PINE VALLEY
TRANSECT RESULTS
CLUSTER 3

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-3/1													
	ARSP	1.4	0.3	1.3	1	0.2	1.5						
	ARCA	1.1	0.2	1.0	1	0.2	1.5						
	CELA (s)	22.8	4.6	21.4	12	2.4	18.2	22.9	4.6	51.2	18	3.6	48.6
	CHGR (d)	78.2	15.6	73.4	33	6.6	50.0	6.1	1.2	13.6	2	0.4	5.4
	HIJA	0.5	0.1	0.5	5	1.0	7.6	0.2	0.0	0.4	1	0.2	2.7
	ORHY	2.5	0.5	2.3	14	2.8	21.2	2.4	0.5	5.4	7	1.4	18.9
	ATCA	1.1	0.2	1.0	1	0.2	1.5	13.1	2.6	29.3	9	1.8	24.3
		106.5	21.3	99.9	66	13.2	100.0	44.7	8.9	99.9	37	7.4	99.9
MX-5-SS-3/2													
	ATCO (s)	7.9	1.6	20.5	3	0.6	15.0	41.5	8.3	42.1	12	2.4	24.0
	KOAM (d)	23.9	4.8	61.9	16	3.2	80.0	57.1	11.4	57.9	38	7.6	76.0
	SAVE	6.8	1.4	17.6	1	0.2	5.0						
		38.6	7.8	100.0	20	4.0	100.0	98.6	19.7	100.0	50	10.0	100.0
MX-5-SS-3/3													
	ARSP	4.2	0.8	5.8	3	0.6	5.3						
	ATCO	1.6	0.3	2.2	1	0.2	1.8	0.8	0.2	0.5	1	0.2	1.2
	CELA (s)	13.0	2.6	18.1	8	1.6	14.0	3.6	0.7	2.4	3	0.6	3.6
	ORHY (d)	53.2	10.6	73.9	45	9.0	79.0	143.1	28.6	95.5	78	15.6	92.9
	SIHY							0.6	0.1	0.4	1	0.2	1.2
	SPCR							1.8	0.4	1.2	1	0.2	1.2
		72.0	14.3	100.0	57	11.4	100.1	149.9	30.0	100.0	84	16.8	100.1

TABLE E-3 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-3/4													
	ATCO	10.2	2.0	15.3	7	1.4	7.9	11.9	2.4	12.7	10	2.0	9.3
	CELA (d)	29.6	5.9	44.3	22	4.4	24.7	38.1	7.6	40.7	28	5.6	26.2
	GUSA (s)	20.8	4.2	31.1	32	6.4	36.0	39.8	8.0	42.5	47	9.4	43.9
	SPCR	3.5	0.7	5.2	23	4.6	25.8	3.2	0.6	3.4	20	4.0	18.7
	SPGR	2.4	0.5	3.6	3	0.6	3.4						
	HIJA	0.1	0.0	0.2	1	0.3	1.1						
	SIJU	0.2	0.0	0.3	1	0.2	1.1						
	ORHY							0.1	0.0	0.1	1	0.2	0.9
	ERCO							0.5	0.1	0.5	1	0.2	0.9
		66.8	13.3	100.0	89	17.8	100.0	93.6	18.7	99.9	107	21.4	99.9
MX-5-SS-3/5													
	ATCO	9.1	1.8	6.9	2	0.4	3.8						
	KOAM (s)	55.3	11.1	42.2	36	7.2	67.9	5.9	1.2	18.2	6	1.2	60.0
	LYAN (d)	65.9	13.2	50.3	13	2.6	24.5	26.5	5.3	81.7	4	0.8	40.0
	SIHY	0.7	0.1	0.5	2	0.4	3.8						
		131.0	26.2	99.9	53	10.6	100.0	32.4	6.5	99.9	10	2.0	100.0
MX-5-SS-3/6													
	ATCO (s)	12.8	2.6	14.6	8	1.6	7.4	21.7	4.3	32.8	11	2.2	11.6
	CELA	22.4	4.5	25.6	24	4.8	22.2	4.7	0.9	7.1	6	1.2	6.3
	EPNE	14.4	2.9	16.4	1	0.2	0.9						
	BOGR	1.7	0.3	1.9	11	2.2	10.2	1.5	0.3	2.3	13	2.6	13.7
	CHVI	6.2	1.2	7.1	2	0.4	1.9						
	GUSA (d)	25.9	5.2	29.6	29	5.8	26.9	35.3	7.1	53.3	46	9.2	48.4
	HIJA	3.9	0.8	4.5	31	6.2	28.7	0.3	0.1	0.5	3	0.6	3.2
	SPCR	0.3	0.1	0.3	2	0.4	1.9	1.9	0.4	2.9	11	2.2	11.6
	AR							0.8	0.2	1.2	5	1.0	5.3
		87.6	17.6	100.0	108	21.6	100.1	66.2	13.3	100.1	95	19.0	100.1

TABLE B-3 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-3/7													
	ARSP							1.4	0.3	1.4	1	0.2	1.4
	ATCO (d)	20.5	4.1	47.6	10	2.0	17.5	31.5	6.3	32.0	11	2.2	15.3
	CELA	10.2	2.0	23.7	10	2.0	17.5	15.7	3.1	16.0	10	2.0	13.9
	ORHY	2.9	0.6	6.7	12	2.4	21.1	0.7	0.1	0.7	2	0.4	2.8
	GUSA (s)	4.6	0.9	10.7	6	1.2	10.5	29.2	5.8	29.7	32	6.4	44.4
	HIJA	0.9	0.2	2.1	9	1.8	15.8	1.2	0.2	1.2	10	2.0	13.9
	MACA	0.5	0.1	1.2	1	0.2	1.8						
	SIJU	0.3	0.1	0.7	3	0.6	5.3						
	SPCR	3.2	0.6	7.4	6	1.2	10.5	1.2	0.2	1.2	3	0.6	4.2
	EPNE							7.0	1.4	7.1	1	0.2	1.4
	BR							10.5	2.1	10.7	2	0.4	2.8
		43.1	8.6	100.1	57	11.4	100.0	98.4	19.5	100.0	72	14.4	100.1
MX-5-SS-3/8													
	ATCO	11.4	2.3	11.7	5	1.0	5.3	42.9	8.6	31.2	16	3.2	14.4
	KOAM (d)	63.1	12.6	64.7	78	15.6	82.1						
	SAVE	12.3	2.5	12.6	2	0.4	2.1						
	AS	1.0	0.2	1.0	1	0.2	1.1						
	HIJA (s)	0.3	0.1	0.3	2	0.4	2.1	47.1	9.4	34.3	66	13.2	59.5
	ORHY	9.1	1.8	9.3	6	1.2	6.3	20.9	4.2	15.2	17	3.4	15.3
	SIHY	0.3	0.1	0.3	1	0.2	1.1						
	CHGR							26.5	5.3	19.3	12	2.4	10.8
		97.5	19.6	99.9	95	19.0	100.1	137.4	27.5	100.0	111	22.2	100.0
MX-5-SS-3/9													
	ARSP	8.8	1.8	12.5	8	1.6	12.7	(No Transect Made)					
	CELA (s)	17.8	3.6	25.2	13	2.6	20.6						
	ATCO (d)	36.9	7.4	52.3	23	4.6	36.5						
	SPCR	7.0	1.4	9.9	19	3.8	30.2						
		70.5	14.2	99.9	63	12.6	100.0						

TABLE E-3 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-3/10													
	ATCO							3.9	0.8	4.9	1	0.2	1.9
	KOAM (d)							39.6	7.9	50.1	24	4.8	45.3
	AS	Playa; no vegetation present.						1.3	0.3	1.6	1	0.2	1.9
	HIJA (s)							31.6	6.3	40.0	26	5.2	49.1
	ORHY							2.7	0.5	3.4	1	0.2	1.9
								79.1	15.8	100.0	53	10.6	100.1
MX-5-SS-3/11													
	ATCO	2.6	0.5	4.4	1	0.2	2.8	19.0	3.8	34.7	8	1.6	10.3
	CELA (d)	14.8	3.0	25.1	9	1.8	25.0	25.8	5.2	47.2	16	3.2	20.5
	CHGR (s)	39.4	7.9	66.9	17	3.4	47.2						
	MACA	0.8	0.2	0.3	2	0.4	5.6	2.1	0.4	3.8	5	1.0	6.4
	ORHY	1.9	0.4	3.2	7	1.4	19.4	3.2	0.6	5.9	14	2.8	17.9
	HIJA							3.8	0.8	6.9	33	6.6	42.3
	ATSP							0.6	0.1	1.1	1	0.2	1.3
	Unk. mustard							0.2	0.1	0.4	1	0.2	1.3
		59.5	12.0	99.9	36	7.2	100.0	54.7	11.0	100.0	78	15.6	100.0

TABLE E-3 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-3/12													
	ARSP	7.0	1.4	7.4	3	0.6	3.4	2.8	0.6	3.1	3	0.6	4.2
	CELA (s)	22.4	4.5	23.7	19	3.8	21.4	21.7	4.3	24.1	22	4.4	31.0
	SPCR	3.9	0.8	4.1	19	3.8	21.4	2.0	0.4	2.2	6	1.2	8.5
	GUSA	18.5	3.7	19.6	25	5.0	28.1	14.2	2.8	15.8	14	2.8	19.7
	ATCO (d)	42.6	8.5	45.1	22	4.4	24.7	12.1	2.4	13.4	8	1.6	11.3
	ORHY	0.1	0.0	0.1	1	0.2	1.1						
	EPNE							8.0	1.6	8.9	1	0.2	1.4
	HIJA							0.6	0.1	0.7	6	1.2	8.5
	BOGR							0.8	0.2	0.9	3	0.6	4.2
	CHNA							24.9	5.0	27.7	3	0.6	4.2
	BR							2.9	0.6	3.2	5	1.0	7.0
		94.5	18.9	100.0	89	17.8	100.1	90.0	18.0	100.0	71	14.2	100.0
MX-5-SS-3/13													
	HIJA (d)	116.0	23.2	74.9	218	43.6	85.8	6.9	1.4	5.8	5	1.0	4.2
	ATCO	9.4	1.9	6.1	2	0.4	0.8						
	KOAM (s)	24.0	4.8	15.5	28	5.6	11.0	92.7	18.5	78.5	102	20.4	85.7
	AS	0.8	0.2	0.5	2	0.4	0.8	1.7	0.3	1.4	1	0.2	0.8
	ORHY	4.7	0.9	3.0	4	0.8	1.6	16.8	3.4	14.2	11	2.2	9.2
		154.9	31.0	100.0	254	50.8	100.0	118.1	23.6	99.9	119	23.8	99.9
MX-5-SS-3/14													
	KOAM (d)	97.9	19.6	69.2	75	15.0	86.2	34.2	6.8	70.1	29	5.8	76.3
	ATCO (s)	43.5	8.7	30.8	12	2.4	13.8	14.6	2.9	29.9	9	1.8	23.7
		141.4	28.3	100.0	87	17.4	100.0	48.8	10.0	100.0	38	7.6	100.0

TABLE E-3 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-3/15													
	HIJA (s)	7.2	1.4	34.8	64	12.8	73.6	3.5	0.7	8.3	32	6.4	65.3
	ORHY	3.4	0.7	16.4	14	2.8	16.1	2.0	0.4	4.7	4	0.8	8.2
	AS	4.0	0.8	19.3	4	0.8	4.6	2.3	0.5	5.5	2	0.4	4.1
	ARSP (d)	3.5	0.7	16.9	2	0.4	2.3	19.5	3.9	46.2	6	1.2	12.2
	AR	0.4	0.1	1.9	1	0.2	1.1						
	ATCO	0.1	0.0	0.5	1	0.2	1.1	10.8	2.2	25.6	4	0.8	8.2
	CELA	2.1	0.4	10.1	1	0.2	1.1						
	TESP							4.1	0.8	9.7	1	0.2	2.0
		20.7	4.1	99.9	87	17.4	99.9	42.2	8.5	100.0	49	9.8	100.0
MX-5-SS-3/16													
	CELA	11.7	2.3	11.7	13	2.6	15.5	22.4	4.5	20.2	21	4.2	13.0
	ATCO (s)	29.4	5.9	29.4	20	4.0	23.8	22.6	4.5	20.3	12	2.4	7.5
	SPCO (d)	45.4	9.1	45.5	44	8.8	52.4	14.9	3.0	13.4	14	2.8	8.7
	ARSP	6.6	1.3	6.6	3	0.6	3.6	3.0	0.6	2.7	2	0.4	1.2
	ORHY	5.8	1.2	5.8	2	0.4	2.4	7.7	1.5	6.9	4	0.8	2.5
	SP	0.3	0.1	0.3	1	0.2	1.2						
	EPNE	0.7	0.1	0.7	1	0.2	1.2	2.5	0.5	2.3	1	0.2	0.6
	HIJA							31.6	6.3	28.4	100	20.0	62.1
	BOGR							6.4	1.3	5.8	7	1.4	4.3
		99.9	20.0	100.0	84	16.8	100.1	111.1	22.2	100.0	161	32.2	99.9
MX-5-SS-3/17													
	KOAM (d)	24.5	4.9	80.3	17	3.4	89.5	31.3	6.3	90.3	27	5.4	84.4
	ATCA	2.5	0.5	8.2	1	0.2	5.3						
	ATCO (s)	3.5	0.7	11.5	1	0.2	5.3	1.5	0.3	4.3	1	0.2	3.1
	HIJA							0.4	0.1	1.2	3	0.6	9.4
	SAVE							1.5	0.3	4.3	1	0.2	3.1
		30.5	6.1	100.0	19	3.8	100.1	34.7	7.0	100.1	32	6.4	100.0

TABLE E-3 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-3/18													
	GUSA	1.0	0.2	1.1	3	0.6	4.1						
	BOGR	10.8	2.2	11.6	11	2.2	15.1	10.3	2.1	9.5	6	1.2	7.1
	EPNE	18.0	3.6	19.4	4	0.8	5.5	0.7	0.1	0.6	1	0.2	1.2
	CELA	7.0	1.4	7.5	10	2.0	13.7	8.6	1.7	8.0	11	2.2	13.1
	ATCO (s)	12.0	2.4	12.9	5	1.0	6.8	32.6	6.5	30.2	14	2.8	16.7
	ORHY	1.7	0.3	1.8	3	0.6	4.1	7.2	1.4	6.7	4	0.8	4.8
	ARSP	6.6	1.3	7.1	3	0.6	4.1	0.8	0.2	0.7	1	0.2	1.2
	SPCR (d)	22.2	4.4	23.9	18	3.6	24.7	38.0	7.6	35.2	24	4.8	28.6
	KOAM	2.2	0.4	2.4	3	0.6	4.1						
	HIJA	8.9	1.8	9.6	11	2.2	15.1	9.7	1.9	9.0	23	4.6	27.4
	SIHY	2.5	0.5	2.7	2	0.4	2.7						
		92.9	18.5	100.0	73	14.6	100.0	107.5	21.5	99.9	84	16.8	100.1
MX-5-SS-3/19													
	HIJA (s)	32.3	6.5	28.2	64	12.8	56.6	35.0	7.0	38.3	86	17.2	68.3
	ATCO	2.7	0.5	2.4	3	0.6	2.7	0.7	0.1	0.8	1	0.2	0.8
	SPCO (d)	65.1	13.0	56.9	32	6.4	28.3	45.4	9.1	49.7	32	6.4	25.4
	CELA	1.9	0.4	1.7	3	0.6	2.7						
	EPNE	2.4	0.5	2.1	1	0.2	0.9						
	ORHY	10.1	2.0	8.8	10	2.0	8.8	8.7	1.7	9.5	6	1.2	4.8
	OP							1.5	0.3	1.6	1	0.2	0.8
		114.5	22.4	100.1	113	22.6	100.0	91.3	18.2	99.9	126	25.2	100.1
MX-5-SS-3/20													
	CHGR (s)	7.6	1.5	7.3	1	0.2	0.4	24.0	4.8	24.1	10	2.0	4.9
	HIJA (d)	93.4	18.7	89.9	239	47.8	98.0	50.3	10.1	50.6	162	32.4	78.6
	ORHY	2.9	0.6	2.8	4	0.8	1.6	8.5	1.7	8.5	13	2.6	6.3
	AR							13.9	2.8	14.0	16	3.2	7.8
	AS							2.8	0.6	2.8	5	1.0	2.4
		103.9	21.1	100.0	244	48.8	100.0	99.5	19.4	100.0	206	41.2	100.0

TABLE E-3 (Cont.)

		Transect 1						Transect 2					
Sample Unit No.	Plant Species	Total Cover (dm)	Total Cover (%)	Rel. Cover (%)	No. of Plants	Density (#/100 dm)	Rel. Density (%)	Total Cover (dm)	Total Cover (%)	Rel. Cover (%)	No. of Plants	Density (#/100 dm)	Rel. Density (%)
MX-5-SS-3/21													
	ORHY (s)	29.1	5.8	91.8	27	5.4	93.1	11.1	2.2	16.6	24	4.8	53.3
	CHGR (d)	2.6	0.5	8.2	2	0.4	6.9	47.5	9.5	71.1	12	2.4	26.7
	OE							3.7	0.7	5.5	5	1.0	11.1
	AB							0.5	0.1	0.7	1	0.2	2.2
	AS							0.3	0.1	0.4	1	0.2	2.2
	AR							3.7	0.7	5.5	2	0.4	4.4
		31.7	6.3	100.0	29	5.8	100.0	66.8	13.3	99.8	45	9.0	99.9
MX-5-SS-3/22													
	CHGR (d)	40.1	8.0	96.2	17	3.4	73.9	39.0	7.8	76.6	21	4.2	28.0
	ORHY (s)	0.8	0.2	1.9	3	0.6	13.0	3.5	0.7	6.9	15	3.0	20.0
	OE	0.6	0.1	1.4	2	0.4	8.7						
	STCO	0.2	0.0	0.5	1	0.2	4.3						
	HIJA							4.1	0.8	8.1	30	6.0	40.0
	CELA							2.5	0.5	4.9	3	0.6	4.0
	LEER							0.6	0.1	1.2	4	0.8	5.3
	ASLE							1.1	0.2	2.2	1	0.2	1.3
	Unk. grass							0.1	0.0	0.2	1	0.2	1.3
		41.7	8.3	100.0	23	4.6	99.9	50.9	10.1	100.1	75	15.0	99.9
MX-5-SS-3/23													
	HIJA (s)	8.6	1.7	54.4	109	21.8	91.6	2.3	0.5	4.1	22	4.4	47.8
	ORHY	0.9	0.2	5.7	5	1.0	4.2	0.4	0.1	0.7	1	0.2	2.2
	CHGR (d)	4.2	0.8	26.6	1	0.2	0.8	52.5	10.5	92.6	17	3.4	37.0
	AR	1.1	0.2	7.0	2	0.4	1.7						
	OE	0.5	0.1	3.2	1	0.2	0.8	0.4	0.1	0.7	1	0.2	2.2
	STCO	0.5	0.1	3.2	1	0.2	0.8	0.8	0.2	1.4	4	0.8	8.7
	ATCA							0.3	0.1	0.5	1	0.2	2.2
		15.8	3.1	100.1	119	23.8	99.9	56.7	11.5	100.0	46	9.2	100.1

TABLE E-4

PINE VALLEY
TRANSECT RESULTS
CLUSTER 4

Sample Unit No.	Plant Species		Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover. (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover. (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-4/1														
	ARNO		22.2	4.4	16.4	13	2.6	11.2	32.3	6.5	28.2	14	2.8	13.6
	CHVI	(d)	49.7	9.9	36.8	35	7.0	30.2	16.5	3.3	14.4	15	3.0	14.6
	CELA		4.1	0.8	3.0	6	1.2	5.2	9.3	1.9	8.1	11	2.2	10.7
	ORHY	(s)	33.2	6.6	24.6	26	5.2	22.4	27.8	5.6	24.3	24	4.8	23.3
	HIJA		2.8	0.6	2.1	8	1.6	6.9	7.9	1.6	6.9	19	3.8	18.5
	GUSA		10.1	2.0	7.5	12	2.4	10.3	1.6	0.3	1.4	4	0.8	3.9
	AR		9.2	1.8	6.8	9	1.8	7.8						
	SIHY		1.6	0.3	1.2	5	1.0	4.3	5.1	1.0	4.5	6	1.2	5.8
	GRSP		2.1	0.4	1.6	2	0.4	1.7						
	STCO								2.7	0.5	2.4	3	0.6	2.9
	BOGR								2.3	0.5	2.0	1	0.2	1.0
	EPNE								7.0	1.4	6.1	4	0.8	3.9
	SPCR								2.1	0.4	1.8	2	0.4	1.9
			135.0	26.8	100.0	116	23.2	100.0	114.6	23.0	100.1	103	20.6	100.1
MX-5-SS-4/2														
	GUSA	(d)	83.6	16.7	53.7	47	9.4	41.6	30.0	6.0	17.3	19	3.8	13.5
	ORHY		18.5	3.7	11.9	21	4.2	18.6	28.2	5.6	16.2	33	6.6	23.4
	CELA		10.6	2.1	6.8	12	2.4	10.6	25.6	5.1	14.7	25	5.0	17.7
	CHGR	(d)	35.8	7.2	23.0	20	4.0	17.7	78.9	15.8	45.4	55	11.0	39.0
	ARNO		3.5	0.7	2.3	3	0.[illegible]	2.7	6.8	1.4	3.9	3	0.6	2.1
	SIHY		2.5	0.5	1.6	7	1.4	6.2	2.2	0.4	1.3	5	1.0	3.6
	SPCR		1.2	0.2	0.8	3	0.6	2.7	2.0	0.4	1.2	1	0.2	0.7
			155.7	31.1	100.1	113	22.6	100.1	173.7	34.7	100.0	141	28.2	100.0

TABLE E-4 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover. (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover. (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-4/3													
	CELA (d)	25.9	5.2	22.1	20	4.0	17.1	79.6	15.9	70.6	67	13.4	73.6
	CHVI (s)	39.3	7.9	33.6	22	4.4	18.8	7.4	1.5	6.6	4	0.8	4.4
	GUSA	16.6	3.3	14.2	14	2.8	12.0	20.4	4.1	18.1	12	2.4	13.2
	ORHY	10.5	2.1	9.0	11	2.2	9.4	2.2	0.4	2.0	4	0.8	4.4
	HIJA	16.3	3.3	13.9	44	8.8	37.6						
	ARNO	7.9	1.6	6.8	5	1.0	4.3						
	SPCR	0.6	0.1	0.5	1	0.2	0.9						
	SIHY							0.5	0.1	0.4	2	0.4	2.2
	SPGR							0.6	0.1	0.5	1	0.2	1.1
	EPNE							2.1	0.4	1.9	1	0.2	1.1
		117.1	23.5	100.1	117	23.4	100.1	112.8	22.5	100.1	91	18.2	100.0
MX-5-SS-4/4													
	CELA (s)	48.3	9.7	52.4	30	6.0	35.7	7.0	1.4	7.8	4	0.8	6.8
	CHVI (d)	25.8	5.2	28.0	12	2.4	14.3	69.9	14.0	77.8	38	7.6	64.4
	ORHY	9.6	1.9	10.4	30	6.0	35.7	12.3	2.5	13.7	16	3.2	27.1
	SIHY	1.0	0.2	1.1	3	0.6	3.6						
	SPGR	0.5	0.1	0.5	4	0.8	4.8						
	GUSA	7.0	1.4	7.6	5	1.0	6.0						
	EPNE							0.6	0.1	0.7	1	0.2	1.7
		92.2	18.5	100.0	84	16.8	100.1	89.8	18.0	100.0	59	11.8	100.0

TABLE E-4 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-4/5													
	CHGR (s)	25.4	5.1	21.0	10	2.0	12.3	37.7	7.5	27.4	22	4.4	22.9
	GUSA (d)	85.8	17.2	70.8	51	10.2	63.0	71.1	14.2	51.7	53	10.6	55.2
	ORHY	2.5	0.5	2.1	12	2.4	14.8	5.7	1.1	4.1	13	2.6	13.5
	HO	0.2	0.0	0.2	1	0.2	1.2	0.2	0.0	0.1	1	0.2	1.0
	SPCR	0.1	0.0	0.1	1	0.2	1.2						
	EPNE	5.1	1.0	4.2	2	0.4	2.5	22.4	4.5	16.3	4	0.8	4.2
	CELA	1.1	0.2	0.9	1	0.2	1.2						
	STCO	0.9	0.2	0.7	2	0.4	2.5						
	SIJU	0.1	0.0	0.1	1	0.2	1.2	0.5	0.1	0.4	3	0.6	3.1
		121.2	24.2	100.1	81	16.2	99.9	137.6	27.4	100.0	96	19.2	99.9
MX-5-SS-4/6													
	GUSA (d)	97.1	19.4	65.4	71	14.2	65.7	117.9	23.6	90.1	80	16.0	76.2
	HIJA	4.8	1.0	3.2	9	1.8	8.3						
	CELA	6.3	1.3	4.2	4	0.8	3.7	8.6	1.7	6.6	7	1.4	6.7
	ORHY	2.2	0.4	1.5	4	0.8	3.7	1.8	0.4	1.4	10	2.0	9.5
	CHGR (s)	35.9	7.2	24.2	16	3.2	14.8	1.2	0.2	0.9	1	0.2	1.0
	SIJU	0.8	0.2	0.5	2	0.4	1.9	1.3	0.3	1.0	7	1.4	6.7
	SPGR	1.4	0.3	0.9	2	0.4	1.9						
		148.5	29.8	99.9	108	21.6	100.0	130.8	26.2	100.0	105	21.0	100.1

AD-A113 183 ERTEC WESTERN INC LONG BEACH CA F/G 6/3
FIELD SURVEYS, IOC VALLEYS. VOLUME II, PART II. BIOLOGICAL RESO--ETC(U)
AUG 81 F04704-80-C-0006
UNCLASSIFIED E-TR-48-VOL-2-PT-2 NL

5 of 6

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TABLE B-4 (Cont.)

Sample Unit No.	Plant Species		Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover. (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover. (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-4/7	ORHY		11.5	2.3	7.4	10	2.0	4.0	23.8	4.8	15.0	28	5.6	14.2
	CHNA		2.5	0.5	1.6	1	0.2	0.4						
	ATCA		8.6	1.7	5.5	2	0.4	0.8						
	ST		7.5	1.5	4.8	11	2.2	4.4	21.1	4.2	13.3	30	6.0	15.2
	SIHY		2.2	0.4	1.4	2	0.4	0.8	7.7	1.5	4.9	11	2.2	5.6
	CHGR		9.7	1.9	6.3	10	2.0	4.0	34.4	6.9	21.7	22	4.4	11.2
	SPCR	(s)	20.5	4.1	13.2	38	7.6	15.2	28.9	5.8	18.2	50	10.0	25.4
	GUSA	(d)	55.2	11.0	35.6	87	17.4	34.8	41.3	8.3	26.0	49	9.8	24.9
	BOGR		37.5	7.5	24.2	89	17.8	35.6	1.6	0.3	1.0	7	1.4	3.6
			155.2	30.9	100.0	250	50.0	100.0	158.8	31.8	100.1	197	39.4	100.1
MX-5-SS-4/8	GUSA	(d)	71.2	14.2	71.0	105	21.0	73.4	105.0	21.0	81.8	161	32.2	83.0
	ORHY		4.7	0.9	4.7	7	1.4	4.9						
	SIHY		1.2	0.2	1.2	2	0.4	1.4	3.5	0.7	2.7	9	1.8	4.6
	SPCR	(s)	23.2	4.6	23.1	29	5.8	20.3	19.8	4.0	15.4	24	4.8	12.4
			100.3	19.9	100.0	143	28.6	100.0	128.3	25.7	99.9	194	38.8	100.0
MS-5-SS-4/9	GUSA	(d)	76.8	15.4	68.9	127	25.4	66.5	92.5	18.5	80.6	174	34.8	77.7
	SPCR	(s)	11.4	2.3	10.2	11	2.2	5.8	17.3	3.5	15.1	33	6.6	14.7
	SIHY		0.9	0.2	0.8	2	0.4	1.1	0.3	0.1	0.3	1	0.2	0.5
	BOGR		3.8	0.8	3.4	11	2.2	5.8						
	HIJA		17.7	3.5	15.9	38	7.6	19.9	4.7	0.9	4.1	16	3.2	7.1
	OPER		0.3	0.1	0.3	1	0.2	0.5						
	ORHY		0.6	0.1	0.5	1	0.2	0.5						
			111.5	22.4	100.0	191	38.2	100.1	114.8	23.0	100.1	224	44.8	100.0

TABLE E-4 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-4/10													
	ORHY (d)	81.6	16.3	45.1	61	12.2	32.1	103.3	20.7	63.5	66	13.2	58.4
	ATCA	11.4	2.3	6.3	3	0.6	1.6	0.8	0.2	0.5	1	0.2	0.9
	GUSA (s)	54.2	10.8	29.9	55	11.0	29.0	35.4	7.1	21.7	33	6.6	29.2
	CHVI	2.6	0.5	1.4	1	0.2	0.5						
	ST	3.5	0.7	1.9	3	0.6	1.6						
	HIJA	3.1	0.6	1.7	9	1.8	4.7	0.3	0.1	0.2	2	0.4	1.8
	BOGR	17.7	3.5	9.8	55	11.0	29.0	0.2	0.0	0.1	1	0.2	0.9
	SIHY	1.8	0.4	1.0	2	0.4	1.1	0.2	0.0	0.1	1	0.2	0.9
	EPNE	5.1	1.0	2.8	1	0.2	0.5	12.8	2.6	7.9	1	0.2	0.9
	ARNO							1.3	0.3	0.8	1	0.2	0.9
	SPCR							0.2	0.0	0.1	1	0.2	0.9
	CHGR							8.3	1.7	5.1	6	1.2	5.3
		181.0	36.1	99.9	190	38.0	100.1	162.8	32.7	100.0	113	22.6	100.1
MX-5-SS-4/11													
	GUSA (d)	81.2	16.2	65.1	109	21.8	59.6	31.6	6.3	25.3	63	12.6	24.4
	ORHY	3.8	0.8	3.1	4	0.8	2.2	4.5	0.9	3.6	4	0.8	1.6
	SIHY	0.6	0.1	0.5	1	0.[illegible]	0.5						
	SPCR	23.9	4.8	19.2	30	6.0	16.4	18.6	3.7	14.9	33	6.6	12.8
	ARNO	2.4	0.5	1.9	2	0.4	1.1						
	HIJA	10.4	2.1	8.3	34	6.8	18.6	3.2	0.6	2.6	10	2.0	3.9
	CELA	1.1	0.2	0.9	2	0.4	1.1	10.4	2.1	8.3	12	2.4	4.7
	ATCA	1.3	0.3	1.0	1	0.2	0.5	0.9	0.2	0.7	1	0.2	0.4
	BOGR (s)							43.0	8.6	34.4	131	26.2	50.8
	SPGR							0.4	0.1	0.3	1	0.2	0.4
	CHGR							2.0	0.4	1.6	2	0.4	0.8
	EPNE							10.5	2.1	8.4	1	0.2	0.4
		124.7	25.0	100.0	183	36.6	100.0	125.1	25.0	100.1	258	51.6	100.2

TABLE E-4 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover. (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover. (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-4/12													
	SPCR (d)	49.0	9.8	42.2	35	7.0	43.2	46.2	9.2	31.9	30	6.0	25.4
	SIHY	7.9	1.6	6.8	9	1.8	11.1	2.0	0.4	1.4	3	0.6	2.5
	ATCO (s)	37.7	7.5	32.5	19	3.8	23.5	19.9	4.0	13.7	12	2.4	10.2
	ORHY	9.5	1.9	8.2	12	2.4	14.8	11.3	2.3	7.8	16	3.2	13.6
	GUSA	5.8	1.2	5.0	3	0.6	3.7	33.3	6.7	23.0	36	7.2	30.5
	CELA	6.1	1.2	5.3	3	0.6	3.7	32.0	6.4	22.1	20	4.0	17.0
	SPGR							0.3	0.1	0.2	1	0.2	0.9
		116.0	23.2	100.0	81	16.2	100.0	145.0	29.1	100.1	118	23.6	100.1
MX-5-SS-4/13													
	CELA	9.6	1.9	8.6	8	1.6	7.7						
	SPCR (d)	43.2	8.6	38.9	58	11.6	55.8	92.9	18.6	68.4	93	18.6	72.7
	ORHY	1.2	0.2	1.1	1	0.2	1.0	9.0	1.8	6.6	5	1.0	3.9
	ATCO (s)	46.1	9.2	41.5	26	5.2	25.0	24.9	5.0	18.3	13	2.6	10.2
	SIHY	3.1	0.6	2.8	5	1.0	4.8	7.2	1.4	5.3	13	2.6	10.2
	GUSA	7.5	1.5	6.7	5	1.0	4.8						
	SPGR	0.5	0.1	0.5	1	0.2	1.0	0.9	0.2	0.7	3	0.6	2.3
	OP							0.9	0.2	0.7	1	0.2	0.8
		111.2	22.1	100.1	104	20.8	100.1	135.8	27.2	100.0	128	25.6	100.1

TABLE E-4 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-4/14													
	SPCR (d)	34.4	6.9	31.9	60	12.0	42.6	55.8	11.2	47.2	73	14.6	51.8
	ATCO	14.3	2.9	13.2	12	2.4	8.5	17.9	3.6	15.1	13	2.6	9.2
	CELA	11.7	2.3	10.8	10	2.0	7.1	1.4	0.3	1.2	2	0.4	1.4
	ORHY (s)	15.2	3.0	14.1	12	2.4	8.5	24.8	5.0	21.0	12	2.4	8.5
	GUSA	28.2	5.6	26.1	38	7.6	27.0	7.0	1.4	5.9	14	2.8	9.9
	ARLO	2.0	0.4	1.9	5	1.0	3.6						
	SIHY	1.8	0.4	1.7	2	0.4	1.4	0.4	0.1	0.3	1	0.2	0.7
	BOGR	0.3	0.1	0.3	1	0.2	0.7						
	SPGR	0.1	0.0	0.1	1	0.2	0.7	2.0	0.4	1.7	3	0.6	2.1
	HIJA							8.0	1.6	6.8	22	4.4	15.6
	OP							1.0	0.2	0.8	1	0.2	0.7
		108.0	21.6	100.1	141	28.2	100.1	118.3	23.8	100.0	141	28.2	99.9
MX-5-SS-4/15													
	ATCO	29.7	5.9	23.2	19	3.8	16.1	19.3	3.9	15.4	10	2.0	7.9
	SPCR (d)	31.0	6.2	24.2	44	8.8	37.3	65.8	13.2	52.5	65	13.0	51.6
	ORHY (s)	50.5	10.1	39.4	36	7.2	30.5	10.4	2.1	8.3	9	1.8	7.1
	GUSA	12.3	2.5	9.6	16	3.2	13.6	19.5	3.9	15.6	27	5.4	21.4
	CELA	4.7	0.9	3.7	3	0.6	2.5	4.9	1.0	3.9	5	1.0	4.0
	ARLO							1.6	0.3	1.3	1	0.2	0.8
	HIJA							3.8	0.8	3.0	9	1.8	7.1
		128.2	25.6	100.1	118	23.6	100.0	125.3	25.2	100.0	126	25.2	99.9

TABLE B-4 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover. (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover. (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-4/16													
	CELA	22.3	4.5	52.2	10	2.0	62.5	5.0	1.0	9.1	1	0.2	4.4
	ATCO (d)	20.4	4.1	47.8	6	1.2	37.5	16.0	3.2	29.1	6	1.2	26.1
	ATBO (s)							33.8	6.8	61.5	15	3.0	65.2
	ORHY							0.2	0.0	0.4	1	0.2	4.4
		42.7	8.6	100.0	16	3.2	100.0	55.0	11.0	100.1	23	4.6	100.1
MS-5-SS-4/17													
	CHGR (s)	28.7	5.7	29.5	12	2.4	15.6	10.5	2.1	12.7	3	0.6	5.5
	CELA (d)	64.8	13.0	66.5	50	10.0	64.9	59.0	11.8	71.3	41	8.2	74.6
	ORHY	1.7	0.3	1.8	4	0.8	5.2	1.4	0.3	1.7	4	0.8	7.3
	HIJA	2.0	0.4	2.1	10	2.0	13.0						
	MACA	0.2	0.0	0.2	1	0.2	1.3	0.4	0.1	0.5	1	0.2	1.8
	ATCA							11.1	2.2	13.4	4	0.8	7.3
	SPCR							0.3	0.1	0.4	2	0.4	3.6
		97.4	19.4	100.1	77	15.4	100.0	82.7	16.6	100.0	55	11.0	100.1
MS-5-SS-4/18													
	ORHY	8.9	1.8	7.3	10	2.0	13.9	11.2	2.2	9.1	7	1.4	9.7
	CHVI (d)	87.7	17.5	71.6	37	7.4	51.4	82.6	16.5	66.9	39	7.8	54.2
	CELA (s)	25.9	5.2	21.1	25	5.0	34.7	29.6	5.9	24.0	26	5.2	36.1
		122.5	24.5	100.0	72	14.4	100.0	123.4	24.6	100.0	72	14.4	100.0
MS-5-SS-4/19													
	CHGR (d)	70.6	14.1	79.8	33	6.6	58.9	40.6	8.1	59.4	21	4.2	33.3
	ORHY	0.5	0.1	0.6	3	0.6	5.4	0.7	0.1	1.0	3	0.6	4.8
	CELA (s)	17.1	3.4	19.3	18	3.6	32.1	13.4	2.7	19.6	13	2.6	20.6
	SPCO	0.3	0.1	0.3	2	0.4	3.6						
	HIJA							13.5	2.7	19.8	25	5.0	39.7
	SPCR							0.1	0.0	0.2	1	0.2	1.6
		88.5	17.7	100.0	56	11.2	100.0	68.3	13.6	100.0	63	12.6	100.0

TABLE E-4 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-4/20													
	CHVI (d)	41.4	8.3	37.5	21	4.2	23.3	39.1	7.8	34.1	18	3.6	11.5
	ORHY (s)	36.1	7.2	32.7	44	8.8	48.9	30.4	6.1	26.6	24	4.8	15.3
	CELA	29.0	5.8	26.3	24	4.8	26.7	9.9	2.0	8.6	12	2.4	7.6
	SPER	3.8	0.8	3.5	1	0.2	1.1	0.4	0.1	0.3	1	0.2	0.6
	HIJA							33.9	6.8	29.6	101	20.2	64.3
	OP							0.8	0.2	0.7	1	0.2	0.6
		110.3	22.1	100.0	90	18.0	100.0	114.5	23.0	99.9	157	31.4	99.9
MX-5-SS-4/21													
	CHVI (d)	68.5	13.7	70.0	43	8.6	56.6	55.0	11.0	58.7	42	8.4	45.2
	CELA (s)	13.3	2.7	13.6	12	2.4	15.8	21.3	4.3	22.7	19	3.8	20.4
	ORHY	16.0	3.2	16.4	21	4.2	27.6	16.6	3.3	17.7	30	6.0	32.3
	SIHY							0.4	0.1	0.4	1	0.2	1.1
	HIJA							0.4	0.1	0.4	1	0.2	1.1
		97.8	19.6	100.0	76	15.2	100.0	93.7	18.8	99.9	93	18.6	100.1
MS-5-SS-4/22													
	CHGR (d)	65.9	13.2	61.5	37	7.4	48.1	73.7	14.7	54.4	38	7.6	42.2
	ORHY (s)	21.5	4.3	20.1	23	4.6	29.9	43.6	8.7	32.2	33	6.6	36.7
	CELA	19.7	3.9	18.4	17	3.4	22.1	16.8	3.4	12.4	14	2.8	15.6
	HIJA							1.3	0.3	1.0	5	1.0	5.6
		107.1	21.4	100.0	77	15.4	100.1	135.4	27.1	100.0	90	18.0	100.1
MS-5-SS-4/23													
	CHVI (d)	80.8	16.2	54.3	40	8.0	41.7	102.5	20.5	77.5	49	9.8	52.7
	ORHY (s)	44.5	8.9	29.9	36	7.2	37.5	10.4	2.1	7.9	20	4.0	21.5
	CELA	22.7	4.5	15.3	19	3.8	19.8	15.9	3.2	12.0	16	3.2	17.2
	SIHY	0.7	0.1	0.5	1	0.2	1.0	2.2	0.4	1.7	4	0.8	4.3
	HIJA							1.3	0.3	1.0	4	0.8	4.3
		148.7	29.7	100.0	96	19.2	100.0	132.3	26.5	100.1	93	18.6	100.0

TABLE E-5

PINE VALLEY
TRANSECT RESULTS
CLUSTER 5

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-5/1													
	HIJA	17.7	3.5	12.8	72	14.4	63.7						
	ORHY	4.8	1.0	3.5	6	1.2	5.3	2.0	0.4	1.4	2	0.4	4.4
	ARNO (d)	68.4	13.7	49.5	11	2.2	9.7	48.3	9.7	33.5	11	2.2	23.9
	CHVI (s)	42.3	8.5	30.6	22	4.4	19.5	42.0	8.4	29.2	19	3.8	41.3
	SIHY	1.0	0.2	0.7	1	0.2	0.9	0.5	0.1	0.4	1	0.2	2.2
	GRSP	4.0	0.8	2.9	1	0.2	0.9	50.6	10.1	35.1	11	2.2	23.9
	SPCR							0.7	0.1	0.5	2	0.4	4.4
		138.2	27.7	100.0	113	22.6	100.0	144.1	28.8	100.1	46	9.2	100.1
MX-5-SS-5/2													
	SPCR	3.7	0.7	2.3	3	0.6	1.1	3.0	0.6	1.8	4	0.8	1.2
	BOGR (d)	59.3	11.9	36.4	219	43.8	76.8	66.2	13.2	40.2	290	58.0	89.0
	CHGR	3.1	0.6	1.9	4	0.8	1.4	23.7	4.7	14.4	12	2.4	3.7
	SPGR	1.3	0.3	0.8	1	0.2	0.4						
	GRSP	40.0	8.0	24.6	10	2.0	3.5	11.6	2.3	7.1	2	0.4	0.6
	ARTR (s)	37.0	7.4	22.7	7	1.4	2.5	55.4	11.1	33.7	10	2.0	3.1
	HIJA	9.3	1.9	5.7	25	5.0	8.8						
	SIHY	4.4	0.9	2.7	10	2.0	3.5	3.4	0.7	2.1	5	1.0	1.5
	ORHY	4.8	1.0	3.0	6	1.2	2.1	1.2	0.2	0.7	3	0.6	0.9
		162.9	32.7	100.1	285	57.0	100.1	164.5	32.8	100.0	326	65.2	100.0

TABLE E-5 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover. (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover. (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-5/3													
	ARTR (d)	61.5	12.3	78.8	18	3.6	42.9	148.9	29.8	88.5	37	7.4	50.7
	HIJA	6.1	1.2	7.8	21	4.2	50.0	8.4	1.7	5.0	32	6.4	43.8
	SPGR	0.1	0.0	0.1	1	0.2	2.4						
	GRSP (s)	10.4	2.1	13.3	2	0.4	4.8	10.5	2.1	6.2	2	0.4	2.7
	SIHY							0.5	0.1	0.3	2	0.4	2.7
		78.1	15.6	100.0	42	8.4	100.1	168.3	33.7	100.0	73	14.6	99.9
MX-5-SS-5/4													
	CHGR (d)	179.0	35.8	96.3	82	16.4	95.3	186.0	37.2	99.0	78	15.6	96.3
	ORHY	2.0	0.4	1.1	1	0.2	1.2						
	SIHY	0.3	0.1	0.2	1	0.2	1.2	1.8	0.4	1.0	3	0.6	3.7
	GRSP	1.4	0.3	0.8	1	0.2	1.2						
	ARTR (s)	3.2	0.6	1.7	1	0.2	1.2						
		185.9	37.2	100.1	86	17.2	100.1	187.8	37.6	100.0	81	16.2	100.0
MX-5-SS-5/5													
	CHGR (d)	78.9	15.8	47.6	41	8.2	25.6	124.4	24.9	62.5	82	16.4	74.5
	SIHY	4.5	0.9	2.7	10	2.0	6.3	0.9	0.2	0.5	2	0.4	1.8
	BOGR	18.3	3.7	11.1	90	18.0	56.3						
	ARTR (s)	59.0	11.8	35.6	11	2.2	6.9	36.6	7.3	18.4	7	1.4	6.4
	ORHY	2.1	0.4	1.3	2	0.4	1.3	3.4	0.7	1.7	3	0.6	2.7
	CELA	0.5	0.1	0.3	2	0.4	1.3	1.5	0.3	0.8	2	0.4	1.8
	GRSP	0.1	0.0	0.1	1	0.2	0.6	29.7	5.9	14.9	9	1.8	8.2
	STCO	2.2	0.4	1.3	3	0.6	1.9	0.7	0.1	0.4	2	0.4	1.8
	ARLO							1.7	0.3	0.9	3	0.6	2.7
		165.6	33.1	100.0	160	32.0	100.2	198.9	39.7	100.1	110	22.0	99.9

TABLE E-5 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-5/6	ARTR (d)	153.6	30.7	92.8	33	6.6	78.6	162.3	32.5	95.8	34	6.8	77.3
	CHGR (s)	12.0	2.4	7.3	9	1.8	21.4	0.8	0.2	0.5	1	0.2	2.3
	SIHY							6.4	1.3	3.8	9	1.8	20.5
		165.6	33.1	100.1	42	8.4	100.0	169.5	34.0	100.1	44	8.8	100.1
MX-5-SS-5/7	ARTR (d)	180.0	36.0	91.8	42	8.4	82.4	158.2	31.6	82.3	43	8.6	45.7
	CHGR (s)	13.8	2.8	7.0	5	1.0	9.8	24.4	4.9	12.7	15	3.0	16.0
	SIHY	2.2	0.4	1.1	4	0.8	7.8	2.0	0.4	1.0	3	0.6	3.2
	HIJA							7.7	1.5	4.0	33	6.6	35.1
		196.0	39.2	99.9	51	10.2	100.0	192.3	38.4	100.0	94	18.8	100.0
MX-5-SS-5/8	CHGR (s)	72.4	14.5	53.3	33	6.6	71.7	29.7	5.9	22.9	14	2.8	35.0
	ARTR (d)	60.5	12.1	44.5	11	2.2	23.9	98.6	19.7	76.1	24	4.8	60.0
	SIHY	1.8	0.4	1.3	1	0.2	2.2	0.4	0.1	0.3	1	0.2	2.5
	ORHY	1.2	0.2	0.9	1	0.2	2.2						
	EPNE							0.8	0.2	0.6	1	0.2	2.5
		135.9	27.2	100.0	46	9.2	100.0	129.5	25.9	99.9	40	8.0	100.0
MX-5-SS-5/9	ARTR (d)	143.3	28.7	97.4	36	7.2	92.3	107.9	21.6	89.6	36	7.2	83.7
	CHGR (s)	3.1	0.6	2.1	2	0.4	5.1	12.2	2.4	10.1	6	1.2	14.0
	SIHY	0.7	0.1	0.5	1	0.2	2.6						
	HIJA							0.3	0.1	0.3	1	0.2	2.3
		147.1	29.4	100.0	39	7.8	100.0	120.4	24.1	100.0	43	8.6	100.0

TABLE B-5 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-5/10													
	ARTR (d)	141.2	28.2	81.5	29	5.8	74.4	122.9	24.6	99.8	40	8.0	97.6
	CHVI (s)	28.7	5.7	16.6	8	1.6	20.5						
	ORHY	3.4	0.7	2.0	2	0.4	5.1						
	SIHY							0.2	0.0	0.2	1	0.2	2.4
		173.3	34.6	100.1	39	7.8	100.0	123.1	24.6	100.0	41	8.2	100.0
MX-5-SS-5/11													
	ARTR (d)	112.4	22.5	68.1	22	4.4	55.0	71.1	14.2	66.1	15	3.0	39.5
	CHGR (s)	48.5	9.7	29.4	16	3.2	40.0	22.8	4.6	21.2	17	3.4	44.7
	EPNE	4.2	0.8	2.5	2	0.4	5.0	13.6	2.7	12.7	6	1.2	15.8
		165.1	33.0	100.0	40	8.0	100.0	107.5	21.5	100.0	38	7.6	100.0
MX-5-SS-5/12													
	ARTR (d)	122.0	24.4	80.2	23	4.6	46.9	135.9	27.2	67.4	25	5.0	43.9
	HIJA	3.5	0.7	2.3	13	2.6	26.5						
	CHVI (s)	25.4	5.1	16.7	9	1.8	18.4	56.4	11.3	28.0	23	4.6	40.4
	EPNE	0.7	0.1	0.5	1	0.2	2.0	4.1	0.8	2.0	2	0.4	3.5
	ORHY	0.2	0.0	0.1	1	0.2	2.0						
	SIJU	0.2	0.0	0.1	1	0.2	2.0	0.2	0.0	0.1	1	0.2	1.8
	ASLE	0.1	0.0	0.1	1	0.2	2.0	2.4	0.5	1.2	3	0.6	5.3
	OPER							1.5	0.3	0.7	1	0.2	1.8
	CRCO							1.2	0.2	0.6	2	0.4	3.5
		152.1	30.3	100.0	49	9.8	99.8	201.7	40.3	100.0	57	11.4	100.2

TABLE E-5 (Cont.)

Sample Unit No.	Plant Species		Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-5/13														
	ARTR	(d)	172.0	34.4	99.4	28	5.6	87.5	174.5	34.9	89.2	39	7.8	68.4
	CHVI	(s)	0.3	0.1	0.2	1	0.2	3.1	10.2	2.0	5.2	5	1.0	8.8
	SPGR		0.3	0.1	0.2	1	0.2	3.1						
	SIJU		0.5	0.1	0.3	2	0.4	6.3	0.2	0.0	0.1	1	0.2	1.8
	EPNE								1.2	0.2	0.6	1	0.2	1.8
	ASLE								9.3	1.9	4.8	9	1.8	15.8
	ORHY								0.3	0.1	0.2	2	0.4	3.5
			173.1	34.7	100.1	32	6.4	100.0	195.7	39.1	100.1	57	11.4	100.1
MX-5-SS-5/14														
	ARTR	(s)	25.4	5.1	31.2	5	1.0	71.4	74.2	14.8	60.2	21	4.2	87.5
	JUOS	(d)	55.9	11.2	68.8	2	0.4	28.6	45.4	9.1	36.9	2	0.4	8.3
	EPNE								3.6	0.8	3.0	1	0.2	4.2
			81.3	16.3	100.0	7	1.4	100.0	123.2	24.7	100.1	24	4.8	100.0
MX-5-SS-5/15														
	ARTR	(s)	1.9	0.4	4.9	1	0.2	20.0	50.5	10.1	42.1	11	2.2	42.1
	JUOS	(d)	36.6	7.3	95.1	4	0.8	80.0	69.5	13.9	57.9	3	0.6	57.9
			38.5	7.7	100.0	5	1.0	100.0	120.0	24.0	100.0	14	2.8	100.0
MX-5-SS-5/16														
	ARTR	(d)	148.2	29.6	95.7	48	9.6	90.6	21.5	4.3	26.6	13	2.6	61.9
	SIHY		0.4	0.1	0.3	1	0.2	1.9						
	PE		0.3	0.1	0.2	2	0.4	3.8						
	PIMO		0.8	0.2	0.5	1	0.2	1.9	4.0	0.8	4.9	2	0.4	9.5
	JUOS	(s)	5.2	1.0	3.4	1	0.2	1.9	55.4	11.1	68.5	6	1.2	28.6
			154.9	31.0	100.1	53	10.6	100.1	80.9	16.2	100.0	21	4.2	100.0

TABLE E-5 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-5/17													
	ARTR (d)	148.9	29.8	95.9	37	7.4	60.7	150.4	30.1	97.7	36	7.2	70.6
	HIJA (s)	5.8	1.2	3.7	22	4.4	36.1	2.4	0.5	1.6	14	2.8	27.5
	SIJU	0.5	0.1	0.3	2	0.4	3.3						
	CHGR							1.1	0.2	0.7	1	0.2	2.0
		155.2	31.1	99.9	61	12.2	100.1	153.9	30.8	100.0	51	10.2	100.1
MX-5-SS-5/18													
	ARTR (d)	157.7	31.5	86.9	29	5.8	74.4	41.1	8.2	38.4	6	1.2	19.4
	CHVI (s)	22.7	4.5	12.5	8	1.6	20.5	27.2	5.4	25.4	7	1.4	22.6
	EPNE	0.9	0.2	0.5	1	0.2	2.6	8.2	1.6	7.7	4	0.8	12.9
	ASLE	0.2	0.0	0.1	1	0.2	2.6						
	CHGR							30.5	6.1	28.5	14	2.8	45.2
		181.5	36.2	100.0	39	7.8	100.1	107.0	21.3	100.0	31	6.2	100.1
MX-5-SS-5/19													
	AGDE (d)	12.2	2.4	80.8	35	7.0	97.2	11.0	2.2	100.0	35	7.0	100.0
	CHVI (s)	2.9	0.6	19.2	1	0.2	2.8						
		15.1	3.0	100.0	36	7.2	100.0	11.0	2.2	100.0	35	7.0	100.0
MX-5-SS-5/20													
	ARTR (d)	134.6	26.9	84.8	22	4.4	57.9	122.3	24.5	93.5	24	4.8	58.5
	CHVI (s)	23.4	4.7	14.7	13	2.6	34.2	6.6	1.3	5.1	7	1.4	17.1
	HIJA	0.1	0.0	0.1	1	0.2	2.6	1.6	0.3	1.2	8	1.6	19.5
	EPNE	0.5	0.1	0.3	1	0.2	2.6						
	SIJU	0.2	0.0	0.1	1	0.2	2.6	0.3	0.1	0.2	2	0.4	4.9
		158.8	31.7	100.0	38	7.6	99.9	130.8	26.2	100.0	41	8.2	100.0

TABLE E-5 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-5/21													
	ARTR (d)	138.7	27.7	79.2	30	6.0	56.6	119.9	24.0	80.9	30	6.0	60.0
	CHVI (s)	34.8	7.0	19.9	20	4.0	37.7	27.7	5.5	18.7	16	3.2	32.0
	ASLE	1.6	0.3	0.9	3	0.6	5.7						
	SIJU							0.4	0.1	0.3	2	0.4	4.0
	ORHY							0.2	0.0	0.1	1	0.2	2.0
	STCO							0.1	0.0	0.1	1	0.2	2.0
		175.1	35.0	100.0	53	10.6	100.0	148.3	29.6	100.1	50	10.0	100.0
MX-5-SS-5/22													
	ARTR (d)	100.6	20.1	96.7	33	6.6	82.5	106.2	21.2	92.8	35	7.0	77.8
	GRSP (s)	2.5	0.5	2.4	2	0.4	5.0	6.8	1.4	5.9	3	0.6	6.7
	SIJU	0.3	0.1	0.3	2	0.4	5.0	0.6	0.1	0.5	3	0.6	6.7
	ASLE	0.5	0.1	0.5	2	0.4	5.0						
	ORHY	0.1	0.0	0.1	1	0.2	2.5						
	CHVI							0.4	0.1	0.4	1	0.2	2.2
	HIJA							0.4	0.1	0.4	3	0.6	6.7
		104.0	20.8	100.0	40	8.0	100.0	114.4	22.9	100.0	45	9.0	100.1
MX-5-SS-5/23													
	ARTR (d)	133.6	26.7	60.0	39	7.8	13.0	105.4	21.1	55.4	36	7.2	13.4
	BOGR (s)	51.8	10.4	23.3	210	42.0	69.8	53.9	10.8	28.3	211	42.2	78.4
	HIJA	8.8	1.8	4.0	28	5.6	9.3	1.4	0.3	0.7	3	0.6	1.1
	GRSP	17.6	3.5	7.9	5	1.0	1.7	21.8	4.4	11.5	7	1.4	2.6
	SIHY	8.1	1.6	3.6	14	2.8	4.7	6.2	1.2	3.3	10	2.0	3.7
	ORHY	2.7	0.5	1.2	5	1.0	1.7	1.5	0.3	0.8	2	0.4	0.7
		222.6	44.5	100.0	301	60.2	100.2	190.2	38.1	100.0	269	53.8	99.9

TABLE E-6

PINE VALLEY
TRANSECT RESULTS
RSS

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Total Cover (%)	Rel. Cover (%)	No. of Plants	Density (#/100 dm)	Rel. Density (%)
RSS-1							
	CHGR (d)	75.1	15.0	76.7	44	8.8	43.1
	CELA (s)	12.0	2.4	12.3	13	2.6	12.8
	ORHY	3.9	0.8	4.0	21	4.2	20.6
	SIJU	0.8	0.2	0.8	6	1.2	5.9
	SPCR	0.4	0.1	0.4	4	0.9	3.9
	MACA	0.3	0.1	0.3	1	0.2	1.0
	HIJA	5.4	1.1	5.5	13	2.6	12.8
		97.9	19.7	100.0	102	20.5	100.1
RSS-2							
	SPGR	0.4	0.1	0.6	1	0.2	1.1
	SPCR	5.7	1.1	7.9	19	3.8	21.1
	GUSA (d)	22.9	4.6	31.5	28	5.6	31.1
	BOGR	2.9	0.6	4.0	20	4.0	22.2
	BR	1.7	0.3	2.3	1	0.2	1.1
	ARSP	10.3	2.1	14.2	8	1.6	8.8
	CELA (s)	15.1	3.0	20.8	8	1.6	8.9
	ATCO	13.7	2.7	18.8	5	1.0	5.6
		72.7	14.5	100.1	90	18.0	99.9
RSS-3							
	CELA (s)	27.2	5.4	32.5	40	8.0	36.4
	CHVI (d)	38.0	7.6	45.4	23	4.6	20.9
	ORHY	10.1	2.0	12.1	20	4.0	18.2
	HIJA	8.4	1.7	10.0	27	5.4	24.6
		83.7	16.7	100.0	110	22.0	100.1

TABLE E-6 (cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Total Cover (%)	Rel. Cover (%)	No. of Plants	Density (#/100 dm)	Rel. Density (%)
RSS-4							
	EPNE (s)	47.0	9.4	26.7	22	4.4	31.9
	ARTR (d)	108.4	21.7	61.5	26	5.2	37.7
	CHGR	19.0	3.8	10.8	18	3.6	26.1
	SIHY	1.2	0.2	0.7	2	0.4	2.9
	GRSP	0.7	0.1	0.4	1	0.2	1.5
		176.3	35.2	100.1	69	13.8	100.1

TABLE B-7

**PINE VALLEY
TRANSECT RESULTS
CMF**

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
CMF-1													
	CHGR (d)	87.0	17.4	79.0	40	8.0	62.5	67.3	13.5	66.8	35	7.0	49.3
	CELA (s)	21.2	4.2	19.3	18	3.6	28.1	30.4	6.1	30.2	23	4.6	32.4
	ORHY	1.4	0.3	1.3	5	1.0	7.8	3.1	0.6	3.1	13	2.6	18.3
	EPNE	0.5	0.1	0.5	1	0.2	1.6						
		110.1	22.0	100.1	64	12.8	100.0	100.8	20.2	100.1	71	14.2	100.0
CMF-2													
	CHGR (d)	80.5	16.1	71.6	46	9.2	57.5	70.1	14.0	82.3	39	7.8	58.2
	ORHY	1.7	0.3	1.5	8	1.6	10.0	1.7	0.3	2.0	11	2.2	16.4
	CELA (s)	24.9	5.0	22.2	25	5.0	31.3	11.8	2.4	13.9	13	2.6	19.4
	EPNE	5.3	1.1	4.7	1	0.2	1.3						
	MACA							1.3	0.3	1.5	3	0.6	4.5
	SPCR							0.3	0.1	0.4	1	0.2	1.5
		112.4	22.5	100.0	80	16.0	100.1	85.2	17.1	100.1	67	13.4	100.0

TABLE B-7 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
CMF-4													
	SPCR (d)	35.0	7.0	58.3	40	8.0	65.6	4.8	1.0	12.9	6	1.2	18.2
	ATCO	15.0	3.0	25.0	9	1.8	14.8	1.0	0.2	2.7	1	0.2	3.0
	GUSA	7.6	1.5	12.7	9	1.8	14.8	3.9	0.8	10.5	2	0.4	6.1
	ORHY (s)	2.4	0.5	4.0	3	0.6	4.9	19.1	3.8	51.2	19	3.8	57.6
	CELA							7.3	1.5	19.6	3	0.6	9.1
	SIHY							1.2	0.2	3.2	2	0.4	6.1
		60.0	12.0	100.0	61	12.2	100.1	37.3	7.5	100.1	33	6.6	100.1
CMF-5													
	ARTR (d)	111.4	22.3	94.3	41	8.2	89.1	111.8	22.4	87.4	32	6.4	78.1
	ORHY	0.3	0.1	0.3	1	0.2	2.2	1.5	0.3	1.2	1	0.2	2.4
	CH	5.6	1.1	4.7	3	0.6	6.5						
	OP	0.8	0.2	0.7	1	0.2	2.2	0.6	0.1	0.5	1	0.2	2.4
	CHVI (s)							9.2	1.8	7.2	3	0.6	7.3
	EPNE							4.6	0.9	3.6	3	0.6	7.3
	SIHY							0.2	0.0	0.2	1	0.2	2.4
		118.1	23.7	100.0	46	9.2	100.0	127.9	25.5	100.1	41	8.2	99.9

TABLE E-8

PINE VALLEY
TRANSECT RESULTS
RESITINGS

Sample Unit No.	Plant Species		Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-1/1R			No transects made because of proximity to original site											
MX-5-SS-1/14R	CELA		14.3	2.9	14.1	17	3.4	26.6						
	CHGR	(d)	66.2	13.2	65.5	36	7.2	56.3						
	ORHY	(s)	16.4	3.3	16.2	7	1.4	10.9	No transect made.					
	ERIO		3.0	0.6	3.0	2	0.4	3.1						
	SIHY		0.6	0.1	0.6	1	0.2	1.6						
	EPNE		0.6	0.1	0.6	1	0.2	1.6						
			101.1	20.2	100.0	64	12.8	100.1						
MX-5-SS-1/21R	ARTR	(d)	50.1	10.0	49.9	11	2.2	39.3						
	CHR		20.8	4.2	20.7	9	1.8	32.1	No transect made.					
	CELA		1.8	0.4	1.8	2	0.4	7.1						
	GRSP	(s)	27.8	5.6	27.7	6	1.2	21.4						
			100.5	20.2	100.1	28	5.6	99.9						
MX-5-SS-1/22R	AR	(d)	56.2	11.2	52.9	19	3.8	38.8						
	CH	(s)	39.5	7.9	37.2	22	4.4	44.9						
	GRSP		9.4	1.9	8.8	5	1.0	10.2	No transect made.					
	ORHY		0.6	0.1	0.6	1	0.2	2.0						
	CELA		0.1	0.0	0.1	1	0.2	2.0						
	SIHY		0.5	0.1	0.5	1	0.2	2.0						
			106.3	21.2	100.1	49	9.8	99.9						

TABLE B-8 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-2/13R													
	CELA (s)	8.2	1.6	8.9	11	2.2	18.3						
	CHGR (d)	75.1	15.0	81.1	42	8.4	70.0						
	ORHY	5.1	1.0	5.5	6	1.2	10.0		No transect made.				
	EPNE	4.2	0.8	4.5	1	0.2	1.7						
		92.6	18.4	100.0	60	12.0	100.0						
MX-5-SS-2/14R													
	CHGR (d)	77.5	15.5	71.0	39	7.8	69.6						
	ORHY (s)	21.8	4.4	20.0	14	2.8	25.0						
	CELA	2.3	0.5	2.1	2	0.4	3.6		No transect made.				
	EPNE	7.5	1.5	6.9	1	0.2	1.8						
		109.1	21.9	100.0	56	11.2	100.0						
MX-5-SS-2/15R													
	HIJA	3.1	0.6	4.5	6	1.2	14.6						
	BOGR	0.2	0.0	0.3	1	0.2	2.4						
	EPNE	9.1	1.8	13.3	3	0.6	7.3	4.2	0.8	4.2	1	0.2	1.7
	ORHY (s)	6.1	1.2	8.9	10	2.0	24.4	16.6	3.3	16.7	14	2.8	24.1
	CHGR (d)	47.4	9.5	69.0	16	3.2	39.0	75.1	15.0	75.6	38	7.6	65.5
	CELA	2.8	0.6	4.1	5	1.0	12.2	3.0	0.6	3.0	4	0.8	6.9
	SP							0.5	0.1	0.5	1	0.2	1.7
		68.7	13.7	100.1	41	8.2	99.9	99.4	19.8	100.0	58	11.6	99.9
MX-5-SS-2/18R													
	ATCO (s)	39.7	7.9	32.2	14	2.8	17.5						
	ORHY	20.2	4.0	16.4	20	4.0	25.0						
	CELA (d)	40.0	8.0	32.5	37	7.4	46.3						
	ARPU	1.0	0.2	0.8	1	0.2	1.3		No transect made.				
	CHGR	17.9	3.6	14.5	6	1.2	7.5						
	TEGL	4.4	0.9	3.6	2	0.4	2.5						
		123.2	24.6	100.0	80	16.0	100.1						

TABLE E-8 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-3/16R													
	HIJA	3.2	0.6	4.5	9	1.8	11.1	5.4	1.1	5.7	19	3.8	18.6
	ATCO (d)	21.2	4.2	29.9	15	3.0	18.5	31.6	6.3	33.4	22	4.4	21.6
	GUSA	20.5	4.1	28.9	15	3.0	18.5	12.7	2.5	13.4	13	2.6	12.8
	SPCR (s)	19.9	4.0	28.0	27	5.4	33.3	26.8	5.4	28.4	28	5.6	27.5
	BOGR	6.2	1.2	8.7	15	3.0	18.5	5.4	1.1	5.7	11	2.2	10.8
	CELA							11.6	2.3	12.3	8	1.6	7.8
	SP							1.0	0.2	1.1	1	0.2	1.0
		71.0	14.1	100.0	81	16.2	99.9	94.5	18.9	100.0	102	20.4	100.1
MX-5-SS-3/7R								No transect made.					
	SPCR	8.2	1.6	10.4	4	0.8	8.7						
	ATCO (d)	40.0	8.0	50.5	21	4.2	45.7						
	CELA	5.1	1.0	6.4	4	0.8	8.7						
	ORHY (s)	17.8	3.6	22.5	10	2.0	21.7						
	OPER	2.9	0.6	3.7	1	0.2	2.2						
	ARSP	0.8	0.2	1.0	1	0.2	2.2						
	SIHY	1.3	0.3	1.6	1	0.2	2.2						
	GUSA	3.1	0.6	3.9	4	0.8	8.7						
		79.2	15.9	100.0	46	9.2	100.1						
MX-5-SS-2/8R								No transect made.					
	GRSP (s)	14.9	3.0	15.4	5	1.0	10.0						
	CHGR (d)	66.3	13.3	68.7	27	5.4	54.0						
	ORHY	12.7	2.5	13.2	14	2.8	28.0						
	HIJA	1.2	0.2	1.2	3	0.6	6.0						
	CELA	1.4	0.3	1.5	1	0.2	2.0						
		96.5	19.3	100.0	50	10.0	100.0						

TABLE E-8 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-3/9R													
	CELA (d)	20.8	4.2	33.0	18	3.6	25.4						
	ATCO	15.8	3.2	25.1	17	3.4	23.9						
	ARSP	6.0	1.2	9.5	7	1.4	9.9			No transect made.			
	SPCR (s)	20.4	4.1	32.4	29	5.8	40.9						
		63.0	12.7	100.0	71	14.2	100.1						
MX-5-SS-3/10R													
	ORHY (d)	15.3	3.1	29.0	12	2.4	70.6	32.0	6.4	50.3	30	6.0	68.2
	CH	9.0	1.8	17.1	2	0.4	11.8	28.9	5.8	45.4	10	2.0	22.7
	PR (s)	28.4	5.7	53.9	3	0.6	17.7						
	HIJA							0.7	0.1	1.1	2	0.4	4.6
	ARPU							3.2	0.4	3.1	3	0.4	4.6
		52.7	10.6	100.0	17	3.4	100.1	64.8	12.7	99.9	45	8.8	100.1
MX-5-SS-3/13R													
	CHVI (d)	23.8	4.8	70.2	4	0.8	50.0	24.8	5.0	61.4	6	1.2	33.3
	ORHY (s)	10.1	2.0	29.8	4	0.8	50.0	13.9	2.8	34.4	11	2.2	61.1
	ARPU							1.7	0.3	4.2	1	0.2	5.6
		33.9	6.8	100.0	8	1.6	100.0	40.4	8.1	100.0	18	3.6	100.0
MX-5-SS-3/16R													
	HIJA	7.2	1.4	11.5	11	2.2	22.9						
	SPCR (s)	12.1	2.4	19.3	11	2.2	22.9						
	ATCO (d)	23.9	4.8	38.2	15	3.0	31.3						
	CELA	7.5	1.5	12.0	6	1.2	12.5			No transect made.			
	ORHY	4.7	0.9	7.5	3	0.6	6.3						
	EPNE	7.2	1.4	11.5	2	0.4	4.2						
		62.6	12.4	100.0	48	9.6	100.1						

TABLE E-8 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-3/19R													
	CHVI (d)	10.1	2.0	40.7	5	1.0	33.3	10.5	2.1	27.9	3	0.6	9.4
	CELA	6.0	1.2	24.2	3	0.6	20.0	3.9	0.8	10.4	2	0.4	6.3
	ORHY (s)	1.8	0.4	7.3	2	0.4	13.3	10.1	2.0	26.9	10	2.0	31.3
	ATCA	4.5	0.9	18.2	1	0.2	6.7	4.5	0.9	12.0	1	0.2	3.1
	HIJA	2.4	0.5	9.7	4	0.8	26.7	8.6	1.7	22.9	16	3.2	50.0
		24.8	5.0	100.1	15	3.0	100.0	37.6	7.5	100.1	32	6.4	100.1
MX-5-SS-4/5R	No transects made because of proximity to original site												
MX-5-SS-4/6R													
	GUSA (d)	37.5	7.5	66.4	19	3.8	54.3	61.1	12.2	63.7	50	10.0	68.5
	CELA	19.0	3.8	33.6	16	3.2	45.7	6.7	1.3	7.0	5	1.0	6.9
	ORHY							0.9	0.2	0.9	4	0.8	5.5
	CHGR (s)							26.7	5.3	27.8	12	2.4	16.4
	SIHY							0.6	0.1	0.6	2	0.4	2.7
		56.5	11.3	100.0	35	7.0	100.0	96.0	19.1	100.0	73	14.6	100.0
MX-5-SS-4/7R													
	SPCO	11.9	2.4	9.3	14	2.8	14.6	14.6	2.9	13.3	15	3.0	19.7
	GUSA (d)	8.9	17.2	67.1	60	12.0	62.5	35.1	7.0	32.0	36	7.2	47.4
	ORHY	24.7	4.9	19.3	18	3.6	18.8	1.3	0.2	0.9	1	0.2	1.3
	STCO	3.4	0.7	2.7	3	0.6	3.1	2.0	0.4	1.8	1	0.2	1.3
	SIHY	2.2	0.4	1.7	1	0.2	1.0	3.9	0.8	3.6	4	0.8	5.3
	CHVI (s)							38.5	7.7	35.1	17	3.4	22.4
	EPNE							14.6	2.9	13.3	2	0.4	2.6
		128.1	25.6	100.1	96	19.2	100.0	110.0	21.9	100.0	76	15.2	100.0

TABLE E-8 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-4/9R	No transects made because of proximity to original site												
MX-5-SS-4/10R	GUSA (d)	55.1	11.0	42.3	58	11.6	53.2	65.7	13.1	47.3	50	10.0	54.6
	ORHY (s)	45.9	9.2	35.2	27	5.4	24.8	51.5	10.3	37.1	26	5.2	28.4
	BOGR	3.9	0.8	3.0	6	1.2	5.5	8.8	1.8	6.3	10	2.0	10.9
	ARNO	1.5	0.3	1.2	1	0.2	0.9						
	STCO	3.5	0.7	2.7	2	0.4	1.8	1.2	0.2	0.9	1	0.2	1.1
	SPCO	9.2	1.8	7.1	9	1.8	8.3	0.4	0.1	0.3	2	0.4	2.2
	CELA	3.7	0.7	2.8	4	0.8	3.7	7.4	1.5	5.3	5	0.1	0.6
	ATCA	4.0	0.8	3.1	1	0.2	0.9						
	EPNE	3.5	0.7	2.7	1	0.2	0.9						
	SIHY							2.0	0.4	1.4	1	0.2	1.1
	CHVI							2.0	0.4	1.4	1	0.2	1.1
		130.3	26.0	100.1	109	21.8	100.0	139.0	27.8	100.0	96	18.3	100.0
MX-5-SS-4/11R	No transects made because of proximity to original site.												
MX-5-SS-5/1R	BOGR	14.8	3.0	12.5	22	4.4	47.8						
	ARTR (s)	32.7	6.5	27.6	8	1.6	127.4	61.2	12.2	62.1	11	2.2	45.8
	GRSP (d)	71.0	14.2	59.9	16	3.2	34.8	27.4	5.5	27.8	6	1.2	25.0
	CHVI							6.9	1.4	7.0	2	0.4	8.3
	HIJA							3.0	0.6	3.1	5	1.0	20.8
		118.5	23.7	100.0	46	9.2	100.0	98.5	19.7	100.0	24	4.8	99.9
MX-5-SS-5/2R	No transects made because of proximity to original site.												

TABLE B-8 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-5-SS-5/3R													
	ARTR (d)	169.1	33.8	99.4	38	7.6	97.4	74.7	14.9	58.5	11	2.2	35.5
	ORHY	1.0	0.2	0.6	1	0.2	2.6	0.3	1.5	5.9	1	0.2	3.2
	CHVI (s)							45.6	9.1	35.7	19	3.8	61.3
		170.1	34.0	100.0	39	7.8	100.0	120.6	25.5	100.1	31	6.2	100.0
MX-5-SS-5/8R													
	ARNO	60.2	12.0	50.1	19	3.8	37.3						
	CHVI (s)	59.9	12.0	49.9	32	6.4	62.8	13.7	2.7	7.3	5	1.0	13.2
	ARTR (d)							171.6	34.3	92.6	33	6.6	86.8
		120.1	24.0	100.0	51	10.2	100.1	185.3	37.0	99.9	38	7.6	100.0

TABLE E-9

WAH WAH VALLEY
TRANSECT RESULTS
CLUSTER 1

Sample Unit No.	Plant Species		Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-1/1														
	ATCO	(d)	32.4	6.5	64.0	13	2.6	39.4						
	HIJA	(s)	12.3	2.5	24.3	16	3.2	48.5						
	CELA		2.6	0.5	5.1	2	0.4	6.1	5.8	1.2	100.0	4	0.8	100.0
	TESP		2.6	0.5	5.1	1	0.2	3.0						
	ORHV		0.7	0.1	1.4	1	0.2	3.0						
			50.6	10.1	99.9	33	6.6	100.0	5.8	1.2	100.0	4	0.8	100.0
MX-54-SS-1/2														
	CELA	(d)	26.9	5.4	87.1	14	2.5	71.4	26.4	5.3	74.8	11	2.2	78.6
	ORHY	(s)	0.1	0.0	0.3	1	0.2	5.7	8.9	1.8	25.2	3	0.6	21.4
	ATCO		3.9	0.8	12.6	4	0.8	22.9						
			30.9	6.2	100.0	19	3.5	100.0	35.3	7.1	100.0	14	2.8	100.0
MX-54-SS-1/3														
	KOAM	(d)	20.7	4.1	100.0	15	3.0	100.0	No perennials present.					
			20.7	4.1	100.0	15	3.0	100.0						
MX-54-SS-1/4														
	CELA		1.5	0.3	2.1	1	0.2	1.5						
	ATCO	(s)	9.3	1.9	13.1	4	0.8	5.8	32.9	6.6	38.8	16	3.2	24.6
	KOAM		24.8	5.0	35.0	32	6.4	46.4						
	ORHY		2.3	0.5	3.2	3	0.6	4.4						
	HIJA	(d)	33.0	6.6	46.5	29	5.8	42.0	51.8	10.4	61.2	49	9.8	75.4
			70.9	14.3	99.9	69	13.8	100.1	84.7	17.0	100.0	65	13.0	100.0

TABLE E-9 (Cont.)

Sample Unit No.	Plant Species		Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-1/5														
	HIJA	(s)	13.1	2.6	38.4	28	5.6	71.8						
	CELA	(d)	21.0	4.2	61.[illegible]	11	2.2	28.2	17.3	3.5	93.0	8	1.6	88.9
	ORHY								1.3	0.3	7.0	1	0.2	11.1
			34.1	6.8	100.0	39	7.8	100.0	18.6	3.8	100.0	9	1.8	100.0
MX-54-SS-1/6														
	HIJA	(s)	6.4	1.3	25.3	10	2.0	41.7	4.0	0.8	53.3	8	1.6	88.9
	CELA	(d)	18.9	3.8	74.7	14	2.8	58.3	3.5	0.7	46.7	1	0.2	11.1
			25.3	5.1	100.0	24	4.8	100.0	7.5	1.5	100.0	9	1.8	100.0
MX-54-SS-1/7														
	CELA	(d)	37.7	7.5	88.3	14	2.8	60.9	52.5	10.5	96.7	17	3.4	81.0
	ORHY	(s)	5.0	1.0	11.7	9	1.8	39.1	0.6	0.1	1.1	1	0.2	4.8
	HIJA								1.2	0.2	2.2	3	0.6	14.3
			42.7	8.5	100.0	23	4.6	100.0	54.3	10.8	100.0	21	4.2	100.1
MX-54-SS-1/8														
	CHGR	(d)	90.7	18.1	51.5	37	7.4	34.9	21.0	4.2	17.8	8	1.6	7.1
	ORHY		13.9	2.8	7.9	11	2.2	10.4	2.4	0.5	2.0	4	0.8	3.6
	CELA	(s)	50.6	10.1	28.7	24	4.8	22.6	49.0	9.8	41.6	24	4.8	21.4
	HIJA		18.1	3.6	10.3	31	6.2	29.3	45.5	9.1	38.6	76	15.2	67.9
	OP		1.2	0.2	0.7	1	0.2	0.9						
	SPCR		0.8	0.2	0.5	1	0.2	0.9						
	SPGR		0.9	0.2	0.5	1	0.2	0.9						
			176.2	35.2	100.1	106	21.2	99.9	117.9	23.6	100.0	112	22.4	100.0

TABLE E-9 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-1/9													
	HIJA (d)	45.0	9.0	37.0	74	14.8	62.7	28.0	5.6	24.0	41	8.2	46.6
	CHGR (s)	44.7	8.9	36.7	20	4.0	17.0	14.1	2.8	12.1	6	1.2	6.8
	CELA	14.4	2.9	11.6	14	2.8	11.9	36.2	7.2	31.0	19	3.8	21.6
	ORHY	5.4	1.1	4.4	6	1.2	5.1	29.0	5.8	24.9	16	3.2	18.2
	EPNE	9.8	2.0	8.1	3	0.6	2.5	9.4	1.9	8.1	6	1.2	6.8
	OP	2.4	0.5	2.0	1	0.2	0.9						
		121.7	24.4	100.0	118	23.6	100.1	116.7	23.3	100.1	88	17.6	100.0
MX-54-SS-1/10													
	CELA (s)							30.7	6.1	73.1	24	4.8	75.0
	HIJA (d)	32.5	6.5	100.0	39	7.8	100.0	11.3	2.3	26.9	8	1.6	25.0
		32.5	6.5	100.0	39	7.8	100.0	42.0	8.4	100.0	32	6.4	100.0
MX-54-SS-1/11													
	CELA (d)	32.9	6.6	100.0	20	4.0	100.0	10.9	2.2	73.2	9	1.8	52.9
	HIJA (s)							4.0	0.8	26.8	8	1.6	47.1
		32.9	6.6	100.0	20	4.0	100.0	14.9	3.0	100.0	17	3.4	100.0
MX-54-SS-1/12													
	HIJA (d)	51.5	10.3	74.6	75	15.0	86.2	10.9	2.2	32.4	26	5.2	74.3
	CELA (s)	14.7	2.9	21.3	9	1.8	10.3	18.3	3.7	54.5	7	1.4	20.0
	ORHY	2.8	0.6	4.1	3	0.6	3.5	4.4	0.9	13.1	2	0.4	5.7
		69.0	13.8	100.0	87	17.4	100.0	33.6	6.8	100.0	35	7.0	100.0

TABLE E-9 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-1/13													
	HIJA (d)	64.3	12.9	63.5	83	16.6	79.1	103.9	20.8	87.4	142	28.4	92.2
	CELA	13.6	2.7	13.4	8	1.6	7.6	6.4	1.3	5.4	5	1.0	3.3
	SPCR	2.0	0.4	2.0	3	0.6	2.9						
	CHGR (s)	17.0	3.4	16.8	7	1.4	6.7	7.4	1.5	6.2	5	1.0	3.3
	ORHY	4.1	0.8	4.1	3	0.6	2.9	0.7	0.1	0.6	1	0.2	0.7
	SIHY	0.2	0.0	0.2	1	0.2	1.0	0.5	0.1	0.4	1	0.2	0.7
		101.2	33.1	100.0	105	21.0	100.2	118.9	23.8	99.8	154	30.8	100.2
MX-54-SS-1/14													
	ORHY	3.1	0.6	7.5	7	1.4	14.3	1.1	0.2	1.9	2	0.4	2.9
	HIJA (d)	20.8	4.2	50.4	33	6.6	67.4	37.1	7.4	62.9	48	9.6	68.6
	CELA (s)	8.4	1.7	20.3	6	1.2	12.2	19.3	3.9	32.7	17	3.4	24.3
	CHGR	9.0	1.8	21.8	3	0.6	6.1						
	SPGR							1.5	0.3	2.5	3	0.6	4.3
		41.3	8.3	100.0	49	9.8	100.0	59.0	11.8	100.0	70	14.0	100.1
MX-54-SS-1/15													
	EPNE	4.2	0.8	5.3	1	0.2	1.5						
	ORHY	11.3	2.3	14.1	9	1.8	13.9						
	CHGR (d)	34.4	6.9	43.1	12	2.4	18.5						
	CELA (s)	11.6	2.3	14.6	10	2.0	15.4	20.4	4.1	58.8	9	1.8	52.9
	HIJA	16.9	3.4	21.2	32	6.4	49.2						
	SPGR	1.4	0.3	1.8	1	0.2	1.5						
	SPCR							14.3	2.9	41.2	8	1.6	47.1
		79.8	16.0	100.1	65	13.0	100.0	34.7	7.0	100.0	17	3.4	100.0

TABLE E-9 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover. (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover. (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-1/16													
	CELA (d)	27.1	5.4	93.1	11	2.2	91.7	77.4	15.5	68.2	37	7.4	46.3
	SPGR	2.0	0.4	6.9	1	0.2	8.3						
	HIJA (s)							34.2	6.8	30.1	41	8.2	51.3
	ORHY							1.9	0.4	1.7	2	0.4	2.5
		29.1	5.8	100.0	12	2.4	100.0	113.5	22.7	100.0	80	16.0	100.1
MX-54-SS-1/17													
	CELA	21.8	4.4	18.2	14	2.8	21.2	18.3	3.7	12.7	15	3.0	15.6
	ORHY (d)	62.0	12.4	51.9	28	5.6	42.4	59.3	11.9	41.2	24	4.8	25.0
	CHGR (s)	28.2	5.6	23.6	16	3.2	24.2	19.6	3.9	13.6	12	2.4	12.5
	SPCO	4.4	0.9	3.7	5	1.0	7.6						
	SPGR	3.1	0.6	2.6	3	0.6	4.6	0.7	0.1	0.5	1	0.2	1.0
	LY							1.6	0.3	1.1	1	0.2	1.0
	HIJA							36.1	7.2	25.1	39	7.8	40.6
	SPCR							8.2	1.6	5.7	4	0.8	4.2
		119.5	23.9	100.0	66	13.2	100.0	143.8	28.7	99.9	96	19.2	99.9
MX-54-SS-1/18													
	CELA	5.0	1.0	5.3	3	0.6	4.1	4.3	0.9	4.6	2	0.4	3.5
	HIJA (s)	45.2	9.0	48.3	54	10.8	73.0	17.2	3.4	18.4	24	4.8	41.4
	CHGR (d)	25.1	5.0	26.8	13	2.6	17.6	63.4	12.7	67.9	26	5.2	44.8
	GRSP	17.0	3.4	18.2	3	0.6	4.1						
	ORHY	1.3	0.3	1.4	1	0.2	1.4	5.3	1.1	5.7	3	0.6	5.2
	SPCR							3.2	0.6	3.4	3	0.6	5.2
		93.6	18.7	100.0	74	14.8	100.2	93.4	18.7	100.0	58	11.6	100.1

TABLE E-9 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-1/19													
	CELA	5.8	1.2	23.2	2	0.4	25.0	19.3	3.9	11.8	9	1.8	9.4
	ORHY (s)	10.0	2.0	40.0	3	0.6	37.5	44.6	8.9	27.2	28	5.6	29.2
	CHGR (d)	6.3	1.3	25.2	1	0.2	12.5	75.1	15.0	45.8	30	6.0	31.3
	SPCO	2.3	0.5	9.2	1	0.2	12.5						
	SPGR	0.6	0.1	2.4	1	0.2	12.5						
	EPNE							1.2	0.2	0.7	1	0.2	1.0
	SPCR							11.0	2.2	6.7	7	1.4	7.3
	HIJA							12.7	2.5	7.8	21	4.2	21.9
		25.0	5.1	100.0	8	1.6	100.0	163.9	32.7	100.0	96	19.2	100.1
MX-54-SS-1/20													
	HIJA (d)	42.3	8.5	32.1	32	6.4	34.8	40.7	8.1	33.9	65	13.0	57.5
	ORHY	32.9	6.6	25.0	26	5.2	28.3	19.0	3.8	15.8	11	2.2	9.7
	CHGR (s)	38.2	7.6	29.0	22	4.4	23.9	29.3	5.9	24.4	15	3.0	13.3
	SPCR	4.7	0.9	3.6	4	0.8	4.4	15.3	3.1	12.7	11	2.2	9.7
	CELA	23.6	2.7	10.3	8	1.6	8.7	15.7	3.1	13.1	10	2.0	8.9
	SPGR							0.2	0.0	0.2	1	0.2	0.9
		131.7	26.3	100.0	92	18.4	100.1	120.2	24.0	100.1	113	22.6	100.0
MX-54-SS-1/21													
	ORHY	11.5	2.3	11.9	13	2.6	16.1	8.6	1.7	9.6	7	1.4	8.4
	CHGR (d)	37.3	7.5	38.5	25	5.0	30.9	23.6	4.7	26.4	14	2.8	16.9
	EPNE	14.4	2.9	14.9	3	0.6	3.7	10.1	2.0	11.3	1	0.2	1.2
	CELA (s)	29.0	5.8	29.9	27	5.4	33.3	24.6	4.9	27.6	24	4.8	28.9
	HIJA	4.7	0.9	4.9	13	2.6	16.1	16.5	3.3	18.5	33	6.6	39.8
	SPCR							2.2	0.4	2.5	1	0.2	1.2
	SPGR							3.7	0.7	4.1	3	0.6	3.6
		96.9	19.4	100.1	81	16.2	100.1	89.3	17.7	100.0	83	16.6	100.0

TABLE E-9 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Total Cover (%)	Rel. Cover (%)	No. of Plants	Density (#/100 dm)	Rel. Density (%)	Transect 2 Total Cover (dm)	Total Cover (%)	Rel. Cover (%)	No. of Plants	Density (#/100 dm)	Rel. Density (%)
MX-54-SS-1/22													
	ORHY	19.5	3.9	11.9	17	3.4	14.9	22.2	4.4	16.6	19	3.8	15.8
	CHGR (d)	102.5	20.5	62.4	53	10.6	46.5	59.9	12.0	44.9	24	4.8	20.0
	CELA (s)	23.5	4.7	14.3	17	3.4	14.9	24.1	4.8	18.1	20	4.0	16.7
	SIHY	2.3	0.5	1.4	2	0.4	1.8	0.1	0.0	0.1	1	0.2	0.8
	HIJA	16.5	3.3	10.0	25	5.0	21.9	22.4	4.5	16.8	52	10.4	43.3
	AS							0.8	0.2	0.6	1	0.2	0.8
	LE							2.4	0.5	1.8	2	0.4	1.7
	ER							1.5	0.3	1.1	1	0.2	0.8
		164.3	32.9	100.0	114	22.8	100.0	133.4	26.7	100.0	120	24.0	99.9
MX-54-SS-1/23													
	CHGR (d)	62.6	12.5	63.7	36	7.2	52.2	125.3	25.1	85.3	42	8.4	68.9
	ORHY	3.5	0.7	3.6	5	1.0	7.3	2.6	0.5	1.8	3	0.6	4.9
	CELA (s)	17.9	3.6	18.2	10	2.0	14.5	6.0	1.2	4.1	5	1.0	8.2
	HIJA	8.2	1.6	8.3	15	3.0	21.7	3.7	0.7	2.5	9	1.8	14.8
	ARTR	4.7	0.9	4.8	2	0.4	2.9	5.5	1.1	3.7	1	0.2	1.6
	EPNE	1.4	0.3	1.4	1	0.2	1.5	3.8	0.8	2.6	1	0.2	1.6
		98.3	19.6	100.0	69	13.8	100.1	146.9	29.4	100.0	61	12.2	100.0

TABLE E-10

WAH WAH VALLEY
TRANSECT RESULTS
CLUSTER 2

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-2/1													
	CELA	13.1	2.6	13.3	7	1.4	17.5	6.0	1.2	8.2	3	0.6	8.6
	ATCO (d)	50.8	10.2	51.7	17	3.4	42.5	41.1	8.2	55.8	15	3.0	42.9
	ORHY	2.2	0.4	2.2	4	0.8	10.0	0.6	0.1	0.8	1	0.2	2.9
	ARSP (s)	7.2	1.4	7.3	3	0.6	7.5	22.8	4.6	31.0	11	2.2	31.4
	TESP	9.9	2.0	10.1	3	0.6	7.5						
	CHGR	15.1	3.0	15.4	6	1.2	15.0						
	HIJA							3.1	0.6	4.2	5	1.0	14.3
		98.3	19.6	100.0	40	8.0	100.0	73.6	14.7	100.0	35	7.0	100.1
MX-54-SS-2/2													
	KOAM (s)	35.5	7.1	47.4	26	5.2	66.7						
	ATCO (d)	36.4	7.3	48.6	12	2.4	30.8	31.2	6.2	100.0	10	2.0	100.0
	CELA	3.0	0.6	4.0	1	0.2	2.6						
		74.9	15.0	100.0	39	7.8	100.1	31.2	6.2	100.0	10	2.0	100.0
MX-54-SS-2/3													
	ATCO (d)	41.0	8.2	65.0	11	2.2	31.4	69.1	13.8	54.6	20	4.0	27.0
	HIJA (s)	2.1	0.4	3.3	4	0.8	11.4	28.8	5.8	22.8	33	6.6	44.6
	ARSP	2.8	0.6	4.4	4	0.8	11.4	19.2	3.8	15.2	13	2.6	17.6
	CELA	10.4	2.1	16.5	4	0.8	11.4	4.7	0.9	3.7	4	0.8	5.4
	SIHY	6.8	1.4	10.8	12	2.4	34.3	0.7	0.1	0.6	1	0.2	1.4
	ORHY							2.2	0.4	1.7	2	0.4	2.7
	OP							1.9	0.4	1.5	1	0.2	1.4
		63.1	12.7	100.0	35	7.0	99.9	126.6	25.2	100.1	74	14.8	100.1

TABLE E-10 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-2/4													
	CELA (s)	38.9	7.8	40.2	21	4.2	50.0	45.7	9.1	49.1	30	6.0	57.7
	ATCO (d)	57.8	11.6	59.8	21	4.2	50.0	47.4	9.5	50.9	22	4.4	42.3
		96.7	19.4	100.0	42	8.4	100.0	93.1	18.6	100.0	52	10.4	100.0
MX-54-SS-2/5													
	ATCO (d)	45.4	9.1	98.5	14	2.8	93.3	100.9	20.2	94.2	38	7.6	92.7
	CELA (s)	0.7	0.1	1.5	1	0.2	6.8	6.2	1.2	5.8	3	0.6	7.3
		46.1	9.2	100.0	15	3.0	100.1	107.1	21.4	100.0	41	8.2	100.0
MX-54-SS-2/6													
	ATCO (d)	32.7	6.5	46.3	11	2.2	17.2	40.8	8.2	57.8	13	2.6	43.3
	HIJA	14.8	3.0	20.9	37	7.4	57.8						
	ARSP	12.2	2.4	17.3	8	1.6	12.5						
	CELA (s)	7.5	1.5	10.6	6	1.2	9.4	29.8	6.0	42.2	17	3.4	56.7
	SIHY	1.2	0.2	1.7	1	0.2	1.6						
	GUSA	2.3	0.5	3.3	1	0.2	1.6						
		70.7	14.1	100.1	64	12.8	100.1	70.6	14.2	100.0	30	6.0	100.0
MX-54-SS2/7													
	CELA (s)	30.8	6.2	43.9	17	3.4	48.6	2.6	0.5	11.9	2	0.4	25.0
	ATCO (d)	39.4	7.9	56.1	18	3.6	51.4	19.3	3.9	88.1	6	1.2	75.0
		70.2	14.1	100.0	35	7.0	100.0	21.9	4.4	100.0	8	1.6	100.0

TABLE B-10 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-2/8													
	ATCO (d)	69.4	13.9	65.4	20	4.0	48.8	78.0	15.6	60.0	25	5.0	59.5
	GUSA	2.8	0.6	2.6	1	0.2	2.4						
	ARSP	7.0	1.4	6.6	3	0.6	7.3	0.3	0.1	0.2	1	0.2	2.4
	CELA (s)	27.0	5.4	25.4	17	3.4	41.5	53.1	10.6	40.4	16	3.2	38.1
		106.2	21.3	100.0	41	8.2	100.0	131.4	26.3	100.6	42	8.4	100.0
MX-54-SS-2/9													
	CHGR (d)	37.3	7.5	30.3	11	2.2	15.7	58.5	11.7	43.5	18	3.6	41.9
	TESP	3.4	0.7	2.8	2	0.4	2.9						
	ATCO (s)	43.6	8.7	35.4	20	4.0	28.6	18.5	3.7	13.8	9	1.8	20.9
	ARSP	7.5	1.5	6.1	9	1.8	12.9	2.0	0.4	1.5	2	0.4	4.7
	EPNE	0.3	0.6	2.4	1	0.2	1.4	55.4	11.1	41.2	14	2.8	32.6
	KOAM	28.3	5.7	23.0	27	5.4	38.6						
		120.4	24.7	100.0	70	14.0	100.1	134.4	26.9	100.0	43	8.6	100.1
MX-54-SS-2/10													
	TEGL	18.1	3.6	17.8	3	0.6	9.1	25.3	5.1	29.5	5	1.0	33.3
	CHGR (s)	46.1	9.2	45.4	21	4.2	63.6	4.1	0.8	4.8	2	0.4	13.3
	EPNE (d)	34.6	6.9	34.1	7	1.4	21.2	50.2	10.0	58.5	6	1.2	40.0
	ATCA	0.3	0.1	0.3	1	0.2	3.0	6.2	1.2	7.2	2	0.4	13.3
	ATCO	2.5	0.5	2.5	1	0.2	3.0						
		101.6	20.3	100.1	33	6.6	99.9	85.8	17.1	100.0	15	3.0	99.9

TABLE E-10 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-2/11													
	CELA	13.6	2.7	27.1	7	1.4	28.0	13.3	2.7	14.0	5	1.0	16.7
	SP	1.3	0.3	2.6	2	0.4	8.0						
	ATCO (s)	9.5	1.9	18.9	4	0.8	16.0	22.2	4.4	23.3	8	1.6	26.7
	EPNE	0.8	0.2	1.6	1	0.2	4.0						
	TEGL	3.5	0.7	7.0	1	0.2	4.0	9.9	2.0	10.4	3	0.6	10.0
	LE	0.6	0.1	1.2	1	0.2	4.0						
	ER	1.1	0.2	2.2	1	0.2	4.0						
	CHGR (d)	19.8	4.0	39.4	8	1.6	32.0	49.8	10.0	52.3	14	2.8	46.7
		50.2	10.1	100.0	25	5.0	100.0	95.2	19.1	100.0	30	6.0	100.1
MX-54-SS-2/12													
	ATCO	11.5	2.3	12.6	7	1.4	17.1	11.4	2.3	14.5	6	1.2	16.7
	CHGR (d)	66.1	13.2	72.3	23	4.6	56.1	30.8	6.2	39.1	11	2.2	30.6
	CELA (s)	10.5	2.1	11.5	8	1.6	19.5	26.9	5.4	34.2	14	2.8	38.9
	ORHY	2.0	0.4	2.2	1	0.2	2.4	1.5	0.3	1.9	1	0.2	2.8
	SPGR	0.7	0.1	0.8	1	0.2	2.4	1.5	0.3	1.9	1	0.2	2.8
	TEGL	0.6	0.1	0.7	1	0.2	2.4						
	ARSP							6.6	1.3	8.4	3	0.6	8.3
		91.4	18.2	100.1	41	8.2	99.9	78.7	15.8	100.0	36	7.2	100.1
MX-54-SS-2/13													
	ORHY	4.2	0.8	4.4	4	0.8	6.6	1.2	0.2	2.3	1	0.2	4.8
	ATCO (d)	39.3	7.9	41.1	18	3.6	29.5	24.3	4.9	46.0	8	1.6	38.1
	ARSP (s)	23.7	4.7	24.8	19	3.8	31.2	16.3	3.3	30.9	9	1.8	42.9
	HIJA	9.7	1.9	10.1	12	2.4	19.7						
	CHGR	17.0	3.4	17.8	6	1.2	9.8	6.4	1.3	12.1	1	0.2	4.8
	CELA	1.8	0.4	1.9	2	0.4	3.3	4.6	0.9	8.7	2	0.4	9.5
		95.7	19.1	100.1	61	12.2	100.1	52.8	10.6	100.0	21	4.2	100.1

TABLE E-10 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-2/14													
	ARSP (s)	18.9	3.8	25.8	12	2.4	31.6	7.6	1.5	14.1	4	0.8	13.3
	ATCO (d)	44.7	8.9	61.1	14	2.8	36.8	33.3	6.7	61.8	13	2.6	43.3
	KOAM	9.6	1.9	13.1	12	2.4	31.6	13.0	2.6	24.1	13	2.6	43.3
		73.2	14.6	100.0	38	7.6	100.0	53.9	10.8	100.0	30	6.0	99.9
MX-54-SS-2/15													
	HIJA	37.6	7.5	29.3	53	10.6	46.5	9.2	1.8	8.1	25	5.0	32.1
	CHVI (d)	47.6	9.5	37.1	26	5.2	22.8	46.8	9.4	41.3	19	3.8	24.4
	GUSA (s)	36.5	7.3	28.5	30	6.0	26.3	22.4	4.5	19.8	21	4.2	26.9
	CELA	1.3	0.3	1.0	1	0.2	0.9	1.8	0.4	1.6	1	0.2	1.3
	ORHY	2.3	0.5	1.8	2	0.4	1.8	4.9	1.0	4.3	3	0.6	3.9
	ATCO	1.2	0.2	0.9	1	0.2	0.9						
	SPCO	1.7	0.3	1.3	1	0.2	0.9						
	ATCA							0.1	0.0	0.1	1	0.2	1.3
	SPGR							1.0	0.2	0.9	1	0.2	1.3
	TEAX							20.2	4.0	17.8	5	1.0	6.4
	EPNE							7.0	1.4	6.2	2	0.4	2.6
		128.2	25.6	99.9	114	22.8	100.1	113.4	22.7	100.1	78	15.6	100.2
MX-54-SS-2/16													
	KOAM	25.1	5.0	27.6	34	6.8	52.3						
	ATCO (d)	58.7	11.7	64.4	23	4.6	35.4	52.6	10.5	42.6	15	3.0	31.9
	ARSP	7.3	1.5	8.0	8	1.6	12.3	20.9	4.2	16.9	10	2.0	21.3
	CHGR (s)							29.8	6.0	24.2	11	2.2	23.4
	TEGL							3.5	0.7	2.8	1	0.2	2.1
	CELA							11.3	2.3	9.2	9	1.8	19.2
	TESP							5.3	1.1	4.3	1	0.2	2.1
		91.1	18.2	100.0	65	13.0	100.0	123.4	24.8	100.0	47	9.4	100.0

TABLE E-10 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-2/17													
	HIJA (s)	30.9	6.2	33.1	53	10.6	66.3	9.6	1.9	14.7	17	3.4	47.2
	CHGR	15.0	3.0	16.1	7	1.4	8.8	17.6	3.5	26.9	5	1.0	13.9
	ORHY	0.7	0.1	0.8	1	0.2	1.3						
	ATCO (d)	43.1	8.6	46.2	14	2.8	17.5	31.7	6.3	48.4	10	2.0	27.8
	SIHY	0.5	0.1	0.5	1	0.2	1.3						
	CELA	3.1	0.6	3.3	4	0.8	5.0						
	ARSP							6.6	1.3	10.1	4	0.8	11.1
		93.3	18.6	100.0	80	16.0	100.2	65.5	13.0	100.1	36	7.2	100.0
MX-54-SS-2/18													
	CELA	2.4	0.5	2.1	5	1.0	5.2	19.3	3.9	23.1	14	2.8	16.7
	ATCO (d)	53.2	10.6	47.2	23	4.6	24.0	32.0	6.4	38.3	16	3.2	19.1
	HIJA (s)	39.7	7.9	35.2	61	12.2	63.5	30.4	6.1	36.4	52	10.4	61.9
	ORHY	0.3	0.1	0.3	1	0.2	1.0						
	CHGR	17.2	3.4	15.3	6	1.2	6.3						
	SIHY							1.8	0.4	2.2	2	0.4	2.4
		112.8	22.5	100.1	96	19.2	100.0	83.5	16.8	100.0	84	16.8	100.1

TABLE E-10 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-2/19													
	GUSA	8.0	1.6	23.4	10	2.0	17.9	7.3	1.5	10.9	7	1.4	9.5
	ATCO (d)	7.7	1.5	22.5	3	0.6	5.4	30.6	6.1	45.9	18	3.6	24.3
	CELA	6.7	1.3	19.6	5	1.0	8.9	1.1	0.2	1.7	1	0.2	1.4
	HIJA (s)	11.8	2.4	34.5	38	7.6	67.9	13.0	2.6	19.5	36	7.2	48.7
	ORHY							4.7	0.9	7.1	3	0.6	4.1
	EPNE							2.5	0.5	3.8	1	0.2	1.4
	SPCR							7.3	1.5	10.9	7	1.4	9.5
	SIHY							0.2	0.0	0.3	1	0.2	1.4
		34.2	6.8	100.0	56	11.2	100.1	66.7	13.3	100.1	74	14.8	100.3
MX-54-SS-2/20													
	CHGR (s)	28.4	5.7	50.3	9	1.8	50.0						
	ATCO (d)	20.8	4.2	36.8	7	1.4	38.9	18.7	3.7	72.2	5	1.0	55.6
	ARSP	2.2	0.4	3.9	1	0.2	5.6	7.2	1.4	27.8	4	0.8	44.4
	TEGL	5.1	1.0	9.0	1	0.2	5.6						
		56.5	11.3	100.0	18	3.6	100.1	25.9	5.1	100.0	9	1.8	100.0
MX-54-SS-2/21													
	ORHY	4.5	0.9	13.8	3	0.6	16.7	3.3	0.7	3.0	2	0.4	1.6
	SIHY (s)	16.3	3.3	49.9	11	2.2	61.1						
	HIJA (d)	7.1	1.4	21.7	3	0.6	16.7	97.1	19.4	87.5	113	22.6	90.4
	KOAM							10.6	2.1	9.6	10	2.0	8.0
Unidentified Perennial grass (Stipa?)		4.8	1.0	14.7	1	0.2	5.6						
		32.7	6.6	100.1	18	3.6	100.1	111.0	22.2	100.1	125	25.0	100.0

TABLE E-10 (Cont.)

Sample Unit No.	Plant Species	Transect 1						Transect 2					
		Total Cover (dm)	Total Cover (%)	Rel. Cover (%)	No. of Plants	Density (#/100 dm)	Rel. Density (%)	Total Cover (dm)	Total Cover (%)	Rel. Cover (%)	No. of Plants	Density (#/100 dm)	Rel. Density (%)
MX-54-SS-2/22													
	ATCO (d)	10.9	2.2	58.0	4	0.8	44.4	45.8	9.2	62.6	14	2.8	26.9
	TESP	7.9	1.6	42.0	5	1.0	55.6						
	ARSP							2.2	0.4	3.0	4	0.8	7.7
	HIJA (s)							16.0	3.2	21.9	20	4.0	38.5
	KOAM							7.0	1.4	9.6	9	1.8	17.3
	CELA							0.5	0.1	0.7	1	0.2	1.9
	SIHY							1.7	0.3	2.3	4	0.8	7.7
		18.8	3.8	100.0	9	1.8	100.0	73.2	14.6	100.1	52	10.4	100.0
MX-54-SS-2/23													
	HIJA (d)	123.2	24.6	80.0	283	56.6	93.4	197.9	39.6	91.2	362	72.4	97.1
	ORHY (s)	7.4	1.5	4.8	4	0.8	1.3	11.1	2.2	5.1	9	1.8	2.4
	ATCO	3.5	0.7	2.3	1	0.2	0.3						
	CHVI	17.8	3.6	11.6	14	2.8	4.6						
	ATCA	2.1	0.4	1.4	1	0.2	0.3						
	CELA							7.9	1.6	3.6	2	0.4	0.5
		154.0	30.8	100.1	303	60.6	99.9	216.9	43.4	99.9	373	74.6	100.0

TABLE E-11

WAH WAH VALLEY
TRANSECT RESULTS
CLUSTER 3

Sample Unit No.	Plant Species		Transect 1						Transect 2					
			Total Cover (dm)	Total Cover (%)	Rel. Cover (%)	No. of Plants	Density (#/100 dm)	Rel. Density (%)	Total Cover (dm)	Total Cover (%)	Rel. Cover (%)	No. of Plants	Density (#/100 dm)	Rel. Density (%)
MX-54-SS-3/1														
	CELA	(d)	26.7	5.3	46.8	11	2.2	47.8	49.7	9.9	95.6	23	4.6	92.0
	ATCA	(s)	10.6	2.1	18.6	4	0.8	17.4						
	CHGR		7.8	3.5	31.0	6	1.2	26.1						
	ORHY		2.1	0.4	3.7	2	0.4	8.7	2.3	0.5	4.4	2	0.4	8.0
			57.1	11.3	100.1	23	4.6	100.0	52.0	10.4	100.0	25	5.0	100.0
MX-54-SS-3/2														
	CHGR	(s)	78.9	15.8	73.7	29	5.8	69.1						
	ATCO	(d)	20.3	4.1	19.0	10	2.0	23.8	66.7	13.3	70.6	20	4.0	60.6
	TESP		1.5	0.3	1.4	1	0.2	2.4						
	CELA		6.3	1.3	5.9	2	0.4	4.8	27.8	5.6	29.4	13	2.6	39.4
			107.0	21.5	100.0	42	8.4	100.1	94.5	18.9	100.0	33	6.6	100.0
MX-54-SS-3/3														
	ATCO	(s)	37.3	7.5	35.1	10	2.0	22.2	19.3	3.9	20.4	10	2.0	21.3
	ARSP		0.5	0.1	0.5	1	0.2	2.2						
	GRSP	(d)	35.5	7.1	33.4	8	1.6	17.8	24.7	4.9	26.1	6	1.2	12.8
	TEGL		9.8	2.0	9.2	1	0.2	2.2	24.8	5.0	26.2	5	1.0	10.6
	ORHY		6.6	1.3	6.2	7	1.4	15.6						
	HIJA		5.5	1.1	5.2	14	2.8	31.1	8.7	1.7	9.2	23	4.6	48.9
	TESP		3.7	0.7	3.5	1	0.2	2.2	1.0	0.2	1.1	1	0.2	2.1
	CH		3.8	0.8	3.6	1	0.2	2.2	5.4	1.1	5.7	1	0.2	2.1
	GUSA		3.5	0.7	3.3	2	0.4	4.4						
	EPNE								10.7	2.1	11.3	1	0.2	2.1
			106.2	21.3	100.0	45	9.0	99.9	94.6	18.9	100.1	47	9.4	99.9

TABLE E-11 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-3/4													
	TEGL (s)	44.3	8.9	32.9	12	2.4	22.6						
	CELA	3.5	0.7	2.6	2	0.4	3.8	24.5	4.9	31.5	12	2.4	34.3
	ATCO (d)	50.0	10.0	37.1	21	4.2	39.6	52.0	10.4	66.7	18	3.6	51.4
	HIJA	4.1	0.8	3.0	9	1.8	17.0						
	EPNE	22.8	4.6	16.9	4	0.8	7.6						
	CHGR	1.6	0.3	1.2	1	0.2	1.9						
	ARSP	1.0	0.2	0.7	1	0.2	1.9	0.7	0.1	0.9	3	0.6	8.6
	TESP	7.5	1.5	5.6	3	0.6	5.7						
	ORHY							0.7	0.1	0.9	2	0.4	5.7
		134.8	27.0	100.0	53	10.6	100.1	77.9	15.5	100.0	35	7.0	100.0
MX-54-SS-3/5													
	ORHY	18.9	3.8	15.7	10	2.0	17.5	14.6	2.9	9.5	6	1.2	9.0
	CELA (s)	34.7	6.9	28.8	22	4.4	38.6	40.3	8.1	26.1	22	4.4	32.8
	CHVI	5.9	1.2	4.9	3	0.6	5.3						
	ATCO (d)	61.0	12.2	50.6	22	4.4	38.6	98.4	19.7	63.7	36	7.2	53.7
	SIHY							1.2	0.2	0.8	3	0.6	4.5
		120.5	24.1	100.0	57	11.4	100.0	154.5	30.9	100.1	67	13.4	100.0

TABLE E-11 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-3/6													
	ATCO (d)	28.2	5.6	45.9	13	2.6	30.2	14.5	2.9	20.5	10	2.0	21.3
	HIJA	5.1	1.0	8.3	16	3.2	37.2	6.2	1.2	8.8	19	3.8	40.4
	CELA	6.5	1.3	10.6	6	1.2	14.0	14.9	3.0	21.1	10	2.0	21.3
	TESP	2.1	0.4	3.4	1	0.2	2.3						
	TEGL	9.0	1.8	14.7	2	0.4	4.7	7.2	1.4	10.2	2	0.4	4.3
	ORHY	0.8	0.2	1.3	1	0.2	2.3	3.0	0.6	4.2	3	0.6	6.4
	CHGR	9.7	1.9	15.8	4	0.8	9.3						
	EPNE (s)							24.9	5.0	35.2	3	0.6	6.4
		61.4	12.2	100.0	43	8.6	100.0	70.7	14.1	100.0	47	11.4	100.1
MX-54-SS-3/7													
	TEGL (d)	29.0	5.8	40.6	8	1.6	17.8	69.4	13.9	53.8	16	3.2	20.3
	CELA	6.9	1.4	9.7	6	1.2	13.3						
	ARSP	0.5	0.1	0.7	1	0.2	2.2						
	HIJA	6.2	1.2	8.7	14	2.8	31.1	22.7	4.5	17.6	46	9.2	58.2
	ATCO (s)	26.3	5.3	36.8	12	2.4	26.7	26.8	5.4	20.8	10	2.0	[illegible]
	ORHY	2.1	0.4	2.9	3	0.6	6.7	1.7	0.3	1.3	2	0.4	2.5
	CH	0.5	0.1	0.7	1	0.2	2.2	1.8	0.4	1.4	1	0.2	1.3
	GUSA							1.7	0.3	1.3	1	0.2	1.3
	SPCR							0.7	0.1	0.5	1	0.2	1.3
	LE							2.7	0.5	2.1	1	0.2	1.3
	EPNE							1.5	0.3	1.2	1	0.2	1.3
		71.5	14.3	100.1	45	9.0	100.0	129.0	25.7	100.0	79	15.8	100.2

TABLE E-11 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-3/8													
	CELA	9.6	1.9	12.2	7	1.4	15.9	4.7	0.9	5.2	3	0.6	5.8
	ATCO	15.5	3.1	19.6	8	1.6	18.2	14.7	2.9	16.3	9	1.8	17.3
	ORHY	1.4	0.3	1.8	3	0.6	6.8						
	TEGL (d)	16.6	3.3	21.0	6	1.2	13.6	33.4	6.7	37.1	6	1.2	11.5
	CH (s)	19.1	3.8	24.2	8	1.6	18.2	30.1	6.0	33.4	12	2.4	23.1
	EPNE	14.4	2.9	18.2	5	1.0	11.4						
	HIJA	2.4	0.5	3.0	7	1.4	15.9	7.1	1.4	7.9	22	4.4	42.3
		79.0	15.8	100.0	44	8.8	100.0	90.0	17.9	99.9	52	10.4	100.0
MX-54-SS-3/9													
	CELA (s)	12.5	2.5	19.1	11	2.2	13.8	19.2	3.8	21.8	11	2.2	23.9
	ATCO (d)	29.6	5.9	45.2	13	2.6	16.3	51.8	10.4	58.9	22	4.4	47.8
	HIJA	19.4	3.9	29.6	48	9.6	60.0						
	ARSP	2.7	0.5	4.1	5	1.0	6.3	8.6	1.7	9.8	7	1.4	15.2
	ORHY	1.2	0.2	1.8	2	0.4	2.5	6.8	1.4	7.7	4	0.8	8.7
	CH	0.1	0.0	0.2	1	0.2	1.3						
	SIHY							1.2	0.2	1.4	1	0.2	2.2
	SPCR							0.4	0.1	0.5	1	0.2	2.2
		65.5	13.0	100.0	80	16.0	100.2	88.0	17.6	100.1	46	9.2	100.0
MX-54-SS-3/10													
	KOAM	17.8	3.6	45.9	22	4.4	66.7	3.2	0.6	5.8	3	0.6	5.9
	ATCO (d)	18.8	3.8	48.5	7	1.4	21.2	15.7	3.1	28.3	8	1.6	15.7
	CELA	2.2	0.4	5.7	4	0.8	12.1	2.5	0.5	4.5	3	0.6	5.9
	ORHY							4.4	0.9	7.9	2	0.4	3.9
	ARSP							8.8	1.8	15.9	8	1.6	15.7
	HIJA (s)							20.9	4.2	37.7	27	5.4	52.9
		38.8	7.8	100.1	33	6.6	100.0	55.5	11.1	100.1	51	10.2	100.0

TABLE B-11 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-3/11													
	EPNE (s)	32.3	6.5	42.2	6	1.2	19.4	0.4	0.1	0.5	1	0.2	1.8
	ORHY	0.5	0.1	0.7	1	0.2	3.2						
	CH	9.6	1.9	12.6	3	0.6	9.7						
	HIJA	5.6	1.1	7.3	9	1.8	29.0	8.7	1.7	10.5	24	4.8	42.9
	TEGL	24.4	4.9	31.9	6	1.2	19.4	0.3	0.1	0.4	1	0.2	1.8
	GUSA	0.5	0.1	0.7	1	0.2	3.2						
	GU							2.7	0.5	3.3	2	0.4	3.6
	CELA	3.6	0.7	4.7	5	1.0	16.1	10.5	5.1	30.7	11	2.2	19.6
	CHGR (d)							43.0	8.6	51.7	16	3.2	28.6
	ARSP							2.5	0.5	3.0	1	0.2	1.8
		76.5	15.3	100.1	31	6.2	100.0	68.1	16.6	100.1	56	11.2	100.1
MX-54-SS-3/12													
	HIJA	7.6	1.5	5.8	10	2.0	27.0	1.1	0.2	1.4	3	0.6	14.3
	CH	28.5	5.7	21.8	9	1.8	24.3	9.5	1.9	11.9	4	0.8	19.1
	EPNE (d)	49.1	9.8	37.6	10	2.0	27.0	44.8	9.0	56.3	7	1.4	33.3
	TEGL (s)	31.4	6.3	24.1	5	1.0	13.5	18.2	3.6	22.9	4	0.8	19.1
	ATCO	13.9	2.8	10.7	3	0.6	8.1	3.3	0.7	4.2	1	0.2	4.8
	CELA							2.7	0.5	3.4	2	0.4	9.5
		130.5	26.1	100.0	37	7.4	99.9	79.6	15.9	100.1	21	4.2	100.1

TABLE E-11 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-3/13	CHGR (d)	37.2	7.4	31.2	12	2.4	28.6	44.8	9.0	48.7	13	2.6	44.8
	EPNE	14.3	2.9	12.0	3	0.6	7.1	17.8	3.6	19.4	3	0.6	10.3
	ORHY	2.5	0.5	2.1	1	0.2	2.4						
	ATCO (s)	40.8	8.2	34.2	16	3.2	38.1	15.8	3.2	17.2	7	1.4	24.1
	TEGL	20.3	4.1	17.0	6	1.2	14.3	8.8	1.8	9.6	2	0.4	6.9
	GUSA	1.5	0.3	1.3	2	0.4	4.8						
	STPI	1.3	0.3	1.1	1	0.2	2.4						
	ARSP	1.3	0.3	1.1	1	0.2	2.4	4.8	1.0	5.2	4	0.8	13.8
		119.2	24.0	100.0	42	8.4	100.1	92.0	18.6	100.1	29	5.8	99.9
MX-54-SS-3/14	CELA (s)	38.4	7.7	39.1	24	4.8	47.1	32.9	6.6	41.5	14	2.8	37.8
	ATCO (d)	51.1	10.2	52.1	24	4.8	47.1	42.2	8.4	53.3	19	3.8	51.4
	CHGR	5.0	1.0	5.1	1	0.2	2.0						
	ARSP	3.3	0.7	3.4	1	0.2	2.0						
	ORHY	0.3	0.1	0.3	1	0.2	2.0						
	KOAM							4.1	0.8	5.2	4	0.8	10.8
		98.1	19.7	100.0	51	10.2	100.2	79.2	15.8	100.0	37	7.4	100.0
MX-54-SS-3/15	ATCO	7.4	1.5	5.7	4	0.8	11.8	1.8	0.4	1.8	2	0.0	0.8
	CHGR (s)	29.8	6.0	23.0	12	2.4	35.3	25.1	5.0	25.1	7	1.4	28.9
	EPNE (d)	57.8	11.6	44.5	8	1.6	23.5	54.5	10.9	54.6	11	2.2	45.5
	TEGL	32.0	6.4	24.7	8	1.6	23.5	18.5	3.7	18.5	6	1.2	24.8
	CELA	2.8	0.6	2.2	2	0.4	5.9						
		129.8	26.1	100.1	34	6.8	100.0	99.9	20.0	100.0	26	4.8	100.0

TABLE E-11 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-3/16													
	CHGR (d)	14.6	2.9	20.3	6	1.2	11.8	25.1	5.0	25.2	9	1.8	22.0
	ORHY	1.7	0.3	2.4	2	0.4	3.9	0.7	1.4	7.0	1	0.2	2.4
	CELA (s)	7.4	1.5	10.3	4	0.2	2.0	31.5	6.3	31.6	17	3.4	41.5
	HIJA	22.7	4.5	31.5	33	6.6	64.7						
	ATCO	10.9	2.2	15.1	4	0.8	7.8	34.0	6.8	34.1	12	2.4	29.3
	LE	3.3	0.7	4.6	1	0.2	2.0						
	EPNE	8.8	1.8	12.2	3	0.6	5.9						
	ARSP	2.7	0.5	3.7	1	0.2	2.0	2.1	0.4	2.1	2	0.4	4.9
		72.1	14.4	100.1	54	10.2	100.1	93.4	19.9	100.0	41	8.2	100.1
MX-54-SS-3/17													
	KOAM	17.8	3.6	35.3	12	2.4	32.4	2.4	0.5	4.2	4	0.8	18.2
	ATCO (s)	8.1	1.6	16.1	16	3.2	43.2	29.5	5.9	51.6	12	2.4	54.5
	CHGR (d)	15.6	3.1	30.9	4	0.8	10.8	24.5	4.9	42.8	5	1.0	22.7
	ARSP	6.5	1.3	12.9	4	0.8	10.8						
	TESP	2.4	0.5	4.8	1	0.2	2.7						
	SPGR							0.8	0.2	1.4	1	0.2	4.6
		50.4	10.1	100.0	37	7.4	99.9	57.2	11.5	100.0	22	4.4	100.0
MX-54-SS-3/18													
	ATCO (s)	4.5	0.9	8.7	4	0.8	8.2	32.6	6.5	47.5	10	2.0	32.3
	HIJA	9.8	2.0	18.9	23	4.6	46.9	3.1	0.6	4.5	6	1.2	19.4
	CELA (d)	34.5	6.9	66.6	20	4.0	40.8	31.7	6.3	46.2	14	2.8	45.2
	ARSP	3.0	0.6	5.8	2	0.4	4.1	1.2	0.2	1.8	1	0.2	3.2
		51.8	10.4	100.0	49	9.8	100.0	68.6	13.6	100.0	31	6.2	100.1

TABLE E-11 (Cont.)

Sample Unit No.	Plant Species	Transect 1						Transect 2					
		Total Cover (dm)	Total Cover (%)	Rel. Cover (%)	No. of Plants	Density (#/100 dm)	Rel. Density (%)	Total Cover (dm)	Total Cover (%)	Rel. Cover (%)	No. of Plants	Density (#/100 dm)	Rel. Density (%)
MX-54-SS-3/19													
	ATCO (d)	29.4	5.9	44.9	7	1.4	13.5	24.5	4.9	35.5	10	2.0	17.5
	CELA	12.2	2.4	18.6	8	1.6	15.4	11.8	2.4	17.1	5	1.0	8.8
	HIJA (s)	19.2	3.8	29.3	35	7.0	67.3	31.5	6.3	45.7	40	8.0	70.2
	TESP	1.7	0.3	2.6	1	0.2	1.9						
	ARSP	3.0	0.6	4.6	1	0.2	1.9	1.0	0.2	1.5	1	0.2	1.8
	ORHY							0.2	0.0	0.3	1	0.2	1.8
		65.5	13.0	100.0	52	10.4	100.0	69.0	13.8	100.1	57	11.4	100.1
MX-54-SS-3/20													
	HIJA	1.1	0.2	1.2	3	0.6	5.9	10.7	2.1	9.1	23	4.6	35.9
	CELA	15.1	3.0	16.1	11	2.2	21.6	33.7	6.7	28.8	15	3.0	23.4
	CHGR (d)	52.6	10.5	56.2	25	5.0	49.0	19.5	3.9	16.6	9	1.8	14.1
	ORHY	8.1	1.6	8.7	4	0.8	7.8	9.1	1.8	7.8	7	1.4	10.9
	TEGL (s)	16.1	3.2	17.2	5	1.0	9.8	43.8	8.8	37.4	9	1.8	14.1
	SPGR	0.6	0.1	0.6	3	0.6	5.9	0.4	0.1	0.3	1	0.2	1.6
		93.6	18.6	100.0	51	10.2	100.0	117.2	23.4	100.0	64	12.8	100.0
MX-54-SS-3/21													
	HIJA (d)	63.6	12.7	64.4	103	20.6	90.4	22.9	4.6	20.4	38	7.6	62.3
	ORHY	2.4	0.5	2.4	4	0.8	3.5	3.7	0.7	3.3	3	0.6	4.9
	ATCO	16.7	3.3	16.9	3	0.6	2.6	5.4	1.1	4.8	1	0.2	1.6
	TEGL (s)	10.4	2.1	10.5	2	0.4	1.8	36.9	7.4	32.9	7	1.4	11.5
	CH	4.1	0.8	4.2	1	0.2	0.9	16.0	3.2	14.3	3	0.6	4.9
	CELA	1.5	0.3	1.5	1	0.2	0.9	21.7	4.3	19.3	8	1.6	13.1
	EPNE							5.7	1.1	5.1	1	0.2	1.6
		98.7	19.7	99.9	114	22.8	100.1	112.3	22.4	100.1	61	12.2	99.9

TABLE E-11 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-3/22													
	ATCO (d)	30.3	6.1	40.0	11	2.2	22.5	32.4	6.5	44.1	16	3.2	26.7
	CHVI	8.1	1.6	10.7	6	1.2	12.2	7.5	1.5	10.2	4	0.8	6.7
	SPCO (s)	16.0	3.2	21.1	17	3.4	34.7						
	ORHY	8.4	1.7	11.1	7	1.4	14.3	0.4	0.1	0.5	1	0.2	1.7
	SP	1.6	0.3	2.1	2	0.4	4.1						
	CELA	2.9	0.6	3.8	4	0.8	8.2	5.7	1.1	7.8	9	1.8	15.0
	SPCR							4.8	1.0	6.5	6	1.2	10.0
	SIHY							1.3	0.3	1.8	2	0.4	3.3
	HIJA							12.2	2.4	16.6	18	3.6	30.0
	TESP							4.5	0.9	6.1	1	0.2	1.7
	ARSP							4.7	0.9	6.4	3	0.6	5.0
	ARNO	8.5	1.7	11.2	2	0.4	4.1						
		75.8	15.2	100.0	49	9.8	100.1	73.5	14.7	100.0	60	12.0	100.1
MX-54-SS-3/23													
	ARNO	9.8	2.0	8.7	5	1.0	8.5						
	CELA	16.0	3.2	14.2	10	2.0	17.0	21.3	4.3	21.6	16	3.2	25.4
	ATCO (d)	33.0	6.6	29.3	16	3.2	27.1	24.1	4.8	24.4	14	2.8	22.2
	ORHY (s)	29.5	5.9	26.2	13	2.6	22.0	16.6	3.3	16.8	9	1.8	14.3
	CHVI	16.3	3.3	14.5	6	1.2	10.2	26.9	5.4	27.3	9	1.8	14.3
	SIHY	3.3	0.7	2.9	4	0.8	6.8	6.8	1.4	6.9	8	1.6	12.7
	SP	1.3	0.3	1.2	2	0.4	3.4	0.3	0.1	0.3	1	0.2	1.6
	SPCR	1.0	0.2	0.9	1	0.2	1.7						
	ARSP	2.5	0.5	2.2	2	0.4	3.4	1.5	0.3	1.5	1	0.2	1.6
	HIJA							1.1	0.2	1.1	5	1.0	7.9
		112.7	22.7	100.1	59	11.8	100.1	98.6	19.8	99.9	63	12.6	100.0

TABLE E-12

WAH WAH VALLEY
TRANSECT RESULTS
CLUSTER 4

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-4/1													
	HIJA	34.5	6.9	43.1	56	11.2	73.7						
	ATCO (s)	40.0	8.0	50.0	17	3.4	22.4						
	ARSP	2.3	0.5	2.9	2	0.4	2.6						
	TESP	3.2	0.6	4.0	1	0.2	1.3						
	PRFA (d)							116.2	23.2	92.8	14	2.8	87.5
	EPNE							9.0	1.8	7.2	2	0.4	12.5
		80.0	16.0	100.0	76	15.2	100.0	125.2	25.0	100.0	16	3.2	100.0
MS-54-SS-4/2													
	CHGR (d)	59.7	11.9	56.0	22	4.4	28.6	13.2	2.6	11.9	5	1.0	5.3
	HIJA (s)	18.5	3.7	17.3	29	5.8	37.7	38.7	7.7	34.7	61	12.2	64.2
	CELA	11.1	2.2	10.4	10	2.0	13.0	5.5	1.1	4.9	6	1.2	6.3
	ORHY	17.2	3.4	16.1	15	3.0	19.5	19.7	3.9	17.7	9	1.8	9.5
	TEGL	0.2	0.0	0.2	1	0.2	1.3	12.0	2.4	10.8	4	0.8	4.2
	GUSA							13.2	2.6	11.9	6	1.2	6.3
	ARSP							1.2	0.2	1.1	1	0.2	1.1
	ATCO							7.9	1.6	7.1	3	0.6	3.2
		106.7	21.2	100.0	77	15.4	100.1	111.4	22.1	100.1	95	19.0	100.1

TABLE E-12 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-4/3													
	HIJA (d)	53.2	10.6	59.4	46	9.2	75.4	2.0	0.4	4.2	3	0.6	15.8
	ATCO (s)	32.8	6.6	36.7	12	2.4	19.7	5.4	1.1	11.3	1	0.2	5.3
	CELA	2.4	0.5	2.7	2	0.4	3.3						
	SPCR	1.1	0.2	1.2	1	0.2	1.6						
	TEGL							9.4	1.9	19.6	3	0.6	15.8
	GUSA							11.3	2.3	23.5	5	1.0	26.3
	ARPU							4.0	0.8	8.3	2	0.4	10.5
	EPNE							2.5	0.5	5.2	1	0.2	5.3
	CHVI							13.4	2.7	27.9	4	0.8	21.1
		89.5	17.9	100.0	61	12.2	100.0	48.0	9.7	100.0	19	3.8	100.1
MS-54-SS-4/4													
	CHGR (s)	12.6	2.5	12.7	6	1.2	37.5	24.7	4.9	37.1	10	2.0	58.8
	EPNE (d)	86.5	17.3	87.3	10	2.0	62.5	41.9	8.4	62.9	7	1.4	41.2
		99.1	19.8	100.0	16	3.2	100.0	66.6	13.3	100.0	17	3.4	100.0
MS-54-SS-4/5													
	CELA	23.9	4.8	31.5	15	3.0	40.5	1.8	0.4	2.7	2	0.4	2.7
	ATCO (s)	41.0	8.2	54.1	17	3.4	46.0	4.6	0.9	6.8	3	0.6	4.1
	ORHY	5.7	1.1	7.5	4	0.8	10.8	4.3	0.9	6.4	3	0.6	4.1
	TEGL	5.2	1.0	6.9	1	0.2	2.7	1.0	0.2	1.5	1	0.2	1.4
	HIJA (d)							53.4	10.7	79.2	64	12.8	86.5
	TESP							2.3	0.5	3.4	1	0.2	1.4
		75.8	15.1	100.0	37	7.4	100.0	67.4	13.6	100.0	74	14.8	100.2

TABLE E-12 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-4/6													
	EPNE (d)	24.8	5.0	100.0	3	0.6	100.0	2.5	0.5	100.0	1	0.2	100.0
		24.8	5.0	100.0	3	0.6	100.0	2.5	0.5	100.0	1	0.2	100.0
MX-54-SS-4/7													
	EPNE (d)	40.1	8.0	53.3	6	1.2	17.7	9.6	1.9	24.8	3	0.6	6.3
	ORHY	2.5	0.5	3.3	2	0.4	5.9						
	HIJA (s)	18.5	3.7	24.6	22	4.4	64.7	21.6	4.3	55.8	42	8.4	87.5
	CHGR	14.2	2.8	18.9	4	0.8	11.8	3.2	0.6	8.3	2	0.4	4.2
	TEGL							4.3	0.9	11.1	1	0.2	2.1
		75.3	15.0	100.1	34	6.8	100.1	38.7	7.7	100.0	48	9.6	100.1
MX-54-SS-4/8	CHGR (s)	5.2	1.0	6.8	3	0.6	25.0	28.8	5.8	31.0	8	1.6	50.0
	EPNE (d)	53.3	10.7	70.0	7	1.4	58.3	64.2	12.8	69.0	8	1.6	50.0
	TEGL	17.7	3.5	23.2	2	0.4	16.7						
		76.2	15.2	100.0	12	2.4	100.0	93.0	18.6	100.0	16	3.2	100.0
MX-54-SS-4/9	HIJA (d)	53.6	10.7	72.0	46	9.2	75.4	106.6	21.3	94.8	74	14.8	94.9
	ATCO	4.0	0.8	5.4	3	0.6	4.9	1.6	0.3	1.4	1	0.2	1.3
	KOAM (s)	10.5	2.1	14.1	9	1.8	14.8	2.4	0.5	2.1	2	0.4	2.6
	ORHY	4.8	1.0	6.5	2	0.4	3.3	1.8	0.4	1.6	1	0.2	1.3
	EPNE	1.5	0.3	2.0	1	0.2	1.6						
		74.4	14.9	100.0	61	12.2	100.0	112.4	22.5	99.9	78	15.6	100.1

TABLE E-12 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-4/10	CHVI (d)	26.7	5.3	39.6	16	3.2	66.7	31.5	6.3	38.8	15	3.0	30.0
	ATCO	6.0	1.2	8.9	2	0.4	8.3	12.6	2.5	15.5	6	1.2	12.0
	TEGL (s)	29.8	6.0	44.2	4	0.8	16.7	27.0	5.4	33.2	9	1.8	18.0
	EPNE	4.5	0.9	6.7	1	0.2	4.2						
	ORHY	0.5	0.1	0.7	1	0.2	4.2						
	LE							2.9	0.6	3.6	3	0.6	6.0
	SIHY							1.5	0.3	1.9	2	0.4	4.0
	DISP							5.1	1.0	6.3	14	2.8	28.0
	ER							0.7	0.1	0.9	1	0.2	2.0
		67.5	13.5	100.1	24	4.8	100.1	81.3	16.2	100.2	50	10.0	100.0
MX-54-SS-4/11	EPNE (s)	26.0	5.2	38.9	5	1.0	26.3						
	HIJA	14.6	2.9	21.8	8	1.6	42.1						
	ATCO (d)	23.8	4.8	35.6	5	1.0	26.3	7.3	1.5	67.6	2	0.4	50.0
	ORHY	2.5	0.5	3.7	1	0.2	5.3	3.5	0.7	32.4	2	0.4	50.0
		66.9	13.4	100.0	19	3.8	100.0	10.8	2.2	100.0	4	0.8	100.0

TABLE E-12 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Total Cover (%)	Rel. Cover (%)	No. of Plants	Density (#/100 dm)	Rel. Density (%)	Transect 2 Total Cover (dm)	Total Cover (%)	Rel. Cover (%)	No. of Plants	Density (#/100 dm)	Rel. Density (%)
MX-54-SS-4/12													
	ATCO (d)	19.8	4.0	38.1	9	1.8	29.0	28.9	5.8	48.1	6	1.2	16.2
	HIJA (s)	4.7	0.9	9.0	9	1.8	29.0	31.2	6.2	51.9	31	6.2	83.8
	CHGR	7.4	1.5	14.2	3	0.6	9.7						
	EPNE	8.8	1.8	16.9	3	0.6	9.7						
	ARSP	11.3	2.3	21.7	7	1.4	22.6						
		52.0	10.5	99.9	31	6.2	100.0	60.1	12.0	100.0	37	7.4	100.0
MX-54-SS-4/13													
	ATCO (s)	15.6	3.1	32.4	9	1.8	20.0	29.9	6.0	29.8	7	1.4	23.3
	ARSP	11.6	2.3	24.1	12	2.4	26.7	0.3	0.1	0.3	1	0.2	3.3
	HIJA	14.4	2.9	29.9	20	4.0	44.4	2.3	0.5	2.3	3	0.6	10.0
	CHGR (d)	5.4	1.1	11.2	2	0.4	4.4	55.9	11.2	55.6	16	3.2	53.3
	KOAM	1.1	0.2	2.3	2	0.4	4.4	0.6	0.1	0.6	1	0.2	3.3
	EPNE							11.3	2.3	11.2	1	0.2	3.3
	ORHY							0.2	0.0	0.2	1	0.2	3.3
		48.1	9.6	99.9	45	9.0	99.9	100.5	20.2	100.0	30	6.0	99.8
MX-54-SS-4/14													
	ORHY	6.8	1.4	7.6	5	1.0	8.5						
	ELA	4.2	0.8	4.7	4	0.8	6.8	0.4	0.1	0.3	1	0.2	2.8
	CHGR	16.8	3.4	18.9	9	1.8	15.3	21.0	4.2	16.8	9	1.8	25.0
	TEGL (d)	20.9	4.2	23.5	3	0.6	5.1	47.4	9.5	38.0	8	1.6	22.2
	HIJA	25.1	5.0	28.2	35	7.0	59.3	4.9	1.0	3.9	7	1.4	19.4
	EPNE (s)	15.3	3.1	17.2	3	0.6	5.1	48.7	9.7	39.0	10	2.0	27.8
	SPGR							2.4	0.5	1.9	1	0.2	2.8
		89.1	17.9	100.1	59	11.8	100.1	124.8	25.0	99.9	36	7.2	100.0

TABLE E-12 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-4/15													
	CHGR (d)	40.4	8.1	59.7	17	3.4	65.4	41.0	8.2	42.5	17	3.4	37.8
	LE	5.5	1.1	8.1	2	0.4	7.7	9.7	1.9	10.1	3	0.6	6.7
	EPNE (s)	20.3	4.1	30.0	4	0.8	15.4	28.4	5.7	29.4	7	1.4	15.6
	HIJA	1.5	0.3	2.2	3	0.6	11.5	17.4	3.5	18.0	18	3.6	40.0
		67.7	13.6	100.0	26	5.2	100.0	96.5	19.3	100.0	45	9.0	100.1
MX-54-SS-4/16													
	H[illegible] (s)	29.3	5.9	30.8	50	10.0	63.3	26.9	5.4	25.0	44	8.8	58.7
	O[illegible] (d)	26.4	5.3	27.7	17	3.4	21.5	30.1	6.0	27.9	16	3.2	21.3
	CELA	1.8	0.4	1.9	3	0.6	3.8	13.1	2.6	12.2	8	1.6	10.7
	EPNE	12.8	2.6	13.5	4	0.8	5.1	13.8	2.8	12.8	2	0.4	2.7
	TEGL	24.9	5.0	26.2	5	1.0	6.3	17.1	3.4	15.9	3	0.6	4.0
	SPGR							0.4	0.1	0.4	1	0.2	1.3
	LYAN							6.4	1.3	5.9	1	0.2	1.3
		95.2	19.2	100.1	79	15.8	100.0	107.8	21.6	100.1	75	15.0	100.0
MX-54-SS-4/17													
	CHGR (s)	30.4	6.1	29.3	8	1.6	9.8	34.5	6.9	31.0	10	2.0	11.2
	ORHY	4.5	0.9	4.3	3	0.6	3.7	2.5	0.5	2.2	1	0.2	1.1
	CELA	15.4	3.1	14.8	11	2.2	13.4	28.6	5.7	25.7	18	3.6	20.2
	HIJA (d)	46.5	9.3	44.8	58	11.6	70.7	34.9	7.0	31.3	58	11.6	65.2
	EPNE	7.1	1.4	6.8	2	0.4	2.4	10.9	2.2	9.8	2	0.4	2.3
		103.9	20.8	100.0	82	16.4	100.0	111.4	22.3	100.0	89	17.8	100.0
MX-54-SS-4/18													
	CELA (d)	40.8	8.2	100.0	31	6.2	100.0	14.0	2.8	19.8	4	0.8	17.4
	TEGL (s)							42.1	8.4	59.4	5	1.0	21.7
	ORHY							4.4	0.9	6.2	1	0.2	4.4
	HIJA							10.4	2.1	14.7	13	2.6	56.5
		40.8	8.2	100.0	31	6.2	100.0	70.9	14.2	100.1	23	4.6	100.0

TABLE E-12 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-4/19	ATCO (d)	23.2	4.6	47.8	7	1.4	36.8	46.2	9.2	57.5	16	3.2	48.5
	ORHY	4.4	0.9	9.1	3	0.6	15.8						
	CHGR (s)	2.1	0.4	4.3	1	0.2	5.3	13.8	2.8	17.2	7	1.4	21.2
	CELA	5.6	1.1	11.6	5	1.0	26.3	2.9	0.6	3.6	2	0.4	6.1
	SPGR	0.5	0.1	1.0	1	0.2	5.3						
	TEGL	7.5	1.5	15.5	1	0.2	5.3	5.0	1.0	6.2	2	0.4	6.1
	ARNO	5.2	1.0	10.7	1	0.2	5.3						
	ARSP							12.5	2.5	15.6	6	1.2	18.2
		48.5	9.6	100.0	19	3.8	100.1	80.4	16.1	100.1	33	6.6	100.1
MX-54-SS-4/20	ORHY (s)	14.0	2.8	41.9	6	1.2	33.3	7.8	1.6	8.5	6	1.2	10.5
	CELA	2.7	0.5	8.1	2	0.4	11.1						
	LEMO	1.8	0.4	5.4	2	0.4	11.1						
	SPGR	2.9	0.6	8.7	3	0.6	16.7						
	ATCO	1.6	0.3	4.8	1	0.2	5.6						
	TEGL	6.1	1.2	18.3	2	0.4	11.1	2.1	0.4	2.3	1	0.2	1.8
	CHVI (d)	2.8	0.6	8.4	1	0.2	5.6	35.8	7.2	39.0	12	2.4	21.1
	SIHY	1.5	0.3	4.5	1	0.2	5.6						
	HIJA							14.3	2.9	15.6	29	5.8	50.9
	GUSA							6.2	1.2	6.8	1	0.2	1.8
	EPNE							17.9	3.6	19.5	2	0.4	3.5
	LEPU							7.7	1.5	8.4	6	1.2	10.5
		33.4	6.7	100.1	18	3.6	100.1	91.8	18.4	100.1	57	11.4	100.1

TABLE E-12 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-4/21													
	HIJA	6.5	1.3	7.2	9	1.8	24.3						
	ORHY	0.4	0.1	0.4	2	0.4	5.4						
	CHGR (d)	47.2	9.4	52.4	15	3.0	40.5	22.7	4.5	26.5	9	1.8	47.4
	EPNE (s)	19.4	3.9	21.5	3	0.6	8.1	38.1	7.6	44.5	5	1.0	26.3
	TEGL	11.1	[illegible]	12.3	3	0.6	8.1	24.4	4.9	28.5	4	0.8	21.1
	ATCO	3.6	0.7	4.0	2	0.4	5.4						
	CELA	1.9	0.4	2.1	3	0.6	8.1	0.5	0.1	0.6	1	0.2	5.3
		90.1	18.0	99.9	37	7.4	99.9	85.7	17.1	100.1	19	3.8	100.1
MX-54-SS-4/22													
	TEGL (d)	20.3	4.1	28.4	2	0.4	6.5	56.7	11.3	62.5	10	2.0	38.5
	CHGR	25.2	5.0	35.3	12	2.4	38.7	2.0	0.4	2.2	3	0.6	11.5
	HIJA	3.8	0.8	5.3	13	2.6	41.9	1.4	0.3	1.5	2	0.4	7.7
	EPNE (s)	15.4	3.1	21.6	2	0.4	6.5	12.9	2.6	14.2	3	0.6	11.5
	ATCA	6.7	1.3	9.4	2	0.4	6.5	15.5	3.1	17.1	5	1.0	19.2
	ATCO							1.3	0.3	1.4	1	0.2	3.9
	CELA							0.4	0.1	0.4	1	0.2	3.9
	OP							0.5	0.1	0.6	1	0.2	3.9
		71.4	14.3	100.0	31	6.2	100.1	90.7	18.2	99.9	26	5.2	100.1
MX-54-SS-4/23													
	CHGR (d)	58.0	11.6	55.3	25	5.0	36.8	21.1	4.2	28.1	9	1.8	14.1
	HIJA	10.8	2.2	10.3	22	4.4	32.4	12.2	2.4	16.3	32	6.4	50.0
	ORHY	7.7	1.5	7.3	9	1.8	13.2	6.1	1.2	8.1	6	1.2	9.4
	CELA	14.1	2.8	13.4	9	1.8	13.2	8.4	1.7	11.2	7	1.4	10.9
	TEGL	12.2	2.4	11.6	2	0.4	2.9						
	EPNE (s)	2.1	0.4	2.0	1	0.2	1.5	23.1	4.6	30.8	6	1.2	9.4
	ATCO							1.7	0.3	2.3	1	0.2	1.6
	ATCA							2.4	0.5	3.2	3	0.6	4.7
		104.9	20.9	99.9	68	13.6	100.0	75.0	14.9	100.0	64	12.8	100.1

TABLE E-13

WAH WAH VALLEY
TRANSECT RESULTS
CLUSTER 5

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-5/1													
	HIJA (d)	83.3	16.7	55.5	120	24.0	85.7	95.0	19.0	68.8	176	35.2	86.3
	OP	3.4	0.7	2.3	1	0.2	0.7						
	EPNE	15.1	3.0	10.1	3	0.6	2.1	4.8	1.0	3.5	2	0.4	1.0
	ATCO	5.7	1.1	3.8	5	1.0	3.6	3.9	0.8	2.8	2	0.4	1.0
	SIHY	0.7	0.1	0.5	1	0.2	0.7						
	GUSA	4.3	0.9	2.9	4	0.8	2.9	34.3	6.9	24.9	24	4.8	11.8
	TEGL (s)	35.1	7.0	23.4	5	1.0	3.6						
	CELA	2.5	0.5	1.7	1	0.2	0.7						
		150.1	30.0	100.2	140	28.0	100.0	138.0	27.7	100.0	204	40.8	100.1
MX-54-SS-5/2													
	HIJA	32.9	6.6	22.5	61	12.2	60.4						
	CELA	7.8	1.6	5.3	7	1.4	6.9						
	CHGR (d)	63.2	12.6	43.3	21	4.2	20.8						
	ATCO	14.2	2.8	9.7	4	0.8	4.0	6.8	1.4	16.2	4	0.8	18.2
	EPNE	20.4	4.1	14.0	3	0.6	3.0						
	GUSA	4.7	0.9	3.2	3	0.6	3.0						
	ORHY	2.7	0.5	1.9	2	0.4	2.0						
	SUTO (s)							35.1	7.0	83.8	18	3.6	81.8
		145.9	29.1	99.9	101	20.2	100.1	41.9	8.4	100.0	22	4.4	100.0

TABLE E-13 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-5/3													
	CH	18.7	3.7	17.4	3	0.6	4.7						
	CHVI							10.4	2.1	12.5	6	1.2	9.8
	TEGL (s)	28.4	5.7	26.4	4	0.8	6.3	5.2	1.0	6.2	1	0.2	1.6
	CELA	5.8	1.2	5.4	3	0.6	4.7	10.1	2.0	12.1	5	1.0	8.2
	ATCO	17.1	3.4	15.9	8	1.6	12.5	8.0	1.6	9.6	3	0.6	4.9
	HIJA (d)	18.4	3.7	17.1	39	7.8	60.9	21.7	4.3	26.1	36	7.2	59.0
	GU	12.6	2.5	11.7	4	0.8	6.3	0.8	0.2	1.0	2	0.4	3.3
	ORHY	6.8	1.4	6.3	3	0.6	4.7	2.3	0.5	2.8	1	0.2	1.6
	TEAX							19.5	3.9	23.4	5	1.0	8.2
	EPNE							5.3	1.1	6.4	2	0.4	3.3
		107.8	21.6	100.2	64	12.8	100.1	83.3	16.7	100.1	61	12.2	99.9
MX-54-SS-5/4													
	HIJA (d)	53.6	10.7	52.9	129	25.8	78.7	30.0	6.0	48.2	87	17.2	76.3
	ATCO	14.4	2.9	14.2	5	1.0	3.1	14.5	2.9	23.3	8	1.6	7.0
	GUSA (s)	23.5	4.7	23.2	26	5.2	15.9	13.4	2.7	21.5	16	3.2	14.0
	ORHY	0.8	0.2	0.8	1	0.2	0.6						
	EPNE	4.3	0.9	4.2	1	0.2	0.6						
	CHVI	3.2	0.6	3.2	1	0.2	0.6	4.3	0.9	6.9	3	0.6	2.6
	OP	1.6	0.3	1.6	1	0.2	0.6						
		101.4	20.3	100.1	164	32.8	100.1	62.2	12.5	99.9	114	22.6	99.9

TABLE E-13 (Cont.)

Sample Unit No.	Plant Species		Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-5/5														
	ATCO	(s)	13.7	2.7	13.9	4	0.8	16.0	33.5	6.7	32.7	11	2.2	39.3
	TEGL	(d)	43.0	8.6	43.6	9	1.8	36.0	42.9	8.6	41.9	8	1.6	28.6
	ARNO		12.7	2.5	12.9	3	0.6	12.0						
	EPNE		3.5	0.7	3.6	1	0.2	4.0						
	ORHY		2.4	0.5	2.4	1	0.2	4.0						
	CHGR		17.7	3.5	17.9	4	0.8	16.0	24.5	4.9	23.9	8	1.6	28.6
	CELA		4.1	0.8	4.2	2	0.4	8.0						
	LE		1.6	0.3	1.6	1	0.2	4.0						
	TESP								1.6	0.3	1.6	1	0.2	3.6
			98.7	19.6	100.1	25	5.0	100.0	102.5	20.5	100.1	28	5.6	100.1
MX-54-SS-5/6														
	ARNO		12.7	2.5	17.7	3	0.6	6.8	7.1	1.4	8.8	1	0.2	1.4
	CHVI		21.1	4.2	29.5	9	1.8	20.5	11.1	2.2	13.8	2	0.4	2.7
	ATCO	(d)	20.6	4.1	28.8	10	2.0	22.7	32.3	6.5	40.1	13	2.6	17.6
	EPNE		7.0	1.4	9.8	2	0.4	4.6						
	HIJA	(s)	9.0	1.8	12.6	19	3.8	43.2	29.2	5.8	36.2	56	11.2	75.7
	CELA		1.2	0.2	1.7	1	0.2	2.3						
	SIHY								0.9	0.2	1.1	2	0.4	2.7
			71.6	14.2	100.1	44	8.8	100.1	80.6	16.1	100.0	74	14.8	100.1

TABLE E-13 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-5/7													
	CHVI (s)	3.4	0.7	15.1	2	0.4	11.8	15.8	3.2	19.2	12	2.4	28.6
	ARNO (d)	10.6	2.1	47.1	5	1.0	29.4	27.6	5.5	33.6	10	2.0	23.8
	TEAX	2.1	0.4	9.3	1	0.2	5.9	7.8	1.6	9.5	4	0.8	9.5
	HIJA	4.8	1.0	21.3	7	1.4	41.2						
	GUSA	1.2	0.2	5.3	1	0.2	5.9						
	LYAN	0.4	0.1	1.8	1	0.2	5.9						
	LEPU							1.9	0.4	2.3	1	0.2	2.4
	ATCO							6.2	1.2	7.6	4	0.8	9.5
	CR							4.3	0.9	5.2	4	0.8	9.5
	CELA							1.6	0.3	2.0	1	0.2	2.4
	ORHY							2.3	0.5	2.8	1	0.2	2.4
	EPNE							14.6	2.9	17.8	5	1.0	11.9
		22.5	4.5	99.9	17	3.4	100.0	82.1	16.5	100.0	42	8.4	100.0
MX-54-SS-5/8													
	EPNE (s)	30.4	6.1	53.5	6	1.2	42.9						
	CHNA	17.6	3.5	31.0	5	1.0	35.7						
	CHGR	8.8	1.8	15.5	3	0.6	21.4	3.3	0.7	6.7	1	0.2	5.9
	CHNA (d)							33.7	6.7	68.8	7	1.4	41.2
	HIJA							0.9	0.2	1.8	2	0.4	11.8
	GUSA							9.3	1.9	19.0	5	1.0	29.4
	ARPU							1.8	0.4	3.7	2	0.4	11.8
		56.8	11.4	100.0	14	2.8	100.0	49.0	9.9	100.0	17	3.4	100.1

TABLE E-13 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-5/9	HIJA (d)	29.1	5.8	32.8	49	9.8	68.1	2.1	0.4	8.1	1	0.2	6.3
	CHVI	11.6	2.3	13.1	5	1.0	6.9	1.4	0.3	5.4	2	0.4	12.5
	GUSA	2.7	0.5	3.0	2	0.4	2.8	1.9	0.4	7.4	2	0.4	12.5
	TEAX	1.5	0.3	1.7	2	0.4	2.8						
	ARNO (s)	20.3	4.1	22.9	5	1.0	6.9	2.9	0.6	11.2	2	0.4	12.5
	TEGL	7.3	1.5	8.2	1	0.2	1.4	7.9	1.6	30.6	4	0.8	25.0
	ATCO	15.5	3.1	17.5	7	1.4	9.7	3.2	0.6	12.4	2	0.4	12.5
	ORHY	0.7	0.1	0.8	1	0.2	1.4						
	EPNE							4.0	0.8	15.5	1	0.2	6.3
	SIHY							2.4	0.5	9.3	2	0.4	12.5
		88.7	17.7	100.0	72	14.4	100.0	25.8	5.2	99.9	16	3.2	100.1
MX-54-SS-5/10	HIJA (d)	73.3	14.7	80.6	91	18.2	88.4	38.0	7.6	52.7	77	15.4	77.8
	ATCO (s)	11.0	2.2	12.1	5	1.0	4.9	13.1	2.6	18.2	6	1.2	6.1
	SIHY	0.7	0.1	0.8	1	0.2	1.0	0.6	0.1	0.8	1	0.2	1.0
	ORHY	2.3	0.5	2.5	3	0.6	2.9	16.0	3.2	22.2	10	2.0	10.1
	CELA	0.8	0.2	0.9	1	0.2	1.0	0.2	0.0	0.3	2	0.4	2.0
	ARSP	2.8	0.6	3 1	2	0.4	1.9	2.0	0.4	2.8	1	0.2	1.0
	CHVI							2.2	0.4	3.1	2	0.4	2.0
		90.9	18.3	100.0	103	20.6	100.1	72.1	14.3	100.1	99	19.8	100.0
MX-54-SS-5/11	ATCO (d)	69.3	13.9	96.2	22	4.4	91.7	86.3	17.3	92.4	28	5.6	80.0
	KOAM (s)	0.0	0.0	0.1	1	0.2	4.2	4.9	1.0	5.3	6	1.2	17.1
	ARSP (s)	2.7	0.5	3.8	1	0.2	4.2	2.2	0.4	2.4	1	0.2	2.9
		72.0	14.4	100.1	24	4.8	100.1	93.4	18.7	100.1	35	7.0	100.0

TABLE E-13 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-5/12													
	ATCO (d)	87.1	17.4	96.1	23	4.6	85.2	28.5	5.7	48.5	12	2.4	41.4
	KOAM	3.5	0.7	3.9	4	0.8	14.8	2.0	0.4	3.4	1	0.2	3.4
	CHVI (s)							12.3	2.5	20.9	6	1.2	20.7
	SIHY							1.3	0.3	2.2	1	0.2	3.4
	ARSP							9.5	1.9	16.2	6	1.2	20.7
	TEGL							2.9	0.6	4.9	1	0.2	3.4
	LEMO							0.3	0.1	0.5	1	0.2	3.4
	CELA							2.0	0.4	3.4	1	0.2	3.4
		90.6	18.1	100.0	27	5.4	100.0	58.8	11.9	100.0	29	5.8	99.8
MX-54-SS-5/13													
	KOAM	2.1	0.4	12.8	9	1.8	22.0						
	ATCO (s)	7.1	1.4	43.9	12	2.4	29.3	3.3	0.7	13.3	8	1.6	10.7
	TESP	3.6	0.7	21.9	7	1.4	17.1						
	ARSP	0.7	0.1	4.4	4	0.8	9.8	1.4	0.3	5.7	5	1.0	6.7
	HIJA (d)	2.4	0.5	14.8	7	1.4	17.1	14.3	2.9	57.4	55	11.0	73.3
	CELA	0.4	0.7	2.4	2	0.4	4.9						
	TEAX							3.2	0.6	13.0	2	0.4	2.7
	SPGR							0.2	0.0	0.8	1	0.2	1.3
	ORHY							0.1	0.0	0.5	1	0.2	1.3
	GUSA							0.5	0.9	1.8	2	0.4	2.7
	EPNE							1.9	0.4	7.5	1	0.2	1.3
		16.3	3.8	100.2	41	8.2	100.2	24.9	5.8	100.0	75	15.0	100.0

TABLE E-13 (Cont.)

		Transect 1						Transect 2					
Sample Unit No.	Plant Species	Total Cover (dm)	Total Cover (%)	Rel. Cover (%)	No. of Plants	Density (#/100 dm)	Rel. Density (%)	Total Cover (dm)	Total Cover (%)	Rel. Cover (%)	No. of Plants	Density (#/100 dm)	Rel. Density (%)
MX-54-SS-5/14													
	HIJA (s)	35.8	7.2	27.0	36	7.2	60.0	17.3	3.5	41.2	15	3.0	51.7
	ATCO	20.3	4.1	15.3	9	1.8	15.0						
	TEGL (d)	70.4	14.1	53.0	11	2.2	18.3	11.4	2.3	27.3	3	0.6	10.3
	CELA	6.4	1.3	4.8	4	0.8	6.7	1.5	0.3	3.6	1	0.2	3.5
	ARPU							8.4	1.7	20.0	7	1.4	24.1
	ORHY							1.8	0.4	4.3	2	0.4	6.9
	TEAX							1.5	0.3	3.6	1	0.2	3.5
		132.9	26.7	100.1	60	12.0	100.0	41.9	8.5	100.0	29	5.8	100.0
MX-54-SS-5/15													
	CELA	16.6	3.3	12.5	8	1.6	9.2	0.2	0.0	0.2	1	0.2	2.1
	SPGR	2.4	0.5	1.8	1	0.2	1.2						
	SIHY	2.8	0.6	2.1	1	0.2	1.2	1.0	0.2	1.1	1	0.2	2.1
	HIJA (s)	72.9	14.6	54.8	56	11.2	64.4						
	ARSP	14.6	2.9	11.0	10	2.0	11.5	34.7	6.9	37.2	24	4.8	50.0
	ORHY	4.5	0.9	3.4	1	0.2	1.2						
	ATCO (d)	16.3	3.3	12.3	9	1.8	10.3	57.5	11.5	61.6	22	4.4	45.8
	ARPU	3.0	0.6	2.3	1	0.2	1.2						
		133.1	26.7	100.2	87	17.4	100.2	93.4	18.6	100.1	48	9.6	100.0

TABLE E-13 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-5/16													
	ARSP (s)	20.7	4.1	25.1	13	2.6	29.5	24.5	4.9	29.9	15	3.0	33.3
	ATCO (d)	44.4	8.9	53.9	12	2.4	27.3	43.0	8.6	52.4	17	3.4	37.8
	GUSA	1.0	0.2	1.2	1	0.2	2.3						
	ORHY	1.0	0.2	1.2	1	0.2	2.3	1.5	0.3	1.8	1	0.2	2.2
	TEGL	6.3	1.3	7.7	1	0.2	2.3						
	HIJA	7.9	1.6	9.6	15	3.0	34.1	8.6	1.7	10.5	9	1.8	20.0
	SIHY	1.1	0.2	1.3	1	0.2	2.3						
	CELA							3.9	0.8	4.8	2	0.4	4.4
	CHVI							0.5	0.1	0.6	1	0.2	2.2
		82.4	16.5	100.0	44	8.8	100.1	82.0	16.4	100.0	45	9.0	99.9
MX-54-SS-5/17													
	ATCO (s)	26.8	5.4	20.4	11	2.2	20.8	37.4	7.5	44.6	17	3.4	39.5
	CELA	22.9	4.6	17.4	11	2.2	20.8	23.2	4.6	27.7	10	2.0	23.3
	ARSP (d)	52.6	10.5	40.0	23	4.6	43.4	22.3	4.5	26.6	15	3.0	34.9
	ORHY	10.3	2.1	7.8	4	0.8	7.6	0.9	0.2	1.1	1	0.2	2.3
	TEGL	18.3	3.7	13.9	3	0.6	5.7						
	CHVI	0.5	0.1	0.4	1	0.2	1.9						
		131.4	26.4	99.9	53	10.6	100.2	83.8	16.8	100.0	43	8.6	100.0

TABLE E-13 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-5/18													
	TEGL (d)	66.8	13.4	57.4	11	2.2	35.5						
	ATCO (s)	18.3	3.7	15.7	5	1.0	16.1	2.0	0.4	9.5	1	0.2	7.1
	EPNE	14.5	2.9	12.5	5	1.0	16.1	4.3	0.9	20.4	1	0.2	7.1
	CHVI	7.3	1.5	6.3	5	1.0	16.1						
	GUSA	8.3	1.7	7.1	4	0.8	12.9	0.9	0.2	4.3	2	0.4	14.3
	ER							0.9	0.2	4.3	1	0.2	7.1
	TECA							8.9	1.8	42.2	5	1.0	35.7
	CHNA							2.3	0.5	10.9	1	0.2	7.1
	LEPU	1.2	0.2	1.0	1	0.2	3.2	0.1	0.0	0.5	1	0.2	7.1
	HIJA							0.4	0.1	1.9	1	0.2	7.1
	CAPI							1.3	0.3	6.2	1	0.2	7.1
		116.4	23.4	100.0	31	6.2	99.9	21.1	4.4	100.2	14	2.8	99.7
MX-54-SS-5/19													
	HIJA (d)	20.6	4.1	38.4	47	9.4	74.6	30.0	6.0	38.4	49	9.8	77.8
	ATCO	29.0	5.8	54.1	13	2.6	20.6						
	ORHY	4.0	0.8	7.5	3	0.6	4.8	1.9	0.4	2.4	3	0.6	4.8
	CELA							0.2	0.0	0.3	1	0.2	1.6
	TESPxTEAX (s)							36.9	7.4	47.4	7	1.4	11.1
	EPNE							8.2	1.6	10.5	2	0.4	3.2
	ATCA							0.8	0.2	1.0	1	0.2	1.6
		53.6	10.7	100.0	63	12.6	100.0	78.0	15.6	100.0	63	12.6	100.1

TABLE E-13 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-5/20													
	CELA	1.9	0.4	10.4	3	0.6	4.9	1.5	0.3	2.1	1	0.2	2.2
	HIJA (d)	15.4	3.1	85.0	56	11.2	91.8	30.2	6.1	40.9	24	4.8	52.2
	ATCO (s)	0.6	0.1	3.2	1	0.2	1.6	30.5	6.1	41.2	12	2.4	26.1
	ORHY	0.3	0.1	1.4	1	0.2	1.6	6.9	1.4	9.3	4	0.8	8.7
	SIHY							2.8	0.6	3.8	4	0.8	8.7
	ARPU							2.0	0.4	2.8	1	0.2	2.2
		18.2	3.7	100.0	61	12.2	99.9	73.9	14.9	100.1	46	9.2	100.1
MX-54-SS-5/21													
	ATCO (d)	7.9	1.6	62.4	14	2.8	51.9	7.8	9.6	49.4	13	2.6	33.3
	GU	1.2	0.2	9.7	2	0.4	7.4	2.6	0.5	16.3	5	1.0	12.8
	ORHY (s)	1.9	0.4	14.7	7	1.4	25.9	2.3	0.5	14.7	9	1.8	23.1
	SIHY	0.3	0.1	2.5	1	0.2	3.7						
	CELA	0.5	0.1	3.6	2	0.4	7.4	0.4	0.1	2.4	2	0.4	5.1
	EPNE	0.9	0.2	7.1	1	0.2	3.7						
	ARPU							2.6	0.5	16.7	9	1.8	23.1
	SPGR							0.1	0.0	0.4	1	0.2	2.6
		12.7	2.6	100.0	27	5.4	100.0	15.8	11.2	99.9	39	7.8	100.0
MX-54-SS-5/22													
	HIJA (d)	17.3	3.5	29.4	54	10.8	79.4	24.7	4.9	48.1	73	14.6	81.1
	ATCO	1.7	0.3	2.9	2	0.4	2.9	3.1	0.6	6.0	2	0.4	2.2
	EPNE (s)	24.9	5.0	42.4	5	1.0	7.4						
	CH	14.9	3.0	25.3	7	1.4	10.3						
	GU							22.3	4.5	43.4	14	2.8	15.6
	ORHY							1.3	0.3	2.5	1	0.2	1.1
		58.8	11.8	100.0	68	13.6	100.0	51.4	10.3	100.0	90	18.0	100.0

TABLE E-13 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Total Cover (%)	Rel. Cover (%)	No. of Plants	Density (#/100 dm)	Rel. Density (%)	Transect 2 Total Cover (dm)	Total Cover (%)	Rel. Cover (%)	No. of Plants	Density (#/100 dm)	Rel. Density (%)
MX-54-SS 5/23													
	CHNA (d)	26.1	5.2	74.5	12	2.4	42.9						
	ARPU (s)	5.7	1.1	16.2	9	1.8	32.1	3.9	0.8	34.1	16	3.2	53.3
	ORHY	0.6	0.1	1.9	3	0.6	10.7						
	ATCO	1.7	0.3	5.0	3	0.6	10.7	4.0	0.8	35.2	7	1.4	23.3
	GUSA	0.8	0.2	2.4	1	0.2	3.6						
	HIJA							3.5	0.7	30.7	7	1.4	23.3
		34.9	6.9	100.0	28	5.6	100.0	11.4	2.3	100.0	30	6.0	99.9

TABLE E-14

WAH WAH VALLEY
TRANSECT RESULTS
CMF's

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-CMF-1													
	HIJA (s)	5.1	1.0	20.1	12	2.4	57.1	2.6	0.5	83.9	4	0.8	80.0
	CELA (d)	20.3	4.1	79.9	9	1.8	42.9						
	ORHY							0.5	0.1	16.1	1	0.2	20.0
		25.4	5.1	100.0	21	4.2	100.0	3.1	0.6	100.0	5	1.0	100.0
MX-54-CMF-2													
	ATCO (d)	24.6	4.9	49.7	6	1.2	24.0	54.1	10.8	67.5	11	2.2	32.4
	KOAM (s)	24.9	5.0	50.3	19	3.8	76.0	26.0	5.2	32.5	23	4.6	67.7
		49.5	9.9	100.0	25	5.0	100.0	80.1	16.0	100.0	34	6.8	100.1
MX-54-CMF-3													
	TEGL (d)	100.0	20.0	68.7	12	2.4	52.2	66.7	13.3	56.7	10	2.0	66.7
	ATCO	3.0	0.6	2.1	1	0.2	4.4						
	EPNE (s)	28.2	5.6	19.4	4	0.8	17.4	50.9	10.2	43.3	5	1.0	33.3
	CH	12.4	2.5	8.5	5	1.0	21.7						
	ATCA	2.0	0.4	1.4	1	0.2	4.4						
		145.6	29.1	100.1	23	4.6	100.1	117.6	23.5	100.0	15	3.0	100.0

TABLE E-14 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-CMF-4													
	TEGL	10.3	2.1	21.7	2	0.4	14.3	11.3	2.3	19.1	3	0.6	13.0
	CHGR (d)	16.2	3.2	34.1	6	1.2	42.9	28.1	5.6	47.5	9	1.8	39.1
	ATCO (s)	13.0	2.6	27.4	3	0.6	21.4	16.0	3.2	27.0	8	1.6	34.8
	EPNE	7.9	1.6	16.6	2	0.4	14.3						
	ARNO	0.1	0.0	0.2	1	0.2	7.1	3.3	0.7	5.6	2	0.4	8.7
	GUSA							0.5	0.1	0.8	1	0.2	4.4
		47.5	9.5	100.0	14	2.8	100.0	59.2	11.9	100.0	23	4.6	100.0
MX-54-CMP-5													
	TESP	2.4	0.5	3.2	2	0.4	3.7						
	ARSP	16.9	3.4	23.0	10	2.0	18.5	15.3	3.1	22.5	8	1.6	13.3
	ATCO (s)	32.7	6.5	44.6	15	3.0	27.8	8.2	1.6	12.0	7	1.4	11.7
	CELA	0.7	0.1	1.0	1	0.2	1.9	0.4	0.1	0.6	1	0.2	1.7
	HIJA (d)	19.3	3.9	26.3	24	4.8	44.4	41.7	8.3	61.2	42	8.4	70.0
	LEMO	0.4	0.1	0.5	1	0.2	1.9						
	ORHY	1.0	0.2	1.4	1	0.2	1.9						
	GUSA							1.5	0.3	2.2	1	0.2	1.7
	SIHY							1.0	0.2	1.5	1	0.2	1.7
		73.4	14.7	100.0	54	10.8	100.1	68.1	13.6	100.0	60	12.0	100.1

TABLE E-15

WAH WAH VALLEY TRANSECT RESULTS RRS's

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Total Cover (%)	Rel. Cover (%)	No. of Plants	Density (#/100 dm)	Rel. Density (%)
MX-54-RSS-1							
	HIJA (d)	60.6	12.1	74.0	126	25.2	87.5
	CELA (s)	19.6	3.9	23.9	15	3.0	10.4
	SPGR	0.5	0.1	0.6	1	0.2	0.7
	ORHY	1.2	0.2	1.5	2	0.4	1.4
		81.9	16.3	100.0	144	28.8	100.0
MX-54-RSS-2							
	ATCO (d)	82.2	16.4	77.3	16	3.2	55.2
	KOAM (s)	24.2	4.8	22.7	13	2.6	44.8
		106.4	21.2	100.0	29	5.8	100.0
MX-54-RSS-3							
	ATCO (d)	79.6	15.9	82.4	26	5.2	74.3
	CELA (s)	14.0	2.8	14.5	6	1.2	17.1
	ORHY	1.8	0.4	1.9	2	0.4	5.7
	SPGR	1.2	0.2	1.2	1	0.2	2.9
		96.6	19.3	100.0	35	7.0	100.0
MX-54-RSS-4							
	ATCO (s)	11.4	2.3	9.3	3	0.6	3.3
	HIJA (d)	92.7	18.5	76.0	81	16.2	88.0
	ORHY	5.1	1.0	4.2	3	0.6	3.3
	TEAX	8.0	1.6	6.6	1	0.2	1.1
	GUSA	1.8	0.4	1.5	2	0.4	2.2
	KOAM	0.3	0.1	0.3	1	0.2	1.1
	ARSP	2.7	0.5	2.2	1	0.2	1.1
		122.0	24.4	100.1	92	18.4	100.1

TABLE E-16

WAH WAH VALLEY
TRANSECT RESULTS
RESITINGS

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-1/21R	No transects made because of proximity to original site.												
MX-54-SS-2/16R	No transects made because of proximity to original site.												
MX-54-SS-2/19R	No transects made because of proximity to original site.												
MX-54-SS-2/21R													
	CHVI (d)	57.4	11.5	62.2	23	4.6	35.4	16.5	3.3	28.5	9	1.8	20.9
	HIJA (s)	23.5	4.7	25.5	37	7.4	56.9	21.9	4.4	37.8	23	4.6	53.5
	ORHY	7.6	1.5	8.2	4	0.8	6.2	12.0	2.4	20.7	9	1.8	20.9
	CELA	3.8	0.8	4.1	1	0.2	1.5	3.3	0.7	5.7	1	0.2	2.3
	ATCA							4.3	0.9	7.4	1	0.2	2.3
		92.3	18.5	100.0	65	13.0	100.0	58.0	11.7	100.1	43	8.6	99.9
MX-54-SS-3/14R													
	ARSP (d)	24.5	4.9	35.3	12	2.4	30.8	No transect made.					
	ATCO	18.8	3.8	27.1	13	2.6	33.3						
	CELA (s)	19.8	3.4	28.5	12	2.4	30.7						
	EPNE	2.9	0.6	4.2	1	0.2	2.6						
	TESP	3.5	0.7	5.0	1	0.2	2.6						
		69.5	13.4	100.1	39	7.8	100.0						

TABLE E-16 (Cont.)

Sample Unit No.	Plant Species		Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-3/15R														
	HIJA		2.8	0.6	3.7	8	1.6	20.0	12.7	2.5	23.3	44	8.8	54.3
	ATCO		2.4	0.5	3.2	1	0.2	2.5	15.6	3.1	28.6	15	3.0	18.6
	CH	(s)	16.8	3.4	22.2	10	2.0	25.0	7.1	1.4	13.0	4	0.8	4.9
	EPNE		4.9	1.0	6.5	4	0.5	6.3						
	TEGL	(d)	40.1	8.0	53.0	11	2.2	27.5	3.2	0.6	5.9	3	0.6	3.7
	ARNO		2.0	0.4	2.6	4	0.5	6.3	4.2	0.8	7.7	4	0.8	4.9
	CELA		6.7	1.3	8.9	5	1.0	12.5	5.0	1.0	9.2	4	0.8	4.9
	SIHY								2.4	0.5	4.4	3	0.6	3.7
	ORHY								0.8	0.2	1.5	2	0.4	2.5
	TESP								3.6	0.7	6.6	2	0.4	2.5
			75.7	15.2	100.1	43	8.0	100.1	54.6	10.8	100.2	81	16.2	100.0
MX-54-SS-3/16R														
	ATCO	(d)	59.1	11.8	62.4	22	4.4	30.6	29.9	6.0	39.0	14	2.8	24.6
	ARSP		10.3	2.1	10.9	8	1.6	11.1	4.8	1.0	6.4	5	1.0	8.8
	CELA	(s)	3.5	0.7	3.7	3	0.6	4.2	28.5	5.7	37.2	18	3.6	31.6
	HIJA		21.1	4.2	22.3	38	7.6	52.8	7.7	1.5	10.0	15	3.0	26.3
	SPGR		0.7	0.1	0.7	1	0.2	1.4						
	ORHY								5.7	1.1	7.4	5	1.0	8.8
			94.7	18.9	100.0	72	14.4	100.1	76.6	15.3	100.0	57	11.4	100.1
MX-54-SS-3/22R									No transect made.					
	CELA	(s)	8.5	1.7	15.9	12	2.4	28.6						
	ATCO	(d)	30.0	6.0	56.3	15	3.0	35.7						
	SPCR		5.9	1.2	11.1	11	2.2	26.2						
	ARSP		1.5	0.3	2.8	1	0.2	2.4						
	CH		7.4	1.5	13.9	3	0.6	7.1						
			53.3	10.7	100.0	42	8.4	100.0						

TABLE E-16 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-4/7R													
	CELA (d)	85.8	17.2	100.0	51	10.2	100.0	No transect made.					
		85.8	17.2	100.0	51	10.2	100.0						
MX-54-SS-4/14R													
	HIJA (d)	26.5	5.3	47.0	50	10.0	89.3	27.1	5.4	39.7	46	9.2	67.7
	ORHY	0.5	0.1	0.9	1	0.2	1.8	4.5	0.9	6.6	3	0.6	4.4
	EPNE	10.9	2.2	19.3	2	0.4	3.6	10.4	2.1	15.2	3	0.6	4.4
	CELA	1.6	0.3	2.8	1	0.2	1.8	4.1	0.8	6.0	4	0.8	5.9
	TEGL (s)	16.9	3.4	30.0	2	0.4	3.6	6.3	1.3	9.2	1	0.2	1.5
	CHGR							15.4	3.1	22.6	10	2.0	14.7
	SP							0.5	0.1	0.7	1	0.2	1.5
		56.4	11.3	100.0	56	11.2	100.1	68.3	13.7	100.0	68	13.6	100.1
MX-54-SS-5/1R	No transects made because of proximity to original site.												
MX-54-SS-5/5R													
	ORHY	8.5	1.7	10.6	4	0.8	7.4	No transect made.					
	LE	1.5	0.3	1.9	1	0.2	1.9						
	CHGR	11.3	2.3	14.4	4	0.8	7.4						
	EPNE	0.1	0.0	0.1	1	0.2	1.9						
	HIJA (s)	14.5	2.9	18.2	25	5.0	46.3						
	ARNO	7.2	1.4	9.0	1	0.2	1.9						
	GUSA	5.6	1.1	7.0	6	1.2	11.1						
	TEGL (d)	20.4	4.1	25.5	5	1.0	9.3						
	ATCO	10.8	2.2	13.5	7	1.4	13.0						
		79.9	16.0	100.2	54	10.8	100.2						

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TABLE E-16 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-5/7R													
	ATCO	11.3	2.3	16.9	6	1.2	18.2						
	CHGR (d)	25.4	5.1	37.9	12	2.4	36.4						
	ARNO (s)	13.8	2.8	20.6	5	1.0	15.2						
	CELA	6.4	1.3	9.6	5	1.0	15.2						
	ER	1.5	0.3	2.2	1	0.2	3.0			No transect made.			
	LE	5.0	1.0	7.5	2	0.4	6.1						
	TEAX	2.3	0.5	3.4	1	0.2	3.0						
	HIJA	1.3	0.3	1.9	1	0.2	3.0						
		67.0	13.6	100.0	33	6.6	100.1						
MX-54-SS-5/8R													
	EPNE	8.0	1.6	24.7	2	0.4	18.2						
	CHGR (d)	14.2	2.8	43.8	8	1.6	72.7			No transect made.			
	CHNA (s)	10.2	2.0	31.5	1	0.2	9.1						
		32.4	6.4	100.0	11	2.2	100.0						
MX-54-SS-5/12R													
	ATCO (d)	67.8	13.6	86.0	23	4.6	69.7						
	KOAM	3.4	0.7	4.3	4	0.8	12.1						
	TEAX	0.9	0.2	1.1	1	0.2	3.0			No transect made.			
	ARSP (s)	6.7	1.3	8.5	5	1.0	15.2						
		78.8	15.8	99.9	33	6.6	100.0						

TABLE E-16 (Cont.)

Sample Unit No.	Plant Species	Transect 1 Total Cover (dm)	Transect 1 Total Cover (%)	Transect 1 Rel. Cover (%)	Transect 1 No. of Plants	Transect 1 Density (#/100 dm)	Transect 1 Rel. Density (%)	Transect 2 Total Cover (dm)	Transect 2 Total Cover (%)	Transect 2 Rel. Cover (%)	Transect 2 No. of Plants	Transect 2 Density (#/100 dm)	Transect 2 Rel. Density (%)
MX-54-SS-5/13R	ATCO (d)	32.6	6.5	50.5	10	2.0	41.7	No transect made.					
	KOAM	7.3	1.5	11.3	7	1.4	29.2						
	TESP (s)	22.4	4.5	34.7	6	1.2	25.0						
	CELA	2.3	0.5	3.6	1	0.2	4.2						
		64.6	13.0	100.1	24	4.8	100.1						
MX-54-SS-5/14R	HIJA (d)	27.0	5.4	84.4	43	8.6	93.5	No transect made.					
	ATCO (s)	3.5	0.7	10.9	2	0.4	4.4						
	CELA	1.5	0.3	4.7	1	0.2	2.2						
		32.0	6.4	100.0	46	9.2	100.1						
MX-54-SS-5/18R	ATCO (s)	22.1	4.4	31.4	6	1.2	8.7	43.7	8.7	38.0	16	3.2	19.5
	HIJA (d)	48.3	9.7	68.6	63	12.6	91.3	71.3	14.3	62.0	66	13.2	80.5
		70.4	14.1	100.0	69	13.8	100.0	115.0	23.0	100.0	82	16.4	100.0
MX-54-SS-5/20R	CELA (s)	11.0	2.2	19.1	9	1.8	9.0	1.3	0.3	0.9	2	0.4	1.7
	HIJA (d)	44.4	8.9	77.2	90	18.0	90.0	133.6	26.7	88.6	115	23.0	95.8
	ATCO	2.1	0.4	3.7	1	0.2	1.0	15.9	3.2	10.5	3	0.6	2.5
		57.5	11.5	99.9	100	20.0	100.0	150.8	30.2	100.0	120	24.0	100.0
MX-54-SS-5/23R	No transects made because of proximity to original site.												

APPENDIX F

APPENDIX F-1

BIRDS TO BE EXPECTED IN THE VICINITY OF PINE AND WAH WAH VALLEYS

BIRDS THAT MAY BE EXPECTED IN THE PINE AND WAH WAH VICINITY AS RESIDENTS OR MIGRANTS

Order GAVIIFORMES

Family GAVIIDAE

Gavia immer (Brunnich)	Common Loon
Gavia arctica pacifica (Lawrence)	Arctic Loon

Order PODICIPEDIFORMES

Family PODICIPEDIDAE

Podiceps auritus cornutus (Gmelin)	Horned Grebe
Podiceps caspicus californicus Heermann	Eared Grebe
Aechmophorus occidentalis (Lawrence)	Western Grebe
Podilymbus podiceps podiceps (Linnaeus)	Pied-billed Grebe

Order PELECANIFORMES

Family PELICANIDAE

Pelecanus erythrorhynchos Gmelin	White Pelican

Family PHALACROCORACIDAE

Phalacrocorax auritus auritus (Lesson)	Double-crested Cormorant

Order CICONIIFORMES

Family ARDEIDAE

Ardea herodias treganzai Court	Great Blue Heron
Casmerodius albus egretta (Gmelin)	Common Egret
Leucophoyx thula brewsteri (Thayer and Bangs)	Snowy Egret
Nycticorax nycticorax hoactli (Gmelin)	Black-crowned Night Heron
Botaurus lentiginosus (Rackett)	American Bittern

Family CICONIIDAE

Mycteria americana Linnaeus	Wood Ibis

Family THRESKIORNITHIDAE

Plegadis chihi (Vieillot)	White-faced Ibis

Family PHOENICOPTERIDAE

Phoenicopterus ruber Linnaeus	American Flamingo

Order ANSERIFORMES

Family ANATIDAE

Olor columbianus (Ord)	Whistling Swan
Olor buccinator (Richardson)	Trumpeter Swan
Branta canadensis moffitti Aldrich	Canada Goose
Branta canadensis parvipes (Cassin)	Canada Goose
Branta canadensis taverneri Delacour	Canada Goose
Branta canadensis minima Ridgway	Canada Goose
Branta nigricans (Lawrence)	Black Brant
Chen hyperborea hyperborea (Pallas)	Snow Goose
Chen rossii (Cassin)	Ross' Goose
Dendrocygna bicolor helva Wetmore and Peters	Fulvous Tree Duck
Anas platyrhynchos platyrhynchos Linnaeus	Mallard
Anas rubripes Brewster	Black Duck
Anas strepera Linnaeus	Gadwall
Anas acuta Linnaeus	Pintail
Anas carolinensis Gmelin	Green-winged Teal
Anas discors discors Linnaeus	Blue-winged Teal
Anas cyanoptera septentrionalium Snyder and Lumsden	Cinnamon Teal
Mareca americana (Gmelin)	American Widgeon
Spatula clypeata (Linnaeus)	Shoveler
Aix sponsa (Linnaeus)	Wood Duck
Aythya americana (Eyton)	Redhead
Aythya collaris (Donovan)	Ring-necked Duck
Aythya valisineria (Wilson)	Canvasback
Aythya affinis (Eyton)	Lesser Scaup
Bucephala clangula americana (Bonaparte)	Common Goldeneye
Bucephala albeola (Linnaeus)	Bufflehead
Clangula hyemalis (Linnaeus)	Oldsquaw
Melanitta deglandi ssp.	White-winged Scoter
Oxyura jamaicensis rubida (Wilson)	Ruddy Duck
Lophodytes cucullatus (Linnaeus)	Hooded Merganser
Mergus merganser americanus Cassin	Common Merganser
Mergus serrator serrator Linnaeus	Red-breasted Merganser

Order FALCONIFORMES

Family CATHARTIDAE

Cathartes aura teter Friedmann	Turkey Vulture
Gymnogyps californianus (Shaw)	California Condor

Family ACCIPITRIDAE

Accipiter gentilis atricapillus (Wilson)	Goshawk
Accipiter striatus velox (Wilson)	Sharp-shinned Hawk
Accipiter cooperii (Bonaparte)	Cooper's Hawk
Buteo jamaicensis calurus Cassin	Red-tailed Hawk
Buteo harlani (Audubon)	Harlan's Hawk
Buteo swainsoni Bonaparte	Swainson's Hawk
Buteo lagopus s.johannis (Gmelin)	Rough-legged Hawk
Buteo regalis (Gray)	Ferruginous Hawk
Aquila chrysaetos canadensis (Linnaeus)	Golden Eagle
Haliaeetus leucocephalus alascanus Townsend	Bald Eagle
Circus cyaneus hudsonius (Linnaeus)	Marsh Hawk

Family PANDIONIDAE

Pandion haliaetus carolinensis (Gmelin)	Osprey

Family FALCONIDAE

Falco mexicanus Schlegel	Prairie Falcon
Falco sparverius sparverius Linnaeus	Sparrow Hawk

Order GALLIFORMES

Family TETRAONIDAE

Dendragapus obscurus obscurus (Say)	Blue Grouse
Centrocercus urophasianus urophasianus (Bonaparte)	Sage Grouse

Family PHASIANIDAE

Lophortyx californicus californicus (Shaw)	California Quail
Lophortyx gambelii gambelii Gambel	Gambel's Quail
Phasianus colchicus Linnaeus	Ring-necked Pheasant
Alectoris graeca (Meisner)	Chukar

Family MELEAGRIDIDAE

Meleagris gallopavo merriami Nelson	Turkey

Order GRUIFORMES

Family GRUIDAE

Grus canadensis canadensis (Linnaeus)	Sandhill Crane

Family RALLIDAE

Rallus limicola limicola Vieillot	Virginia Rail
Porzana carolina (Linnaeus)	Sora
Fulica americana americana Gmelin	American Coot

Order CHARADRIIFORMES

Family CHARADRIIDAE

Charadrius alexandrinus nivosus (Cassin)	Snowy Plover
Charadrius vociferus vociferus Linnaeus	Killdeer
Squatarola squatarola (Linnaeus)	Black-bellied Plover

Family SCOLOPACIDAE

Capella gallinago delicata (Ord)	Common Snipe
Numenius americanus americanus Beckstein	Long-billed Curlew
Actitis macularia (Linnaeus)	Spotted Sanpiper
Catoptrophorus semipalmatus inornatus (Brewster)	Willet
Totanus melanoleucus (Gmelin)	Greater Yellowlegs
Totanus flavipes (Gmelin)	Lesser Yellowlegs
Erolia bairdii (Coues)	Baird's Sandpiper
Erolia minutilla (Vieillot)	Least Sandpiper
Limnodromus scolopaceus (Say)	Long-billed Dowitcher
Ereunetes pusillus (Linnaeus)	Semipalmated Sandpiper
Ereunetes mauri Cabanis	Western Sandpiper

Family RECURVIROSTRIDAE

Recurvirostra americana Gmelin	American Avocet
Himantopus mexicanus (Muller)	Black-necked Stilt

Family PHALAROPODIDAE

Steganopus tricolor Vieillot	Wilson's Phalarope
Lobipes lobatus (Linnaeus)	Northern Phalarope

Family LARIDAE

Larus californicus Lawrence	California Gull
Larus pipixcan Wagler	Franklin's Gull
Sterna forsteri Nuttall	Forster's Tern
Chlidonias niger surinamensis (Gmelin)	Black Tern

Order COLUMBIFORMES

Family COLUMBIDAE

Columba fasciata fasciata Say	Band-tailed Pigeon
Columba livia Gmelin	Rock Dove
Zenaidura macroura marginella (Woodhouse)	Mourning Dove

Order CUCULIFORMES

Family CUCULIDAE

Geococcyx californianus (Lesson)	Roadrunner

Order STRIGIFORMES

Family TYTONIDAE

Tyto alba pratincola (Bonaparte)	Barn Owl

Family STRIGIDAE

Otus asio inyoensis Grinnell	Screech Owl
Bubo virginianus ssp.	Great Horned Owl
Speotyto cunicularia hypugaea (Bonaparte)	Burrowing Owl
Asio otus tuftsi Godfrey	Long-eared Owl
Asio flammeus flammeus (Pontoppidan)	Short-eared Owl

Order CAPRIMULGIFORMES

Family CAPRIMULGIDAE

Phalaenoptilus nuttallii nuttallii (Audubon)	Poor-will
Chordeiles minor hesperis Grinnell	Common Nighthawk

Order APODIFORMES

Family APODIDAE

Aeronautes saxatalis saxatalis (Woodhouse)	White-throated Swift

Family TROCHILIDAE

Archilochus alexandri (Bourcier and Mulsant)	Black-chinned Hummingbird
Selasphorus platycercus platycercus (Swainson)	Broad-tailed Hummingbird
Selasphorus rufus (Gmelin)	Rufous Hummingbird

Order CORACIIFORMES

Family ALCEDINIDAE

Megaceryle alcyon caurina (Grinnell)	Belted Kingfisher

Order PICIFORMES

Family PICIDAE

Colaptes auratus auratus (Linnaeus)	Yellow-shafted Flicker
Colaptes auratus cafer (Gmelin)	Red-shafted Flicker
Asyndesmus lewis (Gray)	Lewis' Woodpecker
Sphyrapicus varius nuchalis Baird	Yellow-bellied Sapsucker
Sphyrapicus thyroideus nataliae (Malherbe)	Williamson's Sapsucker
Dendrocopus villosus monticola (Anthony)	Hairy Woodpecker
Dendrocopus villosus orius (Oberholser)	Hairy Woodpecker
Dendrocopus pubescens leucurus (Hartlaub)	Downy Woodpecker
Picoides tridactylus dorsalis Baird	Northern Three-toed Woodpecker

Order PASSERIFORMES

Family TYRANNIDAE

Tyrannus tyrannus (Linnaeus)	Eastern Kingbird
Tyrannus verticalis Say	Western Kingbird
Muscivora forficata (Gmelin)	Scissor-tailed Flycatcher
Myiarchus cinerascens cinerascens (Lawrence)	Ash-throated Flycatcher
Sayornis nigricans (Swainson)	Black Phoebe
Sayornis saya saya (Bonaparte)	Say's Phoebe
Empidonax traillii brewsteri Oberholser	Traill's Flycatcher
Empidonax hammondii (Xantus)	Hammond's Flycatcher
Empidonax oberholseri Phillips	Dusky Flycatcher
Empidonax difficilis hellmayri Brodkorb	Western Flycatcher
Contopus sordidulus veliei Coues	Western Wood Pewee
Nuttallornis borealis (Swainson)	Olive-sided Flycatcher

Family ALAUDIDAE

Eremophila alpestris leucolaema Coues	Horned Lark
Eremophila alpestris utahensis (Behle)	Horned Lark

Family HIRUNDINIDAE

Tachycineta thalassina lepida Mearns	Violet-green Swallow
Iridoprocne bicolor (Vieillot)	Tree Swallow
Riparia riparia riparia (Linnaeus)	Bank Swallow
Stelgidopteryx ruficollis serripennis (Audubon)	Rough-winged Swallow
Hirundo rustica erythrogaster Boddaert	Barn Swallow
Petrochelidon pyrrhonota ssp.	Cliff Swallow
Progne subis arboricola Behle	Purple Martin

Family CORVIDAE

Perisoreus canadensis capitalis Ridgway	Gray Jay
Cyanocitta stelleri macrolopha Baird	Steller's Jay
Aphelocoma coerulescens nevadae Pitelka	Scrub Jay
Aphelocoma ultramarina arizonae (Ridgway)	Mexican Jay
Pica pica hudsonia (Sabine)	Black-billed Magpie
Corvus corax sinuatus Wagler	Common Raven
Corvus brachyrhynchos hesperis Ridgway	Common Crow
Gymnorhinus cyanocephalus Wied	Piñon Jay
Nucifraga columbiana (Wilson)	Clark's Nutcracker

Family PARIDAE

Parus atricapillus nevadensis (Linsdale)	Black-capped Chickadee
Parus gambeli inyoensis (Grinnell)	Mountain Chickadee
Parus gambeli ssp.	Mountain Chickadee
Parus inornatus ridgwayi Richmond	Plain Titmouse
Psaltriparus minimus plumbeus (Baird)	Common Bushtit

Family SITTIDAE

Sitta carolinensis ssp.	White-breasted Nuthatch
Sitta canadensis Linnaeus	Red-breasted Nuthatch
Sitta pygmaea melanotis van Rossem	Pygmy Nuthatch

Family CERTHIIDAE

Certhia familiaris leucosticta van Rossem	Brown Creeper

Family CINCLIDAE

Cinclus mexicanus unicolor Bonaparte	Dipper

Family TROGLODYTIDAE

Troglodytes aedon parkmanii Audubon	House Wren
Thryomanes bewickii eremophilus Oberholser	Bewick's Wren
Telmatodytes palustris plesius (Oberholser)	Long-billed Marsh Wren
Catherpes mexicanus conspersus Ridgway	Cañon Wren
Salpinctes obsoletus obsoletus (Say)	Rock Wren

Family MIMIDAE

Mimus polyglottos leucopterus (Vigors)	Mockingbird
Oreoscoptes montanus (Townsend)	Sage Thrasher

Family TURDIDAE

Turdus migratorius propinquus Ridgway	Robin
Hylocichla guttata auduboni (Baird)	Hermit Thrush
Salia currucoides (Bechstein)	Mountain Bluebird
Myadestes townsendi townsendi (Audubon)	Townsend's Solitaire

Family SYLVIIDAE

Polioptila caerulea amoenissima Grinnell	Blue-gray Gnatcatcher
Regulus satrapa amoenus van Rossem	Golden-crowned Kinglet
Regulus calendula cineraceus Grinnell	Ruby-crowned Kinglet

Family MOTACILLIDAE

Anthus spinoletta alticola Todd	Water Pipit

Family BOMBYCILLIDAE

Bombycilla garrulus pallidiceps Reichonow	Bohemian Waxwing
Bombycilla cedrorum Vieillot	Cedar Waxwing

Family LANIIDAE

Lanius ludovicianus gambeli Ridgway	Loggerhead Shrike

Family STURNIDAE

Sturnus vulgaris vulgaris Linnaeus	Starling

Family VIREONIDAE

Vireo solitarius plumbeus Coues	Solitary Vireo
Vireo gilvus leucopolius (Oberholser)	Warbling Vireo

Family PARULIDAE

Vermivora celata orestera Oberholser	Orange-crowned Warbler
Vermivora virginiae (Baird)	Virginia's Warbler
Dendroica petechia morcomi Coale	Yellow Warbler
Dendroica auduboni auduboni (Townsend)	Audubon's Warbler
Dendroica auduboni memorabilis Oberholser	Audubon's Warbler
Dendroica nigrescens (Townsend)	Black-throated Gray Warbler
Dendroica townsendi (Townsend)	Townsend's Warbler
Oporornis tolmiei monticola Phillips	MacGillivray's Warbler
Geothlypis trichas occidentalis Brewster	Yellowthroat
Icteria virens auricollis (Deppe)	Yellow-breasted Chat
Wilsonia pusilla pileolata (Pallas)	Wilson's Warbler

Family ICTERIDAE

Sturnella neglecta neglecta Audubon	Western Meadowlark
Xanthocephalus xanthocephalus (Bonaparte)	Yellow-headed Blackbird
Agelaius phoeniceus fortis Ridgway	Red-winged Blackbird
Icterus galbula galbula (Linnaeus)	Baltimore Oriole
Icterus galbula bullockii (Swainson)	Bullock's Oriole
Euphagus cyanocephalus (Wagler)	Brewer's Blackbird
Molothrus ater artemisiae Grinnell	Brown-headed Cowbird

Family THRAUPIDAE

Piranga ludoviciana (Wilson)	Western Tanager

Family PLOCEIDAE

Passer domesticus domesticus (Linnaeus)	House Sparrow

Family FRINGILLIDAE

Pheucticus melanocephalus melanocephalus (Swainson)	Black-headed Grosbeak
Passerina amoena (Say)	Lazuli Bunting
Hesperiphona vespertina brooksi Grinnell	Evening Grosbeak

Carpodacus cassinii Baird	Cassin's Finch
Carpodacus mexicanus frontalis (Say)	House Finch
Pinicola enucleator montana Ridgway	Pine Grosbeak
Leucosticte tephrocotis littoralis Baird	Gray-crowned Rosy Finch
Leucosticte tephrocotis tephrocotis (Swainson)	Gray-crowned Rosy Finch
Leucosticte tephrocotis atrata Ridgway	Black Rosy Finch
Spinus pinus pinus (Wilson)	Pine Siskin
Spinus tristis pallidus Mearns	American Goldfinch
Loxia curvirostra bendirei Ridgway	Red Crossbill
Loxia leucoptera Gmelin	White-winged Crossbill
Chlorura chlorura (Audubon)	Green-tailed Towhee
Pipilo erythrophthalmus montanus Swarth	Rufous-sided Towhee
Calamospiza melanocorys Stejneger	Lark Bunting
Passerculus sandwichensis anthinus Bonaparte	Savannah Sparrow
Passerculus sandwichensis nevadensis Grinnell	Savannah Sparrow
Pooecetes gramineus confinis Baird	Vesper Sparrow
Chondestes grammacus strigatus Swainson	Lark Sparrow
Amphispiza bilineata deserticola Ridgway	Black-throated Sparrow
Amphispiza belli nevadensis (Ridgway)	Sage Sparrow
Junco hyemalis hyemalis (Linnaeus)	Slate-colored Junco
Junco hyemalis cismontanus Dwight	Slate-colored Junco
Junco oreganus montanus Ridgway	Oregon Junco
Junco caniceps caniceps (Woodhouse)	Gray-headed Junco
Spizella arborea ochracea Brewster	Tree Sparrow
Spizella passerina arizonae Coues	Chipping Sparrow
Spizella breweri breweri Cassin	Brewer's Sparrow
Zonotrichia leucophrys oriantha Oberholser	White-crowned Sparrow
Zonotrichia leucophrys gambelii (Nuttall)	White-crowned Sparrow
Melospiza lincolnii lincolnii (Audubon)	Lincoln's Sparrow
Melospiza lincolnii alticola (Miller and McCabe)	Lincoln's Sparrow
Melospiza melodia montana Henshaw	Song Sparrow
Melospiza melodia merrilli Brewster	Song Sparrow

SOURCE: Wothen, 1968.

APPENDIX F-2

MAMMALS TO BE EXPECTED IN THE VICINITY OF THE PINE AND WAH WAH VALLEYS

APPENDIX F-2

MAMMALS TO BE EXPECTED IN THE VICINITY OF THE PINE AND WAH WAH VALLEYS

INSECTIVORES

*Merriam Shrew (Sorex merriami)
*Vagrant Shrew (Sorex vagrans)
*Northern Water Shrew (Sorex palustris)
Least Shrew (Sorex nanus)
*Dusky Shrew (Sorex obscurus)
Gray Shrew (Notiosorex crawfordi)

BATS

*Little Brown Bat (Myotis lucifugus)
*Yuma Bat (Myotis yumanensis)
House Bat (Myotis velifer)
*Fringed Myotis (Myotis thysanodes)
*Long-eared Myotis (Myotis evotis)
*Long-legged bat (Myotis volans)
*Calfironia Bat (Myotis californicus)
*Small-footed Bat (Myotis subatatus)
*Silvery-haired Bat (Lasionycteria noctivagans)
*Western Pipistrelle (Pipistrellus hesperus)
*Big Brown Bat (Eptesicus fuscus)
*Red Bat (Lasiurus borealis)
*Hoary Bat (Lasiurus cinereus)
Eastern Big-eared Bat (Plecotis rafinesquei)
Mexican Big-eared Bat (Plecotis phyllotis)
*Spotted Bat (Euderma maculata)
*Pallid Bat (Antrozous pallidus)
*Mexican Free tail Bat (Tadarida brasiliensis)
*Big Free tail Bat (Tadarida molossa)

PIKAS, HARES, RABBITS

Pika or Cony (Ochotona princeps)
White-tailed Jackrabbit (Lepus townsendii)
*Black-tailed Jackrabbit (Lepus californicus)
Snowshoe Rabbit (Lepus americanus)
Mountain Cottontail (Sylvilagus nuttallii)
*Desert Cottontail (Sylvilagus audubonii)
Pigmy Cottontail (Sylvilagus idahoensis)

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* Animals whose range includes the general vicinity of the study area.

Sources: (Utah DNR, 1974) (Burt, 1964)

RODENTS

*Abert Squirrel (Sciurus aberti)
Red Squirrel (Tamiasciurus hudsonicus)
Yellow-bellied Marmot (Marmota flaviventris)
White-tailed Prairie Dog (Cynomys leucurus)[a]
*Utah Prairie Dog (Cynomys parvidens)[a]
Zuni Prairie Dog (Cynomys gunnisoni)[a]
Townsend Ground Squirrel (Spermophilus townsendii)
Belding Ground Squirrel (Spermophilus beldingi)
Richardson Ground Squirrel (Spermophilus richardsoni)
Uinta Ground Squirrel (Spermophilus armatus)
Thirteen-lined Ground Squirrel (Spermophilus tridecemlineatus)
Spotted Ground Squirrel (Spermophilus spilosoma)
*Rock Squirrel (Spermophilus variegatus)
*Antelope Ground Squirrel (Spermophilus leucurus)
*Golden-mantled Ground Squirrel (Spermophilus lateralis)
*Least Chipmunk (Eutamias minimus)
*Yellow-pine Chipmunk (Eutamias amoenus)
Say Chipmunk (Eutamias quadrivittatus)
Uinta Chipmunk (Eutamias umbrinus)
*Cliff Chipmunk (Eutamias dorsalis)
*Northern Flying Squirrel (Glaucomys sabrinus)
Northern Pocket Gopher (Thomonys bottae)
*Valley Pocket Gopher (Thomonys talpoides)
Baird Pocket Mouse (Perognathus flavus)
Apache Pocket Mouse (Perognathus apache)
*Little Pocket Mouse (Perognathus longimembris)
*Great Basin Pocket Mouse (Perognathus parvus)
Wyoming Pocket Mouse (Perognathus fasciatus)
*Long-tailed Pocket Mouse (Perognathus formosus)
Intermediate Pocket Mouse (Perognathus intermedius)
Dark Kangaroo Mouse (Microdipodops megacephalus)
*Ord Kangaroo Rat (Dipodomys ordi)
*Chisel-toothed (Great Basin) Kangaroo Rat (Dipodomys microps)
Merriam Kangaroo Rat (Dipodomys merriami)
Desert Kangaroo Rat (Dipodomys deserti)
Beaver (Castor canadensis)
*Western Havest Mouse (Reithrodontomys megalotis)
*Canyon Mouse (Peromyscus crinitus)
Cactus Mouse (Peromyscus eremicus)
*Deer Mouse (Peromyscus maniculatus)
*Brush Mouse (Peromyscus boylii)
*Pinyon Mouse (Peromyscus truei)
*Long-nosed Deer (Rock) Mouse (Peromyocus difficilis)
*Northern Grasshopper Mouse (Onychomys leucogaster)

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[a] All considered one species (Cynomys gunnisoni, white tailed prairie dog) in Burt, 1964.

*Southern Grasshopper Mouse (Onychomys torridus)
White-throated Wood Rat (Neotoma albigula)
Mexican Wood Rat (Neotoma mexicana)
*Desert Wood Rat (Neotoma lepida)
Stephens Wood Rat (Neotoma stephensi)
*Bushy-tailed Wood Rat (Neotoma cinerea)
Red-backed Mouse (Vole) (Clethrionomys gapperi)
Muskrat (Ondatra zibethicus)
Mountain Phenocomys (Phenocomys intermedius)
Pennsylvanian Meadow Mouse (Microtus pennsylvanicus)
*Montane Meadow Mouse (Microtus longicaudus)
Long-tailed Meadow Mouse (Microtis montanus)
Mexican Vole (Microtus mexicanus)
Big-footed (Richardson) Meadow Mouse (Microtus richardsoni)
*Sagebrush Vole (Lagurus curtatus)
*Alexandrine (Black) Rat (Rattus rattus)
*Norway Rat (Rattus norvegicus)
*House Mouse (Mus musculus)
Big (Western) Jumping Mouse (Zapus princeps)
*Porcupine (Erethizon dorsatum)
*Coyotes (Canis latrans)
*Red fox (Vulpes vulpes)
*Kit Fox (Vulpes macrotis)
*Gray Fox (Urocyon cinereoargenteus)
*Black Bear (Ursus americanus)
Raccoon (Procyon lotor)
*Ring-tail Cat (Bassariscus astutus)
*Ermine (Mustela erminea)
*Long-tailed Weasel (Mustela frenata)
Mink (Mustela vison)
Black-footed Ferret (Mustela nigripes)
Marten (Martes caurina)
Fisher (Martes pennanti)
Wolverine (Gulo luscus)
*Badger (Taxidea taxus)
*Striped Skunk (Mephitis mephitis)
*Spotted Skunk (Spilogale putorius)
Otter (Lutra canadensis)
Canada Lynx (Lynx canadensis)
*Bobcat (Lynx rufus)
*Mountain Lion (Felis concolor)

EVEN-TOED UNGULATES

*Rocky Mountain Elk (Cervus canadensis)
*Mule Deer (Odocoileus hemionus)
Moose (Alces alces)
*Prong-horned Antelope (Antilocapra americana)
Bison (Bison bison)
Bighorn Sheep (Ovis canadensis)
Rocky Mountain Goat (Oreamnos americanus)

APPENDIX F-3

REPTILES AND AMPHIBIANS TO BE EXPECTED IN THE VICINITY OF THE PINE AND WAH WAH VALLEYS

APPENDIX F-3

REPTILES AND AMPHIBIANS TO BE EXPECTED IN THE VICINITY OF PINE AND WAH WAH VALLEYS

AMPHIBIANS	
Great Basin Spadefoot Toad (Western Spadefoot)	Scaphiopus hammondi intermontanus
Great Plains Toad	Bufo cognatus
Western Boreal toad (Western toad)	Bufo boreas boreas
Woodhouse's Toad	Bufo woodhousei woodhousei
Northern leopard frog	Rana pipiens brachycephala
LIZARDS	
Western collared lizard	Crotaphytus collaris bicinctores
Long-nosed leopard lizard	Crotaphytus wislizenii wislizenii
Southern Plateau Fence Lizard (Eastern fence lizard)	Sceloporus undulatus tristichus
Great Basin Fence Lizard (Western Fence Lizard)	Sceloporus occidentalis longipes
Great Basin sagebrush lizard	Sceloporus graciosus graciosus
Northern side-blotched lizard	Uta stansburiana stansburiana
Upper Colorado Basin lizard	Uta stansburiana uniformis
Colorado tree lizard	Urosaurus ornatus wrighti
Mountain short-horned lizard	Phyrnosoma douglassii hernandesi
Desert long-horned lizard	Phyrnosoma platyrhinos platyrhinos
Great Basin Whiptail (Western Whiptail)	Cnemidophorus tigris tigris
Northern Whiptail	Cnemidophorus tigris septentrionalis
Great Basin skink (Western Skink)	Eumeces skiltonianus utahensis

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Source: Distribution maps of reptiles and amphibians of Utah. Utah Division of Wildlife Resources, 1979.

APPENDIX F-3 (cont.)

SNAKES

Wandering garter snake	*Thamnophis elegans vagrans*
Red-Sided garter snake	*Thamnophis sirtalis parietalis*
Ring-neck snake	*Diadophis punctatus*
Western yellow-bellied racer	*Coluber constrictor mormon*
Red racer	*Masticophis flagellum piceus*
Desert striped whipsnake	*Masticophis taeniatus taeniatus*
Gopher snake	*Pituophis melanoleucus*
California king snake	*Lampropetlis getulus californiae*
Milk snake	*Lampropeltis triangulum*
Utah mountain king snake	*Lampropeltis pyromelana infralabialis*
Western long-nosed snake	*Rhinocheilus lecontei lecontei*
Great Basin rattlesnake	*Crotalus viridis lutosus*
Desert night snake	*Hypsiglena torquata deserticola*

APPENDIX G

United States Department of the Interior 6840 (240)

BUREAU OF LAND MANAGEMENT
WASHINGTON, D.C. 20240

August 20, 1980

Instruction Memorandum No. 80- 72[illegible]
Expires 9/30/81

To: All Field Officials

From: Director

Subject: Policy - Conservation of Sensitive, Threatened, or Endangered Plants, Endangered Species Act (ESA) of 1973, as Amended

A. BACKRGOUND

The ESA of 1973, as amended, requires that threatened or endangered (T/E) plant species be identified and conserved (see Enclosure 1 for definitions). Under Section 7 of the Act, the Bureau is required to actively manage species in danger of extinction, to ensure their conservation, and to consult with Fish and Wildlife Service (FWS) on any action that results in a may affect decision to ensure that any action authorized, funded, or carried out by the Bureau does not jeopardize the continued existence of a federally listed species and/or its Critical Habitat. The 1979 amendments to Section 7 now require us to confer with FWS on actions which might affect proposed species.

The Act provides civil and criminal penalties for violations of its provisions and permits citizens to sue to require compliance with the Act, making it one of the most stringent statutes affecting the Bureau of Land Management (BLM). The official Federal listing of a plant species (as T/E) creates a nondiscretionary, legally binding obligation on the part of BLM to use all its authorities to prevent the extinction of the plants as well as to avoid any action which would jeopardize the species' "existence."

BLM/State cooperation in matters concerning official State-listed species is mandated by Title II, Section 202(c)(3) of the Sikes Act (16 U.S.C. 670h), as amended, which states, in part, that cooperative agreements under this Act must ". . . provide adequate protection for fish and wildlife officially classified as threatened or endangered pursuant to Section 4 of the ESA of 1973 (16 U.S.C. 1533) or considered to be threatened, rare, or endangered by the State agency. . . ." Although plants are not specifically mentioned in the Sikes Act, the ESA of 1973 requires their consideration. Thus, plants should be included in Federal/State cooperative programs.

B. POLICY STATEMENT

It is Bureau policy to protect, conserve, and manage federally and State-listed or candidate listings of sensitive, threatened, or endangered plants and to use its authorities in furtherance of the purposes of the ESA and similar State laws. The Bureau, through its actions and/or

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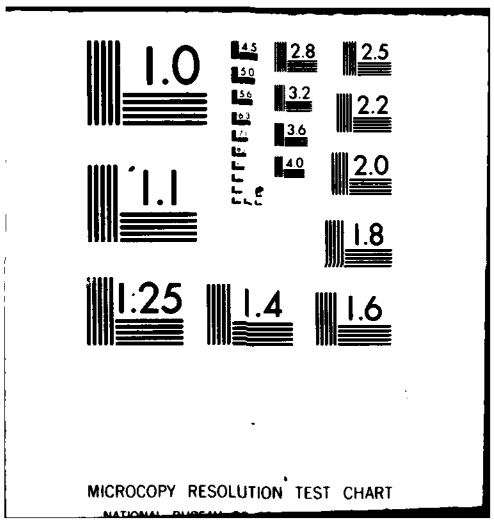
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MICROCOPY RESOLUTION TEST CHART

decisions in all planning and management activities, will ensure that actions authorized, funded, or carried out will not jeopardize the continued existence of such species or result in the destruction or modification of their Critical Habitats.

All candidate species for federally T/E status and sensitive species must be accorded the full protection of the ESA. unless it is determined by the State Director on a case-by-case basis that information on the occurrence of a plant species is adequate to allow a specific action.

The objectives of all programs will include the means to conserve officially listed plants, to promote delisting, and/or to enhance or maintain the ecosystems occupied by plants on Federal or official State inventories. It is also policy to ensure that the habitats of sensitive plants will be managed and/or conserved to minimize or eliminate the need for Federal or State listing in the future.

C. MANAGEMENT GUIDELINES

Management of federally or State-listed species must be implemented with the objective being the eventual delisting of such species. Sensitive species management should be carried out to secure these species' continued survival and ensure that future listing of such species is not necessary.

1. Federally T/E and Sensitive Species Lists

In order to implement BLM policy, it is imperative that each District develop and maintain an up-to-date list of all federally T/E, State-listed, and sensitive plant species which are known or suspected to occur on BLM-administered lands within that District or on adjacent lands which may reasonably be expected to be influenced by Bureau actions. Extreme care should be taken to include on each District list only plant species for which there is reasonable evidence for concern. Those species included in the Federal Register, July 1, 1975 (40 F.R. 27824-27924), and June 17, 1976 (41 F.R. 24524-24572), may serve as a basis for the District lists, but each species should be included only after close scrutiny. Indiscriminate inclusion of species on these lists will be counter-productive. Suggestions should be solicited on an ongoing basis from all Bureau field personnel, as well as appropriate persons in other agencies, universities, and local plant taxonomists, and where present from native plant societies and heritage programs. Through consolidation of the District lists, a current BLM State list should be developed and maintained and made available to all field offices.

The Office of Endangered Species of the FWS expects to have published in the Federal Register by early fall (1980) a listing of plant species under formal Notice of Review. Once available this list should be considered in revising the BLM State lists. All species in this Review which are candidates for T/E status should automatically be added to appropriate BLM State lists.

2. Inventory and Species Status Reports

It is the responsibility of the BLM under the ESA to conduct and maintain on a continuing basis an inventory of the occurrence, populations, and distributions of threatened and endangered plant species. The BLM State lists will afford field personnel with target species on which information can be gathered on an ongoing basis.

On a priority basis, each species should be studied to compile information on which intelligent management decisions for the species can be made. Coordination of such studies may be necessary at the State level in instances where a species is present in two or more Districts or States. The "Guidelines for the Preparation of Status Reports on Rare or Endangered Plant Species" (Enclosure 2) provides a concise format for the compilation of individual species status reports. These guidelines should be useful whether the information on a species is gathered by BLM personnel or by persons outside the Bureau on contract. The status reports for each species should never be considered a final product, but should be constantly upgraded and revised as new information becomes available.

3. Planning

As stated in Section 3(3) of the ESA, as amended, "The terms 'conserve', 'conserving', and 'conservation' mean to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary." All land-use plans and activity plans should take into consideration the management of T/E and sensitive plant species to ensure their conservation. In some cases, it will be necessary for the conservation of species with restricted distributions to develop habitat management plans (HMPs). These HMPs should be done on a priority basis and should follow the format presented in BLM Manual Section 6620. Existing HMPs should be modified to include such species if they occur within the wildlife habitat area. In circumstances where threatened, endangered, and/or sensitive species occur in a narrowly defined area, this area should be examined to see if it meets the criteria for designation as an area of critical environmental concern (ACEC). The most recent BLM policy on ACECs is available in Organic Act Directive No. 77-77, Change 2. For species with disjunct occurrences or species which are widely dispersed HMPs may not be appropriate. In such cases, appropriate management plans should be developed following a format similar to that of HMPs.

George A. Lea

Deputy Director for Lands & Resources

2 Enclosures:
Encl. 1 - Definitions
Encl. 2 - Guidelines for the Preparation of Status Reports on Rare or Endangered Plant Species

In Reply Refer To:
General
6840 (240)

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
WASHINGTON, D.C. 20240

September 8, 1980

Instruction Memorandum No. 80-722, Change 1
Expires 9/30/81

To: All Field Officials

From: Director

Subject: Policy - Conservation of Sensitive, Threatened, or Endangered (T/E) Plants, Endangered Species Act (ESA) of 1973, as Amended

To clarify the process of developing sensitive species lists, the following underlined sentences and word changes are being added to C1 of Instruction Memorandum No. 80-722.

C. MANAGEMENT GUIDELINES

Management of federally or State-listed species must be implemented with the objective being the eventual delisting of such species. Sensitive species management should be carried out to secure these species' continued survival and ensure that future listing of such species is not necessary.

1. Federally T/E, State-Listed T/E, and Sensitive Species Lists

In order to implement the Bureau of Land Management (BLM) policy, it is imperative that each District develop and maintain an up-to-date list of all federally T/E, State-listed, and sensitive plant species which are known or suspected to occur on BLM-administered lands within that District or on adjacent lands which may reasonably be expected to be influenced by Bureau actions. Three lists should be developed. One will include all federally listed T/E species; the second, all State-listed T/E species; and the third, all sensitive species (see definition on Enclosure 1-2). Extreme care should be taken to include on each District sensitive species list only plant species for which there is reasonable evidence for concern. Those species included in the Federal Register, July 1, [illegible] (40 F.R. 27824-27924), and June 17, 1976 (41 F.R. 24524-24572), may se[illegible] a basis for the District lists, but each species should be included only after close scrutiny. Indiscriminate inclusion of species on these lists will be counter-productive. Suggestions should be solicited on an ongoing basis from all Bureau field personnel, as well as appropriate persons in other agencies, universities, and local plant taxonomists, and where present from native plant societies and heritage programs. Through consolidation of the District lists, a current BLM State list should be developed and maintained. Those species which are rare or infrequent in one District but are common or secure elsewhere in the State should not generally be included on the State sensitive species list. The State sensitive species list will serve as the official sensitive plant species document, and a copy of this list should be sent to all Field Offices.

The Office of Endangered Species of the Fish and Wildlife Service expects to have published in the Federal Register by early fall (1980) a listing of plant species under formal Notice of Review. Once available this list should be considered in revising the BLM State lists. All species in this Review which are candidates for T/E status should automatically be added to appropriate BLM State sensitive species lists.

Substitute the following definition under "sensitive species" on Enclosure 1-2 of Instruction Memorandum No. 80-722:

-S-

sensitive species: A species included on a sensitive species list developed by the State Office pursuant to section C1 of this Instruction Memorandum and approved by the State Director. These lists will generally include any species in the State which meet any of the following criteria:

a. Candidate species, i.e., any species not yet officially listed but which are undergoing a status review or are proposed for listing according to Federal Register notices published by the Secretary of the Interior or the Secretary of Commerce.

b. Rare or infrequent species whose populations are consistently small and widely dispersed, or whose ranges are restricted to a few localities, such that any appreciable reduction in numbers, habitat, or habitat condition might lead toward extinction.

c. Other species whose numbers are declining so rapidly that official listing may become necessary as a conservation measure. Declines may be the result of one or more of several factors including: overuse for commercial, scientific, or educational purposes; disease, predation, or grazing; the inadequacy of existing regulatory mechanisms; and/or other natural or human factors adversely affecting the species continued existence.

George A. Lea

Deputy Director for Lands and Resources

ADDRESS ONLY THE DIRECTOR, FISH AND WILDLIFE SERVICE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
WASHINGTON, D.C. 20240

In Reply Refer To:
FWS/OES N69

FEB 06 1981

MAR 2 1981

Memorandum

To: Service Directorate and Chiefs of Divisions and Offices

Deputy Associate
From: Director

Subject: 1980 Plant Notice of Review

The Service recently published a notice of review for plants (December 15, 1980; 45 FR 82479), which is attached. This notice contains lists of the plant taxa native to the U.S. which are being considered for listing as Endangered or Threatened under the Endangered Species Act of 1973, as amended (categories 1 and 2). A list is also provided of plant taxa which were previously under consideration for listing, but are presently presumed either extinct; not valid species, subspecies or varieties; or more abundant or widespread than previously believed and/or not subject to identifiable threats (category 3). This recent notice refines and updates three previous notices.

Sections 2 and 7 of the Endangered Species Act of 1973, as amended, require that Federal agencies use their authorities in carrying out programs for the conservation of Endangered and Threatened species. In light of this obligation, we feel that candidate species should be considered when Service personnel are reviewing projects involving Federal agencies (i.e. environmental impact statements, permits, licenses, development projects, and the like). This early consideration will tend to reduce or eliminate later conflicts.

In particular, when a Federal agency requests a species list in order to conduct a biological assessment under Section 7, Endangered Species personnel have an opportunity to include, along with the listed and proposed species, a list of candidate species that may also be in the area of the Federal project. While stressing the conservation aspects of the Act, it must be made clear that the Federal agency is under no legal obligation to include candidate species in their biological assessment.

In addition to encouraging the conservation of these candidate species by notifying Federal agencies of their presence in project areas, the Service is providing an "early warning" of possible proposals and listings which carry legal obligations. If the Federal agencies develop data and information on these plants, it should be forwarded to the appropriate Regional office.

All governors, other agencies, and interested parties have been contacted and provided copies of this notice. If you need additional copies of this notice, they are available from all the Regional Endangered Species offices. If you have any questions, the Office of Endangered Species, Branch of Biological Support, may be contacted directly (703/235-1975).

Harold J. O'Connor

Attachment

APPENDIX H

APPENDIX H

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Salt Lake City, UT

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Florida State University
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Garwin Lorain
NRC Consultants
Reno, NV

Dr. Hugh Mozingo
Univ. of Nevada
Reno, NV

Ann Pinzel
Director of Natural History
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APPENDIX I

APPENDIX I

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Tim Allen, B.A.
Asst. Biologist

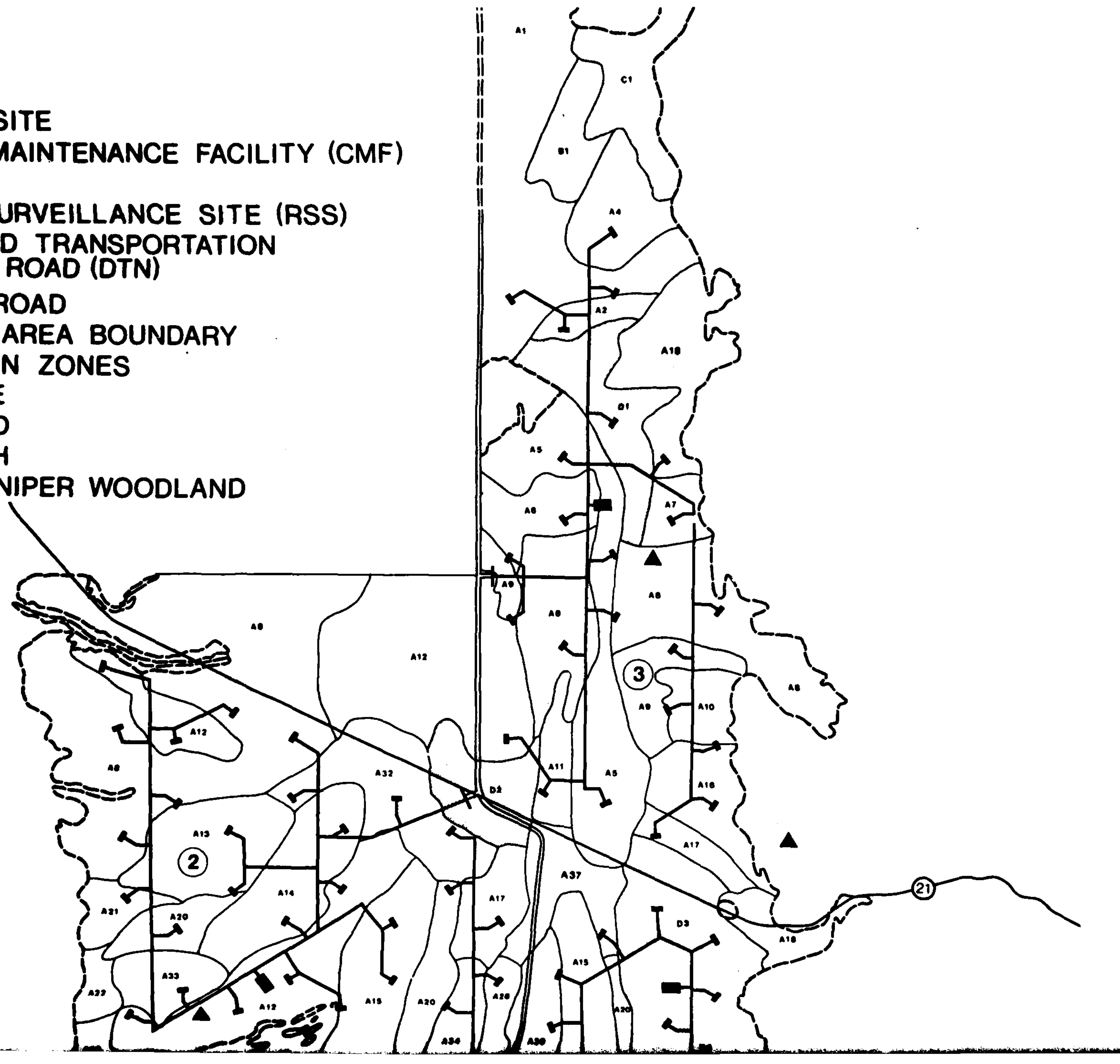
APPENDIX J

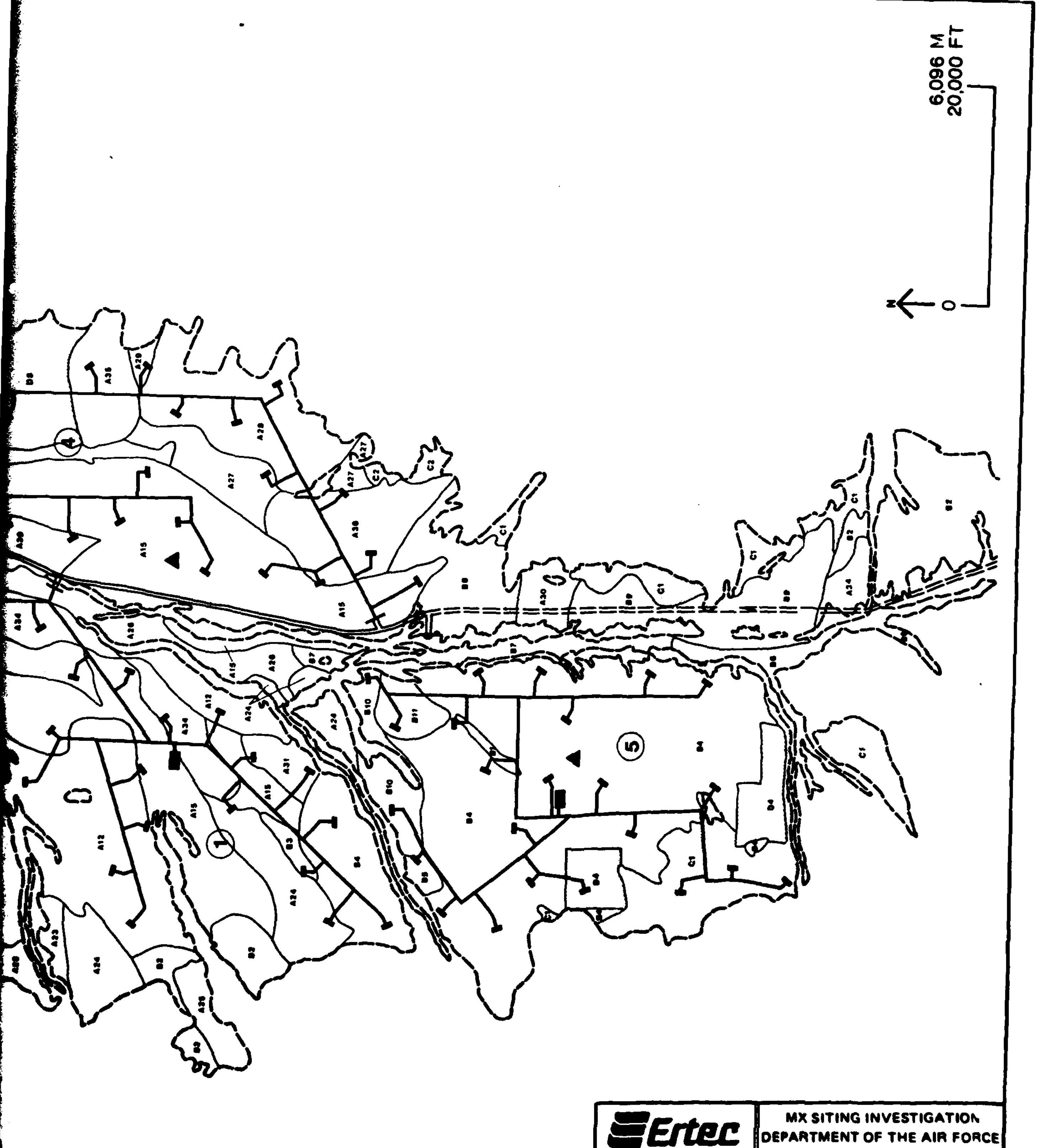
KEY

- ① CLUSTER
- ▪ SHELTER SITE
- ▬ CLUSTER MAINTENANCE FACILITY (CMF)
- — BARRIER
- ▲ REMOTE SURVEILLANCE SITE (RSS)
- ≡ DESIGNATED TRANSPORTATION NETWORK ROAD (DTN)
- — CLUSTER ROAD
- --- SUITABLE AREA BOUNDARY

VEGETATION ZONES

- ⊡ SHADSCALE
- ⊡ GRASSLAND
- ⊡ SAGEBRUSH
- ⊡ PINYON-JUNIPER WOODLAND

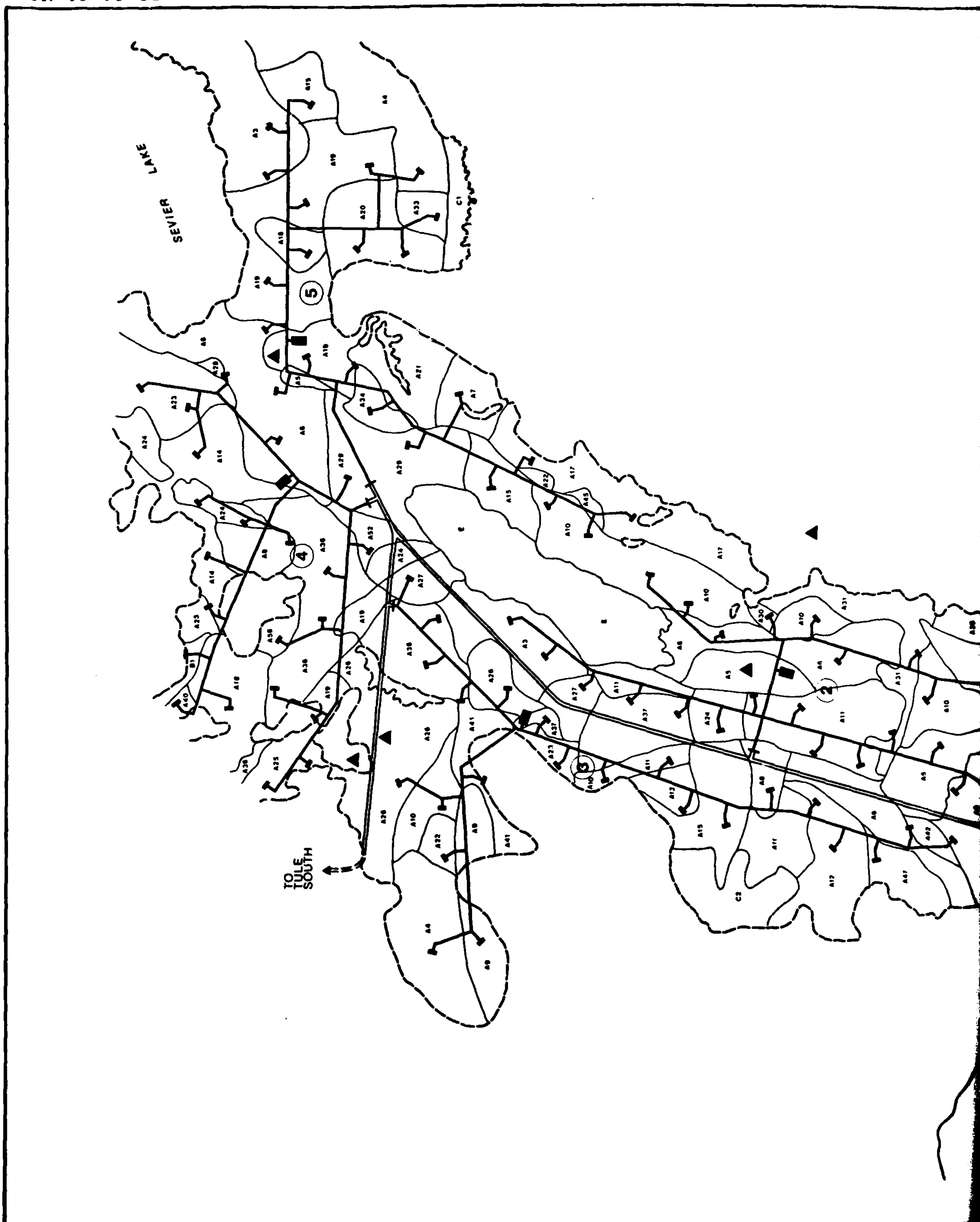


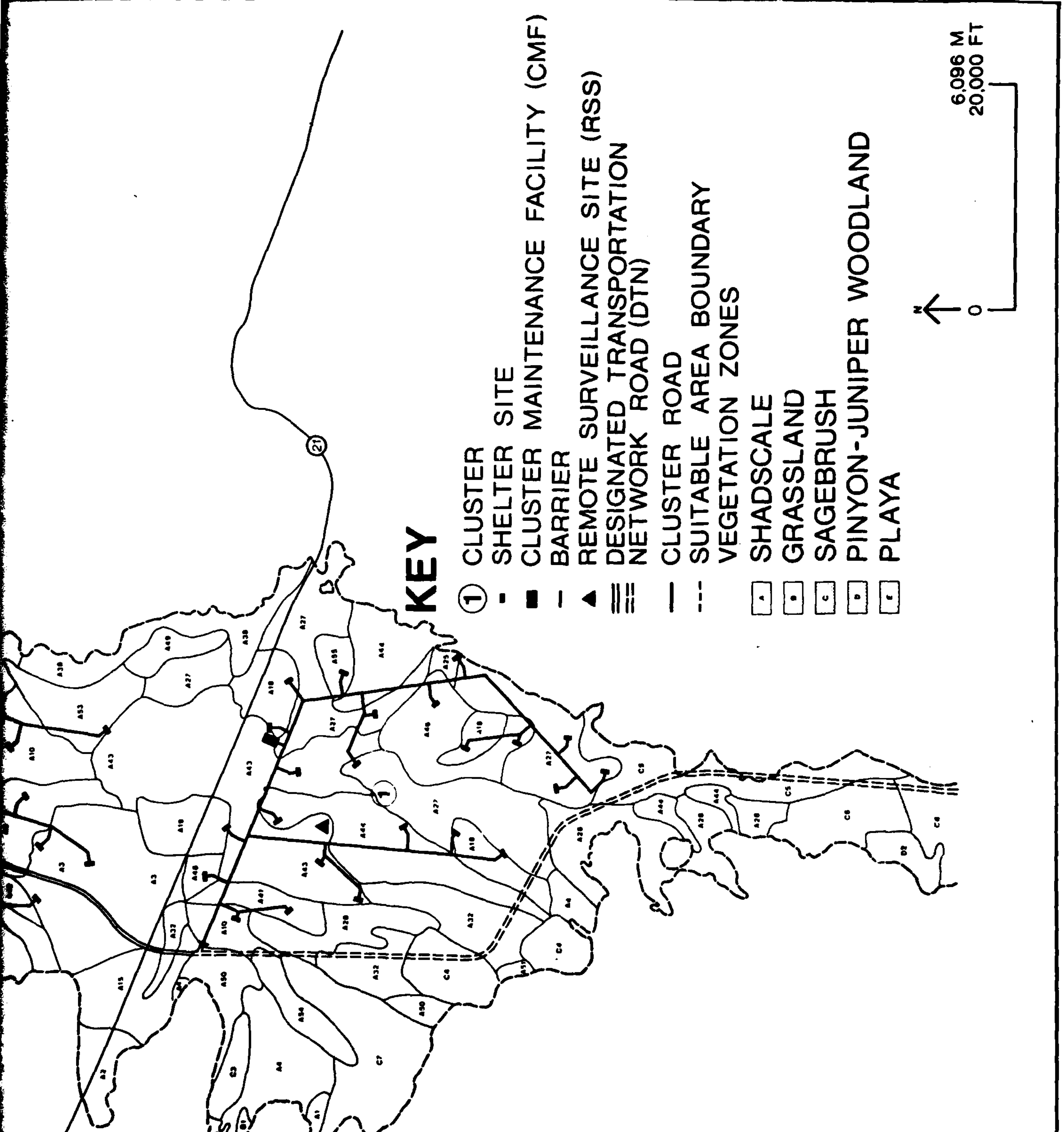


Ertec
The Earth Technology Corporation

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE
BMO/AFRCE-MX

DOMINANT/SUBDOMINANT VEGETATIVE
ASSOCIATIONS IN PINE VALLEY


SEVIER LAKE
TO TULE SOUTH



Ertec
The Earth Technology Corporation

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE
BMO/AFRCE-MX

DOMINANT/SUBDOMINANT VEGETATIVE ASSOCIATIONS IN WAH WAH VALLEY

2