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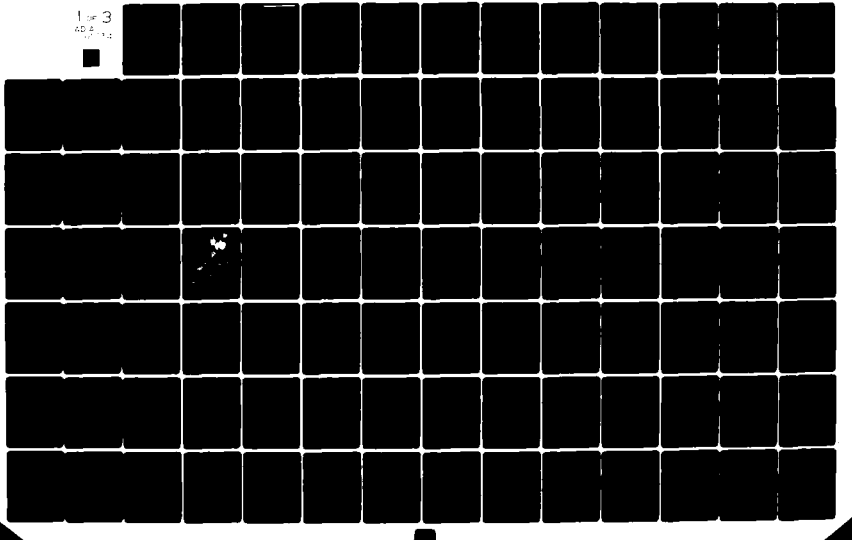

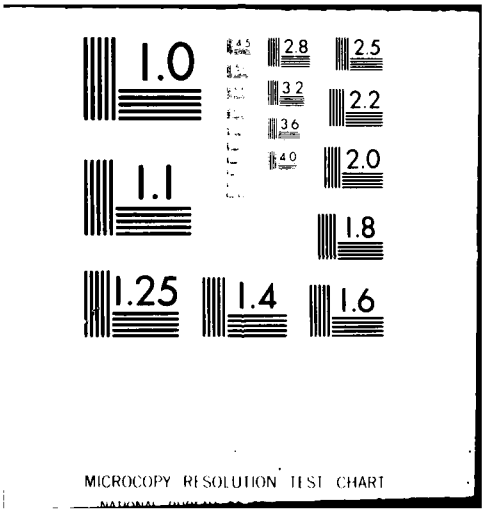
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FN-TR-46

PRELIMINARY BIOLOGICAL AND CULTURAL RESOURCES INVENTORY AND ENVIRONMENTAL EVALUATION OF THE PROPOSED OPERATIONAL BASE SITES IN COYOTE SPRING VALLEY AND THE MILFORD-BERYL AREA

Submitted by

FUGRO NORTHWEST, INC.
4526 11th Avenue N.E.
Seattle, WA 98105

March 20, 1981

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Results of the preliminary biological and cultural resources inventory of the proposed operational base sites in Coyote Spring Valley, Nevada and Milford-Beryl area, Utah, revealed that no threatened or endangered plant species were observed in the study area. Several animal species protected by state law were identified. Numerous cultural sites were recorded and observed by field visits.

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SUMMARY

This report presents the results of a preliminary environmental evaluation of three potential Operational Base (OB) sites located in Coyote Spring Valley, Nevada and near the towns of Beryl and Milford, Utah (Figure 1-1). The study identifies biological and archeological data and discusses possible conflicts resulting from the construction of the OB. The limits of the study area at the three OB sites are based on conceptual layouts developed by a working group on operational base siting. For the environmental study, all sections containing OB facilities were included in each study area.

To define possible conflicts between OB construction and biological and cultural resources at each location, existing information was obtained by a thorough review of literature and records at universities and BLM offices and by consultations with knowledgeable individuals. This approach was designed to identify all known cultural and biological resources in the study areas. In addition, a limited field sampling program was conducted to confirm, to the extent possible within the scope of the study, known resources. No systematic survey of the OB areas was undertaken.

Biological Resources

An overview of the critical habitats and important plant and animal species in the area was compiled from the literature and through personal communication with various state and federal agencies. Emphasis was placed on those species identified as

threatened or endangered on federal or state lists, major game species, and areas identified as key use areas or critical habitat by the Nevada Department of Wildlife and Utah Division of Wildlife Resources. It should be noted that other species not included on these lists, especially those lower on the food chain, may be important to ecosystems both within and adjacent to the OB site.

Limited field surveys were made at 9 locations within the proposed Coyote Spring Valley OB study area and at 14 locations within the Milford-Beryl OB study area to obtain on-site quantitative data on biological resources. These sites were chosen to provide a representative overview of the area and to verify information obtained from the literature.

A summary of important animal species with known habitat in or near the OB study areas is provided in the following tables. Since the existing biological information demonstrates close similarity between the Milford and Beryl study areas, the two are discussed as a single unit.

Coyote Spring Valley is located in a transitional area between the Great Basin and the Mojave Desert, and it contains vegetation representative of both regions. Plant and wildlife species are normally more diverse in such ecotonal areas, and the survey showed more species of plants in Coyote Spring Valley than in the Milford-Beryl area.

Indirect impacts on populations of larger game and furbearing animals will be greater in Coyote Spring Valley than in the Milford-Beryl area.

OVERVIEW OF COYOTE SPRING VALLEY STUDY AREA

Species	Justification and Effect
Desert Tortoise	o Classified as rare by the Nevada Board of Fish and Game Commissioners. o Protected by state law. o Entire study area is within tortoise habitat; 7000-7500 acres of habitat directly affected, with approximately 117 tortoise per square mile. o Indirect affects on thousands of acres due to illegal collection, off-road vehicle usage, and habitat disturbance is likely.
Bighorn sheep	o Protected by state law. o Key habitat and range adjacent to study area. Increased traffic may affect migration routes. o Increased poaching is likely.
Elk	o Protected by state law. o Range in vicinity of the study area. Indirect effects include possible increased poaching and use of habitat by man for recreation.
Mule deer	o Protected by state law. o Range in the vicinity of the study area. Indirect effects include possible increased poaching and use of habitat by man for recreation.
Kit fox	o Protected furbearer status. o Study area includes occupied habitat. Direct effects include disturbance and loss of dens and habitat. o Indirect effects include possible increased hunting and trapping.

OVERVIEW OF COYOTE SPRING VALLEY STUDY AREA (Cont.)

Species	Justification and Effect
Gray fox	o Protected furbearer status. o Probably little habitat directly affected. Indirect effects include possible increase in hunting and trapping.
Bobcat	o Protected furbearer status. o Probably little habitat directly affected. Indirect effects include possible increased trapping, hunting, or poaching.
Mountain Lion	o Protected by state law. o Occurs in the vicinity, but little habitat is directly affected. Indirect effects include possible increased poaching and habitat disturbance.
Raptors Bald Eagle Peregrine falcon Other hawks & falcons	o Bald eagle and peregrine falcon are classified as endangered. o Valley is used during migration. o All raptors are protected by federal law. o Increased disturbance, illegal capture and poaching are possible. o Prey base may be affected.
Grouse & Quail	o Protected by state law. o Much of proposed base lies within habitat. Effects include habitat disturbance, increased hunting, or poaching.
Threatened and Endangered (T&E) plants	o None are known from the literature. o Species observed in the field unidentifiable at this season, but possibly T&E include Ferrocactus sp., Opuntia basilaris, and Sphaeralcea sp.

OVERVIEW OF COYOTE SPRING VALLEY STUDY AREA (Cont.)

Species	Justification and Effect
Other Considerations:	
Wilderness areas	o Direct and indirect effects on wilderness areas adjacent to and within the study area, due to disturbance and habitat destruction are possible.
Water	o Hydrologic connections exist between Coyote Spring Valley and nearby wildlife refuges in the Pahranagat and Moapa areas. Removal of large amounts of groundwater or prevention of recharge could be detrimental to these areas.

OVERVIEW OF MILFORD-BERYL STUDY AREA

Species	Justification and Effect
Antelope	o Protected by state law. o Direct effects include large loss of range and some key habitat. Indirect effects include possible increased hunting and poaching.
Utah Prairie Dog	o Endangered species protected by federal law. o Colonies are located within a few miles from site. Indirect disturbance from increased traffic in the area is possible.
Elk	o Protected by state law. o Winter range is in the vicinity of the base site. Indirect effects from poaching and habitat disturbance are possible.
Kit fox	o Protected furbearer. Den sites are considered key habitat areas by the Utah Division of Wildlife Resources. o Probably a high population in the study area. Direct impact due to habitat loss, and indirect impacts due to increased hunting and harassment are likely.
Bobcat	o Protected furbearer. o Range in adjacent areas. Possible indirect impact due to increased hunting and habitat disturbance.
Mule deer	o Protected by state law. o Range lies within portions of the study area. Direct effects through habitat loss. o Possible indirect effects due to poaching and habitat disturbance within base site and adjacent areas.

OVERVIEW OF MILFORD-BERYL STUDY AREA (Cont.)

Species	Justification and Effect
Raptors	
Golden Eagle	o Protected by federal and state law. o Three nests are within the study area and others are within the site vicinity. o Possible illegal hunting, destruction of prey base, and disturbance to nests and habitat.
Bald Eagle	o Endangered. Protected by federal and state law. o Area used during spring and fall migrations. o Possible indirect effects due to disturbance and disruption of prey base.
Peregrine falcon	o Endangered. Protected by federal law. o Three nests are within the site vicinity, and 1 nest within the study area. o Increased disturbance to the habitat and illegal capture or poaching are possible.
Sage Grouse	o Protected by state law. o A small portion of the study area will have direct effects due to habitat loss, but no strutting grounds exist in the area.
Threatened and Endangered (T&E) Plants	o None are known from the study area but several are in the vicinity. o Species observed in the field that are unidentifiable at this season, but possibly T&E include: Opuntia sp., Astragalus sp., Eriogonum sp. Eriogeron sp., Cryptantha sp., Penstemon sp., and a variety of Gutierrezia sarothrae.

OVERVIEW OF MILFORD-BERYL STUDY AREA (Cont.)

Species	Justification and Effect
Water	o Groundwater levels have dropped greatly within the area and some land subsidence has already occurred

In addition, due to the number of wildlife refuges and amount of wilderness area near the Coyote Spring OB site, indirect impacts on wildlife adjacent to this study area can be expected to be greater. Raptors in migration, and those using the OB areas as hunting territory year-round, may be affected in both areas, but more direct impact on nesting raptors will occur in the Milford-Beryl area.

Although it is beyond the scope of this study, the effects of the OB siting should be considered in relation to the effects of other MX system components, since these components could produce cumulative impacts on wildlife populations. In other words, a number of insignificant impacts on a population may combine to produce a major impact.

Cultural Resources

The Coyote Spring Valley and Milford-Beryl OB study areas show a similar cultural history. Both areas were occupied by populations of the Southern Paiute Culture at the time of Euroamerican contact. Occupation of the areas probably began before 12,000 years ago when the areas were wetter than today, with the Big Game Hunting Culture, and followed with occupation by the Archaic or Desert Culture as the climate became drier. Both areas lie near the Anasazi Culture area in the Southwest, whose influence in the form of distinctive artifact styles is found near the OB study areas. The two study areas differ in the presence of the Fremont Culture, which combined hunting, gathering, and agriculture, in the Milford-Beryl area just before

Southern Paiute occupation. The two study areas show similar historic land use with early farming and ranching by Mormon groups in lowland areas and mining activities in the surrounding mountains.

RECORDED CULTURAL RESOURCES SITES
WITHIN 5 MILES OF THE COYOTE SPRING VALLEY AND
MILFORD-BERYL OB STUDY AREAS

	Coyote Spring Valley	Milford-Beryl Area
Archeological sites	32	39
Historical sites	3	4
Native American Cultural Areas	4	0

Known cultural resources sites were identified from BLM, state, and university site forms and records. Site areas were visited in a limited field survey.

RECORDED ARCHEOLOGICAL SITE TYPES
WITHIN 5 MILES OF THE COYOTE SPRING VALLEY AND MILFORD-BERYL
OB STUDY AREAS

	Coyote Spring Valley	Milford-Beryl Area
Unidentified	0	1
Isolated artifact	0	2
Quarry	0	2
Roasting Pit	1	0
Rockshelter	9	1
Lithic Scatter	16	19
Temporary Campsite	5	11
Village	1	3
TOTAL	32	39

Systematic surveys of the OB study areas are anticipated to reveal a number of sites. Because Coyote Spring Valley occupation was limited to hunting and gathering cultures, with low population densities, the area will probably show fewer total sites than the Milford-Beryl area, including fewer large sites.

With occupation including the hunting and gathering/agriculture Fremont Culture, with higher population densities, the Milford-Beryl area will probably show more sites, including more large village sites with structural remains. In addition, the only Paleoindian site recorded in the two OB study areas is in the Milford-Beryl area.

More historical sites are expected in the Milford-Beryl OB area because this area experienced more intense historical land use than the Coyote Spring Valley area.

No Native American cultural areas have been recorded near the Milford-Beryl area; however, four have been recorded in the Coyote Spring Valley study area.

Although none of the cultural resources sites recorded in the two OB study areas is listed in the National Register of Historic Places, several sites, both recorded and as yet undiscovered would be expected to qualify for listing. In areas where little is known about cultural resources, such as the OB study areas, many cultural resource sites can provide information on prehistory and history, thus qualifying them for inclusion in the National Register.

At this time, not enough information on the number and location of cultural resources in the valleys is available for the Air Force to estimate the number of sites that would need to be mitigated by avoidance or by recovery of scientific information through collection. Because there are more, larger, and more complex sites in the Milford-Beryl area, it is expected that more mitigation will be required in that area.

1.0 INTRODUCTION

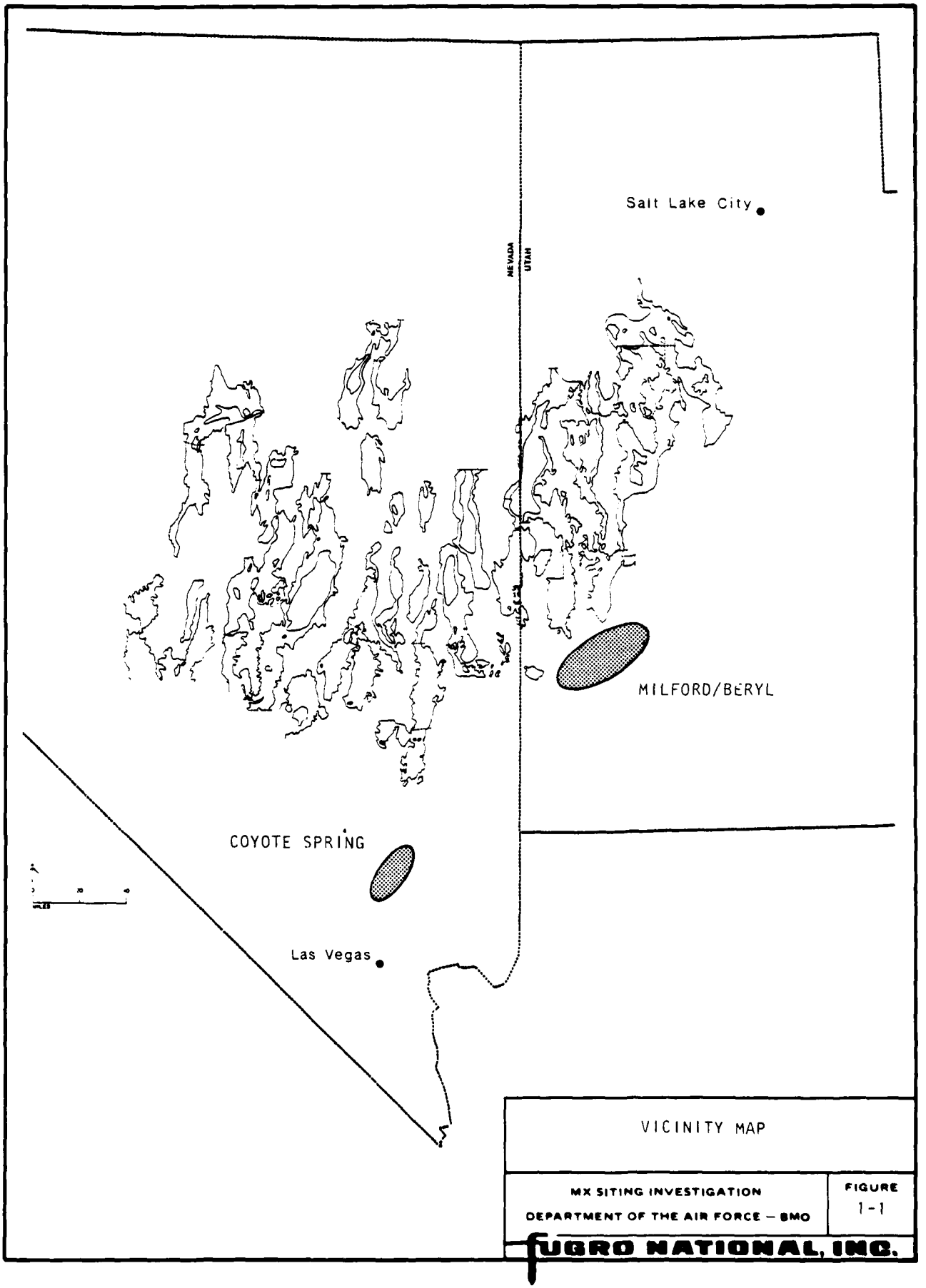
This report presents the results of a preliminary environmental evaluation of three potential Operational Base (OB) sites located in Coyote Spring Valley, Nevada and near the towns of Beryl and Milford, Utah (Figure 1-1). The study identifies biological and archeological data and discusses possible conflicts resulting from the construction of the OB, consisting of the main base, the designated assembly area, the operational base test site, and base housing.

The limits of the study area at the three OB sites are based on conceptual layouts developed by a working group on operational base siting. The group included personnel from SAC, AFRCE, Fugro National, TRW, Martin Marietta, COE, and the Ralph M. Parsons Company. For the environmental study, all sections containing OB facilities were included in the study area. Because of various systems included in each area, the study area sizes varied as shown below:

Coyote Spring	90 Sections (Figure 1-2)
Milford	124 Sections (Figure 1-3)
Beryl	68 Sections (Figure 1-3)

A complete listing of sections included in the study areas is included in Appendix D.

To define possible conflicts between OB location and biological and cultural resources, a thorough review of literature and records at universities and BLM offices, and interviews with



VICINITY MAP

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE
1-1

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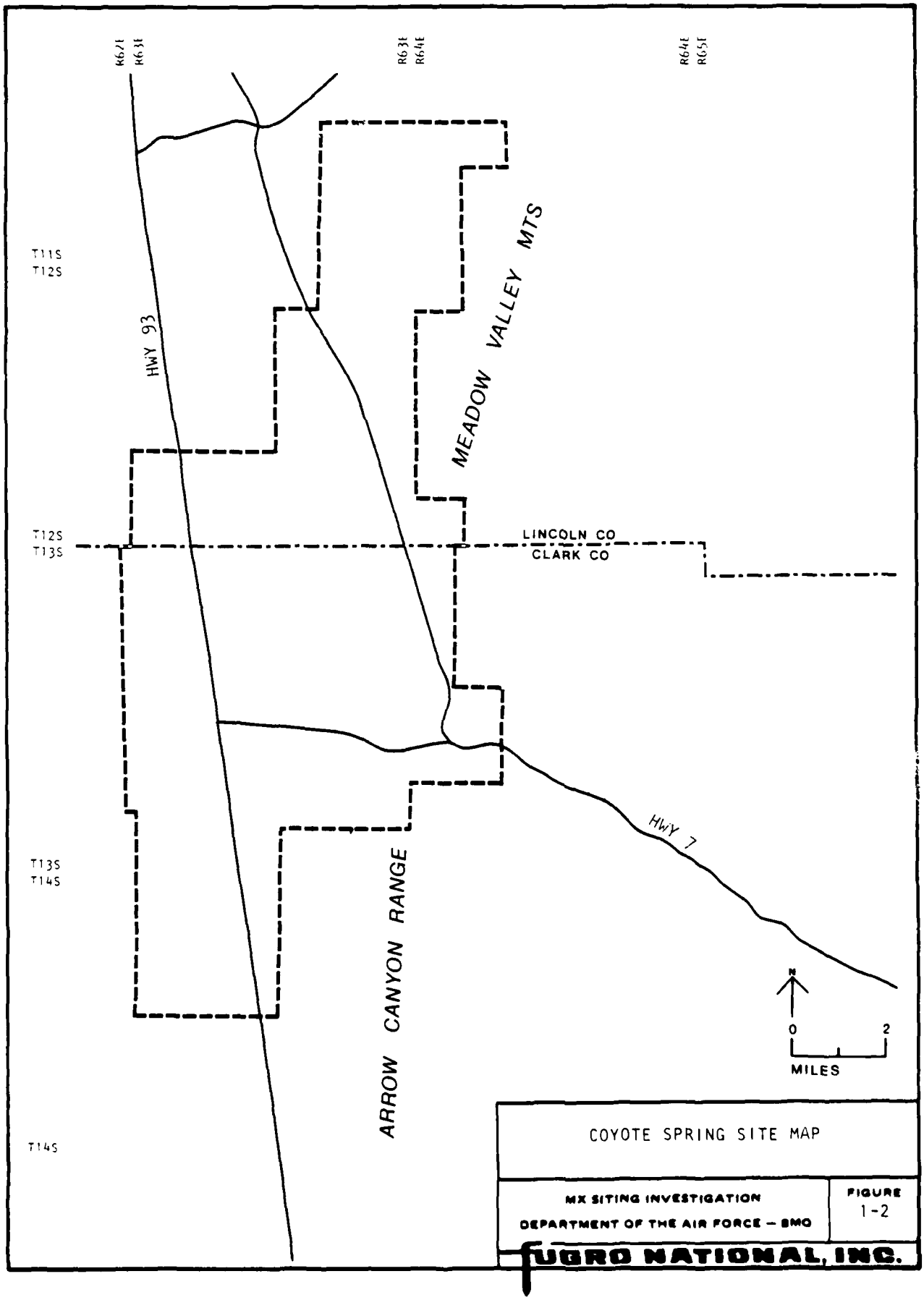

COYOTE SPRING SITE MAP

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE 1-2

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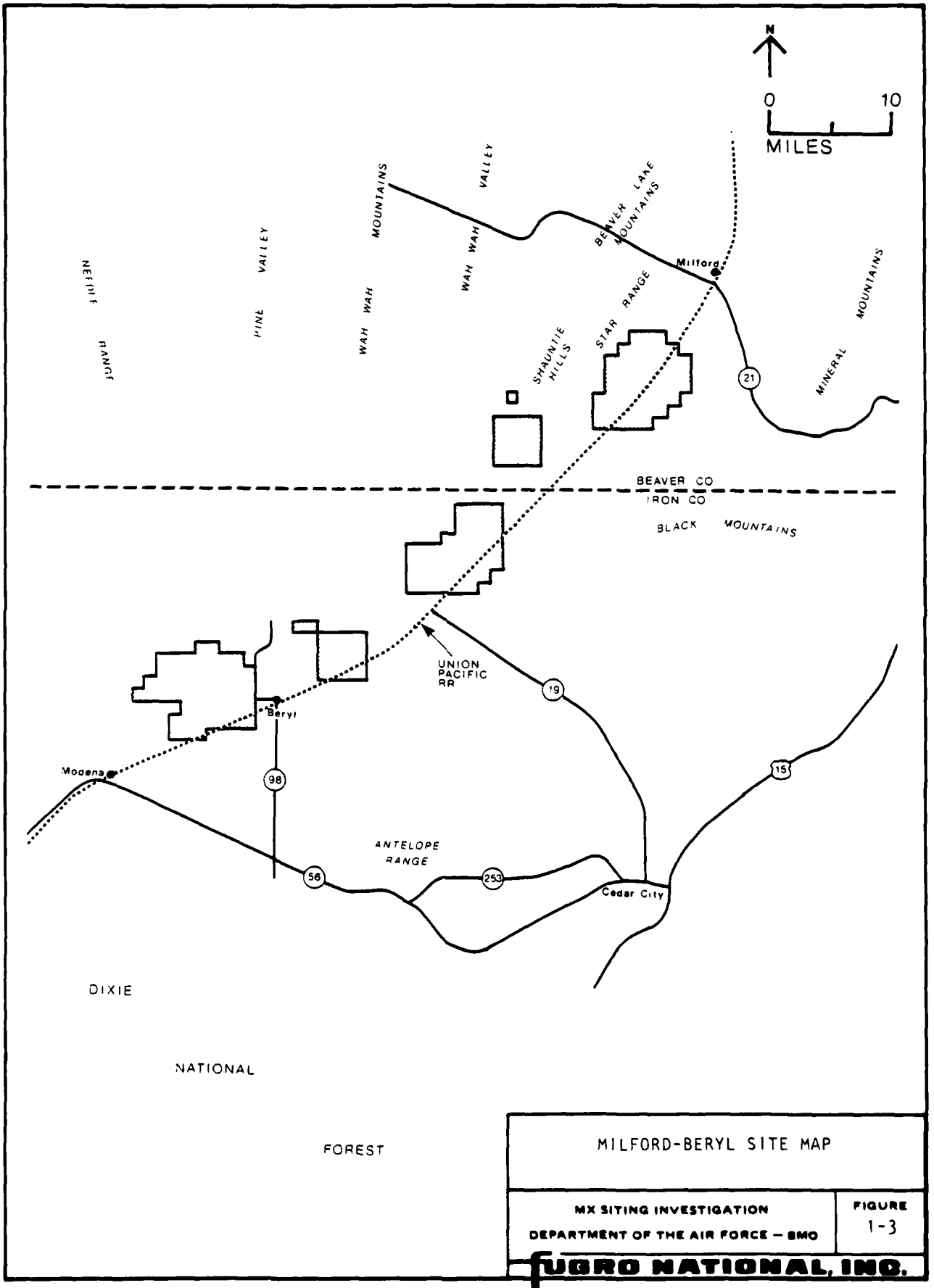


MILFORD-BERYL SITE MAP

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE 1-3

UGRO NATIONAL, INC.

knowledgeable individuals were conducted. This process was designed to identify all known cultural and biological resources. In addition, a limited field sampling was conducted to confirm, to the extent possible within the scope of the study, known resources. No systematic survey of the OB areas was undertaken.

The following sections describe the scope of the biological and cultural resources studies, a description of known resources and sampling findings, and a listing of possible conflicts with known resources.

2.0 BIOLOGICAL RESOURCES METHODOLOGY

2.1 BACKGROUND RESEARCH

Existing environmental information on the proposed OB study areas and the areas surrounding them was obtained from published information and personal communications with representatives of the Bureau of Land Management and state and local resource agencies.

Because a large number of species occur within the proposed OB areas, it was necessary to focus background research on those species and habitats considered important or sensitive by state and federal agencies. Threatened and endangered plant and animal species, as listed in the Federal Register, were considered important, as were game animals. Specific concerns regarding wildlife were obtained from the Nevada Department of Wildlife and the Utah Department of Natural Resources. Other listings compiled by agencies or organizations such as the Northern Nevada Native Plant Society, the Fish and Game Commission, and the U.S. Fish and Wildlife Service were also reviewed.

The following sections discuss the protected plant and wildlife species, give their legal status, and discuss habitats considered to be critical to their life cycles.

2.1.1 Important Wildlife Species and Habitats

In addition to the Federal Register listing of threatened and endangered wildlife, the Nevada Department of Wildlife (NDW) has

cited the wildlife species and habitats listed below as being sensitive in Nevada (Molini 1980):

- o Ferruginous hawks
- o Goshawks
- o Cooper's hawks
- o Sage grouse
- o Antelope
- o Desert tortoise
- o Gila monster (may not be found in the MX area).

NDW also considers the following areas as key use areas critical to species life cycles:

- o Sage grouse strutting grounds
- o Antelope kidding grounds, concentration areas, and migration routes
- o Desert tortoise major or winter burrows that extend deep into the ground
- o Raptor nest sites (cliffs, riparian aspen, pinyon and juniper trees on the ecotone with valleys)
- o Springs, lakes, ponds, and streams that support fish populations
- o Kit and gray fox burrows or den sites
- o Mule deer winter and spring ranges.

Additional areas of NDW concern include:

- o Riparian communities, including the desert riparian types often associated with washes having intermittent water
- o Springs, seeps, and streams
- o Wetlands, marshes, or ponds that provide habitat for waterfowl, shore birds, and aquatic furbearers

- Caliche washes, which are important habitat for desert tortoise
- Ecotonal areas, especially pinyon/juniper and salt desert shrub or northern desert shrub types, which are important nesting areas for ferruginous hawks.

The Utah Division of Wildlife Resources considers the following to be critical in Utah:

- Natural and/or developed open waters, such as seeps, springs, wells, troughs on waterlines, ponds, and guzzlers
- Any riparian or wetland vegetation associated with water
- Trees that provide nesting for any birds and/or winter roosting for the endangered bald eagle
- All habitat within 1 mile of open water
- Areas supporting rare, threatened, or endangered plants
- All habitat within 1 mile of transplanted colonies of the endangered Utah prairie dog
- All habitat within 1.8+ miles (3 km) of sage grouse strutting ground(s) that may also include nesting habitat
- Kit fox, gray fox, and bobcat burrow or den sites
- Burrowing owl burrows
- Bat caves and/or hibernaculums
- Foothill areas with black sagebrush, which are used by pronghorn antelope for the majority of the four seasons, and including winter range and fawning areas
- Foothill areas with desert mallow and/or other forbs used by pronghorn antelope primarily in spring, and including fawning areas
- Foothill areas at the lower limits of pinyon/juniper used by ferruginous hawks for nesting and feeding

- Any habitat within 1 mile of rock cliffs that provide nesting sites for the golden eagle, prairie falcon, red-tailed hawk, and other raptors
- Snake dens
- Sagebrush/pinyon/juniper foothills areas and adjacent higher elevations that provide deer and elk winter range
- Aspen/fir areas at the highest elevations that provide deer and elk summer range.

Because the concerns of the Nevada Department of Wildlife and the Utah Division of Wildlife Resources encompass most of the same species identified by the other agencies, their listings are not given here.

2.1.2 Important Plant Species

The legal status of many rare plants in Nevada and Utah is constantly evaluated at both state and federal levels. Species in danger of extinction in much or all of their ranges are given endangered status. Those species that may become endangered are given threatened status. Federal and state criteria for status determination are similiar, except that state criteria deal with the threat of species extinction within a statewide range, while federal evaluations consider the entire range of a species.

The Federal Register (50 CFR Part 17) lists species considered by the U.S. Fish and Wildlife Service as threatened or endangered. Two groups are important to this study. The first group contains Taxa Currently Listed as Threatened or Endangered, and the second group, Taxa Currently Under Review,

contains candidate species for the threatened or endangered list. Taxa Currently Under Review fall into two categories: (1) plant species for which there is sufficient biological information to support their being listed as threatened or endangered, but, because of the need for additional data and the need to designate critical habitats, final rules may take several years, and (2) plant species for which a threatened or endangered status is probably appropriate, but for which insufficient biological information is presently available to support such a rule. These two categories "may be considered candidates for addition to the threatened or endangered plant list, and, as such, consideration should be given them in environmental planning" (U.S. Fish and Wildlife Service 1980).

Plants considered in the study were limited mainly to Taxa Currently Listed or to Taxa Currently Under Review in the Federal Register. When the Federal Register listing was updated in December, 1980, most plant species of concern to local groups were included in the Currently Under Review category; therefore, the Federal Register presently includes most species of concern to local groups. Utah and Nevada plant species currently listed or under review are given in Appendix A.

2.2. BIOLOGICAL SURVEY METHODS

On-site biological surveys were conducted from February 6 through 12, 1981. In addition to a reconnaissance of the entire

valley to obtain an overview of habitats and community types, 9 study sites in Coyote Spring Valley and 14 study sites in Milford-Beryl study area were examined in detail. These sites were located randomly within a variety of vegetation and habitat types, but close to existing roads to avoid vegetation damage caused by off-road driving. An attempt was also made to obtain data from areas expected to have varying uses within the operations base.

Data obtained at each study site was analyzed and correlated with information from literature and from state and federal agencies to obtain a more complete picture of the biological resources in each valley.

2.2.1 *Traverses*

At each study site, the field crew walked a series of parallel traverses, approximately 15 meters apart and covering about 1 acre. While walking the traverses, crew members recorded such significant abiotic factors as slope, elevation, and soil characteristics and evaluated the type and degree of disturbance in the area. They also compiled a list of all vegetation and wildlife observed on the site. Examples of the data forms used are shown in Appendix B.

2.2.2 Line-Intercept Survey

The line-intercept method, considered to be a standard technique in vegetation analysis (Canfield 1941, Van Dyne 1960), was used to obtain quantitative data at each site. A 50-meter transect line was randomly placed within each study site, and the dis-

tance of the line intercepted by each individual plant was recorded to the nearest decimeter (dm) on the Sample Unit Vegetation Sheet. Two transects 15 meters apart were sampled at each site when possible. The approximate locations of the transects were mapped on a 1:62,500 map. Results obtained from transects were used to calculate the total cover, relative cover, density, and relative density of each species. These calculations were obtained by using the following equations (Smith 1974):

$$\text{Cover (\%)} = \frac{\text{total intercept length of Species A (dm)}}{\text{total transect length (dm)}} \times 100 \qquad (2.2.2\text{-}1)$$

$$\text{Relative cover (\%)} = \frac{\text{total intercept length of Species A (dm)}}{\text{total intercept length of all species (dm)}} \times 100 \qquad (2.2.2\text{-}2)$$

$$\text{Relative density (\%)} = \frac{\text{total individuals of Species A}}{\text{total individuals of all species}} \times 100 \qquad (2.2.2\text{-}3)$$

Density may be calculated in several ways. In this report it is defined as:

$$\text{Density (\#/100 dm)} = \frac{\text{total individuals}}{\text{total transect length}} \times 100 \qquad (2.2.2\text{-}4)$$

2.2.3 Field Journals

Journals describing survey conditions, procedural deviations, and abiotic and biotic relationships were maintained by each crew member. This information was used, when necessary, to analyze and interpret the field information and to answer questions arising during data analysis.

2.2.4 Off-road Travel

Because of the great damage that can be inflicted on plants by off-road travel and the slow growth and recovery rates of desert vegetation, indiscriminate off-road travel was prohibited. The field crew traveled only on established roads and trails.

2.3 SCOPE AND LIMITATIONS

Little site-specific data is currently available for many wildlife groups such as raptors and small mammals. The actual frequency and distribution of sensitive, threatened, or endangered plant species within the study area is also largely unrecorded. This study has attempted to assemble background data and combine it with on-site data collected from a limited number of sites to provide an overview and an information base, to aid in siting decisions, and to help in preparing a plan for a 100 percent survey of the entire area.

The OB study areas are quite large; the sections in which the proposed Milford, Beryl, and Coyote Spring Valley OBs are located encompass 124, 68, and 90 square miles, respectively. Given the limited scope of this study, emphasis was placed on obtaining site-specific information within selected areas considered representative of sections expected to be directly affected.

In some instances, even an on-site study of the entire OB site would have been insufficient to completely delineate biological

relationships, because the site is part of a larger ecosystem. Such animals as bighorn sheep that do not live within the proposed site may be affected if their migration routes pass through the area, or if their water source is affected by water usage within the base. Many raptors nesting in the foothills or cliffs outside the base depend on smaller animals living within the base area for prey. While these factors are discussed in the literature, the survey was too limited to produce much additional insight into these important relationships.

The on-site survey was conducted in February, a month in which many annual plants are either not easily identifiable or are entirely absent. Animals using the area during other seasons would have been absent or inactive during the survey. Snow was also present in parts of the Milford area, which prevented transect surveys in a few of the desired locations. An additional survey undertaken in spring or summer would reveal a greater number of species and individuals. A 100 percent survey of the entire site would permit complete quantification of resources and provide additional information on indirect relationships within the ecosystem.

3.0 BIOLOGICAL RESOURCES OF COYOTE SPRING VALLEY

3.1 ABIOTIC ENVIRONMENT: A LITERATURE REVIEW

This section briefly summarizes abiotic elements of the environment that influence or support the biological community.

3.1.1 Site Description

Coyote Spring Valley is approximately 40 miles north of Las Vegas on the border of Lincoln and Clark counties. The valley lies in a north-south direction and is bordered by the Sheep and Elbow ranges to the west, the Las Vegas Range to the southwest, the Arrow Canyon Range to the southeast, the Meadow Valley Mountains to the east, and the Delamar Range to the north. Pahranagat Wash, extending to the northwest, and Kane Spring Valley, to the northeast, intersect at the valley's northern end. Figure 1-2 shows the general location of the study area.

The northern boundary of the proposed operational base study area is near the intersection of Pahranagat Wash and Coyote and Kane valleys. The southern boundary nears the foothills of the Las Vegas Range. The study area encompasses approximately 90 square miles.

The OB study area is in the eastern portion of Coyote Spring Valley near the Meadow Valley Range, lying mainly in Range 63E, and extending from Township 11S southward through Township 14S. Legal descriptions of these sections are given in Appendix D.

3.1.2 Soils and Slope

Slopes in the axial portion of Coyote Spring Valley range from less than 1 percent to about 3 percent. Slopes greater than 5 percent occur along the valley margins. The soils of the valley consist of dense to very dense sandy gravels.

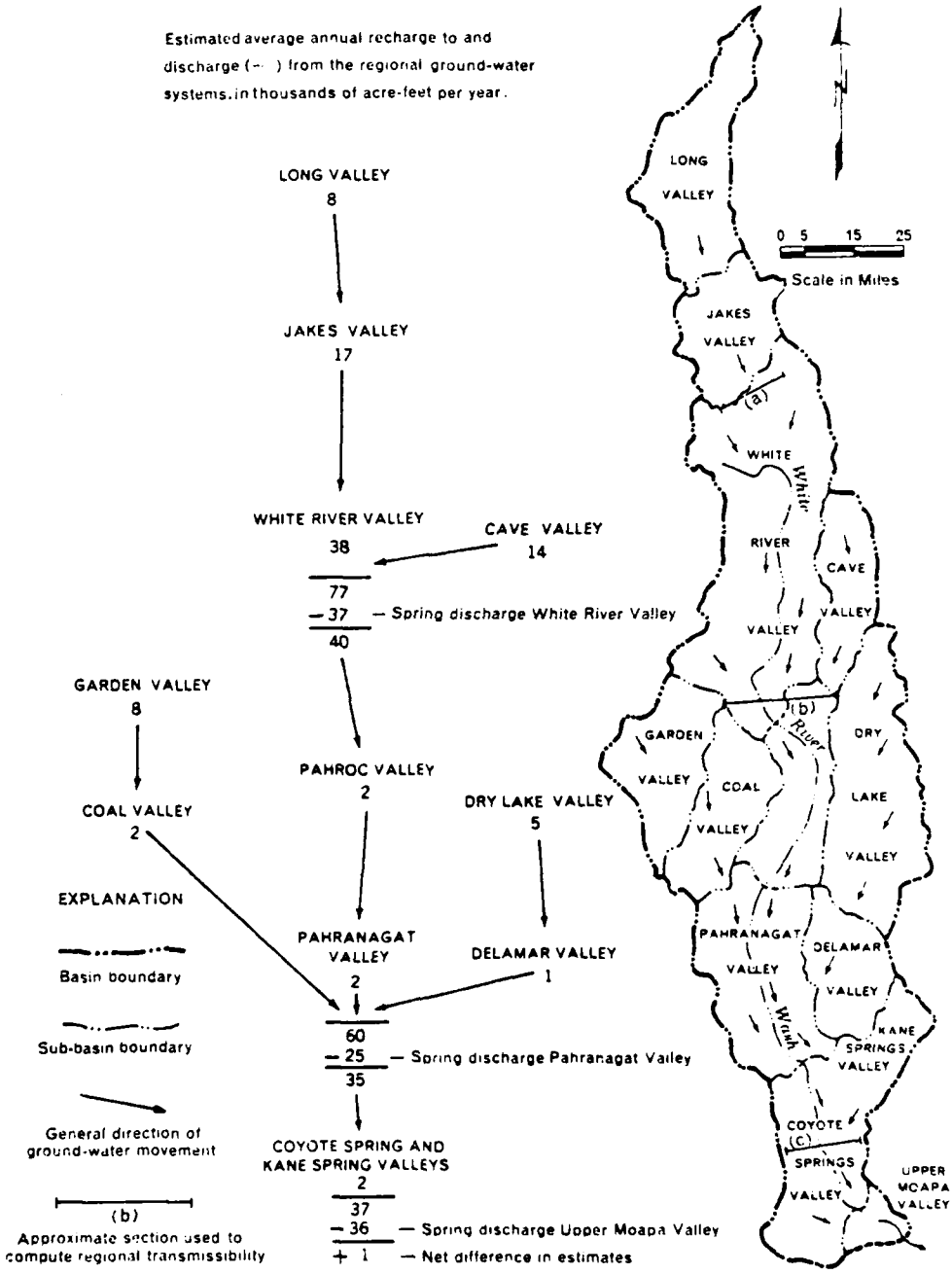
3.1.3 Water

Coyote Spring Valley forms the southern end of the White River regional groundwater flow system that includes 13 valleys in eastern and southeastern Nevada. The occurrence of water in the Coyote Spring Valley area is the result of groundwater discharged from the regional groundwater flow system as well as from the local valley-fill system. Muddy River Springs to the southeast of Coyote Spring Valley is believed to be the regional discharge point for groundwater originating in the valleys north of this area (Eakin 1966) (See Figure 3-1).

The estimated average annual recharge to the local valley-fill system derived from precipitation within the area is 2,000 acre-feet per year (3.2 hm^3/yr). This is also considered to be the perennial yield of the local system. Annual discharge of about 36,000 acre-feet per year (44.4 hm^3/hr) from Muddy River Springs is considered the long-term, perennial yield from the regional groundwater flow system.

Interbasin Groundwater System

Estimated average annual recharge to and discharge (–) from the regional ground-water systems, in thousands of acre-feet per year.



SURFACE AND GROUNDWATER FLOW IN WHITE RIVER VALLEY

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

FIGURE 3-1

SOURCE: EAKIN, 1966

FUGRO NATIONAL, INC.

Water usage in Coyote Spring Valley is limited to filling domestic and ranching needs. This amounts to approximately 100 acre-feet per year from both surface and groundwater sources.

Streamflow in Coyote Spring Valley is intermittent, occurring only for brief periods after heavy storms (Eakin 1966). Surface water occurring in the area and the flow at Muddy River Springs has been fully appropriated by local ranchers and other users.

A system of 76 gallinaceous guzzlers, now under construction, is expected to provide additional water for wildlife in Coyote Spring and Kane Spring valleys. Forty-nine are constructed, the majority of which are located in Kane Spring Valley. Approximately 12 to 14 guzzlers are completed in Coyote Spring Valley. The construction of the remaining 27 guzzlers, located primarily in Coyote Spring Valley, is temporarily halted, awaiting decisions on MX development (Cooper 1981). Discharge from the gallinaceous guzzlers as well as from Coyote Spring in the northwestern portion of the valley is low.

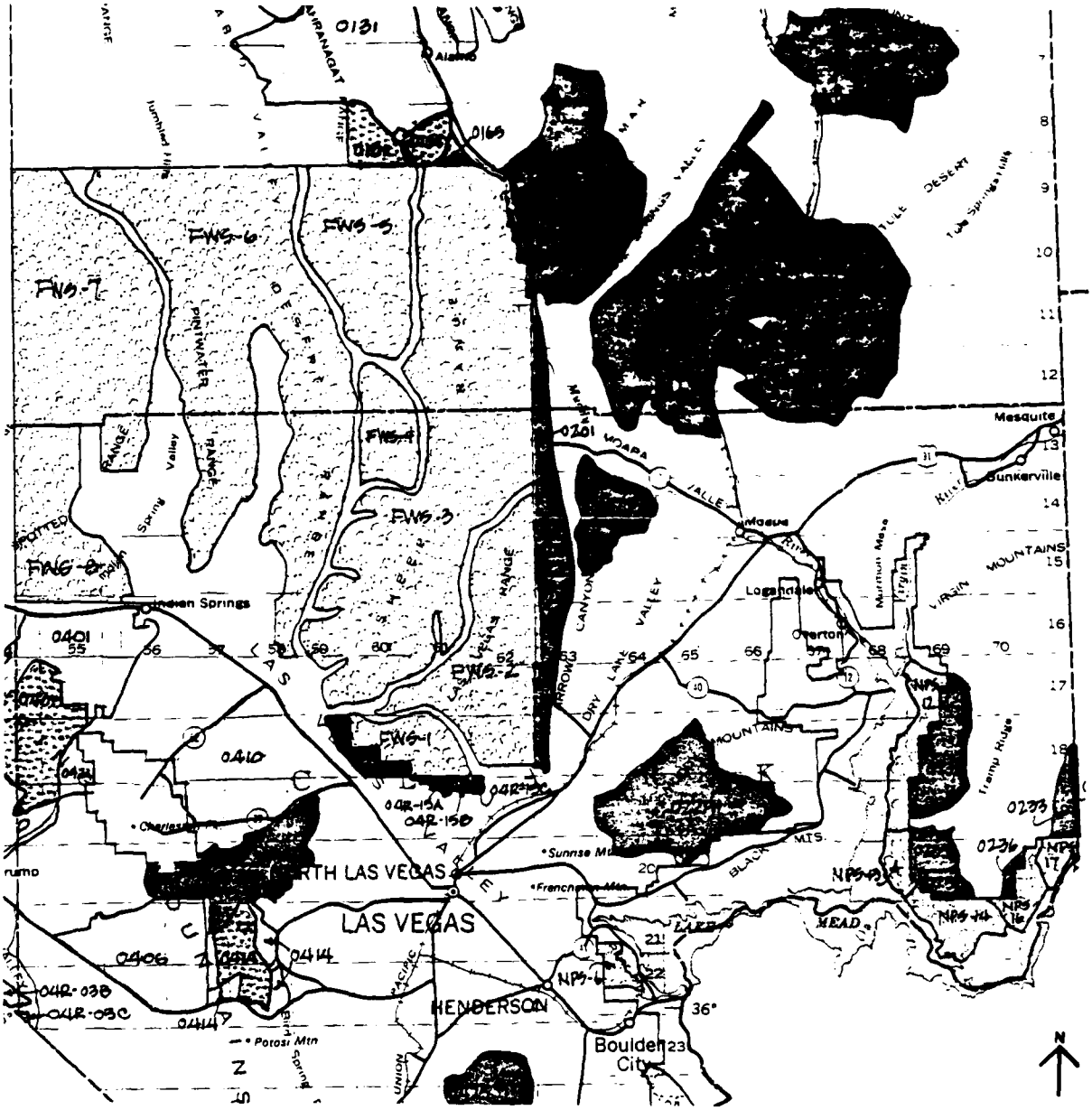
3.1.4 Land Use

All land in Coyote Spring Valley and in the surrounding area is federally owned, and the majority of it is managed by the Bureau of Land Management (BLM). The BLM is currently evaluating the lands under its jurisdiction to identify potential

protected wilderness areas. The BLM lands in the Coyote Spring Valley region were recently reviewed, and decisions reached on November 15, 1980, placed the lands in several categories.

Most of Coyote Spring Valley and an adjoining area to the southeast do not meet wilderness study area criteria. A strip of land on the western side of Coyote Spring Valley and a portion in the southeast area of the valley are designated Wilderness Study Areas, which are to be managed as wilderness areas while further studies are undertaken. Areas lying north and northeast of the valley are definitively designated Wilderness Study Areas; they have been reviewed by the public, and the decisions are final. A portion of the proposed operational base lies within a Wilderness Study Area. Figure 3-2 illustrates the Wilderness Study Areas and their proximities to the proposed OB study area. Many wildlife refuges are also located in the area surrounding Coyote Spring Valley. These are discussed further in Section 3.2.2.

BLM land in the Coyote Spring Valley area is used principally for grazing domestic livestock. Most of the area offers less-than-ideal grazing, because the most abundant plant, the creosote bush, Larrea tridentata, is not especially palatable (U.S.A.F. no date). Coyote Spring Valley lies in two BLM allotments. The majority is in the Arrow Canyon Allotment, where grazing is permitted only in periods when annual weeds and grasses are produced. The remainder lies in the large Delamar



SOURCE: BLM, 1980

WILDERNESS STUDY AREAS

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

FIGURE 3-2

FUGRO NATIONAL, INC.

Allotment that is grazed at a rate of 4,800 animal unit months (AUM) (Driver 1981).

3.2 BIOTIC ENVIRONMENT: A LITERATURE REVIEW

This section summarizes the major plant and animal species that have been identified in the vicinity of the OB study area and discusses possible effects of the project on populations or habitats.

3.2.1 Plant Species of Special Concern

In general, the currently listed threatened and endangered plants of Nevada and Utah have quite specific and narrow habitat requirements, such as elevation, substrate, or community associations; therefore, many of the threatened and endangered plants are found only in small geographical areas, and some geological formations are high density areas for rare plants. Threatened and endangered plants are often located on bajadas, fans, and semi-barren outcrops. Active playas and alluvial valley bottoms are not, with minor exceptions, occupied by rare plants (Welsh and Neese 1980).

No threatened or endangered plants are known to occur in Coyote Spring Valley (Tiehm 1981, Pinzl 1980). Arenaria stenomeres, a species federally listed in the Taxa Currently Under Review category and listed in the State of Nevada as a critically endangered species, occurs at the eastern edge of Coyote Spring Valley, within 2 miles of the OB study area. Other plants of

this species are not expected in the valley itself, because their habitat consists of barren, limestone cliffs and steep, rocky slopes at elevations of 3,300 to 3,600 feet (Pinzl 1980).

Many threatened or endangered species have been located in the adjacent Las Vegas and Sheep ranges. These species are predominantly high-elevation species, and their range is not expected to extend into the valley.

Any disturbance of threatened and endangered plants in Coyote Spring Valley would probably be of indirect nature, and related to increased recreational use of remote areas, increased use of off-road vehicles, and possibly increased plant collection. The Nye milkvetch (Astragalus nyensis) and the triangle Geyer milkvetch (A. geyeri var. triquetrus) occur within 2 miles of Moapa (U.S.A.F. 1980d). These species could be affected by expansion of Moapa, the town closest to the proposed Coyote Spring Valley OB site.

3.2.2 Aquatic Species of Special Concern

Although Coyote Spring Valley does not contain a great deal of sensitive aquatic habitat, other areas within the watershed do; the Moapa Fish Sanctuary and the Moapa Valley National Wildlife Refuge lie down-watershed approximately 8 and 14 miles southeast of the valley. Pahranagat Lake, Pahranagat National Wildlife Refuge, and the Pahranagat Valley Fish Sanctuary lie approximately 26, 28, and 43 miles, respectively, up-watershed.

Several state or federally listed aquatic species are found in each of these protected areas. The following fish and invertebrate species are of special concern in the Moapa Spring and the Muddy River:

Moapa dace (*Moapa coriacea*)	federal listing (endangered)
Moapa White River springfish (*Crenichthys baileyi moapae*)	state listing (rare); USFWS taking action to list
Moapa speckled dace (*Rhinichthys osculus moapae*)	state listing (sensitive)

The following state and federally listed fish and invertebrate species inhabit the Pahranagat area:

Hiko White River springfish (*Crenichthys baileya grandis*)	state listing (rare)
White River springfish (*Crenichthys baileyi baileyi*)	state listing (sensitive); USFWS taking action to list
Pahranagat roundtail chub (*Gila robusta jordani*)	federal listing (endangered)
White River speckled dace (*Rhinichthys osculus velifer*)	state listing (sensitive)

A significant increase in the use of groundwater in Coyote Spring Valley could affect both the Moapa Spring sanctuaries down-watershed and the Pahranagat area up-watershed. A drop in the groundwater level in Coyote Spring Valley could result in a surface water decrease throughout the White River Drainage System. Groundwater in this system could be drawn south at a greater rate from the Pahranagat area, decreasing levels of surface water in that area as well.

Groundwater flowing under Coyote Spring Valley surfaces at Moapa Springs, the source of the Muddy River. A decrease in groundwater levels in Coyote Spring Valley caused by increased water usage would likely result in a decreased discharge of the spring and a resulting decrease in the Muddy River flow.

3.2.3 Terrestrial Wildlife of Concern

A number of threatened, endangered, and game species are present in Nevada. Only major species that may have a relationship to the OB study area are discussed.

3.2.3.1 Desert Tortoise (Gopherus agassizi)

The desert tortoise is a terrestrial tortoise, inhabiting deserts in the Mohave and Southern Great Basin regions. It is currently protected by law and classified as rare by the Nevada Board of Fish and Game Commissioners.

It appears to be declining over much of its range, primarily as a result of agricultural and urban expansion, range mismanagement, overgrazing, off-road vehicle damage, capture of tortoises for pets, and automobile mortalities.

The tortoise life cycle further amplifies the effects of these factors, because sexual maturity is not reached until 10-20 years of age, and, then, each female lays only two to nine eggs each year. Also, because the tortoise releases stored water when handled, it is additionally susceptible to the presence of man; water in this dry habitat is not easily reaccumulated (Stebbins 1954).

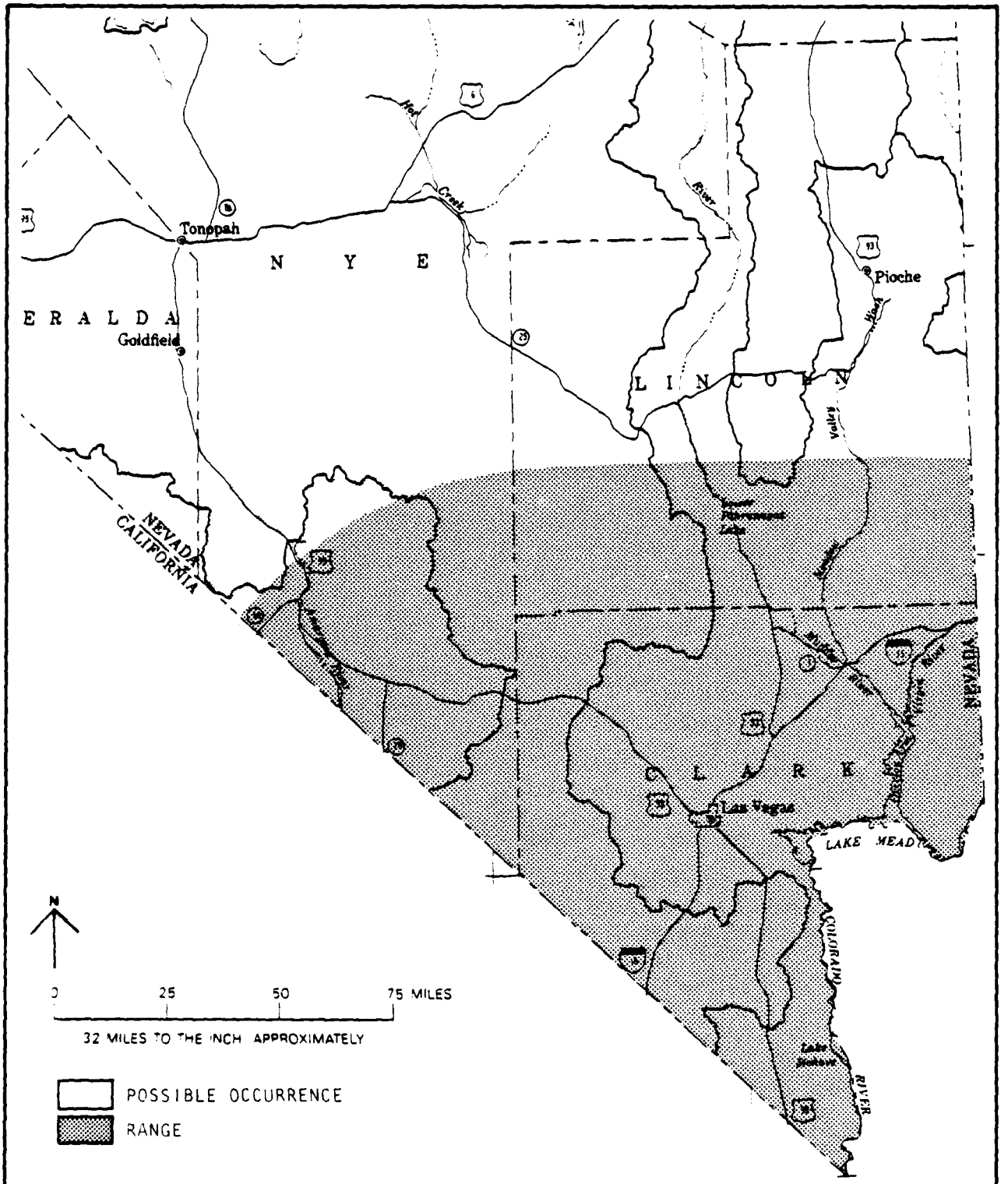
In southern Nevada, the desert tortoise is typically associated with creosote bush (Larrea tridentata) communities on bajadas dissected by washes (Pulliam 1981). The desert tortoise escapes the heat of the summer and cold of the winter by burrowing; in summer, it migrates to bench-like areas just above the washes and returns to the washes in winter to burrow into the banks (Stebbins 1954). Caliche washes are considered an important habitat area for the tortoise by the Nevada Department of Wildlife (Molini 1980).

Desert tortoise range to an elevation of at least 3,500 feet (Stebbins 1954) but commonly occur at elevations just below foothills in southern Nevada, with one, probably an atypical sighting, in a pinyon/juniper community (Pulliam 1981). Range of the tortoise is shown in Figure 3-3.

Forage consists of winter annuals, perennial grasses, and blossoms of desert composites, and water demand is met primarily by moisture contained in these plants (Stebbins 1954).

Coyote Spring Valley lies in an area of low to medium tortoise density; an area of high tortoise density lies nearby, close to the southern end of the Arrow Canyon Range (Turner 1981), and another large, high density area lies to the east of Coyote Spring Valley (Szarka no date).

The entire OB study area lies within the Tortoise range and would directly eliminate 7,000 to 7,500 acres of tortoise habitat in an area having a density of approximately 117 tortoise



TORTOISE RANGE

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE 3-3

SOURCE: NEVADA DEPT. OF WILDLIFE, 1980

FUGRO NATIONAL, INC.

per square mile (U.S. Air Force 1980d). Thousands of additional acres will probably be indirectly affected by the project. Indirect affects include increased off-road vehicle activity and increased illegal collection of tortoise for pets.

3.2.3.2 Bighorn Sheep (Ovis canadensis nelsoni)

The bighorn sheep is protected as a game animal in Nevada (State of Nevada 1978). Only a limited harvest is allowed, and it is in high demand by hunters (McQuivey 1978).

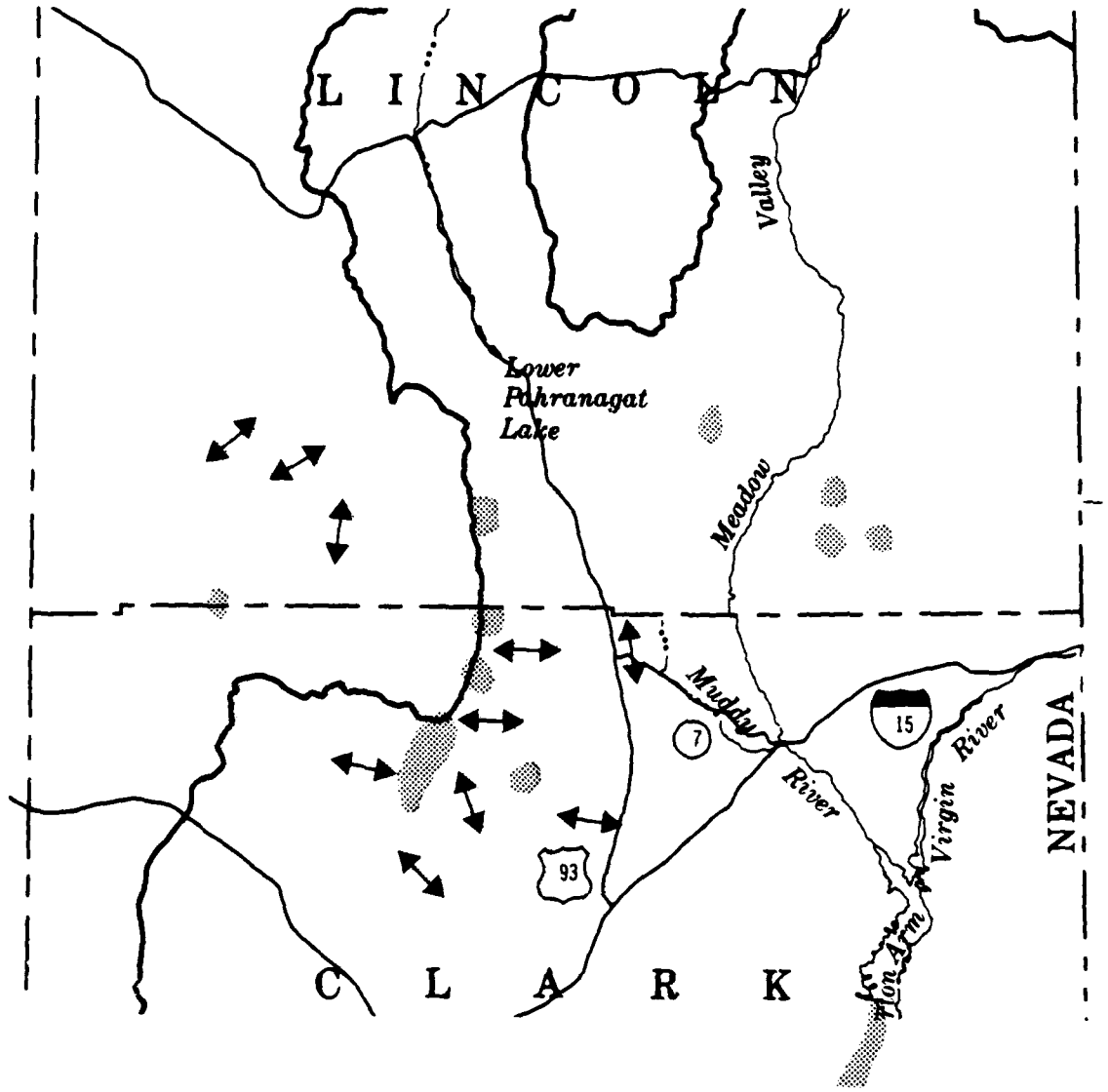
The distribution and population size of bighorn sheep is determined primarily by the availability of water, adequate forage (shrubs, grasses, and forbs), and the presence of escape cover, but the most critical component is probably water (McQuivey 1978). From June through August, water requirements limit them to an area within 2 miles of a permanent water source. This summer range comprises approximately 15-20 percent of the total occupied habitat. When water is more plentiful, plants are more succulent, and the temperatures are cooler, the bighorn disperse over a larger range. They avoid open ground, because they are slow runners and susceptible to predators in the open; rough, precipitous terrain is essential for escape cover (McQuivey 1978).

Bighorn sheep occupy only the southern portion of their historic range. Competition with domestic livestock, wild horses, and burros, interruption of historic migration routes by highways, and over-hunting have all contributed to this range reduction.

They are present in the Delamar Mountains to the north, the Meadow Valley Mountains to the east, the Las Vegas Range to the southwest, the Arrow Canyon Range to the southeast, and the Sheep Range to the west of Coyote Spring Valley. The western portion of Coyote Spring Valley and the Sheep Range lie within the boundaries of the Desert National Wildlife Range, which was established primarily for bighorn sheep protection. Approximately 35 percent of Nevada bighorn occur in the five mountain ranges within the Desert National Wildlife Range (McQuivey 1978). Distribution, critical habitat, and migration of the bighorn is shown in Figure 3-4.

Annual migrations occur between the summer and winter ranges, following the snow line from the high elevations in the summer to lower elevations in the winter. Bighorn sheep usually follow the contours of the mountains in their migrations but occasionally cross wide valleys (McQuivey 1978).

Although Coyote Spring Valley itself does not support bighorn sheep, annual migrations have crossed between the Sheep and Delamar ranges, between the Las Vegas and Arrow Canyon ranges, across Highway 93, between Las Vegas and the proposed base site, between the Meadow Valley and the Arrow Canyon ranges, and across Highway 7 between Moapa and the proposed operating base site. The bighorn would probably be affected by interruption of these migration pathways, increased poaching, and increased recreational use of areas near their water sources.



BIGHORN SHEEP RANGE

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE 3-4

SOURCE: MC QUIVEY, 1978

FUGRO NATIONAL, INC.

3.2.3.3 Elk (Cervus canadensis)

Elk, the largest true deer species in North America, is protected as a game animal in Nevada (State of Nevada 1978). The sagebrush/pinyon/juniper communities on foothills and adjacent higher areas that provide elk and deer winter ranges are considered critical habitat by the Utah Division of Wildlife Resources (Day 1980). These communities would probably be important in Nevada as well.

Elk are browsing animals; forage includes grasses, forbs, sedges, twigs, bark, and low-growing plants.

Their historic range includes much of the northern United States. Migrations occur throughout most of the range in mountainous areas (Hall 1946). Elk winter at lower elevations, returning to higher elevations in the summer.

Nevada is limited to three introduced elk populations, the closest of which lies approximately 50 miles southeast of Coyote Spring Valley in the Spring Mountain Range. Effects on this population, if any, would be indirect and probably due mainly to increased poaching.

3.2.3.4 Mule Deer (Odocoileus hemionus)

Mule deer, found throughout much of central and northern Nevada and Utah, are considered protected, because they are game animals (State of Nevada 1978). The Nevada Department of Wildlife considers mule deer winter and spring ranges key use areas, critical to the species life cycle (Molini 1980).

As snow accumulates in the fall at the higher elevations, mule deer migrate to lower level winter range, returning again to the high elevations in the spring. In milder areas, they may occupy the same range year-round (Hall 1946).

Mule deer diet varies seasonally. Grass and forbs are important food types in the spring, and summer diets are high in browse, with significant amounts of forbs when available. In the winter, browse again makes up a high proportion of the diet. Pinyon and juniper are heavily grazed in late winter. As spring approaches, grass begins to grow and again becomes important (Tueller 1979).

The nearest mule deer ranges lie approximately 25 miles west and 25 miles north of the valley (Walstrom 1973). Because the mule deer range does not include Coyote Spring Valley, affects of the proposed OB would be indirect, possibly through increased poaching and increased use of remote mule deer habitat areas for recreation.

3.2.3.5 Kit Fox (Vulpes macrotis)

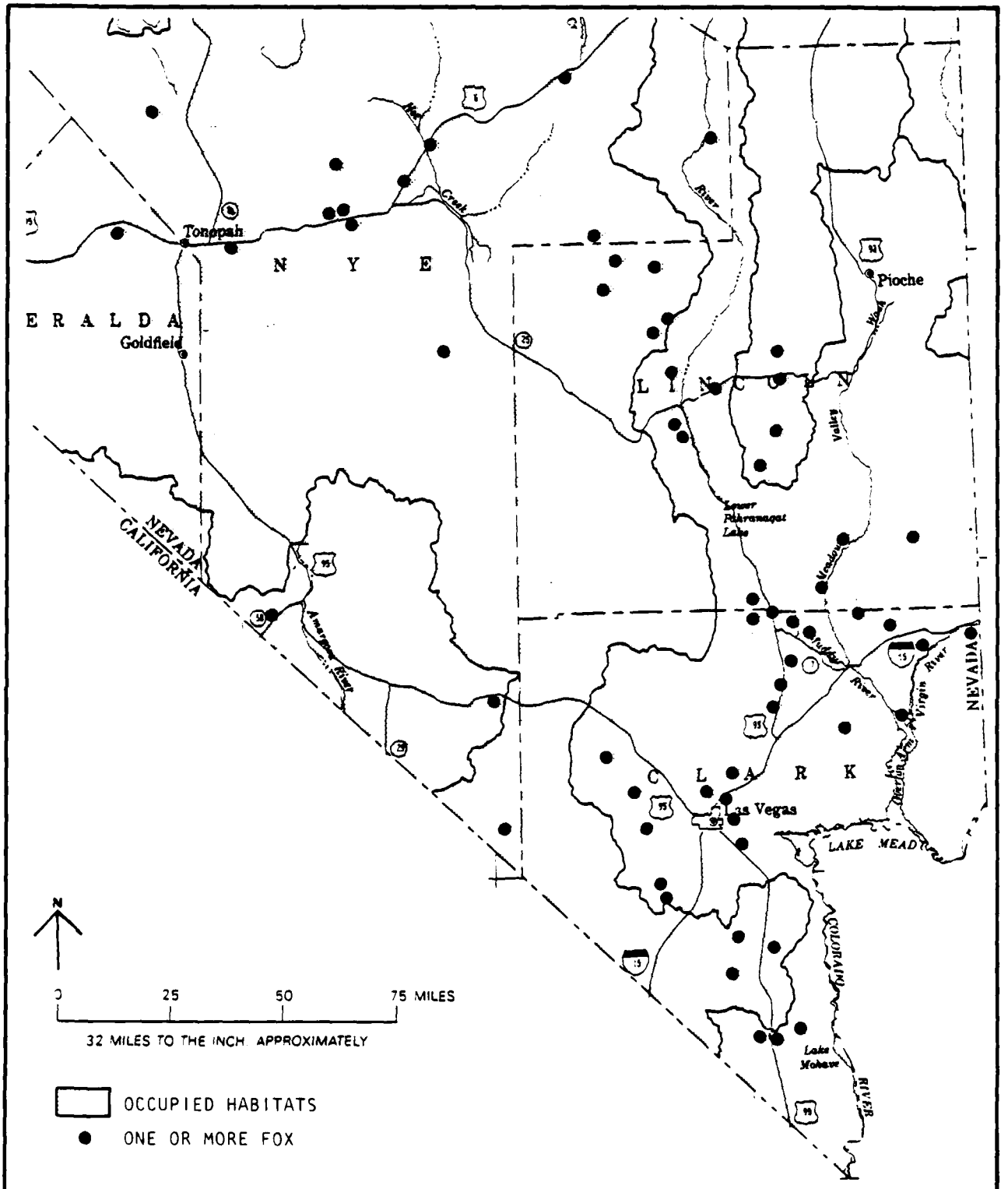
Under the State of Nevada Fish and Game classification, the kit fox has protected status as a fur-bearing animal, and kit fox burrows are considered key use areas by the Nevada Department of Wildlife (Molini 1980). These burrows are important not only as shelters for kit fox and their young but also, when deserted, as habitat for burrowing owls and several species of mammals and reptiles (Egoscue 1956).

The kit fox is the smallest fox native to North America. It is largely nocturnal, remaining near dens in the daytime and hunting after dark. In northern Utah, the blacktailed jackrabbit comprises approximately 95 percent of the kit fox diet (Egoscue 1962). Other prey include small rodents, small birds, and cottontails.

Kit fox are associated with desert valleys in Nevada (Molini 1981), which are often dominated by creosote bush communities. Populations of kit fox tend to be higher in southern than northern Nevada. The kit fox populations are relatively high in 1981 as a result of above-average precipitation since 1973, which has led to increases in vegetation and prey production (Lee 1981). Kit fox probably hunt regularly in areas close to their dens but may range for miles in a night's hunting activity (Egoscue 1962).

Kit fox are known to occur in Coyote Spring Valley, although precise den locations are not known (Lee 1981). Figure 3-5 shows sightings and the general distribution of Kit fox in southern Nevada.

The presence of an Operational Base in the Coyote Spring Valley will probably infringe on both the kit fox habitat and denning areas. Egoscue (1956) found kit fox were not particularly disturbed by the presence of man, lacked natural wariness of traps, and were easily approached at their dens. These traits could lessen the direct affect of the operating base, although



KIT FOX RANGE

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE 3-5

SOURCE: NEVADA DEPT. OF WILDLIFE, 1980

FUGRO NATIONAL, INC.

they would make the kit fox more susceptible to possible increased hunting, trapping, and harrassment. Kit fox have also been observed sitting on highways at night, probably because the heat retained by the paved roads is attractive (Egoscue 1956). Mortalities on highways near the proposed operational base sites could be higher as a result of increased traffic and the attraction of the kit fox to the roads.

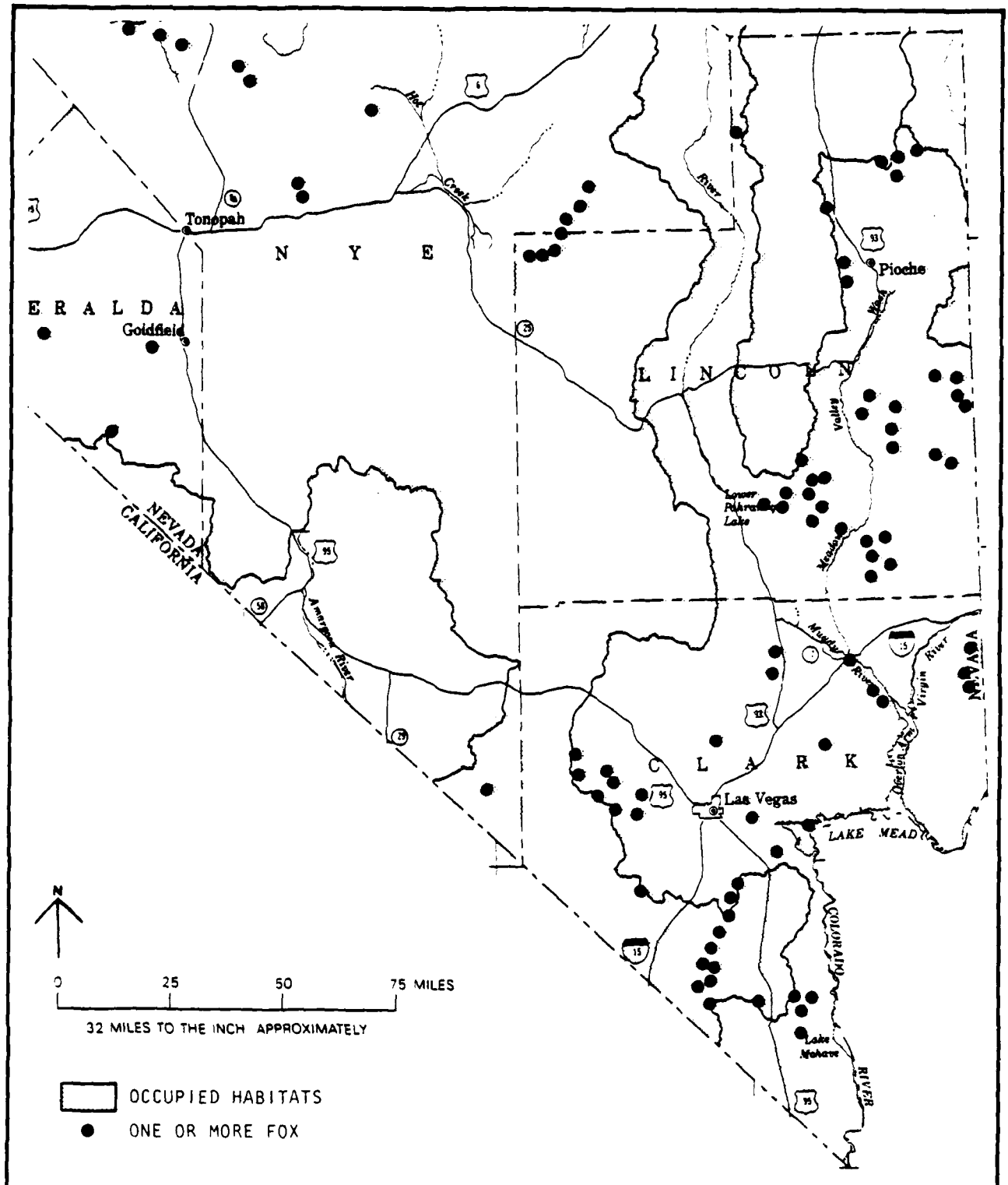
3.2.3.6 Gray Fox (Urocyon cineroargenteus)

The gray fox has protected furbearer status in Nevada (State of Nevada 1978). The Department of Wildlife considers burrows or dens key use habitat, critical to the life cycle (Molini 1980).

Gray fox dens are found in cliffs, burrows, rock piles, and hollow logs or trees (Hall 1946).

Gray fox are more commonly found in the foothill and mountainous areas than in the valleys (Molini 1981). In Nevada, above-average precipitation the last few years has resulted in increased vegetation and prey production, which, in turn, has led to a greater density of gray fox, especially in the typically drier low elevation areas (Lee 1981).

The gray fox occur at a somewhat higher density in southern Nevada than in northern Nevada (Lee 1981). Gray fox distribution is shown in Figure 3-6.



GRAY FOX RANGE

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

FIGURE 3-6

SOURCE: NEVADA DEPT. OF WILDLIFE, 1980

FUGRO NATIONAL, INC.

Gray fox diet in southern Nevada consists primarily of small rodents, and to a lesser extent, cottontail rabbits (Lee 1981), which are numerous in the valley areas.

The combination of these factors indicates that a relatively high population of gray fox may exist within the Coyote Spring Valley, although specific data have not been compiled for this area. Furbearer studies are currently being conducted by the Nevada Department of Wildlife (Molini 1981).

Effects of the proposed Operational Base would probably be indirect, through increased hunting, trapping or poaching.

3.2.3.7 Bobcat (Lynx rufus)

The bobcat has protected furbearer status in Nevada (State of Nevada 1978), and its hunting and trapping are regulated. Bobcat burrows or den sites are considered critical habitat by the Nevada Division of Wildlife (Molini 1980).

They occur throughout much of Nevada and Utah; two of three subspecies, Lynx rufus pallescens and baileyi, have populations with extensive distribution and apparently similar densities in the State of Nevada (Molini 1979).

The primary prey of the bobcat is the cottontail rabbit (Lee 1981), but bobcats are known to feed on jackrabbits, small mammals, and, in spring, on pronghorn antelope fawns (Ball 1981).

Although they generally occupy mountainous areas, bobcats also occur in desert valleys in southern Nevada, especially in wash areas, (Molini 1981, Lee 1981). Bajadas are considered a low density bobcat habitat in southern Nevada (Molini 1981).

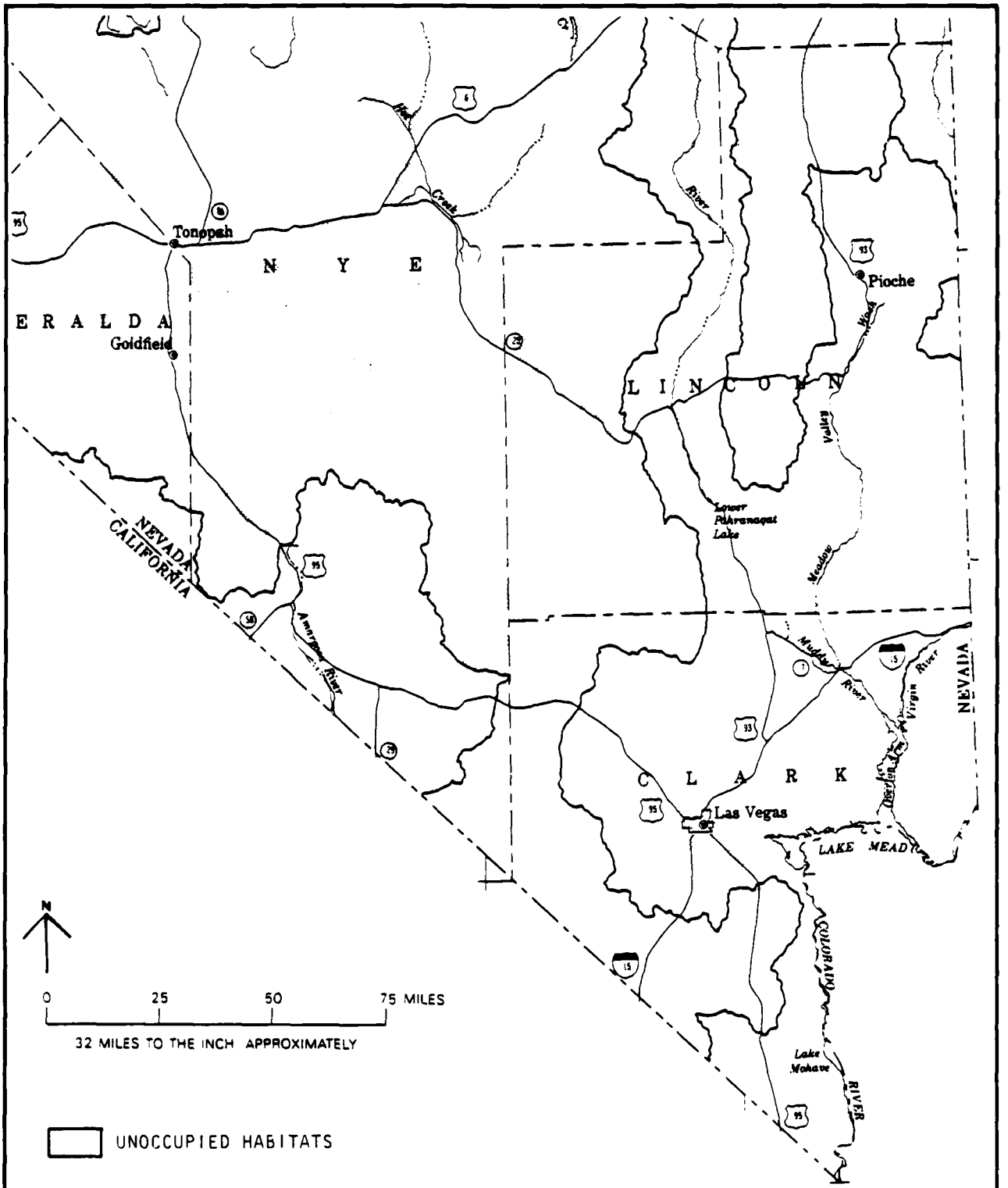
Bobcat density tends to be somewhat higher in southern Nevada than in northern Nevada, and is currently high in response to 7 consecutive years of above-average precipitation and the resultant increase in bobcat prey (Lee 1981). Although no specific data are available for Coyote Spring Valley, bobcat are known to occur in the surrounding areas and are expected to occur to some extent in the valley as well (Molini 1981). Presence of an Operational Base may result in increased hunting, trapping or poaching. Figure 3-7 shows bobcat distribution for southern Nevada.

Rocky areas in canyon mouths are the preferred bobcat habitat, but habitat preference is determined to some extent by the availability of water (Lee 1981).

3.2.3.8 Mountain Lion (Felis concolor)

The mountain lion is protected as a game animal in Nevada (State of Nevada 1978). It has a wide range in Nevada; southern Nevada distribution is illustrated in Figure 3-8.

The mountain lion is the largest cat in North America, and measure 6 to 8 feet in length. Individuals are quite mobile, and may move 75 to 100 miles from their birth site (Walstrom 1973).



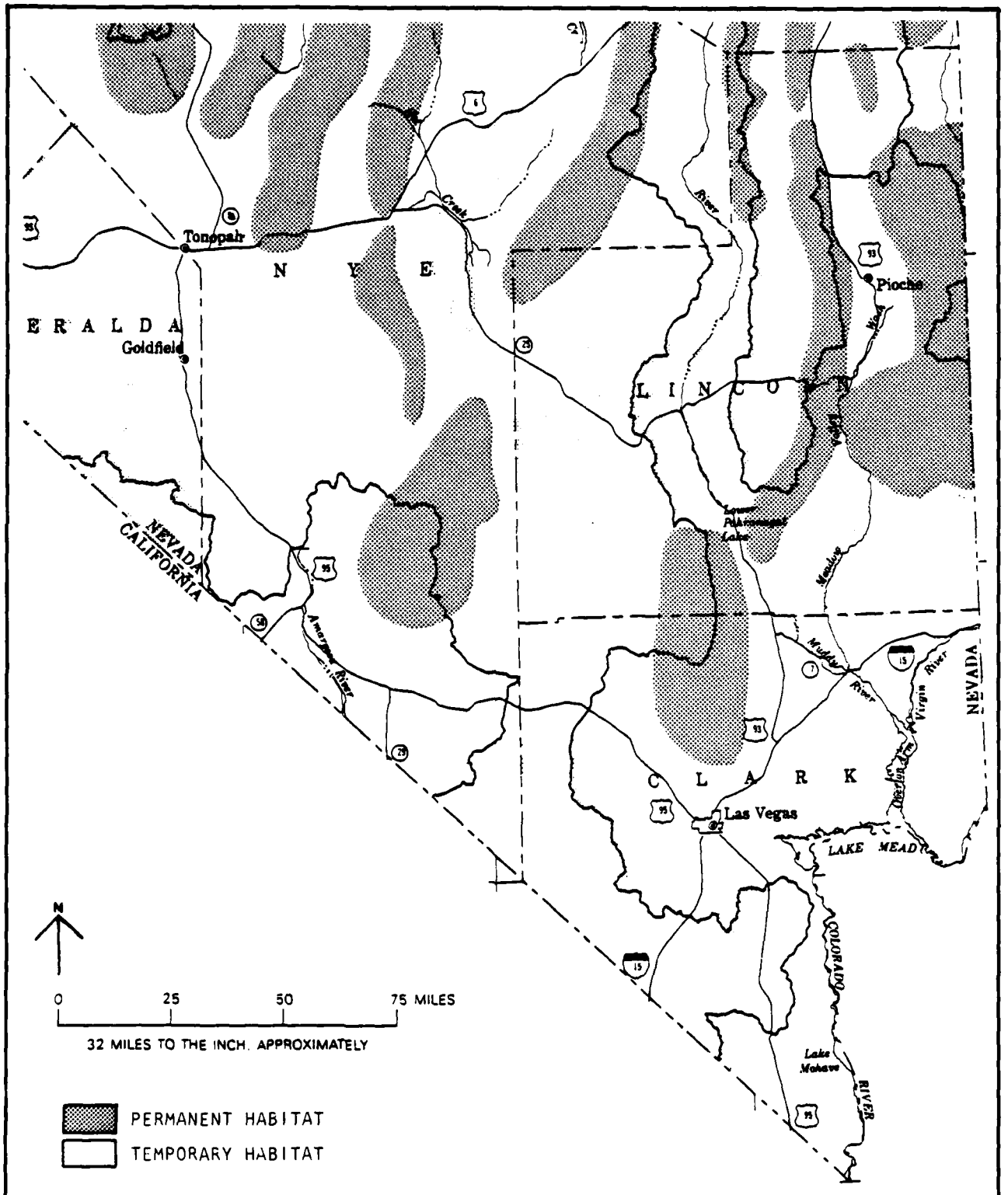
BOBCAT RANGE

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

FIGURE 3-7

SOURCE: NEVADA DEPT. OF WILDLIFE, 1980

UGRO NATIONAL, INC.



MOUNTAIN LION RANGE

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE 3-8

SOURCE: NEVADA DEPT. OF WILDLIFE, 1980

FUGRO NATIONAL, INC.

The most common prey of the mountain lion are large herbivores such as deer, although rabbits, small rodents, porcupines, and occasionally domestic livestock are also taken.

Mountain lion occur in the vicinity of the study site. Expected indirect effects include possible increased poaching and disturbance due to recreational use of remote mountain lion habitat areas.

3.2.3.9 Raptors, Game Birds, and Other Avifauna

The bald eagle (Haliaetus leucocephalus) and American peregrine falcon (Falco peregrinus anatum) are federally classified as endangered (U.S. Fish and Wildlife Service 1980).

The bald eagle winters in western Utah and eastern Nevada, primarily in desert valleys associated with major waterways or marsh systems. Nevada supports a population of 20-30 birds (Nevada Department of Wildlife 1980).

Although principle prey species of the bald eagle vary with habitat, the birds primarily feed on dead or weak animals. Jackrabbits are the major food source in desert scrub lands, and waterfowl and fish are taken along rivers and lakes. 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, pesticide poisoning, and shooting are the principal reasons for the eagles' decline.

Bald eagles are not found in Coyote Spring Valley, but a wintering population is known in Paranagat Valley to the north, and fall migration through Coyote Spring Valley occurs.

Small numbers of peregrine falcon are fall and spring migrants through the OB study areas in both Nevada and Utah. The peregrine feeds on birds, especially waterfowl and shorebirds. Cliffs near permanent waterways are preferred nesting habitat. The decline in numbers is attributed to pesticide poisoning of its food source and illegal capture by falconers (White 1981). The status of the peregrine in the Coyote Spring Valley is not well known. It is documented in the area as a migrant, but no nesting has been reported in the surrounding mountain ranges (Herron 1980).

The ferruginous hawk is classified as a sensitive species by the Bureau of Land Management, Nevada Department of Wildlife (Molini 1980). Prey is similar to the red-tailed hawk and includes pocket gophers, ground squirrels, rabbits, and reptiles. Juniper trees that occur along the foothills of ranges are the preferred nesting sites. The southern end of their breeding grounds is in Dry Lake Valley, and there is a migration route through the valley.

Raptors are subject to indirect impact, even though many live in the mountainous areas surrounding the valley, rather than within the study area itself. Raptors are high in the food chain and

tend to act as indicators of environmental conditions, because any significant impact on their prey base will be reflected by these birds relatively quickly (White 1981).

Buteos, such as the red-tailed hawk, have a more diverse diet, which allows them to thrive even when a major prey species becomes scarce. However, more specialized hawks would be seriously affected. Predator-prey relationships have been documented for many species. Woffinden and Murphy (1977) observed declines in ferruginous hawk populations associated with declining black-tailed jackrabbit populations. 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 blacktailed jackrabbits, their major prey item (Murphy 1975).

Although a diversity of prey is taken, some species are more desireable than others. Eagles prefer larger prey such as jackrabbits, cottontail rabbits, and waterfowl where available. Red-tailed hawks take jackrabbits and cottontails, as well as reptiles and an assortment of rodents and birds. The prairie falcon prefers ground squirrels but will take other small mammals and birds when necessary.

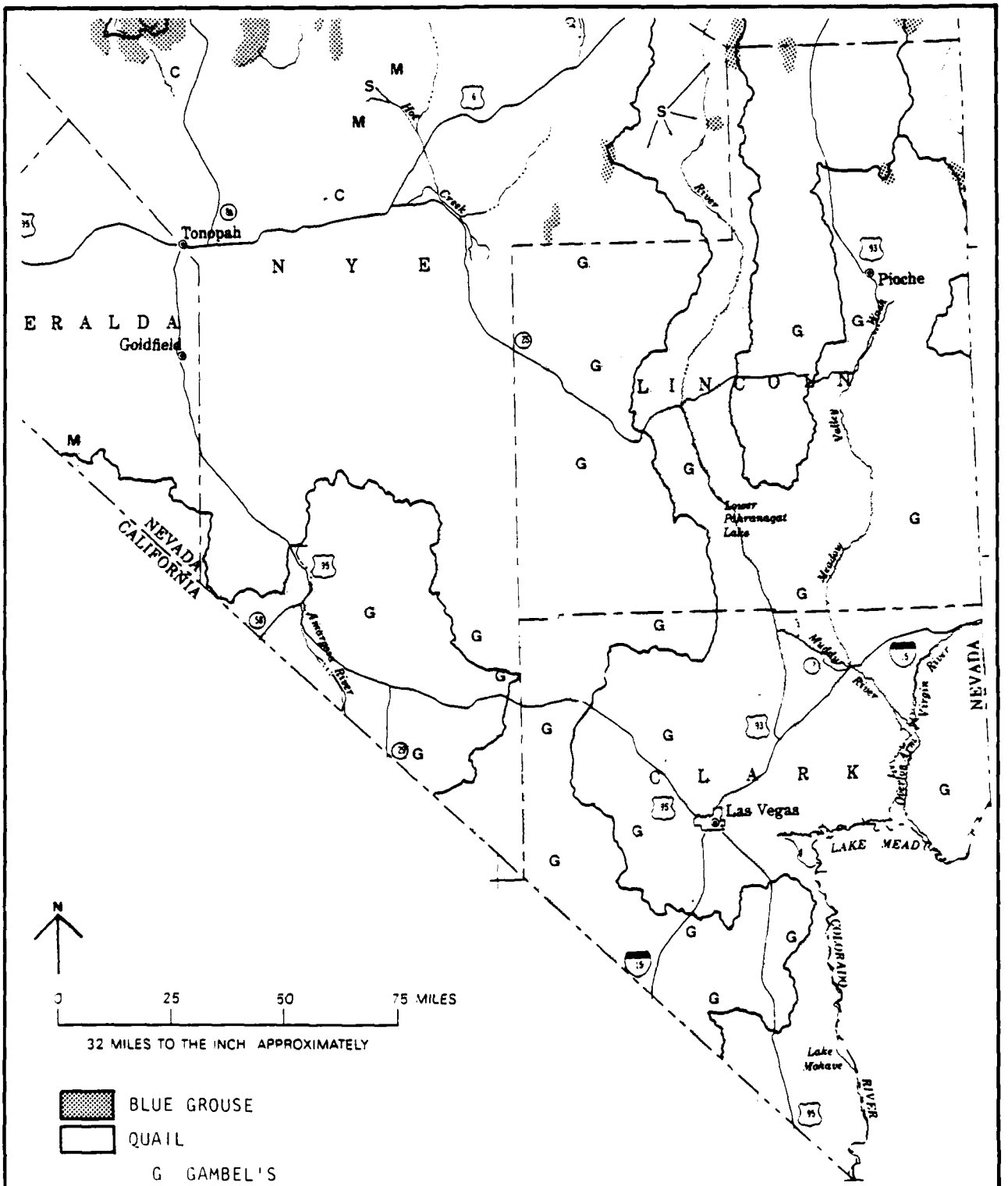
The BLM has studied the eastern Nevada fall raptor migration. (Millsap 1981). Preliminary results indicate that the eastern slopes of the Sheep Range, including the Coyote Spring valley

area, are used during migration by over 14 species of hawks and falcons, including the endangered bald eagle and American peregrine falcon. Accipeters (sharp-shinned and cooper's hawks) are the most abundant group passing through, comprising 60 percent of the total; buteos, especially the red-tailed hawk, are next in numbers. Although the birds are in migration, they depend on valley floor areas for hunting.

Raptor nesting is known to occur along the rocky ledges in the mountain ranges bordering Coyote Spring Valley. The valley floor and foothills are used for hunting and are a vital part of the bird's total habitat.

Upland game birds in the study area include Gambel's quail and mourning dove. Mourning doves are migratory, usually stopping only briefly in the Coyote Spring area during fall migrations. Gambel's quail are native to southern Nevada and occur abundantly in the desert scrub areas of Coyote Spring valley. Clark County birds account for 50 percent of the state's total quail harvest. The introduced scaled quail occurs primarily in northern and central Nevada, although not abundantly. However, a brood of scaled quail was observed in 1979 at Coyote Spring Valley (Molini, et al. 1980).

Three species of quail have been introduced into Nevada. Populations are generally limited to agricultural areas where water is available. Figure 3-9 shows quail and grouse distribution for southern Nevada.



BLUE GROUSE AND QUAIL DISTRIBUTION

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE 3-9

FUGRO NATIONAL, INC.

In order to enhance quail populations, the Nevada Department of Wildlife has installed guzzlers (man-made water collecting and dispensing devices) from upper Meadow Valley through Coyote Spring Valley. To date, of the 76 guzzlers planned, 49 have been installed (Las Vegas NDW 1980).

Sage grouse are not found in the Coyote Spring Valley area. The nearest known population occurs near Pioche.

Chukar partridge, an introduced species, is one of the most abundant and prized game birds. In Nevada, chukar inhabit scrub grasslands in most of the mountain ranges and move into valleys during winter when snow covers forage plants. Abundance is lowest in the eastern portion of the state, and distribution in the mountains of western Utah is limited by water availability. In both Utah and Nevada, populations fluctuate greatly from year to year.

Southwestern Utah and eastern Nevada support a number of other diverse avifauna. Although some species are habitat-specific, distribution for most species tends to be spread out through some broadly defined habitat types throughout the western United States.

Birds are highly mobile; migration brings many species into the southwest only during certain seasons, principally fall and spring. Many thousands of birds pass through eastern Nevada and southwestern Utah, but only a relatively small percentage are

present during the breeding season, and fewer still are year-round residents. Avifauna commonly found in the region, the most likely times of occurrence, and their principal habitats are listed in Table 3-1.

General habitat types include aquatic (natural and artificial ponds, lakes, rivers, and marshes), riparian (bank vegetation associated with wet or aquatic areas, big sage (vegetation dominated by big sage and associated species), shadscale scrub (areas of low shrub height primarily on valley floors and lower foothills), pinyon/juniper woodlands (pinyon pine and juniper tree association on the upper foothills), and homestead plantings (trees planted around ranches and farms).

Horned larks form large flocks in winter and are the most widespread and conspicuous of the songbirds. Big sage and shadscale scrub habitats on the valley floors and foothills support other year-round species, including the black-throated sparrow and loggerhead shrike. Loggerhead shrikes are a common breeding bird in the lower valleys and foothills, although they may also be found in pinyon/juniper woodlands. Most song birds use desert washes to a greater extent than they use surrounding areas (Austin and Bradley 1971).

Avifauna is especially diverse in riparian habitats, as water and associated trees provide excellent habitat for warblers, magpies, flycatchers, and various raptors during both migration and nesting season. Although primarily found on lakes, ponds, and rivers, waterfowl and shorebirds also use stockponds where available.

TABLE 3-1

COMMON AVIFAUNA OF THE UTAH AND NEVADA STUDY AREAS

Species	Habitat					
	Aquatic	Riparian	Big Sage	Shad-scale Scrub	Pinyon-Juniper Woodland	Homestead Plantings
RAPTORS (Falconiformes)						
Turkey Vulture *Cathartes aura*		B*	B	B	B	B
Cooper's Hawk *Accipiter cooperii*	Y*					Y
Red-tailed Hawk *Buteo jamaicensis*		Y	Y		Y	Y
Rough-legged Hawk *Buteo lagopus*				W*		
Ferruginous Hawk *Buteo regalis*				M*,B		
Bald Eagle *Haliaetus leucocephalus*		W	W			W
Golden Eagle *Aquila chrysaetos*	Y	Y	Y	Y	Y	Y
Northern Harrier *Circus cyaneus*	Y	Y	Y	Y	Y	Y
Prairie Falcon *Falco mexicanus*		Y	Y	Y		Y
American Kestrel *Falco sparverius*		Y	Y	Y	Y	Y
QUAIL (Phasianidae)						
Scaled Quail *Callipepla squamata*						

* B = breeding; Y = yearlong; W = winter; and M = migration.

TABLE 3-1 (Cont.)

Species	Habitat					
	Aquatic	Riparian	Big Sage	Shad-scale Scrub	Pinyon-Juniper Woodland	Homestead Plantings
DOVES (Columbidae)						
Mourning Dove *Zenaida macroura*	M,B	M,B	M,B		M,B	M,B
OWLS (Strigidae)						
Great Horned Owl *Bubo virginianus*		Y				Y
Burrowing Owl *Speotyto cunicularia*				Y		
NIGHTJARS (Caprimulgidae)						
Poorwill *Phalaenoptilus nuttalli*		B		B		
Common Nighthawk *Chordeiles minor*	M,B	M,B	M,B		M,B	
WOODPECKERS (Picidae)						
Common Flicker *Colaptes auratus*		Y	Y		Y	Y
Downy Woodpecker *Dendrocopos pubescens*		Y				Y
Yellow-Bellied Sapsucker *Sphyrapicus varius*		W				W
FLYCATHCERS (Tyrannidae)						
Western Kingbird *Tyrannus verticalis*		M,B		M,B	M,B	M,B
Say's Phoebe *Sayornis saya*		B			B	B

TABLE 3-1 (Cont.)

Species	Habitat					
	Aquatic	Riparian	Big Sage	Shad-scale Scrub	Pinyon-Juniper Woodland	Homestead Plantings
FLYCATCHERS (Tyrannidae) (Cont.)						
Dusky Flycatcher *Empidonax oberholseri*		M				M
Gray Flycatcher *Empidonax wrightii*			M,B			
Western Wood Pewee *Contopus sordidulus*		M				M
LARKS (Alaudidae)						
Horned Lark *Eremophila alpestris*				Y		
SWALLOWS (Hirundinidae)						
Violet-green Swallow *Tachycineta thalassina*	M,B	M,B	M,B	M,B	M,B	M,B
Tree Swallow *Iridoprocne bicolor*	M,B	M,B	M,B	M,B	M,B	M,B
Barn Swallow *Hirundo rustica*	M,B	M,B	M,B	M,B	M,B	M,B
Cliff Swallow *Petrochelidon pyrrhonota*	M,B	M,B	M,B	M,B	M,B	M,B
CROWS (Crovidae)						
Common Raven *Corvus corax*		Y	Y	Y	Y	Y
Scrub Jay *Aphelocoma coerulescens*					Y	
Pinyon Jay *Gymnorhinus cyanocephala*					Y	
Black-billed Magpie *Pica pica*		Y	Y		Y	Y

TABLE 3-1 (Cont.)

Species	Habitat					
	Aquatic	Riparian	Big Sage	Shad-scale Scrub	Pinyon-Juniper Woodland	Homestead Plantings
BUSHTITS (Paridae)						
Plain Titmouse Parus inornatus					Y	
Mountain Chickadee Parus gambeli		W				W
WRENS (Troglodytidae)						
Rock Wren Salpinctes obsoletus				Y		
THRASHERS (Mimidae)						
Sage Thrasher Oreoscoptes montanus			B		B	
THRUSHES (Turdidae)						
Swainson's Thrush Catharus ustulatus		M				M
Hermit Thrush Catharus guttatus		M				M
American Robin Turdus migratorius		M				M,W
KINGLETS (Polioptilidae)						
Blue-Gray Gnatchatcher Polioptila caerulea			B			
Ruby-Crowned Kinglet Regulus calendula		M				M

TABLE 3-1 (Cont.)

Species	Habitat					
	Aquatic	Riparian	Big Sage	Shad-scale Scrub	Pinyon-Juniper Woodland	Homestead Plantings
SHRIKES (Laniidae)						
Loggerhead Shrike *Lanius ludovicianus*				Y		
Northern Shrike *Lanius excubitor*			W	W		W
VIREOS (Vireonidae)						
Warbling Vireo *Vireo gilvus*			M			M
Solitary Vireo *Vireo solitarius*			M		B	
WARBLERS (Parulidae)						
Orange-crowned Warbler *Vermivora celata*			M			M
Yellow Warbler *Dendroica petechia*			M,B			M
Yellow-rumped Warbler *Dendroica coronata*			M			M
HOUSE SPARROWS (Ploceidae)						
House Sparrow *Passer domesticus*		Y				Y
BLACKBIRDS (Icteridae)						
Red-winged Blackbird *Agelaius phoeniceus*	M,B	M,B				M
Northern Oriole *Icterus galbula*		B	B			B
Brewer's Blackbird *Euphagus cyanocephalus*		M,B	Y			Y

TABLE 3-1 (Cont.)

Species	Habitat					
	Aquatic	Riparian	Big Sage	Shad-scale Scrub	Pinyon-Juniper Woodland	Homestead Plantings
BLACKBIRDS (Icteridae) (Cont.)						
Brown-headed Cowbird *Molothrus ater*		M B				M,B
TANAGERS (Thraupidae)						
Western Tanager *Piranga ludoviciana*		M				M
SPARROWS AND FINCHES (Fringillidae)						
Black-headed Grosbeak *Pheucticus melanocephalus*		M,B				M
House Finch *Carpodacus mexicanus*		Y	Y			Y
American Goldfinch *Spinus tristis*		Y				Y
Green-tailed Towhee *Chlorura chlorura*			M,B		M,B	
Lark Sparrow *Chondestes grammacus*			B	B		
Black-throated Sparrow *Amphispiza bilineata*			B	B		
Sage Sparrow *Amphispiza belli*			B	B		
Dark-eyed Junco *Junco hyemalis*		M,W	M,W		M,W	M,W
Brewer's Sparrow *Spizella breweri*			M,B		B	
White-crowned Sparrow *Zonotrichia leucophrys*		M	M	M	M	M
Song Sparrow *Melospiza molodia*	Y	Y				Y

3.3 FIELD SURVEY RESULTS

3.3.1 Overview of Vegetative Associations

Creosote bush (Larrea tridentata) dominates the vegetation throughout most of the study area in varying associations with other shrubs. In the southern section of the study area, it exists primarily with Ambrosia dumosa (bursage). The associated shrubs Menodora spinescens, Ephedra torreyana, Yucca schidigera, Krameria sp., Dalea sp., and Encelia virginensis occur in approximately the northern two-thirds of the study area, although each varies greatly in density. Encelia virginensis prefers such disturbed areas as roadsides and washouts, while Yucca schidigera is more plentiful lower on the fans and on the valley floor. The other species vary in accordance with soil types and depths as well as with localized climatic conditions.

Paharanagat Wash has a silty soil with a generally smooth surface. The wash is very wide, and the vegetation consists primarily of creosote bush.

Wash scrub areas are exceptions to the creosote bush dominance. The wash scrub vegetation can be found in washes smaller than the main Pahranagat Wash. These washes range from 5 to 10 feet across and several feet deep to shallow washes 200 feet wide. Species found here include Prunus fasciculatus, Prosopis gland vlosa, Encelia virginensis, and Gutierrezia microcephala. A small wash just east of the badland hills and south of Highway 7 contains desert willow, Chilopsis linearis.

Varied scrub communities occur in the "badland" hill areas. These hills are an erosional feature that tends to follow the Pahranagat Wash southward through the valley. They are composed of a light-colored, sedimentary material, containing many cobbles; vegetation is scarce and mixed. Stunted shrubs (Ephedra torreyana, Eriogonum sp., Dalea sp., Krameria sp.) and the herbaceous perennial Stanleya pinnata are common. An annual or biennial Phacelia sp. is also abundant.

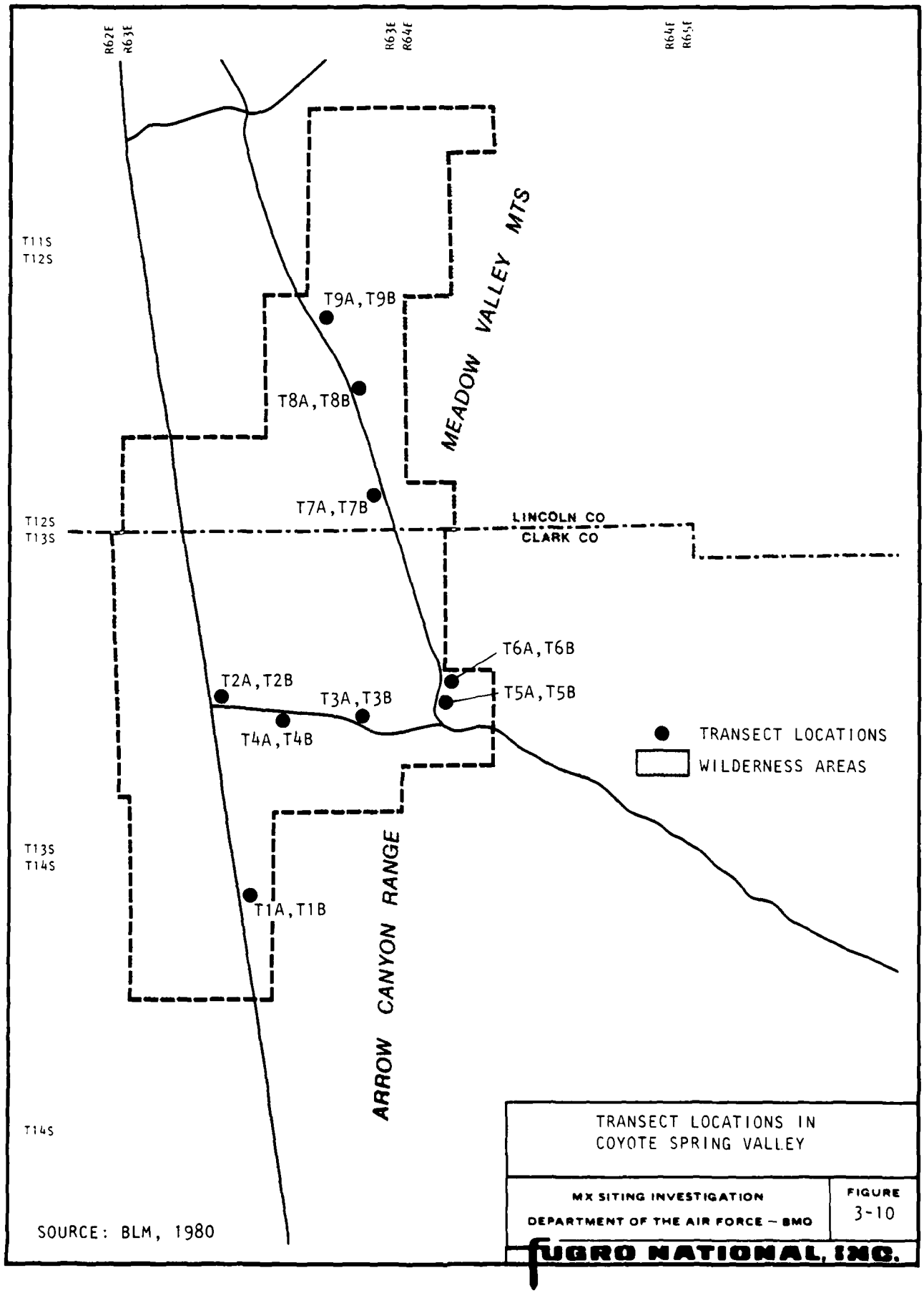
3.3.2 Transect Results

Transect sites were chosen throughout the Coyote Spring OB study area to obtain site-specific information on a variety of vegetative associations. At each site, two parallel, line-intercept transects 15 meters apart were sampled. The transects at each site are discussed together; cover and density are given as averages, unless otherwise specified. In some locations, transects are treated separately due to marked variation in species composition and/or relative species cover. Approximate legal descriptions for the transect locations are given in Table 3-2, and their locations are shown on Figure 3-10. Table 3-3 summarizes all vegetation observed in the Coyote Spring transect areas, Table 3-4 summarizes wildlife data from the transects, and Table 3-5 gives quantitative cover and density data obtained from the transects.

TABLE 3-2

TRANSECT LOCATIONS
COYOTE SPRING VALLEY OPERATING BASE

Site	Township	Range	Section	Dominant Vegetation Type
1	T14S	R 63E	S4	*Larrea tridentata*/mixed shrub
2	T13S	R 63E	S21	*L. tridentata*
3	T13S	R 63E	S24	*L. tridentata*/*Ambrosia dumosa*
4	T13S	R 63E	S22	*L. tridentata*/*Dalea* sp.
5	T13S	R 64E	S19	*L. tridentata*/*Ambrosia dumosa*
6	T13S	R 64E	S20	*L. tridentata*/mixed shrub
7	T12S	R 63E	S36	*L. tridentata*/mixed shrub
8	T12S	R 63E	S23	*L. tridentata*/mixed shrub
9	T12S	R 63E	S11	*Hymenoclea salsola*/*Prunus fascicalatus*, and *P. fasciculatus*/*Prosopis glandulosa*



TRANSECT LOCATIONS IN COYOTE SPRING VALLEY

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE 3-10

FUGRO NATIONAL, INC.

TABLE 3-3

PLANT SPECIES OBSERVED
IN THE COYOTE SPRING VALLEY OPERATING BASE STUDY SITES

Species	Site Number 1	2	3	4	5	6	7	8	9
AGAVACEAE									
Yucca schidigera (Mohave yucca)	X	X			X	X	X	X	X
ASTERACEA									
Acamptopappus sp. (goldenhead)		X				X	X	X	
Ambrosia dumosa (bursage)	X	X	X	X	X	X	X	X	
Ambrosia eriocentra									X
Baileya multiradiata (desert baileya)		X	X					X	
Bebbia juncea (rush bebbia)		X							
Chrysothamnus sp. (rabbitbrush)									X
Dyssodia sp. (dogweed)		X				X	X	X	
Encelia virginensis									
Encelia sp.		X						X	X
Gutierrezia microcephala (thread-leaf snakeweed)			X		X				X
Hymenoclea salsola (white barro-brush)		X	X						X
Psathyrotes sp.									
Psilostrophe cooperi (whitestem paperflower)	X	X							
BORAGINACEAE									
Tiquilia sp.						X			
BRASSIACACEAE									
Descurainia sp.			X		X			X	
Lepidium fremontii (peppergrass)								X	
Stanleya pinnata (desert prince-plume)									
Stanleya sp.				X					
CACTACEAE									
Echinocereus engelmannii (Engel-mann echinocereus)	X	X			X	X	X	X	
Ferocactus acanthodes									

TABLE 3-3 (Cont.)

Species	Site Number 1	2	3	4	5	6	7	8	9
CACTACEAE (Cont.)									
Ferocactus sp.	X	X			X	X			
Neolloydia sp.						X			
Opuntia basilaris (beavertail pricklypear)					X			X	
Opuntia bigelovii (Arizona jumping pricklypear)		X							
Opuntia sp. (cholla)					X	X	X	X	X
CHENOPODIACEAE									
Ceratoides lanata (winterfat)			X						
Salsola sp.									
EPHEDRACEAE									
Ephedra torreyana (torrey Mormon tea)	X			X		X		X	
Ephedra sp. (Mormon tea)					X	X			
FABIACEAE									
Astragalus sp. (milkvetch)				X					
Dalea sp.	X	X		X		X	X	X	X
Prosopis glandulosa (common mesquite)									
HYDROPHYLLACEAE									
Phacelia sp.				X					
KRAMERIACEAE									
Krameria sp.	X	X		X	X	X	X	X	
LAMIACEAE									
Salazaria mexicana (Mexican bladder sage)								X	
LOASACEAE									
Mentzelia sp. (blazing star)				X					

TABLE 3-3 (Cont.)

Species	Site Number 1	2	3	4	5	6	7	8	9
MALVACEAE									
Sphaeralcea sp. (globe mallow)					X		X	X	
Sphaeralcea ambigua		X	X		X		X	X	
OLEACEAE									
Menodora spinescens (spiny menodora)	X	X			X		X	X	
PLANTAGINACEAE									
Plantago sp. (plantain)					X				
POACEAE									
Aristida purpurea (purple threeawn)	X	X			X		X	X	
Bromus rubens (foxtail chess)			X		X				X
Erioneuron pulchellum	X	X			X	X	X	X	
Hilaria rigida (big galleta grass)		X		X			X	X	
Oryzopsis hymenoides (Indian ricegrass)					X				
Vulpia octoflora					X			X	
POLYGONACEAE									
Eriogonum fasciculatum (California buckwheat)	X								
Eriogonum inflatum (desert trumpet)		X		X	X			X	
Eriogonum sp.			X	X	X				
Oxytheca sp.					X		X		
ROSACEAE									
Prunus fasciculata (desert almond)									X
RUTACEAE									
Thamnosma montana (turpentine bush)	X						X		X

TABLE 3-3 (Cont.)

Species	Site Number 1	2	3	4	5	6	7	8	9
ZYGOPHYLLACEAE									
Larrea tridentata var. *divaricata* (creosote bush)	X	X	X	X	X	X	X	X	

TABLE 3-4

WILDLIFE SPECIES AND WILDLIFE SIGNS
OBSERVED ON TRANSECTS IN COYOTE SPRING VALLEY

Species	Site Number								
	1	2	3	4	5	6	7	8	9
Domestic Cattle Sign			X						
Coyote Sign									X
Kangaroo Rat Sign			X	X					
Rabbit Sign	X		X				X	X	X
Small Mammal Burrows		X	X		X	X		X	X

TABLE 3-5

TRANSECT RESULTS - COYOTE SPRING VALLEY
SPECIES KEY

AC	Acamptopappus sp.
AMDU	Ambrosia dumosa
ARPU	Aristida purpurea
DA	Dalea sp.
DY	Dyssodia sp.
EN	Encelia sp.
EPTO	Ephedra torreyana
EP	Epheora sp.
ERPU	Erioneuron pulchellum
GUMI	Gutierrezia microcephala
HIRI	Hilaria rigida
HYSA	Hymenoclea salsola
KR	Krameria sp.
LATR	Larrea tridentata var. divaricata
MESP	Menodora spinescens
OP	Opuntia sp.
PRFA	Prunus fasciculata
PRGL	Prosopis glandulosa
PSCO	Psilostrophe cooperi
SP	Sphaeralcea sp.
THMO	Thamnosma montana
TI	Tiquilia sp.
YUSC	Yucca schidigera

TABLE 3-5

TRANSECT RESULTS
COYOTE SPRING VALLEY OPERATING BASE

Species	Transect 1A Total dm	Cover (%)	Rel. Cover (%)	# Indiv.	Density (#/100dm)	Relative Density (%)	Transect 1B Total dm	Cover (%)	Rel. Cover (%)	# Indiv.	Density (#/100dm)	Relative Density (%)
ERPU	8.1	1.6	10.4	20	4.0	58.8	2.5	0.5	1.8	5	1.0	18.5
DA	20.9	4.2	26.8	3	0.6	8.8	8.4	1.7	6.2	2	0.4	7.4
LATR	11.5	2.3	14.7	2	0.4	5.9	40.7	8.1	29.8	4	0.8	14.8
THMO	5.6	1.1	7.2	1	0.2	2.9						
KR	17.2	3.4	22.0	3	0.6	8.8	13.9	2.8	10.2	2	0.4	7.4
AMDU	13.9	2.8	17.8	4	0.8	11.8	40.4	8.1	29.6	8	1.6	29.6
ARPU	0.9	0.2	1.2	1	0.2	2.9	1.1	0.2	0.8	2	0.4	7.4
YUSC							29.4	5.9	21.6	4	0.8	14.8
TOTALS	78.1	15.6	100.1	34	6.8	99.9	136.4	27.3	100.0	27	5.4	99.9
	Transect 2A						Transect 2B					
YUSC	11.6	2.3	18.1	1	0.2	3.4	29.2	5.8	24.5	2	0.4	6.1
PSCO	8.4	1.7	13.2	1	0.2	3.4						
ERPU	7.6	1.5	11.9	19	3.8	65.5	9.0	1.8	7.5	15	30	45.4
HYSA	2.6	0.5	4.1	1	0.2	3.4						
MESP	16.0	3.2	25.2	3	0.6	10.3	47.5	9.5	39.8	8	1.6	24.2
SP	5.1	1.0	8.0	2	0.4	6.9	5.5	1.1	4.6	2	0.4	6.1
LATR	9.5	1.9	14.9	1	0.2	3.4	19.5	3.9	16.4	3	0.6	9.1
DA	2.8	0.6	4.4	1	0.2	3.4						
ARPU							0.8	0.2	0.7	1	0.2	3.0
KR							7.8	1.6	6.5	2	0.4	6.1
TOTALS	63.6	12.7	99.9	29	5.8	99.7	119.3	23.9	100.0	33	6.6	100.0

TABLE 3-5 (Cont.)

Species	Transect 3A Total dm	Cover (%)	Rel. Cover (%)	# Indiv.	Density (#/100dm)	Relative Density (%)	Transect 3B Total dm	Cover (%)	Rel. Cover (%)	# Indiv.	Density (#/100dm)	Relative Density (%)
LATR	40.1	8.0	79.1	4	0.8	25.0	57.5	11.5	76.0	5	1.0	33.3
AMDU	8.1	1.6	16.0	8	1.6	50.0	11.2	1.1	14.8	6	1.2	40.0
SP	2.2	0.4	4.3	3	0.6	18.8	7.0	1.4	9.3	4	0.8	26.7
GUMI	0.3	0.1	0.5	1	0.2	6.2						
TOTALS	50.7	10.1	99.9	16	3.2	100.0	75.7	15.1	100.1	15	3.0	100.0
	Transect 4A						Transect 4B					
EPTO	8.3	1.7	29.0	3	0.6	30.0	0.6	0.1	1.5	1	0.2	7.7
AMDU	14.2	2.8	49.6	4	0.8	40.0	11.0	2.2	27.8	3	0.6	23.1
KR	4.9	1.0	17.1	2	0.4	20.0	7.5	1.5	19.0	1	0.2	7.7
LATR	1.2	0.2	4.2	1	0.2	10.0						
HIRI							8.1	1.6	20.5	6	1.2	46.2
DA							12.3	2.5	31.1	2	0.4	15.4
TOTALS	28.6	5.7	99.9	10	2.0	100.0	39.5	7.9	99.9	13	2.6	100.1
	Transect 5A						Transect 5B					
AMDU	28.3	5.7	68.2	8	1.6	80.0	36.4	7.3	58.5	12	2.4	63.2
LATR	12.5	2.5	30.1	1	0.2	10.0	18.8	3.8	30.2	4	0.8	21.0
SP	0.7	0.1	1.7	1	0.2	10.0						
MESP							3.1	0.6	5.0	1	0.2	5.3
KR							0.5	0.1	0.8	1	0.2	5.3
EP							3.4	0.7	5.5	1	0.2	5.3
TOTALS	41.5	8.3	100.0	10	2.0	100.0	62.2	12.5	100.0	19	3.8	100.1

TABLE 3-5 (Cont.)

Species	Transect 6A Total dm	Cover (%)	Rel. Cover (%)	# Indiv.	Density (#/100dm)	Relative Density (%)	Transect 6B Total dm	Cover (%)	Rel. Cover (%)	# Indiv.	Density (#/100dm)	Relative Density (%)
AMDU	30 5	6 1	49 6	8	1.6	38.1	6.9	1.4	11.8	3	0.6	18.8
TI	7.8	1.6	12.7	4	0.8	19.0						
EP	4.2	0.8	6.8	2	0.4	9.5						
DY	1.6	0.3	2.6	1	0.2	4.8						
KR	8.4	1.7	13.7	3	0.6	14.3						
ERPU	0.7	0.1	1.1	1	0.2	4.8						
AC	8.3	1.7	13.5	2	0.4	9.5	15.5	3.1	26.4	5	1.0	31.2
YUSC							6.5	1.3	11.1	1	0.2	6.2
LATR							22.2	4.4	37.9	4	0.8	25.0
DA							5.0	1.0	8.5	2	0.4	12.5
EPTO							2.5	0.5	4.3	1	0.2	6.2
TOTALS	61.5	12.3	100.0	21	4.2	100.0	58.6	11.7	100.0	16	3.2	99.9
	Transect 7A						Transect 7B					
KR	9.1	1.8	11.3	2	0.4	11.8						
LATR	23.7	4.7	29.4	4	0.8	23.5	32.8	6.6	23.2	3	0.6	9.1
SP	1.5	0.3	1.9	1	0.2	5.9						
AMDU	23.3	4.7	28.9	6	1.2	35.3	88.9	17.8	62.9	26	5.2	78.8
DA	7.0	1.4	8.7	1	0.2	5.9						
MESP	13.0	2.6	16.1	2	0.4	11.8	12.6	2.5	8.9	2	0.4	6.1
AC	3.1	0.6	3.8	1	0.2	5.9						
HIRI							0.5	0.1	0.4	1	0.2	3.0
YUSC							6.5	1.3	4.6	1	0.2	3.0
TOTALS	80.7	16.1	100.1	17	3.4	100.1	141.3	28.3	100.0	33	6.6	100.0

TABLE 3-5 (Cont.)

Species	Transect 8A Total dm	Cover (%)	Rel. Cover (%)	# Indiv.	Density (#/100dm)	Relative Density (%)	Transect 8B Total dm	Cover (%)	Rel. Cover (%)	# Indiv.	Density (#/100dm)	Relative Density (%)
DA	6.6	1.3	8.2	2	0.4	12.5						
AMDU	16.8	3.4	20.9	4	0.8	25.0	22.9	4.6	33.9	5	1.0	29.4
LATR	38.6	7.7	48.0	4	0.8	25.0						
MESP	6.4	1.3	8.0	3	0.6	18.8	23.5	4.7	34.8	4	0.8	23.5
KR	12.1	2.4	15.0	3	0.6	18.8	3.9	0.8	5.8	1	0.2	5.9
YUSC							10.5	2.1	15.6	1	0.2	5.9
ARPU							0.8	0.2	1.2	1	0.2	5.9
AC							4.3	0.9	6.4	1	0.2	5.9
ERPU							1.6	0.3	2.4	4	0.8	23.5
TOTALS	80.5	16.1	100.1	16	3.2	100.1	67.5	13.6	100.1	17	3.4	100.0
	Transect 9A						Transect 9B					
PRFA	31.9	6.4	34.3	2	0.4	12.5	32.2	6.4	79.1	3	0.6	50.0
GUMI	1.6	0.3	1.7	1	0.2	6.2	1.0	0.2	2.5	1	0.2	16.7
HYSA	39.7	7.9	42.7	9	1.8	56.2	1.9	0.4	4.7	1	0.2	16.7
EN	8.5	1.7	9.2	1	0.2	6.2						
DA	2.4	0.5	2.6	1	0.2	6.2						
OP	1.5	0.3	1.6	1	0.2	6.2						
THMO	7.3	1.5	7.9	1	0.2	6.2						
PRGL							5.6	1.1	13.8	1	0.2	16.7
TOTALS	92.9	18.6	100.0	16	3.2	99.7	40.7	8.1	100.1	6	1.2	100.1

3.3.2.1 Site 1

Site 1 is located at an elevation of approximately 2,480 feet. Substrate is primarily desert pavement and gravel, and slope is less than 3 degrees. Some erosion is present.

Both transects are creosote bush (Larrea tridentata)/mixed shrub associations; frequency of occurrence and percent cover vary.

Percent perennial cover for transects 1A and 1B is approximately 16 and 27 percent, respectively. Shrubs providing approximately 88 percent of the relative cover on the transects include Dalea sp., Krameria sp., Ambrosia dumosa, Larrea tridentata, and Thamnosma montana. Two grasses, Erioneuron pulchellum and Aristida purpurea, make up the remaining 12 percent relative cover. Other species in the area include Echinocereus engelmannii, Ephedra torreyana, Eriogonum fasciculatum, Ferocactus sp., and Psilostrophe cooperi.

With the exception of rabbit pellets, no evidence of wildlife presence was observed.

3.3.2.2 Site 2

Site 2 is located on an alluvial fan not far from the junction of Highways 7 and 93 at an elevation of approximately 5,200 feet. The substrate consists primarily of coarse gravel, cobbles, and rocks, and slope is less than 3 degrees. Low intensity disturbance due to both erosion and garbage dumping was observed.

A creosote bush (Larrea tridentata) association dominates this site. Shrubs present in abundance include L. tridentata, Yucca schidigera, Psilostrophe cooperi, and Menodora spinescens. Three other shrub species occurring less frequently are Hymenoclea salsola, Dalea sp., and Krameria sp. The grass, Erioneuron pulchellum, and the forb, Sphaeralcea sp., are also present. Total perennial cover is approximately 18 percent. Adjacent areas support Acamptopappus sp., Ambrosia dumosa, Bebbia juncea, Dyssodia sp., Echinocereus engelmannii, Encelia sp., Eriogonum inflatum, Ferocactus sp., Hilaria rigida, and Opuntia bigelovii.

A small mammal burrow system and active and inactive small mammal burrows were observed at Site 2.

3.3.2.3 Site 3

Site 3 is located within the Pahranagat Wash at an elevation of 2,200 feet. Slopes range from 0 to 3 degrees, and soils are generally composed of sand and silt, with some gravel and clay.

The vegetative community at Site 3 is a creosote bush (Larrea tridentata)/bursage (Ambrosia dumosa) association. Percent perennial cover is approximately 13 percent. L. tridentata is the dominant plant, having a relative cover of 79 percent. Two other shrubs, Ambrosia dumosa and Gutierrezia microcephala, and a forb, Sphaeralcea sp., are also present on the transect. Other species observed in the area include Baileya multiradiata, Bromus rubens, Descurainia sp., Eriogonum sp., Hymenoclea salsola, and Salsola sp.

Low intensity disturbance caused by cattle grazing was noted. Rabbit pellets and three active kangaroo rat burrows were also observed.

3.3.2.4 Site 4

Site 4 is located at an elevation of approximately 2,300 feet in a hilly area with slopes ranging from 3 to 16 degrees. Soils in this area are a mixture of silt, sand, and gravel. Some minor erosion is present.

The plant community is a creosote bush (Larrea tridentata)/ indigo bush (Dalea sp.)/bursage (Ambrosia dumosa) association. Percent perennial cover is approximately 7 percent. Due to the few individuals present, relative cover, as shown in the transect data, may not be representative of the area; the presence or absence of a single plant results in a large percentage when the total sample is small.

Species in this community include the shrubs L. tridentata, Dalea sp., A. dumosa, Krameria sp., and Ephedra torreyana. Other species in the area include Hilaria rigida, Astragalus sp., Eriogonum inflatum, Eriogonum sp , Mentzelia sp., Phacelia sp., and Stanleya pinnata.

Wildlife sign observed in the area was limited to two active kangaroo rat burrows.

3.3.2.5 Site 5

Site 5 is located on an alluvial fan at an approximate elevation

of 2,400 feet. The soil is composed of fine sand and coarse sand and gravel, and slopes range from 3 to 8 degrees. Off-road vehicle usage has caused low-level disturbance on the site.

On-site vegetation is composed of a creosote bush (Larrea tridentata)/bursage (Ambrosia dumosa) association. Total perennial plant cover is approximately 10 percent, with L. tridentata and A. dumosa comprising 30 and 64 percent of the relative cover, respectively. Associated species include the shrubs Krameria sp., Ephedra sp., and Menodora spinescens, and a forb, Sphaeralcea sp. Numerous species observed in the area adjoining the transects include Aristida purpurea, Bromus rubens, Descurainia sp., Echinocereus engelmannii, Eriogonum inflatum, Eriogonum sp., Erioneuron pulchellum Ferocactus sp., Gutierrezia microcephala, Oryzopsis hymenoides, Opuntia pasi[illegible]rii. Opuntia sp., Oxytheca sp., and Yucca schidigera.

Numerous small mammal burrow systems both active and inactive, are present.

3 3.2.6 Site 6

Site 6 is located in a limestone rock outcrop typical of the hillsides bordering Coyote Spring Valley. Elevation is approximately 2,600 feet. Slopes range from gentle to moderate (3 to 16 degrees), and the substrate consists primarily of rock and coarse and fine gravel. It appears to be a race area for off-road vehicles, but disturbance is low.

A creosote bush (Larrea tridentata)/mixed shrub community is present on the site. The species composition of this community varies a great deal between transects, with only two of eleven species common to both transects. The shrub species, Ambrosia dumosa, Ephedra sp., Krameria sp., and Acamptopappus sp., provide approximately 84 percent of the relative cover on transect 6A. Two forbs, Tiquilia sp. and Dyssodia sp., and the grass, Erioneuron pulchellum, were also observed. All plants on transect 6B are shrubs. These include L. tridentata, Acamptopappus sp., Ambrosia dumosa, Yucca schidigera, Dalea sp., and Ephedra torreyana. Total perennial cover is similar for both transects and averages 12 percent.

Other species in the area include the succulents, Echinocereus engelmanni, Ferocactus sp., and Opuntia sp., and the barrel cactus, Nellodyia sp.

A few small mammal burrow systems were observed. No other evidence of the presence of wildlife was seen.

3.3.2.7 Site 7

Site 7 is located at an elevation of approximately 2,480 feet on a gentle slope of 3 to 8 degrees. Substrate is hard, flat, and composed of relatively coarse gravel and rocks, often cemented together by minerals and referred to as desert pavement.

A creosote bush (Larrea tridentata)/mixed shrub association is the major vegetative association of this area. The two transects are sufficiently different to discuss them separately;

although shrub species are dominant on both transects, species density varies widely.

Shrubs on transect 7A include L. tridentata, Ambrosia dumosa, Menodora spinescens, Krameria sp., Dalea sp., and Acamptopappus sp. These shrubs provide 98.1 percent of the cover, with L. tridentata and A. dumosa accounting for 58 percent of the relative cover. One forb, a Sphaeralcea sp., is present. Total perennial cover on this transect is approximately 16 percent.

The total perennial cover on Transect 7B is approximately 28 percent, and shrubs account for 99.6 percent of the relative cover. Species include A. dumosa, L. tridentata, M. spinescens, and Yucca schidigera. Again, L. tridentata and A. dumosa are the most abundant, accounting for 86 percent of the relative cover. One grass species, Hilaria rigida, also occurs.

Other species in the area include Aristida purpurea, Echinocereus engelmannii, Dyssodia sp., Eriogonum inflatum, Erioneuron pulchellum Hilaria rigida Opuntia sp Oxytheca sp., and Thamnosma montana.

The only wildlife sign observed was rabbit pellets.

3.3.2.8 Site 8

Site 8 is located at an elevation of approximately 2,450 feet on a slope of less than 3 degrees. Substrate is mainly desert pavement. Two sets of tire tracks run through the site, but there is no other disturbance.

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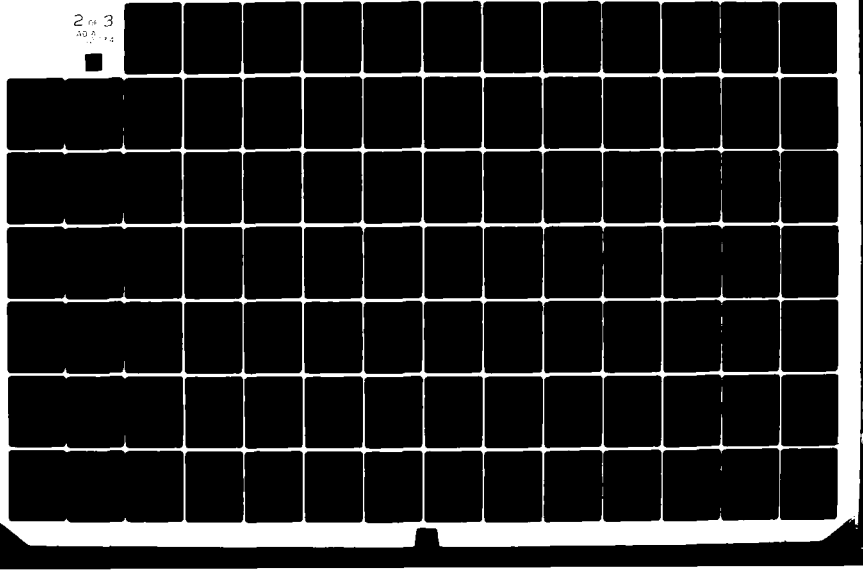
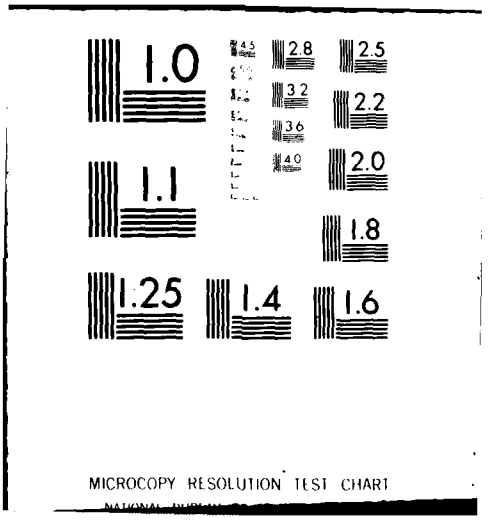
UNCLASSIFIED FN-TR-46 NL




1.0
1.1
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3.2
3.6
4.0
4.5
MICROCOPY RESOLUTION TEST CHART

As on Site 7, also a desert pavement area, the community is a creosote bush (Larrea tridentata)/mixed shrub association.

Other shrubs include Ambrosia dumosa, Krameria sp., Dalea sp., and Menodora spinescens, Yucca schidigera, and Acamptopappus sp. Two grass species, Erioneuron pulchellum and Aristida purpurea, are also present. Total perennial cover is approximately 15 percent.

Other species found on the site but not on the transects include Descurainia sp., Dyssodia sp., Echinocereus engelmanni, Encelia sp., Eriogonum inflatum, Ephedra torreyana, Erioneuron pulchellum, Hilaria rigida, Lepidium fremontii, Opuntia sp., Salazaria mexicana, Sphaeralcea sp., and Vulpia octoflora.

Wildlife sign was limited to small mammal burrow systems and rabbit pellets.

3.3.2.9 Site 9

Site 9 is located in a small wash at an approximate elevation of 2,478 feet. The slope is nearly level, and soil is composed of silt and gravel. Erosion within this area is high.

Species composition, density, and total cover are quite different for Transects 9A and 9B. Transect 9A is located in a white barrowbrush (Hymenoclea salsola)/desert almond (Prunus fasciculata) association. Together, these two species comprise 77 percent of the relative cover. Other shrub species on the transect include Encelia sp., Thamnosma montana, Dalea sp., and

Gutierrezia microcephala. One succulent, Opuntia sp., is also present. Total perennial cover is approximately 19 percent. Other species observed near Transect 9A include Ambrosia eriocentra, Bromus rubens, Chrysothamnus sp., Prosopis glandulosa, and Yucca schidigera.

Transect 9B is located in a desert almond (P. fasciculata)/mesquite (Prospis glandulosa sp.) association. Total perennial cover is a low 8.1 percent, and P. fasciculata makes up 79 percent of the relative cover. The three other species present include P. glandulosa, H. salsola, and G. microcephalia.

Areas within the wash near the site range from a P. glandulosa/ H. salsola association, through pure stands of H. salsola, to a Larrea tridentata association.

Wildlife sign at Site 9 includes coyote scat, rabbit pellets, and an active mammal burrow.

3.4 CONCLUSIONS

No threatened or endangered plants are known to occur in the OB study area. Several are known from the vicinity, but most are at higher elevations. None was observed during the on-site survey. However, due to the time of the survey, several individuals were observed that may possibly be threatened or endangered species, the species or variety of which could not be positively identified. These species include Ferrocactus sp., an unidentified variety of Opuntia basilaris,

and Sphaeralcea sp. The sample area was very small in relation to the entire OB area. It is possible that if these species or varieties are endangered, that larger populations may exist within the OB site. This can be determined only by a survey of the entire area during a season when flowers or other reproduction structures necessary for identification are present.

Animal species protected by federal or state law were identified from the literature. Few wildlife signs were observed during the field survey; no additional information on density, movement, or location of these species was obtained. Direct affects of OB construction would include loss of 7,000-7,500 acres of habitat for the desert tortoise (rare and protected by state law), disturbance of migration routes for bighorn sheep (protected), and effects on bobcat, kit fox and gray fox populations (all protected by state law). Although much of their range may not be located within the OB study area, indirect affects from disturbance or poaching of protected game species or furbearing species such as elk, mule deer, and mountain lion will probably occur.

Eagles and falcons are considered endangered species. No eagle or peregrine falcon nesting is known within the study area, although a wintering eagle population is known to occur in Pahranagat Valley, and both groups migrate through the study area. At least 14 species of hawks and falcons use the valley during migration. Prey for these species consists of a number

of small mammals, birds and reptiles that inhabit the valley. Activities that affect the prey species will affect the raptors, even if nesting does not occur within the valley. Many signs of small animals were observed during the field survey, but no raptors or raptor nests were noted.

Both surface and subsurface water is important for animal communities. Riparian habitats have been identified by the NDW as critical habitat for a number of species that play important roles in the ecosystem. Coyote Spring Valley is hydrologically connected to several areas both up- and down-watershed. A large number of wildlife refuges surround the OB study site, and increased water useage or diversion within the valley will likely affect areas such as Moapa Springs and the Muddy River as well.

Several aquatic species protected by federal or state law occur in the Moapa Springs, the Muddy River, and the Pahranagat area. These are not within the operational base site, but could be indirectly affected by hydrological changes due to increased water usage in Coyote Spring Valley.

Wilderness areas are located adjacent to and within the OB study area. This may cause increased impacts of both a direct and indirect nature. No transects were placed within these areas, so actual site-specific data was not obtained.

Although field studies provided little information on the larger animal species present, they did provide insight into the

characteristic plant communities and indicate habitat is present that could support animal populations described in the literature. The field study also confirmed the presence of many small mammals that provide prey for the raptors migrating through the study area.

4.0 MILFORD-BERYL AREA

4.1 ABIOTIC ENVIRONMENT: A LITERATURE REVIEW

This section briefly summarizes the abiotic elements of the environment that influence or support the biological community. Because of their proximity to each other, Milford and Beryl are discussed together.

4.1.1 Site Description

The proposed Milford-Beryl OB area is located in the Escalante Desert. Elevations range from approximately 5,000 to 6,000 feet. Several mountain ranges border the area, including the Cricket Range to the north, the Beaver Lake Mountains, the Star Range and the Shauntie Hills of the San Francisco Range to the northwest, the Wah Wah and Needle ranges to the west, the Bull Valley Mountains to the south, the Antelope Range to the southeast, and the Mineral Mountains to the northeast.

The legal descriptions of the 192 sections within the Milford-Beryl study area are given in Appendix D. The base will not cover the entire area, but will cover at least a portion of each section listed.

The proposed OB area extends from the vicinity of Milford southwest toward Beryl, a distance of approximately 40 miles.

4.1.2 Soils and Slope

Soils in the area northwest of Beryl are predominantly of the Dixie-Neola series association. These soils are well drained

and are usually shallow to moderately deep. A hardened caliche (calcium carbonate) horizon is present 15 to 36 inches below the surface in Dixie soils and 12 to 24 inches below the surface in Neola soils (U.S.A.F. 1980a).

These caliche horizons limit the depth of root growth. Natural fertility, organic content, and water holding capacity are low, and danger of erosion is moderate to severe. The Dixie-Neola association is used almost entirely for range.

The Zane series is present within the Dixie-Neola association in the Beryl area. These soils are well-drained, deep soils, with a deep rooting zone and a high water-holding capacity; they are high quality soils for irrigation in this area.

Southwest of Milford, soils are generally deep and moderately to strongly alkaline, with low permeability. These soils are predominant on the valley bottoms and floodplains of the site. Slopes in this area are generally 3 degrees or less.

Mildly to strongly alkaline soils occur on the alluvial fans of this area. Slopes range from approximately 0 to 13 degrees (U.S.A.F. 1980a).

4.1.3 Water

The Escalante Desert is a hydrologically closed basin. Surface water and groundwater flow is contained within its boundaries. Four streams in the area provide surface water to the Escalante Desert. They include the Beaver River and the Shoal, Pinto

and Meadow creeks. The total flow contributed by the creeks is usually between 4,000 and 8,000 acre-feet per year and supplies only those areas close to the mouth of each creek (Fix 1950). The largest supply of surface water occurs in the Beaver River, which enters the area west of Minersville. The first 10,000 acre-feet of flow are diverted for use on irrigated acreage around Minersville. The remaining flow is diverted to canals for use on lands south and southeast of Milford. This flow averaged 25,390 acre-feet per year for the period 1932 to 1979 (U.S.G.S. 1980).

There are several small springs in the basin that occasionally have small amounts of flow. However, because of a lack of continual water supply from the groundwater reservoir, there are no springs that flow year-round on a dependable basis.

The Escalante Desert contains one of the largest and most important groundwater basins in the state of Utah. The average withdrawals from the groundwater reservoir total nearly 140,000 acre-feet per year (U.S.G.S. 1980). This rate of withdrawal greatly exceeds the natural recharge to the area, resulting in alterations of the natural groundwater system in the basin. Prior to the early 1960's, groundwater movement in the basin was inward toward the axis of the basin and northeastward toward the northern end. Since that time, flow is inward toward the heavy pumping areas. Another effect of this heavy demand on the groundwater reservoir is an overall lowering of the water table.

The average decline in the basin has been 20 feet since the 1940's with some areas near Beryl Junction experiencing as much as a 50-foot decline in the water table. This amount decreases away from the heavy pumping centers with some areas along the edges of the basin experiencing no declines.

Other effects of the lowering of the water table include land subsidence and surface cracking. There has been evidence of those occurrences in both the northern and southern portions of the basin near the heavily pumped areas.

Because the annual water usage in the Escalante Desert currently exceeds estimates of perennial yields of the area, the Utah State Engineer's office has declared this basin closed to additional appropriations and will allow no new groundwater withdrawals in the area. Any future water users will be required to acquire water rights from existing users in order to use the groundwater supplies of the basin.

Five guzzlers are located in the Shauntie Hills less than 4 miles from the northeastern portions of the OB study area, and two additional guzzlers are located in the Black Mountains approximately 12 miles southeast of the area. These were constructed to provide additional water sources for the pronghorn antelope and other wildlife of the area (Coffeen 1981).

4.1.4 Land Use

Property within the OB study area is a mixture of state, federal, and private ownership. Approximately 50 percent of the land

is federally owned and managed by the Bureau of Land Management (BLM). It is used primarily as range for domestic livestock. The OB study area is within the BLM Pinyon Planning Unit, which is moderately to heavily grazed (Hansen 1981).

The state owns approximately 10 percent of the land, and private holdings account for the remaining 40 percent. There are no croplands within the study area.

Oil and gas leases are widely scattered in the area, and deep tests are currently being drilled. There are also active mines, mills, and relatively undeveloped patent claims. Some gold and silver mining occurs northwest of Beryl, and ore rich in beryllium also occurs in the area (U.S.A.F. 1980a).

Natural, protected areas less than 70 miles from the OB area include Zion National Park, Dixie National Forest, and the State Wildlife Management area at Indian Peak.

4.2 BIOTIC ENVIRONMENT: A LITERATURE REVIEW

This section summarizes the major plant and animal species that have been identified in the vicinity of the OB study area and discusses possible project affects on their populations or habitats.

4.2.1 Plant Species of Special Concern

No threatened or endangered plants are known to occur within the study area (Hansen 1981), although there are several rare plants in the vicinity. The dwarf beardtongue, Penstemon nanus, and the tufted globe mallow, Sphaeralcea caespitosa, are

found just north of Milford (U.S.A.F. 1980b). Both species are listed in the Federal Register in the Taxa Currently Under Review category. West of the study area there are two populations of Tunnel Springs beardtongue, Penstemon concinnus (U.S. A.F. 1980a). While these species are not known on the site itself, it is possible that similar habitat exists there and that they are not known only because thorough studies of the area have not been conducted.

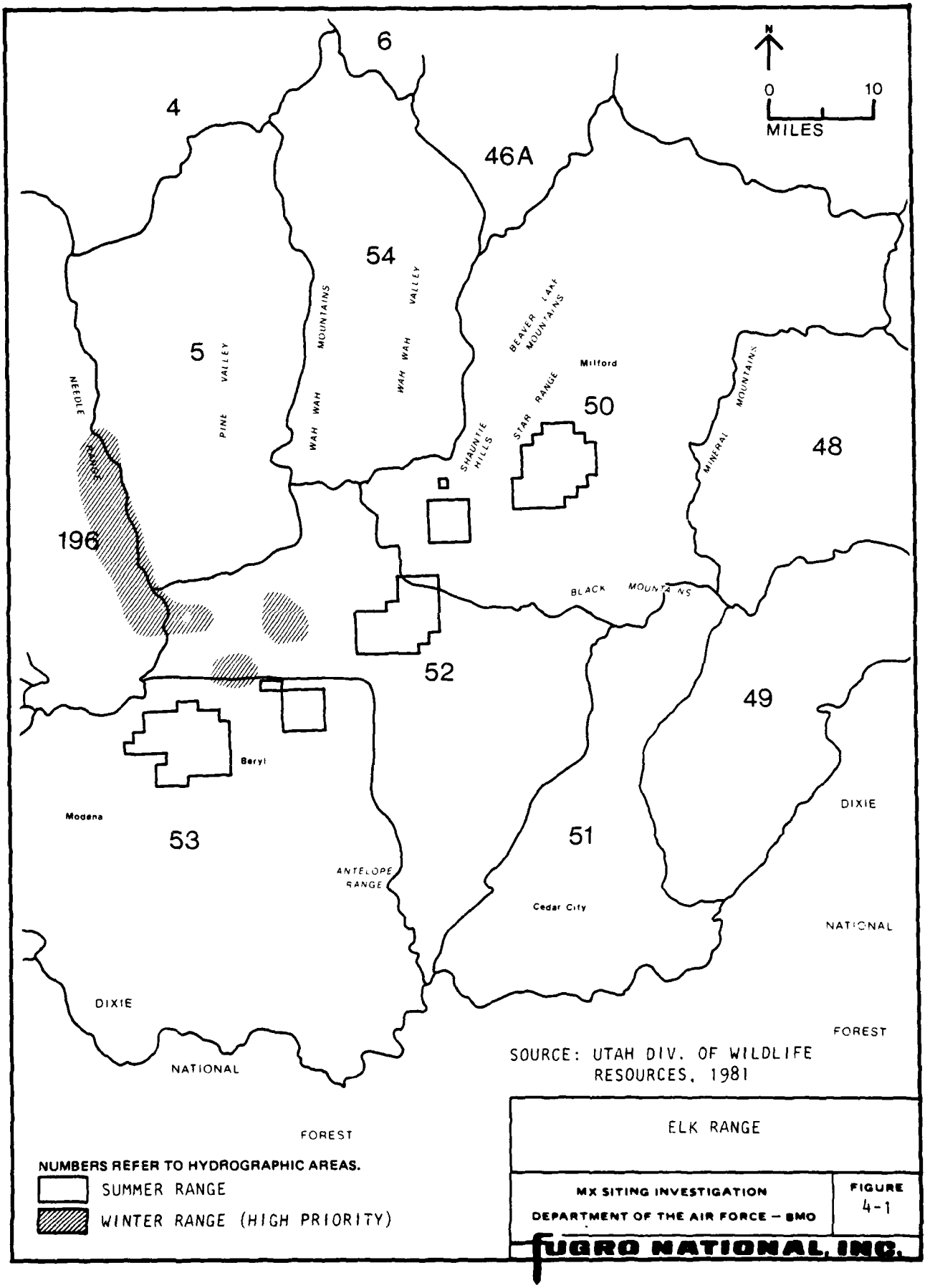
As with the Coyote Spring site, project effects on rare plants in the Beryl and Milford sites would probably be indirect, and due to increased off-road vehicle use, increased recreational use of remote areas, and collection of plants.

4.2.2 Wildlife Species of Special Concern

To avoid repetition, background information for species occurring in both Coyote Spring Valley and the Milford-Beryl area is presented in Section 3.2.3. Specific abundance and range information as applicable to the Milford-Beryl area is discussed in this section.

4.2.2.1 Elk (Cervus canadensis)

As a game animal, the elk is protected by state law. Sagebrush/pinyon/juniper areas of foothills and adjacent higher elevations providing elk winter range and aspen-fir areas of highest elevations providing summer range are considered critical habitats by the Utah Division of Wildlife Resources (Day 1980). Several winter range areas are located in the Milford-Beryl vicinity; their locations relative to the Milford-Beryl study area are illustrated in Figure 4-1.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46A
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PINE VALLEY
WAH WAH MOUNTAINS
WAH WAH VALLEY
BEAVER LAKE MOUNTAINS
Milford
STAR RANGE
50
SHAUNTIE HILLS
MINERAL MOUNTAINS
48
NEOLE
196
BLACK MOUNTAINS
52
49
Beryl
Modena
53
51
DIXIE
ANTELOPE RANGE
Cedar City
NATIONAL
DIXIE
NATIONAL
FOREST
FOREST
SOURCE: UTAH DIV. OF WILDLIFE RESOURCES, 1981
NUMBERS REFER TO HYDROGRAPHIC AREAS.
SUMMER RANGE
WINTER RANGE (HIGH PRIORITY)
ELK RANGE
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO
FIGURE 4-1
FUGRO NATIONAL, INC.

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 of this area were introduced and currently number approximately 50 animals. The herd is not yet increasing due at least in part to poaching and to fawns falling prey to cougars (Coffeen 1981). The desert forage found in the Milford-Beryl area is also somewhat atypical of elk diets (Ball 1981).

As in Coyote Spring Valley, indirect effects on elk are expected from poaching; increased recreational use within elk range may also frighten them from forage or water sources.

4.2.2.2 Kit fox (Vulpes macrotis)

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

Kit fox will usually be widespread in shadscale shrub areas, such as those in the Milford-Beryl study area (Egoscue 1956, Ball 1981). High concentrations of kit fox are possible, and their denning areas near Beryl and Milford must be determined by extensive field research (Ball 1981). Effects would be similar to those expected in Coyote Spring Valley: a loss of habitat as

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*There is no official list.

well as increased hunting of an animal with little wariness of man.

4.2.2.3 Gray fox (Urocyn cinereoargenteus)

Gray fox burrows or den sites are considered key habitat areas by the Utah Division of Wildlife Resources (Day 1980).

Gray fox do not frequent the valley floors near Beryl and Milford, although they are present in the surrounding higher elevation areas (Ball 1981). Effects would be limited to the potential of increased hunting and of recreational use in areas adjacent to the operating base.

4.2.2.4 Bobcat (Lynx rufus)

Bobcat are considered a protected species (Coffeen 1981), and bobcat den sites are considered critical habitat by the Utah Division of Wildlife Resources (DWR) (Day 1980). The species is listed as being under investigation on the unofficial state list of DWR (1980).

In Utah, near Milford and Beryl, bobcats occur primarily in pinyon/juniper communities (Ball 1981) found at elevations between 5,000 and 8,000 feet (Cronquist 1972). The bobcat range extends somewhat lower than this in wash areas, but the bobcat habitat near Milford and Beryl does not include the valley floor (Ball 1981). Any effects of the operational base would be indirect and would include a potential increase in hunting of both the bobcat and its prey and disturbance due to possible increased recreational activities in the bobcat habitat.

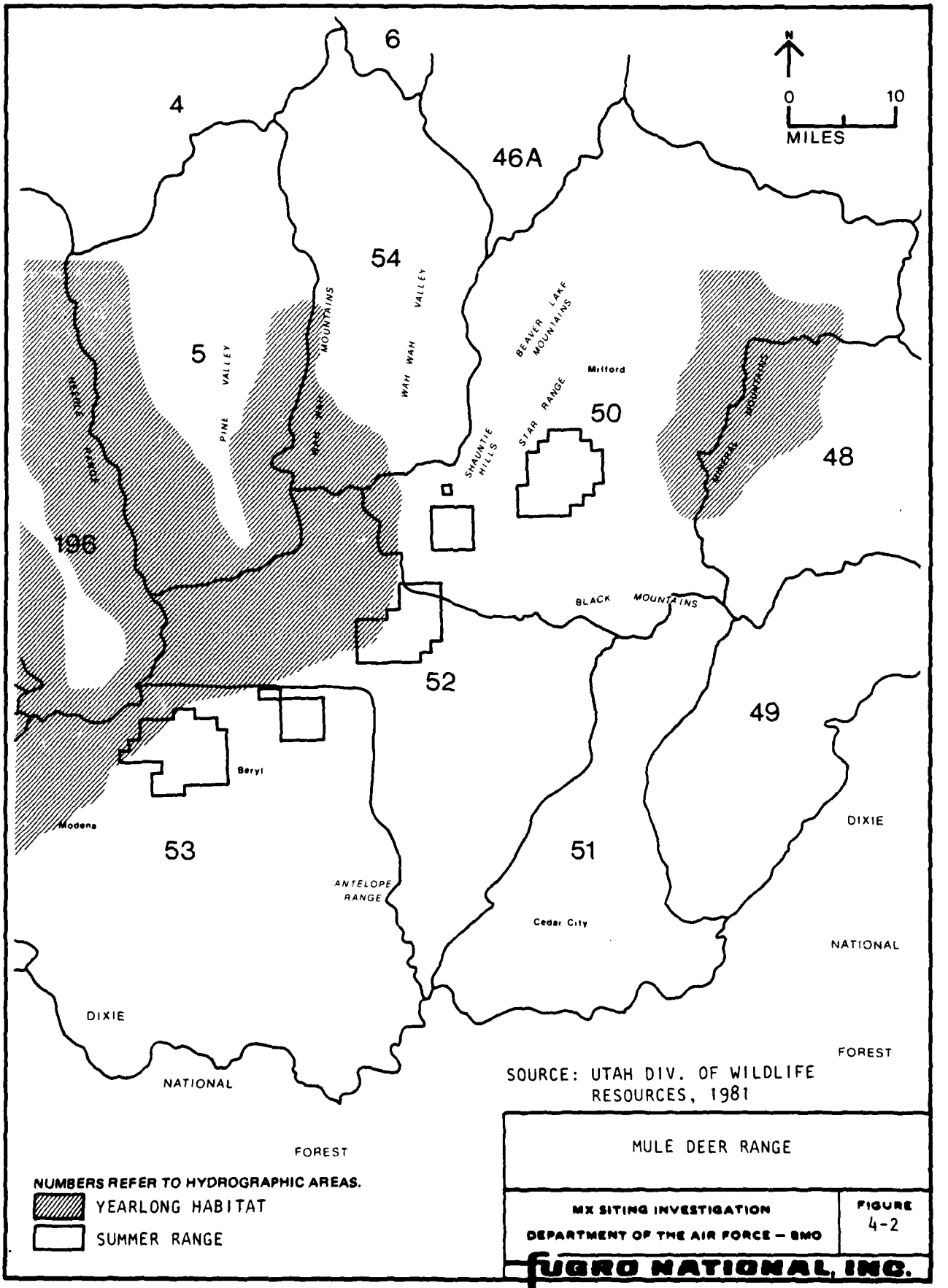
4.2.2.5 Mule deer (Odocoileus hemiouus)

The mule deer is protected as a game animal in Utah. Sagebrush/pinyon/juniper areas of foothills and adjacent higher elevations that provide deer winter range and aspen-fir areas of highest elevations that provide deer summer range are considered critical habitat by the Utah Division of Wildlife Resources (Day 1980).

There are several areas of year-round habitat in the study area and vicinity. Although the mule deer populations in these areas are fairly low (Coffeen 1981), some habitat may be affected. Mule deer usually prefer higher areas that would not receive direct effect from activities in the study area. Indirect effects would probably result from increased poaching and recreational use of remote areas. Figure 4-2 shows mule deer distribution near Milford and Beryl.

4.2.2.6 Pronghorn antelope (Antelocapra americana)

Antelope have protected status as a big game animal in Utah. Areas used year round by antelope for fawning and winter range are considered critical habitat by the Utah Division of Wildlife Resources. An estimated population of 1,200 pronghorn antelope (Antelocapra americana) were reported in Utah in 1970. Seventy-five percent resided in a combination of saltbush/greasewood, Great Basin sagebrush, and pinyon/juniper woodlands. Sagebrush (mostly Artemesia tridentata) is a major food, especially for


6
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46A
54
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PINE VALLEY
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WAH WAH VALLEY
BEAVER LAKE MOUNTAINS
Milford
STAR RANGE
50
SHAUNTIE HILLS
48
PINE VALLEY MOUNTAINS
196
BLACK MOUNTAINS
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Beryl
Modena
53
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DIXIE
ANTELOPE RANGE
Cedar City
NATIONAL
DIXIE
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FOREST
FOREST
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0
10
MILES
SOURCE: UTAH DIV. OF WILDLIFE RESOURCES, 1981
NUMBERS REFER TO HYDROGRAPHIC AREAS.
YEARLONG HABITAT
SUMMER RANGE
MULE DEER RANGE
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO
FIGURE 4-2
FUGRO NATIONAL, INC.

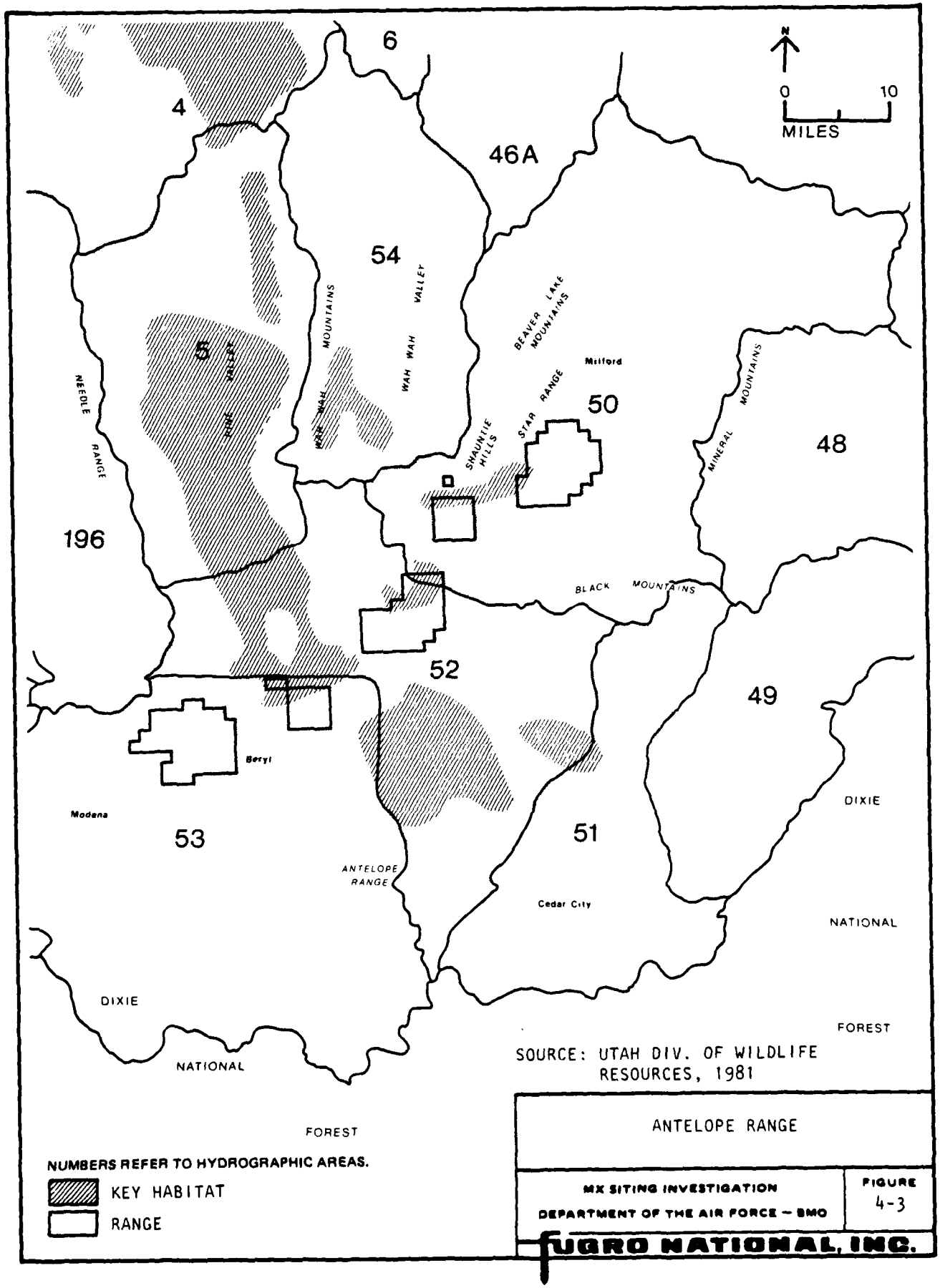
winter forage (Sundstrom 1973). Browse is favored over grass in Utah pronghorn diets. In hot areas, forbs are a critical part of the pronghorn diet, since the water in the forbs can reduce their dependence on scarce water supplies.

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

It has been noted that past human activity has driven off the antelope, and reintroduction may be needed to reestablish a population (Coffeen 1981).

Fences are also a serious threat to pronghorn survival as the animals tend to become entangled in barbed-wire fences and strangle themselves, or, if pursued by predators, run parallel to the fence instead of jumping over it, 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 Escalante Desert region. The proposed Milford-Beryl study area contains large areas of year-long pronghorn antelope habitat, shown in Figure 4-3. Antelope are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WAH WAH VALLEY
BEAVER LAKE MOUNTAINS
Milford
STAR RANGE
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SHAUNTIE HILLS
MINERAL MOUNTAINS
48
NEEDLE RANGE
PINE VALLEY
196
BLACK MOUNTAINS
52
49
Beryl
Modena
53
51
DIXIE
ANTELOPE RANGE
Cedar City
NATIONAL
FOREST
DIXIE
NATIONAL
FOREST
SOURCE: UTAH DIV. OF WILDLIFE RESOURCES, 1981
NUMBERS REFER TO HYDROGRAPHIC AREAS.
KEY HABITAT
RANGE
ANTELOPE RANGE
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO
FIGURE 4-3
FUGRO NATIONAL, INC.

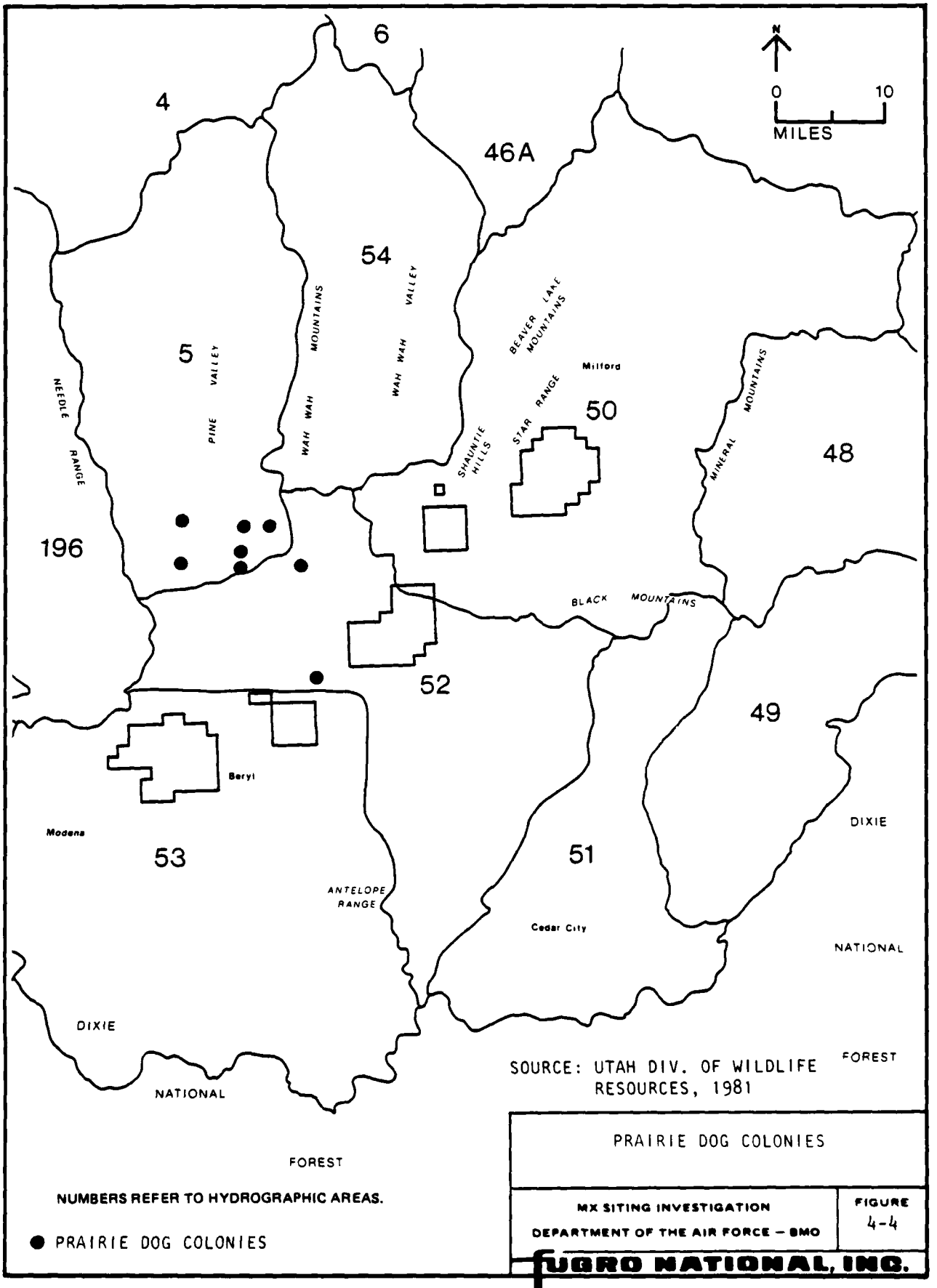
the most abundant big game animal in the area; population is estimated at around 100 animals (Coffeen 1981). Limited hunts have been allowed since 1945 (Hinman no date). Possible effects on the population could include habitat destruction and increased poaching.

4.2.2.7 Utah Prairie Dog (Cynomys parvidens)

The Utah prairie dog (Cynomys parvidens), one of the whitetail prairie dog species, is federally listed as endangered by the U.S. Fish and Wildlife Service.

Prairie dogs require deep, well-drained soils that prevent burrows from flooding. They favor lightly grazed areas, because the grazing keeps the brush low enough for them to stand and survey the surroundings for danger. Because prairie dogs get most of their water from plants, moist forbs are extremely important in their diet.

After years of overgrazing, soil depletion, removal of habitat for crop farming, and poison control programs, prairie dog populations were drastically reduced. In 1972, the Utah Division of Wildlife Resources began transplanting Utah prairie dogs from private to public land. This process is very expensive and time consuming and has only a 5 percent success rate to date. The colonies in southern Pine Valley have been among the most successful of these transplants (Coffeen 1981). Location of the present populations is shown in Figure 4-4.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MILES
PINE VALLEY
NEEDLE RANGE
WAH WAH MOUNTAINS
WAH WAH VALLEY
BEAVER LAKE MOUNTAINS
STAR RANGE
SHAUNTIE HILLS
MINERAL MOUNTAINS
BLACK MOUNTAINS
ANTELOPE RANGE
Milford
Beryl
Modena
Cedar City
DIXIE NATIONAL FOREST
DIXIE NATIONAL FOREST
SOURCE: UTAH DIV. OF WILDLIFE RESOURCES, 1981
NUMBERS REFER TO HYDROGRAPHIC AREAS.
● PRAIRIE DOG COLONIES
PRAIRIE DOG COLONIES
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO
FIGURE 4-4
FUGRO NATIONAL, INC.

There are populations of prairie dogs in the vicinity of the Milford-Beryl study area, although not within the area itself. The successful prairie dog transplant colony in Pine Valley is approximately 10 miles northwest of the Milford-Beryl site. Prairie dogs are also found southeast of the site in the Parowan Valley and near Cedar City (U.S.A.F. 1980a). Possible indirect effects on these colonies include increased traffic through the Parowan Valley and disturbance created by increased numbers of people visiting the prairie dog towns.

4.2.2.8 Blackfooted ferret (Mustela nigripes)

The blackfooted ferret is federally listed as endangered. There are scattered, unconfirmed reports of sightings from Uinta Basin in 1972 and 1975, from New Green River, Utah, in 1976, and from Rich and Emery counties in 1977 and 1978. The primary prey of the blackfooted ferret is the prairie dog. The recently successfully transplanted Utah prairie dogs (Cynomys parvidens) in Pine Valley may provide a potential food source and appropriate habitat for the ferrets (Utah DWR 1980).

4.3.2.9 Raptors, Game Birds and Other Avifauna

A general discussion of raptors and other birds of the Utah and Nevada study areas is given in the Coyote Spring Section.

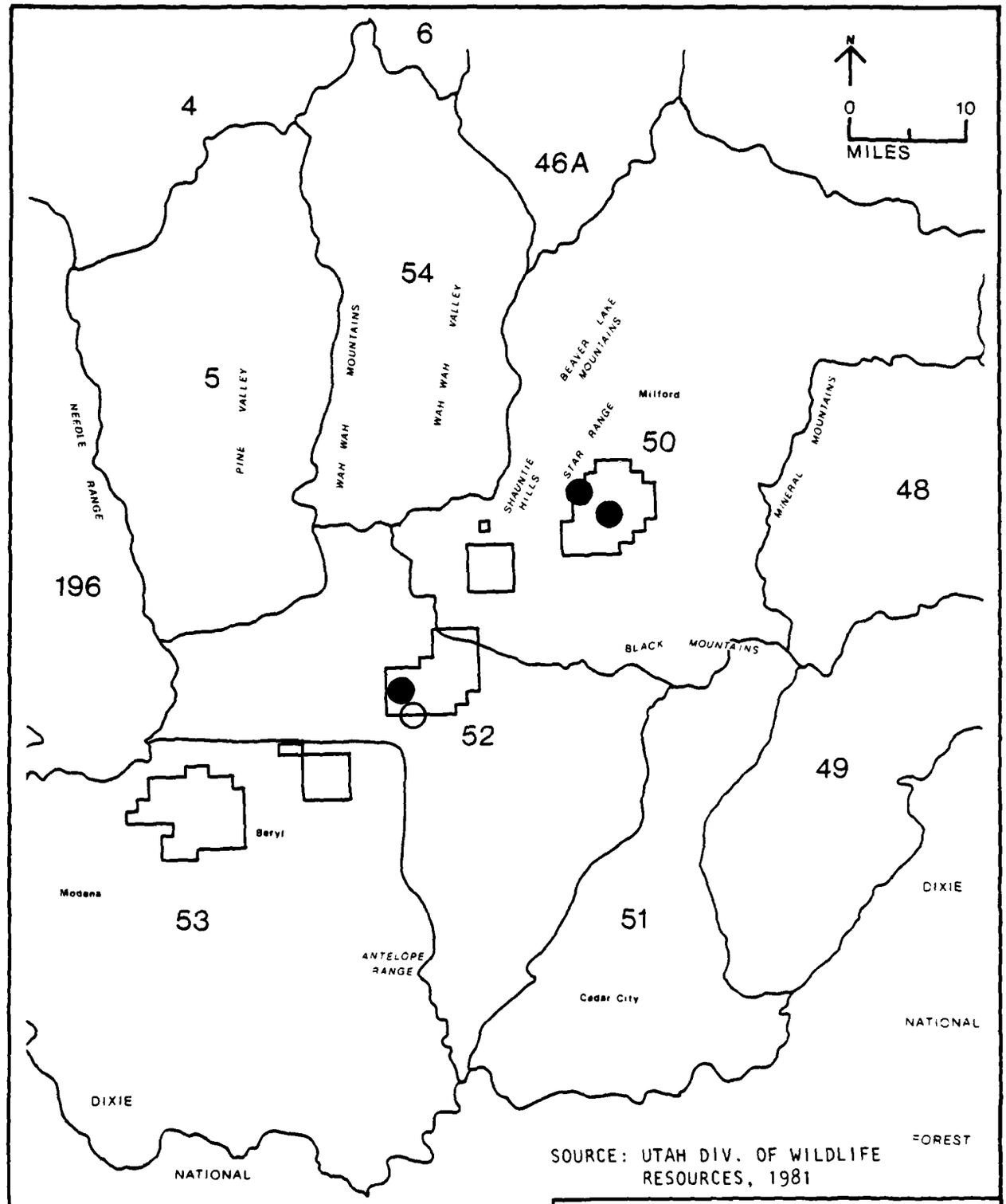
The bald eagle (Haliaetus leucocephalus) is federally classified as endangered (U.S. Fish and Wildlife Service 1980). Utah's population is estimated at 250-350 birds (Nevada Department of Wildlife 1980).

A major wintering area for many of Utah's bald eagles occurs near Cedar City. Figure 4-5 shows eagle distribution in the vicinity of the OB site. Rush Lake, northeast of Cedar City, is a feeding and day use area, and there is a major winter roost site of approximately 70 birds in a nearby canyon (Coffeen 1981). Documented bald eagle sitings are scattered from the south end of the Crickett Range to south of Cedar City (BLM 1981). The eagle winters primarily in desert valleys associated with waterways or marshes. The OB study area, which is directly north of the wintering area, is used during both fall and spring migration.

The golden eagle is protected by state and federal law. Golden eagle nest sites occur at three locations within the Milford-Beryl study area, and additional nest sites are located northward of the site.

The American peregrine falcon (Falco peregrinus anatum) is federally classified as endangered (U.S. Fish and Wildlife Service 1980). The mountains of western Utah have provided peregrine nesting habitat, principally in the Wasatch Range. Three active nests are reported in the study area vicinity, and one is within the study area (see Figure 4-5) (BLM 1981).

Sage grouse are known to occur in the northern portion of the Milford-Beryl study area and in the area to the southeast. Hamlin and Pine valleys to the north and northeast also support large populations of sage grouse (BLM 1980).



GOLDEN EAGLE AND PEREGRINE FALCON. NESTING AREAS

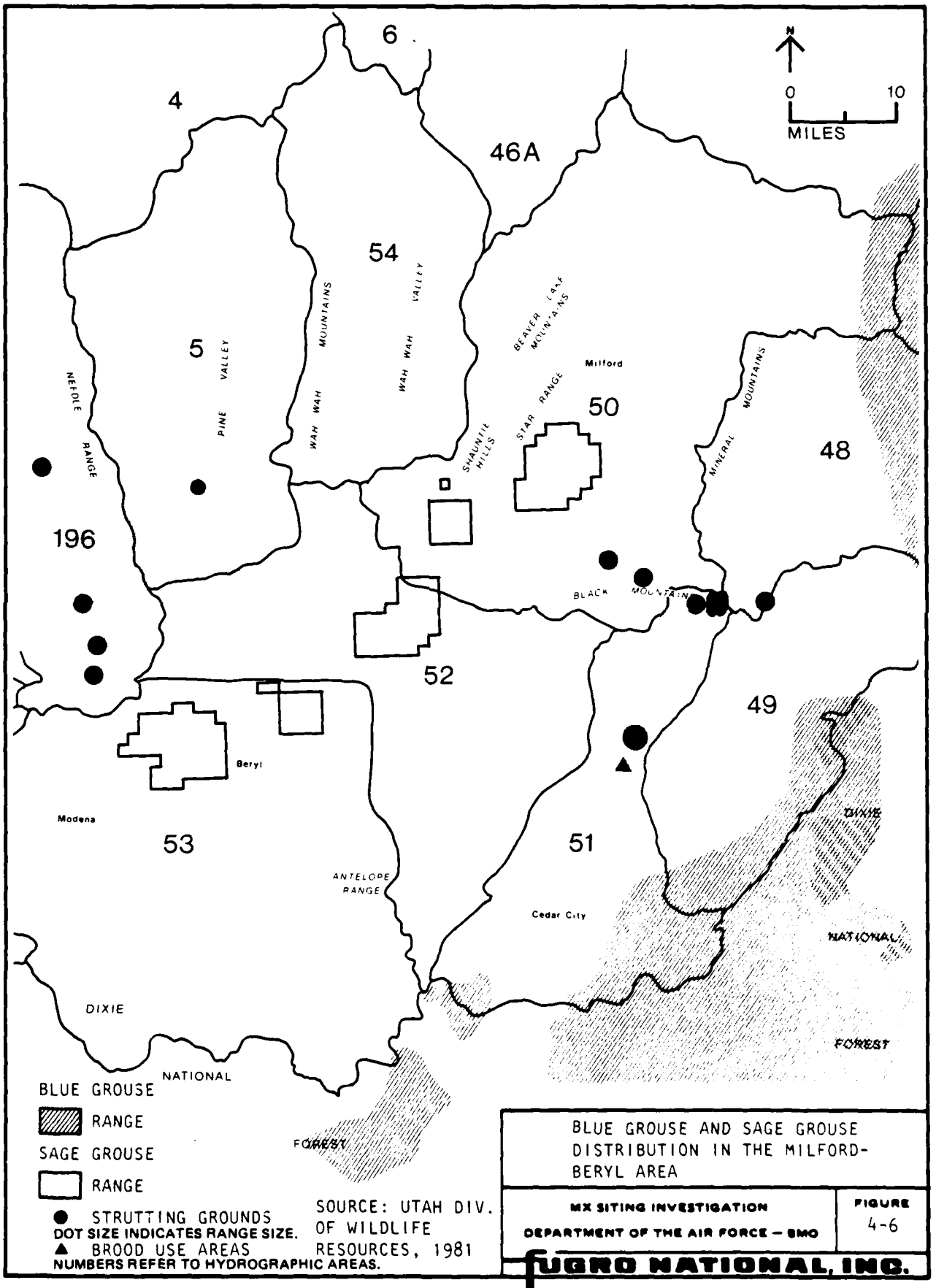
MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE – BMO	FIGURE 4-5

FUGRO NATIONAL, INC.

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, negatively 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). Some sage grouse habitat would be affected by the proposed OB but no strutting grounds are known in the area. Sage grouse locations are shown in Figure 4-6.



BLUE GROUSE AND SAGE GROUSE DISTRIBUTION IN THE MILFORD-BERYL AREA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE 4-6

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4.3 FIELD SURVEY RESULTS

Important species and habitats identified through the literature search were discussed in the sections above. Based on these, a limited field survey was made to obtain actual on-site data.

4.3.1 Overview of Vegetative Associations

Commonly occurring plant associations in the Milford-Beryl area have been compiled from transect data supplemented by field notes. Communities are discussed by elevation.

The vegetation in the vicinity of the Milford-Beryl study area includes a variety of plant species and associations representative of the Escalante Desert region and the lower elevations of the surrounding mountains. In the saline basin on the valley floor, a black greasewood (Sarcobatus vermiculatus)/ shadscale (Atriplex confertifolia) association is dominant. In portions of this area, pure stands of S. vermiculatus occur. Commonly associated species include Kochia americana and Lepidium montanum.

The dominant plant communities from the valley floor to approximately 5,300 feet, where the most prevalent substrate in this area is sandy loam, are rabbitbrush (Chrysothamnus sp.) associations. Common rabbitbrush associations include Chrysothamnus sp./galleta grass (Hilaria jamesii)/winterfat (Ceratoides lanata); Chrysothamnus sp./grassland; and Chrysothamnus sp./ Ceratoides lanata.

Other shrubs frequently present include Ephedra nevadensis, Atriplex canescens, and Gutierrezia sarothrae. Forbs include Sphaeralcea sp. and Erigeron sp. Commonly associated grasses include Sitanion hystrix, Oryzopsis hymenoides, Sporobolus cryptandrus, and Aristida purpurea.

High alluvial fans support a big sagebrush (Artemisia tridentata) association. Soils in these areas are generally salt free, and the groundwater levels are high. Associated shrub species include Chrysothamnus sp. and Gutierrezia sarothrae. The grasses, Hilaria jamesii and Oryzopsis hymenoides, are also frequently present.

An Artemisia nova association is found in the mid-western portion of the region. This vegetation type grows in shallow soils on rocky slopes, primarily on the knolls within the study area. Common shrubs of the Artemisia nova association include Ceratoides lanata, Gutierrezia sarothrae, Chrysothamnus sp., and Ephedra nevadensis. The grasses, Sitanion hystrix and Oryzopsis hymenoides, and the forb, Eriogonum sp., are frequent associations.

In the northeast section of the study area, above approximately 5,300 feet, a mixed shrub/grassland association prevails. Dominant and co-dominant shrubs vary from site to site, presumably in relation to localized edaphic and climatic conditions. Perennial shrubs within this association type include Chrysothamnus sp., Gutierrezia sarothrae, Ephedra nevadensis, Atriplex

canescens, Artemisia tridentata, and Ceratoides lanata. Commonly occurring grasses include Hilaria jamesii, Oryzopsis hymenoides, and Sitanion hystrix.

A pinyon/juniper association is located on the highest study area elevations. Due to the inaccessibility of this area during the survey, this community was not sampled.

A rubber rabbitbrush (Chrysothamnus nauseosus) association is present within large washes from just above the valley floor to the foothills. Communities surrounding the washes vary from Chrysothamnus sp. associations at the lower reaches of washes to big sagebrush (Artemisia tridentata) associations at the higher elevations.

Soil in the washes is composed of sand and gravel. Perennial species frequently occurring with Chrysothamnus nauseosus include Chrysothamnus sp., Ephedra nevadensis, Gutierrezia sarothrae, Ceratoides lanata, Oryzopsis hymenoides, and Astragalus sp.

4.3.2 Transect Results

Transect sites were chosen throughout the proposed Milford-Beryl OB area to obtain site-specific information from a variety of vegetative associations. Sites were chosen for their proximity to existing roads or trails in order to avoid damage to vegetation.

Two parallel transects 15 meters apart were made at the first five sites. Transects at these sites are discussed together, and cover density is given as an average, unless otherwise specified. A snow storm on February 9 prevented sampling second transects at Sites 6 through 14. Legal descriptions of the transect locations in the Milford-Beryl area are given in Table 4-1 and locations are shown on Figure 4-7. Table 4-2 summarizes all vegetation observed in the Milford-Beryl transect areas, Table 4-3 summarizes wildlife data, and Table 4-4 gives quantitative data obtained from the transects.

4.3.2.1 Site 1

Site 1 lies on an alluvial fan at an elevation of approximately 5,450 feet. Slopes range from 0 to 8 percent, and soil consists of silt and fine sand, with some coarse gravel near the surface. Disturbance within the site is low, caused mainly by grazing.

The major plant association is big sagebrush (Artemisia tridentata)/James galleta grass (Hilaria jamesii). Total perennial cover is approximately 24 percent, with big sagebrush comprising 82 percent of the relative cover. Two other grasses, Sitanion hystrix and Aristida purpurea, the shrub, Gutierrezia sarothae, and the succulent, Opuntia sp., are also present along the transect.

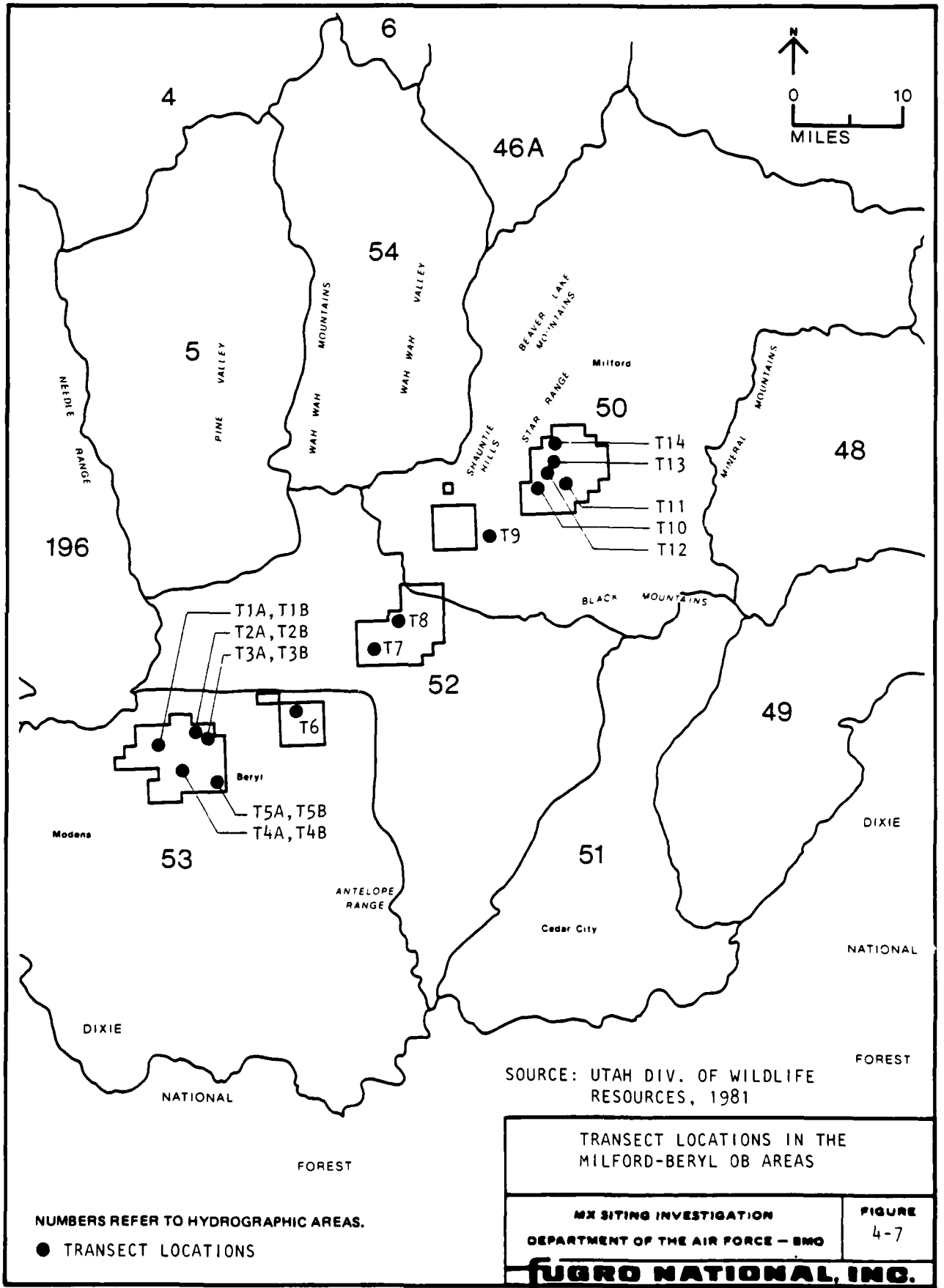
Echinocereus engelmannii was found adjacent to transect 1B; the variety is unknown due to taxonomic problems in differentiating

TABLE 4-1

TRANSECT LOCATIONS
MILFORD-BERYL OPERATING BASE AREA

Site	Township	Range	Section	Vegetation Type
1	T33S	R18W	S24	Artemisia tridentata/Hilaria jamesii
2	T33S	R17W	S10	Chrysothamnus nauseosus/ A. tridentata
3	T33S	R17W	S10	Chrysothamnus sp.
4.	T33S	R16W	S32(1)	Chrysothammus sp./grassland
5	T34S	R17W	S1	Sarcobatus vermiculatus/ Atriplex confertifolia
6	T32S	R15W	S31	A. tridentata
7	T32S	R14W	S5	Chrysothammus sp./grassland
8	T31S	R14W	S22	Chrysothamnus sp./ceratoides lanata
9	T30S	R12W	S18(2)	Chrysothamnus sp./grassland
10	T29S	R12W	S23	A. Chrysothamnus sp.
11	T29S	R11W	S29	Atriplex confertifolia
12	T29S	R12W	S13	Chrysothamnus sp.
13	T29S	R11W	S7	C. nauseosus
14	T29S	R11W	S6	Artemisia nova

(1) Approximate location.
(2) Near, but not within proposed base area.



TRANSECT LOCATIONS IN THE MILFORD-BERYL OB AREAS

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

FIGURE 4-7

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TABLE 4-2

PLANT SPECIES OBSERVED ON TRANSECTS IN THE MILFORD-BERYL OPERATING BASE AREA

Species	Beryl Sites 1	2	3	4	5	Milford Sites 6	7	8	9	10	11	12	13	14
ASTERACEAE														
Artemisia tridentata (big sagebrush)	X	X	X			X		X		X				
Artemisia nova (black sagebrush)														X
Chrysothamnus greenei				X				X	X	X		X		
Chrysothamnus nauseosus (rubber rabbitbrush)			X					X						X
Chrysothamnus viscidiflorus						X	X						X	X
Chrysothamnus sp. (rabbitbrush)			X	X										
Erigeron sp.									X					
Gutierrezia sarothrae (broom snakeweed)	X			X			X	X	X	X		X	X	X
Tetradymia spinosa (spiny horsebrush)											X			
Townsendia sp. (townsendia)				X										
BORAGINACEAE														
Cryptantha sp.		X												
BRASSICACAE														
Descurainia sp. (tansymustard)											X			
Lepidium montanum (Montana pepperweed)										X	X			
Sisymbrium sp. (hedgemustard)													X	
CACTACEAE														
Echinocereus engelmannii (Engelmann echinocereus)	X													
Opuntia sp. (cholla)	X	X												
Opuntia sp. (prickly pear)			X				X							
Opuntia erinacea		X												
CHENOPODIACEAE														
Atriplex canescens (four-winged saltbrush)		X	X									X		
Atriplex confertifolia (shadscale)					X						X			
Ceratoides lanata (winterfat)			X	X				X				X	X	X
Grayia spinosa (spiny hopsage)		X						X						
Halogeton glomeratus (halogeton)					X									
Kochia americana (green molly)											X			

Species	Beryl Sites 1	2	3	4	5	6	7	8	9	10	Milford Sites 11	12	13	14
Salsola iberica												X		
Salsola sp.					X						X			
Sarcobatus vermiculatus (black greasewood)													X	
EPHEDRACEAE														
Ephedra nevadensis (Nevada Mormon tea)	X		X				X					X	X	X
FABIACEAE														
Astragalus sp. (milkvetch)			X										X	
Frasera sp.		X												
MALVACEAE														
Sphaeralcea sp. (globemallow)														
Sphaeralcea grossulariifolia								X	X			X		
POACEAE														
Aristida purpurea (purple threeawn)	X	X		X			X	X	X					
Bouteloua gracilis				X			X							
Bromus tectorum (cheatgrass)							X	X	X		X	X	X	X
Hilaria jamesii (galleta grass)	X	X	X	X			X	X	X	X		X		
Oryzopsis hymenoides (Indian ricegrass)			X	X				X	X	X		X	X	X
Sitanion hystrix (bottlebrush squirreltail)	X							X	X	X		X		X
Sporobolus cryptandrus (sand dropseed)				X			X		X			X		
POLYGONACEAE														
Eriogonum microthecum (slenderbush eriogonum)			X											
Eriogonum sp.			X											X
SCROPHULARIACEAE														
Penstemon sp. (penstemon)		X												

TABLE 4-3

WILDLIFE SPECIES AND WILDLIFE SIGNS OBSERVED ON TRANSECTS IN THE MILFORD-BERYL AREA

Species	Site Numbers 1	2	3	4	5	6	7	8	9	10	11	12	13	14
Horse Sign	X		X											
Cattle Sign		X	X	X		X	X	X	X			X	X	
Coyote Sign		X						X						
Domestic Sheep Sign														
Antelope Sign			X											
Gopher Sign	X													
Cottontail Rabbit		X								X				
Rabbit Sign		X	X		X	X		X		X				
Small Mammal Burrows						X		X			X			
Horned Lark				X									X	
Raven						X								

TABLE 4-4

TRANSECT RESULTS - MILFORD-BERYL STUDY AREA

Species Key	
ARNO	Artemisia nova
ARPU	Aristida purpurea
ARTR	Artemisia tridentata
ATCA	Atriplex canescens
ATCO	Atriplex confertifolia
BOGR	Bouteloua gracilis
CELA	Ceratoides lanata
CHNA	Chrysothamnus nauseosus
CH	Chrysothamnus sp.
EPNE	Ephedra nevadensis
ER	Erigeron sp.
GUSA	Gutierrezia sarothrae
HIJA	Hilaria jamesii
KOAM	Kochia americana
OP	Opuntia sp.
ORHY	Oryzopsis hymenoides
SAVE	Sarcobatus vermiculatus
SIHY	Sitanion hystrix
SPCR	Sporobolus cryptandrus

TABLE 4-4
TRANSECT RESULTS
MILFORD-BERYL STUDY AREA

Species	Transect 1A Total dm	Cover (%)	Rel. Cover (%)	# Indiv.	Density (#/100dm)	Relative Density (%)	Transect 1B Total dm	Cover (%)	Rel. Cover (%)	# Indiv.	Density (#/100dm)	Relative Density (%)
HIJA	10.1	2.0	7.4	22	4.4	31.0	11.1	2.2	10.4	30	6.0	51.7
ARTR	106.5	21.3	77.9	33	6.6	46.5	91.7	18.3	86.4	25	5.0	43.1
OP	7.4	1.5	5.4	3	0.6	4.2	2.8	0.6	2.6	2	0.4	3.4
GUSA	11.1	2.2	8.1	9	1.8	12.7	0.6	0.1	0.6	1	0.2	1.7
SIHY	0.3	0.1	0.2	1	0.2	1.4						
ARPU	1.3	0.3	1.0	3	0.6	4.2						
TOTALS	136.7	27.4	100.0	71	14.2	100.0	106.2	21.2	100.0	58	11.6	99.9
	Transect 2A						Transect 2B					
ARTR	46.2	9.2	45.8	8	1.6	34.8	26.4	5.3	32.1	8	1.6	50.0
CHNA	54.7	10.9	54.2	15	3.0	65.2	54.9	11.0	66.8	7	1.4	43.8
ARPU							0.9	0.2	1.1	1	0.2	6.2
TOTALS	100.9	20.1	100.0	23	4.6	100.0	82.2	16.5	100.0	16	3.2	100.0
	Transect 3A						Transect 3B					
CH	94.9	19.0	79.0	52	10.4	88.1	103.3	20.7	81.9	53	10.6	85.5
ATCA	8.6	1.7	7.2	1	0.2	1.7	3.9	0.8	3.1	1	0.2	1.6
ARTR	3.5	0.7	2.9	2	0.4	3.4	10.2	2.0	8.1	2	0.4	3.2
ORHY	3.6	0.7	3.0	3	0.6	5.1	2.0	0.4	1.6	4	0.8	6.4
EPNE	9.4	1.9	7.8	1	0.2	1.7	6.5	1.3	5.2	1	0.2	1.6
HIJA							0.2	0.0	0.2	1	0.2	1.6

TABLE 4-4 (Cont.)

Species	Transect 4A Total dm	Cover (%)	Rel Cover (%)	# Indiv.	Density (#/100dm)	Relative Density (%)	Transect 4B Total dm	Cover (%)	Rel. Cover (%)	# Indiv.	Density (#/100dm)	Relative Density (%)
CH	84.4	16.9	80.0	36	7.2	52.2	73.3	14.7	61.0	33	6.6	27.5
ORHY	6.6	1.3	6.3	8	1.6	11.6	0.5	0.1	0.4	1	0.2	0.8
HIJA	4.2	0.8	4.0	11	2.2	16.0	30.8	6.2	25.6	73	14.6	60.8
SPCR	1.6	0.3	1.5	1	0.2	1.4						
BOGR	1.4	0.3	1.3	4	0.8	5.8						
ARPU	7.3	1.5	6.9	9	1.8	13.0	5.2	1.0	4.3	7	1.4	5.8
GUSA							10.3	2.1	8.6	6	1.2	5.0
TOTALS	105.5	21.1	100.0	69	13.8	100.0	120.1	24.1	99.9	120	24.0	99.9
	Transect 5A						Transect 5B					
ATCO	96.1	19.2	54.2	42	8.4	68.8	70.7	14.1	45.9	31	6.2	68.9
SAVE	81.3	16.3	45.8	19	3.8	31.2	83.2	16.6	54.1	14	2.8	31.1
TOTALS	177.4	35.5	100.0	61	12.2	100.0	153.9	30.7	100.0	45	9.0	100.0
	Transect 6											
ARTR	128.5	25.7	100.00	27	5.4	100.00						
TOTALS	128.5	25.7	100.00	27	5.4	100.00						
	Transect 7											
CH	35.1	7.0	41.2	18	3.6	23.1						
ARPU	18.8	3.8	22.1	14	2.8	18.0						
HIJA	13.8	2.8	16.2	38	7.6	48.7						
GUSA	16.4	3.3	19.3	7	1.4	9.0						
SPCR	1.1	0.2	1.3	1	0.2	1.3						
TOTALS	85.2	17.1	100.1	78	15.6	100.1						

TABLE 4-4 (Cont.)

Species	Total dm	Cover (%)	Rel. Cover (%)	# Indiv.	Density (#/100 dm)	Relative Density (%)
			Transect 8			
CH	93.7	18.7	77.8	50	10.0	57.5
SIHY	1.5	0.3	1.2	2	0.4	2.3
CELA	20.3	4.0	16.9	25	5.0	28.7
ARTR	2.3	0.5	1.9	1	0.2	1.2
HIJA	2.3	0.5	1.9	8	1.6	9.2
ORHY	0.3	0.1	0.2	1	0.2	1.2
TOTALS	120.4	24.1	99.9	87	17.4	100.1
			Transect 9			
CH	69.7	13.9	65.4	31	6.2	43.7
SPCR	19.8	4.0	18.6	18	3.6	25.4
HIJA	6.8	1.4	6.4	13	2.6	18.3
GUSA	3.9	0.8	3.7	2	0.4	2.8
SIHY	2.1	0.4	2.0	3	0.6	4.2
ER	0.8	0.2	0.8	1	0.2	1.4
ORHY	2.7	0.5	2.5	2	0.4	2.8
ARPU	0.8	0.2	0.8	1	0.2	1.4
TOTALS	106.6	21.4	100.2	1	14.2	100.0
			Transect 10			
ARTR	95.3	19.1	73.8	14	2.8	40.0
CH	29.4	5.9	22.8	15	3.0	42.8
ORHY	2.5	0.5	1.9	2	0.4	5.7
GUSA	1.2	0.2	0.9	2	0.4	5.7
HIJA	0.7	0.1	0.5	2	0.4	5.7
TOTALS	129.1	25.8	99.9	35	7.0	99.9

TABLE 4-4 (Cont.)

Species	Total dm	Cover (%)	Rel. Cover (%)	# Indiv.	Density (#/100 dm)	Relative Density (%)
			Transect 11			
SAVE	68.2	13.6	51.2	15	3.0	37.5
ATCO	56.5	11.3	42.4	23	4.6	57.5
KOAM	8.6	1.7	6.4	2	0.4	5.0
TOTALS	133.3	26.6	100.0	40	8.0	100.0
CELA	3.2	0.6	4.1	3	0.6	4.8
ORHY	0.6	0.1	0.8	1	0.2	1.6
CH	65.6	13.1	84.4	42	8.4	67.7
HIJA	5.5	1.1	7.1	14	2.8	22.6
EPNE	2.8	0.6	3.6	2	0.4	3.2
TOTALS	77.7	15.5	100.0	62	12.4	99.9
			Transect 13			
GUSA	156.8	31.4	98.1	29	5.8	90.6
CHNA	3.1	0.6	1.9	3	0.6	9.4
TOTALS	159.9	32.0	99.9	32	6.4	100.0
			Transect 14			
GUSA	3.4	0.7	4.3	2	0.4	4.2
ARNO	41.0	8.2	51.6	25	5.0	53.2
SIHY	0.4	0.1	0.5	1	0.2	2.1
ORHY	4.3	0.9	5.4	3	0.6	6.4
ATCO	20.2	4.0	25.4	10	2.0	21.3
CH	10.1	2.0	12.7	6	1.2	12.7
TOTALS	79.4	15.9	99.9	47	9.4	99.9

some of the varieties of this species. It should be noted that E. engelmanii var. purpureus is proposed for federal listing as an endangered species and that, with the exception of Opuntia sp., all cacti are recommended as threatened or endangered (Welsh and Thorne 1979).

Animal sign on the site was limited to horse droppings and a small amount of rabbit pellets.

4.3.2.2 Site 2

Transects on Site 2 cross the Negro Liza Wash at an elevation of approximately 5,500 feet. Soil texture is a composite of fine and coarse sand, fine and coarse gravel, silt and clay. Slope is less than 3 degrees. Disturbance from grazing is moderate.

Along the wash, on-site vegetation consists mainly of a rubber rabbitbrush (Chrysothamnus nauseosus)/big sagebrush (Artemisia tridentata) association. Between the wash and the terrace, the dominant association is A. tridentata. Chrysothamnus nauseosus and, to a lesser extent, Aristida purpurea are also are found on the transect lines. Total percent cover is approximately 18 percent.

Other species in the area include Penstemon sp., Opuntia sp., Chrysothamnus sp., Hilaria jamesii, and Atriplex canescens.

One cottontail rabbit (Silvilagus audobonii), coyote scat, and numerous rabbit pellets were also observed on the site.

4.3.2.3 Site 3

Site 3 is located at an elevation of approximately 5,500 feet. Soil consists of silt, fine and coarse sand, and coarse gravel, and slope is less than 3 percent. Low disturbance from grazing was observed on the site.

This area is transitional between the big sagebrush (Artemisia tridentata) associations on the higher alluvial fans and the valley floor rabbitbrush (Chrysothamnus sp.) associations. Vegetation consists of the dominant Chrysothamnus sp., with several other shrubs present along the transect in much smaller numbers. These include Ephedra nevadensis, Artemisia tridentata, and Atriplex canescens. The grasses, Hilaria jamesii and Oryzopsis hymenoides, are also present. Total cover is approximately 25 percent, composed mainly of Chrysothamnus (80 percent relative cover).

Species adjacent to the transect area include Sitanion hystrix, Astragalus sp., Opuntia sp., Ceratoides lanata, Eriogonum microthecum, and Eriogonum sp.

No animals were seen at this site, although some rabbit pellets, horse droppings, and possible antelope scat were recorded.

4.3.2.4 Site 4

Site 4 is located on the valley floor at an elevation of approximately 5,250 feet. Slopes are less than 3 degrees, and soils are composed of silt and fine sand.

On-site vegetation is composed of a rabbitbrush (Chrysothamnus sp.)/grassland association. Grasses found on the transect include Oryzopsis hymenoides, Hilaria jamesii, Aristida purpurea, and Sporobolus cryptandrus. The shrubs, Chrysothamnus sp. and Gutierrezia sarothrae, are also present and Ceratoides lanata is adjacent to the transect. Total cover averages 23 percent, with Chrysothamnus sp. comprising 71 percent of the relative cover, and grasses making up the most of the remainder.

Disturbance due to cattle grazing is high in this area. Approximately 20 horned larks were the only wildlife observed.

4.3.2.5 Site 5

Site 5 is located within a saline basin on the valley floor at an approximate elevation of 5,200 feet. Soils are composed of silt and clay, and slope is less than 3 degrees.

The dominant plant association is black greasewood (Sarcobatus vermiculatus)/shadscale (Atriplex confertifolia). No other plant species occur along the transects, although the forb Halogeton glomeratus, an indicator of disturbed areas, is present near Transect 5A. The relative covers of S. vermiculatus and A. confertifolia are roughly equal, although A. confertifolia has a higher number of individuals. Total perennial cover averages approximately 33 percent.

Disturbance due to grazing is low. Wildlife sign in the area was limited to a few rabbit pellets.

4.3.2.6 Site 6

Site 6 is located in the foothills at an elevation of 5,392 feet. Slopes are less than 3 degrees, and soil is a mixture of silt, clay, and loam.

This area supports a big sagebrush (Artemisia tridentata) association. A. tridentata is the only plant species on the transect, although rabbitbrush (Chrysothamnus sp.) occurs in the vicinity. Total cover is approximately 26 percent.

Wildlife and animal sign include one raven, three small mammal burrows, and a few rabbit pellets. There is little evidence of cattle usage.

4.3.2.7 Site 7

Site 7 is located at an elevation of 5,240 feet on a slope of less than 3 degrees. The substrate consists of silty loam mixed with gravel.

The site is dominated by a rabbitbrush (Chrysothamnus sp.)/ grassland community, and perennial cover is approximately 17 percent. The majority of the cover consists of shrubs, with Chrysothamnus sp. and Gutierrezia sarothrae representing approximately 41 and 19 percent of the relative cover, respectively. The grasses, Aristida purpurea (22 percent relative cover) and Hilaria jamesii (19 percent relative cover), are also common. A few individuals of Sporobolus cryptandrus, another grass, are also present.

Cheatgrass (Bromus tectorum), Opuntia sp., and Nevada Mormon tea (Ephedra nevadensis) are present in the area adjacent to the transect.

Disturbance resulting from grazing is moderate. No wildlife or sign were observed.

4.3.2.8 Site 8

Site 8 is located at an elevation of 5,480 feet. Slope ranges from 0 to 3 degrees, and soil consists of a mixture of silt, coarse sand, and gravel.

On-site vegetation consists of a rabbitbrush (Chrysothamnus sp.)/winterfat (Ceratoides lanata) association. Sitanion hystrix, Hilaria jamesii, Oryzopsis hymenoides, and Artemisia tridentata are present on the transect. The majority of this cover is made up of Chrysothamnus sp. (relative cover 78 percent) and C. lanata (relative cover 17 percent). Other species found adjacent to the transect include Aristida purpurea, Bromus tectorum, and Gutierrezia sarothrae. A pure stand of C. lanata is located a short distance to the north. Total perennial cover was approximately 24 percent.

Disturbance as a result of grazing is low in this area, although cattle were grazing during the survey. Animal signs include coyote scat, rabbit pellets, and small mammal burrows. North of the transect but still within the Chrysothamnus sp./Ceratoides lanata association, a coyote and a rough-legged hawk were sighted.

4.3.2.9 Site 9

Site 9 is located at an elevation of 5,150 feet on a slope of less than 3 degrees. Soil consists of silty loam containing particles of sand, clay, and fine and coarse gravel.

On-site vegetation is composed of a rabbitbrush (Chrysothamnus sp.)/grassland association. Chrysothamnus sp. (65 percent relative cover) dominates. Total perennial cover is approximately 21 percent. A variety of grasses, including Sporobolus cryptandrus, Hilaria jamesii, Sitanion hystrix, Oryzopsis hymenoides, Aristida purpurea, Gutierrezia sarothrae, and Erigeron sp., are present in small numbers along the transect and provide approximately 40 percent of the relative cover. Additional species adjacent to the transect include Bromus tectorum and Sphaeralcea sp.

Disturbance due to grazing is moderate. No wildlife or wildlife sign were observed.

4.3.2.10 Site 10

Site 10 is located just above the valley floor at an approximate elevation of 5,250 feet. Soils are composed of fine sand, silt, and coarse gravel, and slope is less than 3 degrees.

On-site vegetation is dominated by a big sagebrush (Artemisia tridentata)/rabbitbrush (Chrysothamnus sp.) association. A. tridentata provides approximately 74 percent of the relative cover and Chrysothamnus sp. 23 percent. The other three species

occurring less frequently along the transect include Oryzopsis hymenoides, Hilaria jamesii, and Gutierrezia sarothrae. Total perennial cover is approximately 26 percent. Plant species adjacent to the transect include Bromus tectorum, Sitanion hystrix, and Lepidium montanum.

Little grazing disturbance or wildlife sign were noted, although one cottontail rabbit and a small amount of rabbit pellets was observed.

4.3.2.11 Site 11

Site 11 is located on the valley floor at an approximate elevation of 5,020 feet. This area is nearly level, and soil is mainly silt.

The dominant vegetative association is black greasewood (Sarcobatus vermiculatus)/shadscale (Atriplex confertifolia), an association typical of valley floors in Utah. Total perennial cover is approximately 27 percent. Sarcobatus vermiculatus and Atriplex confertifolia comprise 51 and 42 percent of the relative cover, respectively. Green molly (Kochia americana) is also present on the transect. Species observed adjacent to the transect include Lepidium montanum, Bromus tectorum, Descurainia sp., and Tetradymia spinosa.

Disturbance due to grazing is low. The only wildlife sign observed was several small mammal burrows.

4.3.2.12 Site 12

Site 12 is located near the IPP line at an elevation of approximately 5,180 feet. Soils here are composed of silt and coarse gravel, and slopes are less than 3 degrees.

The dominant plant is rabbitbrush (Chrysothamnus sp.); winterfat (Ceratoides lanata) and galleta grass (Hilaria jamesii) are represented to a lesser extent. Oryzopsis hymenoides and Ephedra nevadensis are found in small numbers along the transect. Total perennial cover is approximately 16 percent, with Chrysothamnus sp. accounting for 85.4 percent of the relative cover. A number of other species are found in the area adjoining the transect, including Atriplex canescens, Gutierrezia sarothrae, Sphaeralcea sp., Sporobolus cryptandrus, Sitanion hystrix, Bromus tectorum, and Salsola iberica. B. tectorum and S. iberica are characteristic of disturbed areas.

Grazing disturbance in the transect area is moderate. No wildlife or wildlife sign were observed.

4.3.2.13 Site 13

Site 13 is located in a small wash near the IPP line at an elevation of approximately 5,200 feet. Soils are a sand and gravel mixture, and slopes are less than 3 degrees.

The dominant vegetation is a rubber rabbitbrush (Chrysothamnus nauseosus) association in which C. nauseosus comprises 98 percent of the relative cover. Only one other species, broom

snakeweed (Gutierrezia sarothrae), is found on the transect. Total perennial cover is approximately 32 percent. Several other species are represented in adjacent areas, including Ephedra nevadensis, Astragalus sp., Sisymbrium sp., Ceratoides lanata, Oryzopsis hymenoides, Bromus tectorum. and Salsola iberica.

Disturbance caused by cattle grazing is high. This is also indicated by the presence of B. tectorum and S. iberica, plants indicative of disturbed areas. Several horned larks were the only wildlife observed on the site.

4.3.2.14 Site 14

Site 14 is located at an elevation of approximately 5,300 feet on slopes ranging from 3 to 8 degrees. Soils are silty loams with gravel on the surface.

Black sagebrush (Artemisia nova) is the major plant association on the portion of the transect located on a foothill having shallow soils. The remainder of the transect site is a mixed shrub/grassland association containing the shrubs Artemisia nova, Atriplex confertifolia, Gutierrezia sarothrae, and Chrysothamnus sp. Two grasses, Sitanion hystrix and Oryzopsis hymenoides, are also present. Total cover is approximately 16 percent. Ceratoides lanata, Ephedra nevadensis, Bromus tectorum, and Eriogonum sp. are present in the area adjacent to the transect.

No wildlife or wildlife signs were observed in this area.

4.4 CONCLUSIONS

No threatened or endangered plants are known to occur in the study area although several are known to be present in the vicinity. Others may be undiscovered because few studies have been made within the area. No threatened or endangered plant species were observed during the field survey. However, due to the time of the survey, several individuals were observed that may possibly be threatened or endangered species, although the species or variety could not be positively identified. These species include an unidentified variety of Gutierrezia sarothrae, Opuntia sp., Penstemon sp., Eriogonum sp., Astragalus sp., Erigeron sp., and Crypthantha sp. The sample area was very small in relation to the entire OB area. It is possible that if these species or varieties are endangered, that larger populations may exist within the OB area. This can be determined only by a survey of the entire area during a season when flowers or other reproductive structures necessary for identification are present.

Several animal species protected by state or federal law were identified from the literature. Direct effects of OB construction would include loss of some habitat supporting small year-round protected mule deer populations in the study area and vicinity. Large areas of year-round pronghorn antelope habitat are located in the study area, and both habitat and antelope would probably be affected. Both antelope and mule deer are protected by state law. Raptors, game birds and other species either use the study area or migrate through it, including the

endangered bald eagle. Golden eagle nests and a peregrine falcon nest are known to exist in the study area; additional nests are in the vicinity. Sage grouse are also known to occur in the northern portion of the study area, and some habitat would be effected. Eagles and falcons are protected by federal law; the sage grouse is protected by state law.

Indirect effects on elk, kit fox, and bobcat, all protected species, could result from poaching and increased human usage of the habitat. Prairie dog transplant colonies are located in the vicinity, and one colony is approximately 10 miles from the study area; any affects would be indirect, and probably due to increased traffic. Increased activity within the area, and disruption of the prey base may also effect raptors and carnivores in the area.

Although the field studies provided little information on the larger animal species present, they did provide insight into the characteristic plant communities and indicate habitat is present that could support animal populations described in the literature. The field study also confirmed the presence of many small mammals that provide prey for raptors migrating through the study area.

5.0 CULTURAL RESOURCES STUDY METHODS

5.1 BACKGROUND RESEARCH

The information presented here is based on literature and records searches, consultations with agency and academic personnel familiar with the OB study areas, and field visits to the areas.

5.1.1 Records Search and Agency Consultations

Table 5-1 presents a list of all agencies, institutions, and individuals consulted.

The literature and records search consisted of visiting the primary agencies and institutions that maintain information on the study areas and plotting the Native American cultural areas, and known archeological and historical sites onto maps of the OB study areas. In addition to plotting known sites, all cultural resources site forms, survey reports, and academic publications dealing with the OB study areas were collected. Data believed out of date or incorrect were updated and corrected whenever possible. Emphasis was placed on visits to the University of Nevada at Las Vegas, the University of Utah, the Utah State Historical Society, and the Utah State Office of the Bureau of Land Management. Data at each of these centers were cross-checked and evaluated, comparing site records to mapped site locations and computer printouts.

TABLE 5-1

AGENCIES, INSTITUTIONS, AND INDIVIDUALS CONSULTED FOR INFORMATION ON CULTURAL RESOURCES

Institution	Personnel	Interview Type		Resource			
		Visit	Phone Call	Records	Maps	Computer	Publication
HDR	William Doelle Linda Mayro	X		X	X	X	X
U. Nevada-Las Vegas Archeological Research Center	Kathleen Bergen Linda Brennan Richard Brooks	X		X	X		
BLM--Las Vegas Office	Stan Rolf	X			X		X
Facilitators, Inc.	Michael Ostanik Susan Ostanik	X		X	X		X
BLM--Cedar City Office	Gardiner Dalley	X			X		
S. Utah State College	Richard Thompson	X		X	X		X
Brighman Young U.	Dale Berge	X			X		X
BLM--Richfield Office	Marian Rivette	X			X		
University of Utah	James O'Connell Richard Holmer Alan Lichty	X		X	X	X	
Utah State Historical Society	James Dykeman David Madsen	X		X	X		X
BLM--Utah State Office	Richard Fike	X		X	X		X
BLM--Nevada State Office	Richard Hanes		X				X
Nevada State Museum	David Johnson Evelyn Seelinger		X		X		
Basin Research Associates	Colin Busby Larry Kobori	X					X

Consultations also included interviews with agency and academic personnel familiar with the OB study areas. These interviews were also used to gather information on sites that are known but not recorded.

5.1.2 Field Visits

In addition to the literature and records search, field visits were made to each of the study areas. The locations of all known sites were observed and photographed, and all passable roads in the OB study areas were driven.

5.1.3 Data Analysis

Data for areas within 5 miles of the boundaries of each OB study area are evaluated in this report; this area can be expected to have the highest, indirect project effects. When the background research was complete, these data were evaluated in terms of the general environmental setting and the nature, cultural affiliation, and significance of each known cultural resources site. The potential for other sites in the areas was also considered.

Environmental categories used for evaluating the data include mountains, bajadas, and valleys, including some (in the Milford-Beryl OB study area) with rivers. These environmental categories are general but useful for considering settlement patterns and areas of high cultural resources potential.

Sites are tabulated and evaluated by type, including isolated artifact, quarry, lithic scatter, temporary campsite, and

village, which are defined in Appendix C. This classification is taken from the MX Cultural Resources Field Manual and is used to provide data compatible with previous MX research. Much of this previous work identifies sub-types within these site categories, but the limited data available for this study do not allow such subdivisions.

Discussions of significance in this study are based on the criteria used to establish the eligibility of a given site or group of sites for the National Register of Historic Places:

To qualify for the National Register of Historic Places, a cultural property must meet one of the criteria for significance established by the President's Advisory Council on Historic Preservation presented below:

> The quality of significance in American history, architecture, archeology, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:
>
> (1) That are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> (2) That are associated with the lives of persons significant in our past; or
>
> (3) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> (4) That have yielded, or may be likely to yield, information important in prehistory or history (36 CFR 800.10).

In areas like the Coyote Spring and Milford-Beryl OB study areas, where little is known about the prehistory or history and where very few cultural resources surveys have been made, most sites must be considered significant -- any information they can yield will be important to the scientific record.

5.2 COYOTE SPRING VALLEY

5.2.1 Southern Paiute Land Use

The Coyote Spring OB study area falls within the former territory of the Southern Paiute Indians. This group and the closely related Chemehuevi Indians occupied an area north and west of the Colorado River; this area included southern Nevada (Hauck, et al. 1979). Their territory included the Mojave and Great Basin deserts, both of which produced varied but low densities of widely dispersed plant and animal resources upon which the Southern Paiute subsisted. As a result, Southern Paiute population density was low, and only about 300 were recorded living in an area of approximately 9,000 square miles around Las Vegas in the middle of the 19th century (Hauck, et al. 1979).

Southern Paiute subsistence consisted primarily of hunting and gathering a wide variety of plant and animal species; a little horticulture was practiced in such better watered areas as the Moapa, Pahranagat, and Meadow valleys and as far northwest as Pahrump Valley and Ash Meadows (Fowler et al. 1973, Hauck et al. 1979). They collected the seeds and roots of numerous grasses and other herbaceous plants, shrubs, and trees; hunted reptiles,

amphibians, and large and small mammals; and gathered insects. Garden plots, located in moist areas near streams, were used to grow corn, squash, beans, and sunflowers.

Resources were usually not abundant enough in local areas to support large groups of people, making the family the primary economic unit. Families gathered briefly for rabbit and antelope drives and during years in which pine nut crops were large. In addition, when hunting and collecting during the warmer months allowed good stores of food, families gathered to winter together in large camps or villages near dependable sources of water.

Because the abundance of plant and animal resources varied seasonally and from year to year as well as in location, the Southern Pauite used a flexible settlement pattern to exploit them. In the spring, when stored foods were depleted, families moved to moist flats such as playas to collect early plants and insect larvae. In the summer, they gathered seeds in the lower sagebrush zone, and collected berries and hunted deer and mountain sheep in the mountains. In the fall, they collected pine nuts in the mountains and made rabbit and antelope drives on the valley floors.

American mineral exploration and settlement of Southern Paiute territory ended the aboriginal lifeway. Many Southern Paiutes were removed to the Moapa Reservation, which lies southeast of the OB study area. The Moapa Band is presently working for

economic independence, adding land to their reservation, undertaking new agricultural projects, and exploring new marketing of their crafts and other commercial ventures.

5.2.2 Prehistoric Land Use

Information on prehistoric cultures in the Coyote Spring Valley OB area comes from several sources, including the work of Crabtree and Ferraro (1980), Fowler et al. (1973), Hauck et al. (1979), and Shutler et al. (1960).

Table 5-2 summarizes the prehistoric cultures that have been identified in southern Nevada and their time periods. Each culture is identified by distinctive styles (forms) of projectile points as well as other kinds of tools, and some are characterized by particular types of dwellings or styles of pottery.

Occupation of the area may have occurred by 12,000 years B.P. (Before Present) or earlier with the Big Game Hunting Culture and subsequent (approximately 9,000-7,500 B.P.) San Diequito/ Lake Mohave Culture. Remains of both of these cultures are characterized by distinctive styles of spear points. Sites are located along the shores of now-dry lakes and waterways or on the mesas and rocky terraces overlooking them.

Remains of the later (approximately 7,000-4,000 B.P) Pinto Culture are sparse, suggesting that this period when the waterbodies dried may have seen very low population densities

TABLE 5-2

PREHISTORIC CULTURAL SEQUENCE OF THE
COYOTE SPRING VALLEY OB STUDY AREA

Years B.P.*	Coyote Spring Area	Muddy River Area	
200			
400			
600	Protohistoric Culture		
800		Mesa House Phase	Anasazi Tradition
1,000		Lost City Phase	
1,200			
1,400		Muddy River Phase	
1,600			
1,800	Desert Culture	Moapa Phase	
2,000			
4,000			
6,000	Pinto Culture		Big Game-Hunting Tradition
8,000	San Diequito/Lake Mohave Culture		
10,000			
12,000	Big Game Hunting Culture		

* Before Present.

and even abandonment of some areas. The remains that have been identified show that stone tools for milling seeds were added to artifact inventories. Site assemblages suggest generalized hunting and gathering, with sites located along the remaining watercourses.

The Desert Culture (approximately 4,000-1,350 B.P.) also shows hunting and gathering of varied resources, with sites located near water sources. Sites include temporary camps near springs, rockshelters, roasting pits, and circular rock alignments that probably represent the remains of temporary huts.

While the Desert Culture existed in the Great Basin and most of southern Nevada, a series of cultural phases related to the Anasazi Tradition of the Southwest appeared in the Muddy and Virgin river valleys. These include the Moapa (approximately 2,000-1,450 B.P), Muddy River (approximately 1,450-1,250 B.P), Lost City (approximately 1,250-850 B.P), and Mesa House (approximately 850-800 B.P.) phases.

The Anasazi Tradition is characterized by a subsistence change to agriculture, even though direct evidence in the form of remains such as corn, beans, and squash have not been found at sites representing the Moapa and Muddy River phases. A settlement change to pithouses with storage cists located on knolls and mesas above the Moapa Valley in the Moapa Phase suggests the appearance of agriculture. Temporary camps and rockshelters

were used for hunting and gathering in the hinterlands as far west as the Spring Mountains. Some camps were used to mine minerals, probably for trade as well as use. Pottery appeared in the Muddy River Phase, and burials were made in and around pithouses.

Increasing numbers and large-sized sites suggest that the population increased, with the highest population density during the Lost City Phase. In addition to pithouses, villages included surface structures of rock and adobe. Temporary sites also included rock alignments and pits that were probably used for roasting plant foods.

The Anasazi Tradition ended with the Mesa House Phase, which is characterized by few sites. With its location of sites on high bluffs, narrow entrances to courtyards, and relatively large number of projectile points, this phase is thought to have possibly seen conflict between the Pueblo and Southern Paiute peoples. By 800 B.P., Pueblo groups abandoned the entire region, perhaps because drought damaged their agricultural base or because the Southern Paiute drove them away.

The Protohistoric Culture, the archeological manifestation of Southern Paiute occupation, dates from approximately 950 B.P. to Euroamerican contact. The Southern Paiute settlement pattern contrasted sharply with that of the Anasazi in its use of a wide variety of environments and lack of any substantial, permanent

dwellings. These characteristics and the ethnographic information discussed above suggest that the Protohistoric Culture practiced a generalized hunting and gathering subsistence, had limited agriculture, and conducted seasonal settlement movements like that of the Desert and Pinto cultures. Site types included camp sites at springs, roasting pits, rockshelters, and circular rock alignments located throughout southern Nevada.

5.2.3 Historical Land Use

Information on historical activities in the Coyote Spring Valley OB study area comes from the work of Hauck et al. (1979) and Roske and Planzo (no date).

Historical activities, including exploration, settlement, farming, and mining, all skirted the Coyote Spring OB study area. Euroamerican activities began around 1760 with the Spanish missionary Francisco Garces, who during the next 20 years led several expeditions through the southern Great Basin. In the early 19th Century, Jedediah Smith and, later, Peter Skene Ogden of the Hudson's Bay Company followed Garces, passing down the Virgin and Colorado rivers and west to California. The federal government sponsored numerous surveys of the Great Basin during the middle of the century to establish permanent wagon routes and the best route for the transcontinental railroad.

Mormons established the earliest settlement in the area at Las Vegas in 1855. A missionary post and rest station for

travelers to California, this settlement also served as a base for lead mining in mountains nearby. Soon after, Brigham Young sent other Mormon settlers into the Muddy River and Virgin River valleys to farm crops that could not be grown successfully around Salt Lake City.

Ranching began in the Las Vegas area in 1865 and expanded throughout the area, including the Spring Mountains and Muddy and Virgin River valleys, after the railroad was completed in 1905. Mining of such minerals as silver, gold, lead, copper, and zinc in various mountain ranges also began in the middle of the 19th century. More recently, non-metals such as gypsum, dolomitic limestone, and silica sand have been mined.

The primary historical land uses in the Coyote Spring OB area appear to have been ranching and mineral prospecting.

5.3 MILFORD-BERYL OB STUDY AREA

5.3.1 Southern Pauite Land Use

Like the Coyote Spring OB study area, the Milford-Beryl OB study area was inhabited by the Southern Pauite Indians (Jennings 1978). These groups practiced a generalized hunting and gathering subsistence strategy based on a variety of plant and animal resources. Some horticulture of corn, squash, and other plants provided a minor dietary supplement. Their mobile settlement pattern took them to a number of places throughout the year; they located dwellings in caves, rockshelters, and on sand

dunes. Sagebrush branches were used to construct huts and windbreaks in open areas. Their cultural inventory included baskets, milling stones, and chipped stone tools. In addition, they made crude pottery tempered with coarse fragments of crushed rock and used small stemmed, triangular projectile points.

5.3.2 Prehistoric Land Use

The prehistory of the Milford-Beryl OB study area, outlined in Jennings' study of Utah and the eastern Great Basin (1978), is similar to that of the Coyote Spring OB study area, although different names are used for the cultures and fewer cultural types are distinguished (Table 5-3). Occupation begins before 12,000 years B.P., and the earliest occupation is termed the Lithic Stage, equivalent to the Big Game Hunting Culture. Distinctive spear points have been reported from this period in the Escalante Desert near the study area (Keller and Hunt 1967) and in the Sevier Desert north of the area.

The Desert Archaic Stage (beginning by 10,000 B.P.) follows the Lithic Stage and marks a shift from big game hunting to hunting and gathering a wide range of plant and animal resources, particularly grasses and small game. Small groups of people moved frequently in a yearly cycle that involved valley bottom, bajada, and mountain environments. Most settlements were temporary, and population was sparse. Diagnostic artifacts include milling stones, basketry, and projectile points.

TABLE 5-3

PREHISTORIC CULTURES IN THE MILFORD-BERYL OB STUDY AREA

Years B.P.*	Culture
200	Southern Paiute Tradition
500	
1,000	Fremont Culture
2,000	
4,000	
6,000	Desert Archaic Stage
8,000	
10,000	Lithic Stage (Big Game Hunting Culture)
12,000	

* Before Present.

This culture continued until Euroamerican contact, with a shift from the use of spear-tipped projectiles to the bow and arrow about 4,000 B.P.

After about 1,900 B.P., Anasazi Tradition influence from the Southwest is seen in the area. Pottery from this tradition appears in sites in the study area. The unique Fremont Culture (approximately 1,400 to 700 B.P.) developed and showed a blend of Desert Archaic and Anasazi Tradition traits, with a subsistence pattern based on both farming and hunting and gathering.

The Fremont Culture settlement pattern was characterized by the use of distinctive pottery styles and by permanent villages with substantial structures, including granaries. The Fremont Culture surrounding the study area has been termed Parowan, and several Fremont village sites have been investigated. Sites are located on alluvial fans where mountain streams empty into valleys or within valleys, and many are large and show long-term use. Building and rebuilding commonly occurred, resulting in large mounds containing remnants of superimposed pithouses, granaries, and ceremonial structures.

After about 550 B.P., Fremont peoples abandoned the area; the reason for this is unknown but may have involved drought or pressure by the Southern Paiute.

5.3.3 Historical Land Use

No summaries of historical activities are available for the Milford-Beryl OB study area, although the area was a locus of early Mormon settlement. Farming and ranching have been the primary land use activites, with mining, particularly in the Shauntie Hills north of the study area, a later addition.

6.0 COYOTE SPRING VALLEY CULTURAL RESOURCES

6.1 ARCHEOLOGICAL SITES

One group of archeological sites near the Coyote Spring OB study area has been placed on the National Register of Historic Places. These sites, which constitute the Sheep Mountain Range Archeological District, are west of the proposed OB site. They are noted for their integrity and good condition.

Little archeological research and few cultural resources surveys have been undertaken in the area. Few archeological sites have been recorded, most from artifact collectors. These sites are shown in Figure 6-1 and Table 6-1. Only four sites have been recorded within the OB study area. All are lithic scatters located on the bajadas; no information is available on their cultural affiliation or significance in terms of potential eligibility for the National Register of Historic Places.

Within an area 5 miles north of the study area boundary, 12 sites have been recorded, one of which is in Kane Springs Valley; the rest are in Coyote Spring Valley. There are eight lithic scatters located in both valley and bajada environments. No information is available on their cultural affiliation. Almost no information is available on significance; however, one of the sites covers a very large area (1 mile x 2 miles). There are three temporary campsites, one containing ring-shaped stone alignments. They occur in valley and bajada environments. No

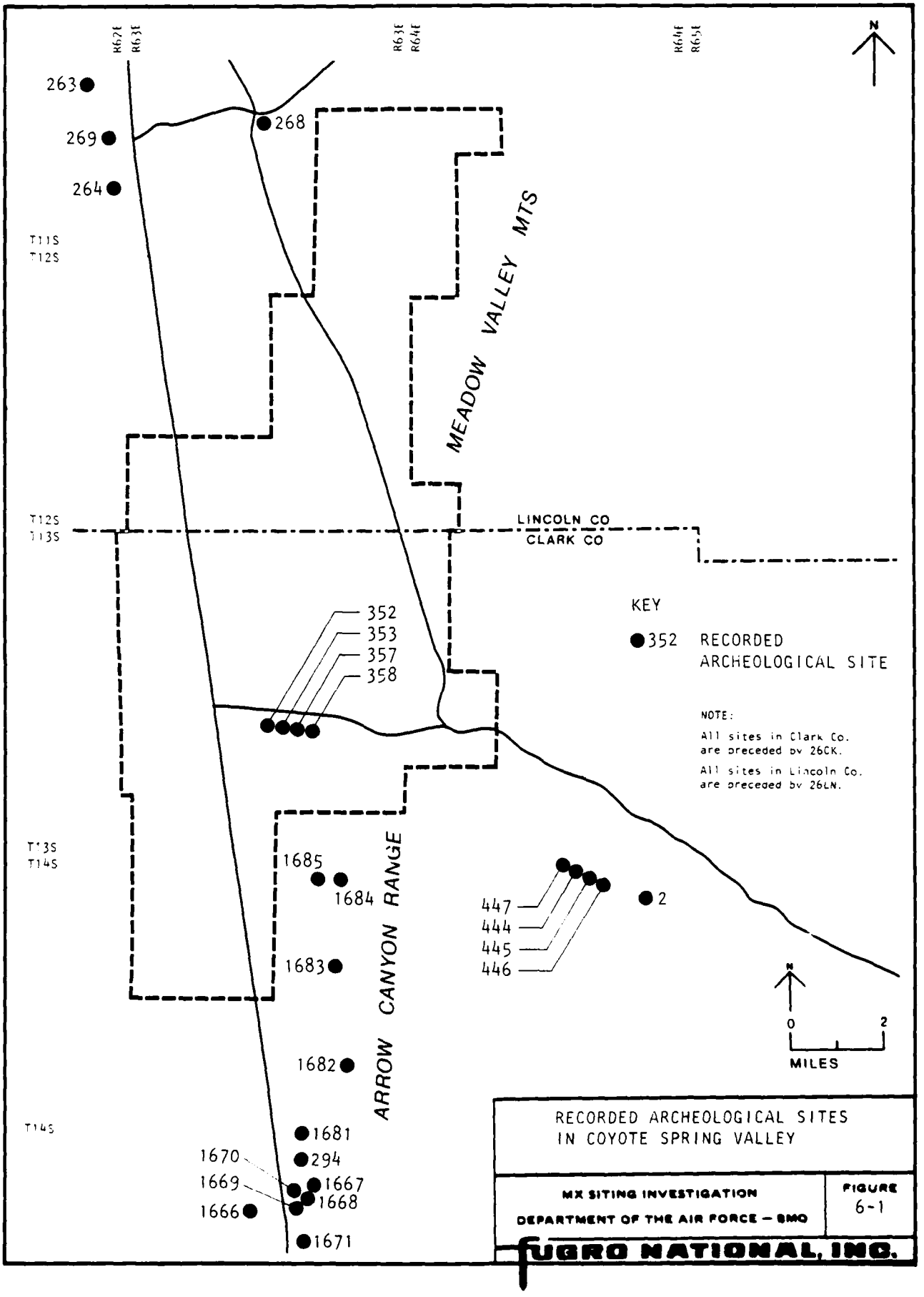

R62E
R63E
R63E
R64E
R64E
R65E
N
263
269
264
268
T11S
T12S
MEADOW VALLEY MTS
T12S
T13S
LINCOLN CO
CLARK CO
KEY
352 RECORDED ARCHEOLOGICAL SITE
NOTE:
All sites in Clark Co. are preceded by 26CK.
All sites in Lincoln Co. are preceded by 26LN.
352
353
357
358
T13S
T14S
1685
1684
1683
1682
ARROW CANYON RANGE
447
444
445
446
2
N
0
2
MILES
T14S
1681
294
1670
1669
1667
1668
1666
1671
RECORDED ARCHEOLOGICAL SITES IN COYOTE SPRING VALLEY
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO
FIGURE 6-1
UGRO NATIONAL, INC.

TABLE 6-1

RECORDED ARCHEOLOGICAL SITES IN THE COYOTE SPRING VALLEY OB AREA

Site Number	Legal Description (T	R	S)*	Site Type	Environment	Cultural Affiliation	Significance
Sites Within Study Area Boundary							
26CK352	13	63	27	Lithic Scatter	Bajada	--	--
26CK353	13	63	27	Lithic Scatter	Bajada	--	--
26CK357	13	63	27	Lithic Scatter	Bajada	--	--
26CK358	13	63	27	Lithic Scatter	Bajada	--	--
Sites North of Study Area Boundary							
Kane Springs Valley							
26LN268	11	63	21	Lithic Scatter	Valley	--	--
Coyote Spring Valley							
26LN260	11	62	22	Lithic Scatter	Bajada	--	Very Large
26LN261	11	62	23	Temporary Campsite	Bajada	--	--
26LN262	11	62	12	Temporary Campsite (w/stone rings)	Valley	--	Numerous Artifacts
26LN263	11	62	13	Lithic Scatter	Bajada	--	--

* T = Township South; R = Range East; and S = Section.

TABLE 6-1 (Cont.)

Site Number	Legal Description (T	R	S)	Site Type	Environment	Cultural Affiliation	Significance
Sites North of Study Area Boundary (Cont.)							
26LN264	11	62	25	Lithic Scatter	Valley	--	--
26LN269	11	62	24	Lithic Scatter	Valley	--	--
26LN273	11	62	1	Temporary Campsite	Bajada	--	--
26LN274	10	62	25	Possible Village	Bajada	--	Large
26LN1672	11	62	12	Lithic Scatter	Valley	--	--
26LN1673	11	62	12	Lithic Scatter	Valley	--	--
26LN1674	11	62	12	Lithic Scatter	Valley	--	--
Sites Southeast of Study Area Boundary							
26CK2	14	64	12	Rockshelter Petroglyph	Mountains	--	--
26CK444	14	64	3	Rockshelter Petroglyph	Mountains	--	--
26CK445	14	64	3	Rockshelter Petroglyph	Mountains	--	--
26CK446	14	64	3	Rockshelter Petroglyph	Mountains	--	--
26CK447	14	64	3	Rockshelter Petroglyph	Mountains	--	--

TABLE 6-1 (Cont.)

Site Number	Legal Description (T	R	S)	Site Type	Environment	Cultural Affiliation	Significance
Sites South of Study Area Boundary							
26CK294	15	63	3	Lithic Scatter Rock Alignment	Valley	--	Large
26CK1666	15	63	-	3 Rock Shelters	Bajadas	Southern Paiute	--
26CK1667	15	63	-	Temporary Campsite w/Roasting Pits	Bajadas	--	--
26CK1668	15	63	-	Rockshelter Roasting Pits	Bajadas	Southern Paiute	--
26CK1669	15	63	-	2 Rock Shelters	Bajadas	--	--
26CK1670	15	63	-	Roasting Pits	Bajadas	--	--
26CK1671	15	63	-	Rockshelter	Bajadas	--	--
26CK1681	14	63	-	Lithic Scatter	Valley	--	--
26CK1683	14	63	-	Lithic Scatter	Valley	--	--
26CK1684	14	63	-	Temporary Campsite	Valley	Southern Paiute	--
26CK1685	14	63	-	Lithic Scatter	Valley	--	--

information is available on cultural affiliation or significance; however, the site with stone rings produced a surface collection of numerous artifacts. There is a possible village site, located on the bajada. No information is available on cultural affiliation or significance, but the site is large, covering an area of 400 feet by 600 feet.

Numerous archeological sites have been recorded along the Muddy River southeast of the study area. Because these sites lie more than 5 miles from the study area boundary, they are not discussed. There are five sites within approximately 5 miles of the study area boundary. All are rockshelters located in the Arrow Canyon Range, and four of them have associated petroglyphs. While four of them are in an area excavated by the Civilian Conservation Corps, no information is available on their cultural affiliation or significance.

Eleven sites have been recorded within the 5-mile area south of the study area boundary. There are four lithic scatters, one with a rock alignment; all occur in valley environments. No information is available on cultural affiliation or significance, but one site is large, covering an area of about 200 feet by 1,400 feet. There are four rockshelters, and one has associated roasting pits. All are located in bajada environments. Two contain Southern Paiute pottery; no information is available on their significance. There are two temporary campsites in

the badajas and valleys. One has Southern Paiute pottery; no information is available on their significance. One site, located in the bajada environment, consists of roasting pits. No information is available on its cultural affiliation or significance.

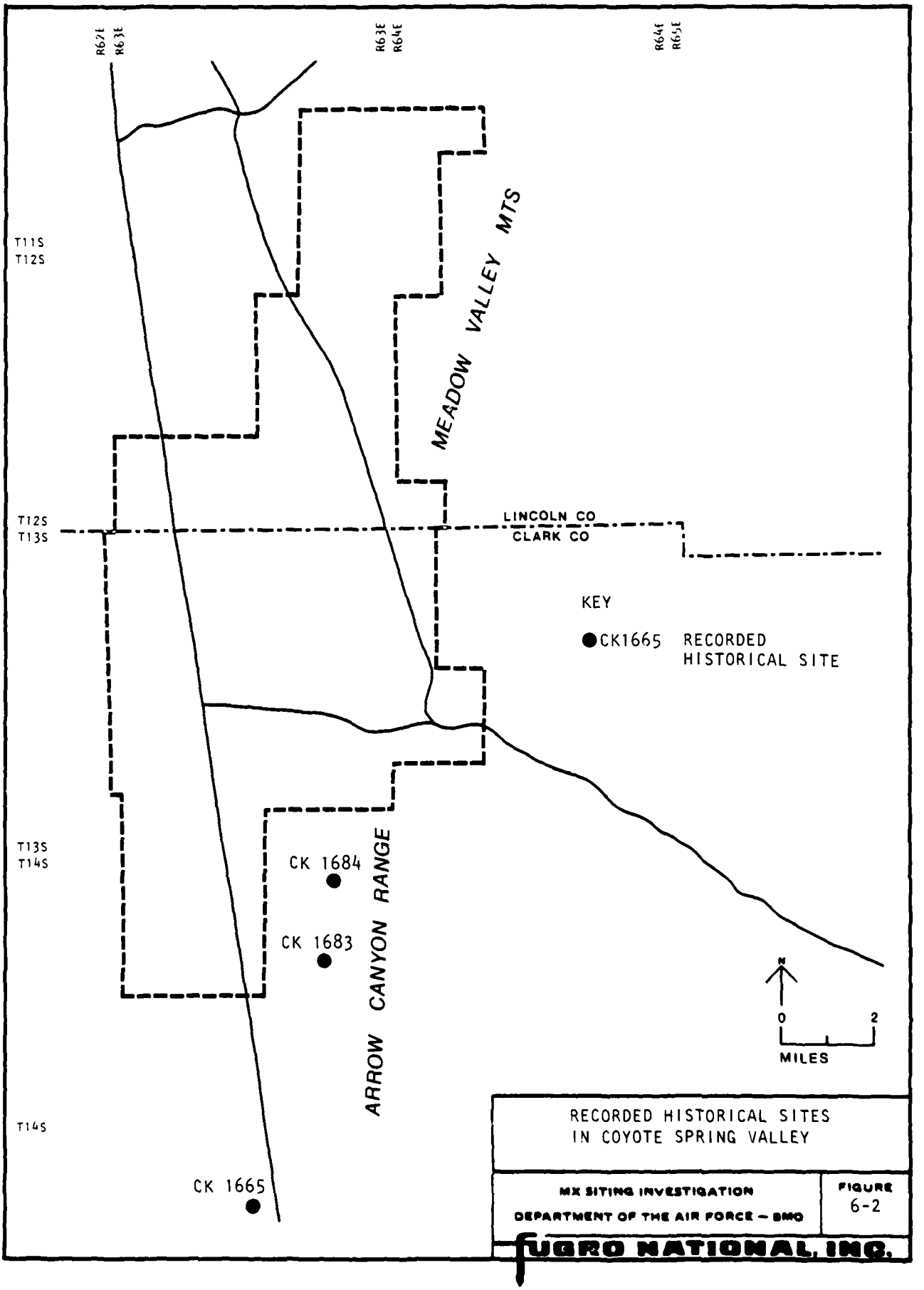
6.2 HISTORICAL SITES

No historical sites have been recorded within the OB study area boundary, and only three have been recorded within the 5-mile area surrounding the study area (Figure 6-2, Table 6-2). All are south of the study area. One consists of a campsite, used in the 1930s by the Fay Perkins family, early settlers in the area. The two remaining sites are trash dumps, one associated with a railroad survey conducted about 1901 and the other with well construction.

6.3 NATIVE AMERICAN CULTURAL AREAS

Information on Native American cultural areas comes from work by Facilitators, Inc. (Ostanik and Ostanik 1980).

No Native American cultural areas have been recorded within the OB study area boundary, although four areas have been recorded nearby (Figure 6-3, Table 6-3). Two sites occur north of the study area boundary, Kane Springs Wash and Coyote Springs. Both were used traditionally for habitation, burial, plant gathering, hunting, and rock art; trails passed near them. Use continues in Kane Springs Wash, while access to the



RECORDED HISTORICAL SITES IN COYOTE SPRING VALLEY

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE 6-2

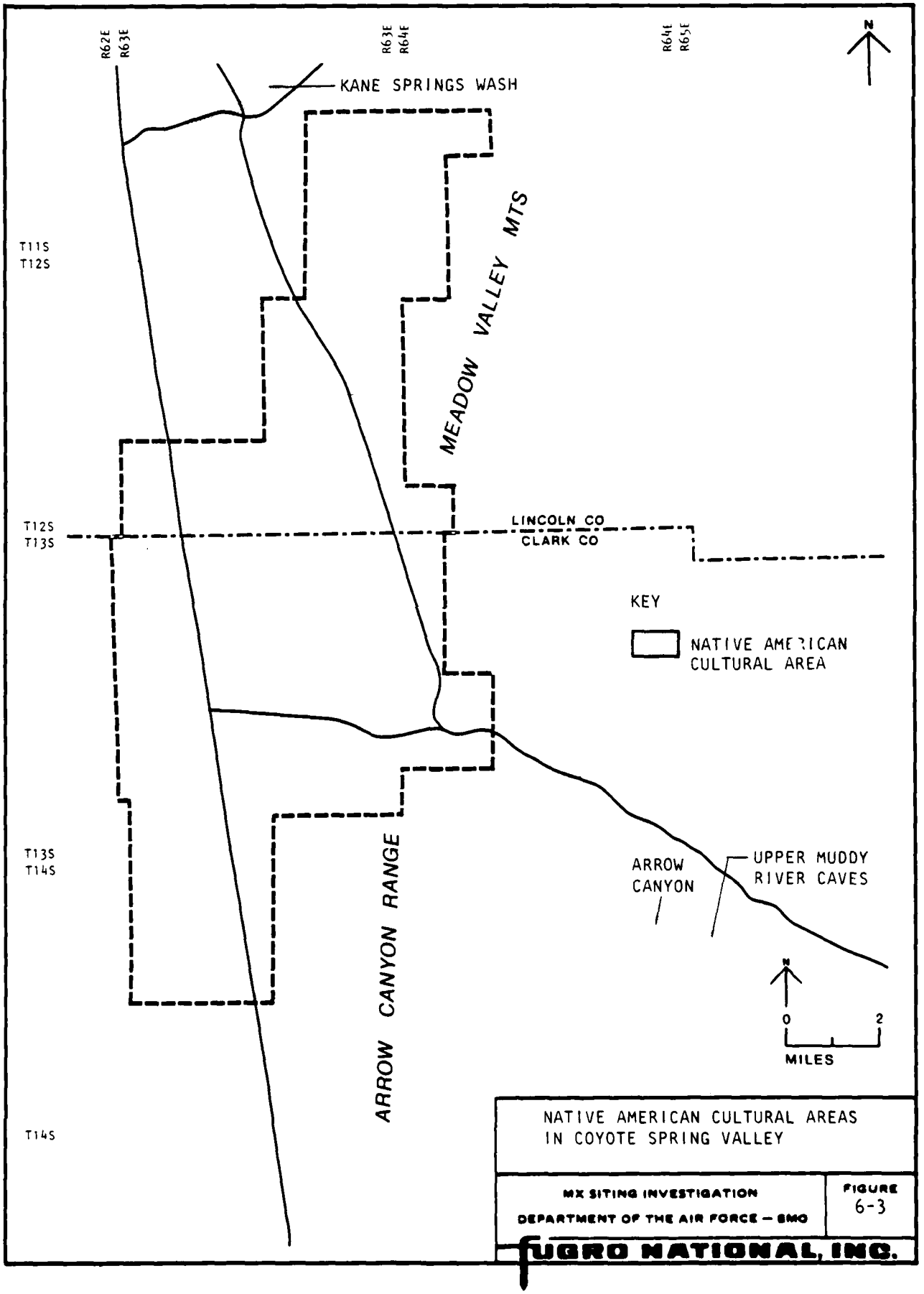
FUGRO NATIONAL, INC.

TABLE 6-2

RECORDED HISTORICAL SITES IN THE COYOTE SPRING VALLEY OB AREA

Site Number	Legal Description (T R S)*	Site Type	Comments
Sites South of Study Area Boundary			
26CK1665	15 63 -	Settlers' Campsite	Popular camping spot for settlers; area used by Fay Perkins family in 1930s.
26CK1683	14 63 -	Dump	Left from railroad survey about 1901.
26CK1684	14 63 -	Dump	Iron casings and tin cans resulting from well construction.

* T = Township South; R = Range East; and S = Section.



NATIVE AMERICAN CULTURAL AREAS
IN COYOTE SPRING VALLEY

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE
6-3

FUGRO NATIONAL, INC.

TABLE 6-3

RECORDED NATIVE AMERICAN CULTURAL AREAS
IN THE COYOTE SPRING VALLEY OB AREA

Site Number	Site Name	Native American Use
Sites North of Study Area Boundary		
1	Kane Springs Wash	Habitation, trail, burial, plant gathering, hunting, rock art
4	Northern Coyote Spring Valley, near Coyote Springs	Habitation, burial, trail, plant gathering, hunting, rock art
Southeast of Study Area Boundary		
5	Arrow Canyon	Habitation, trail, burial, hunting, rock art, battle, sacred site
6	Upper Muddy Caves	Habitation, trail, burial, plant gathering, rock art

Source of information: Facilitators, Inc. Data Sheets (Ostanik and Ostanik 1980)

Coyote Springs area has been curtailed by private land owne - ship. Two sites occur southeast of the study area boundary, Arrow Canyon and the Upper Muddy Caves. The Arrow Canyon site area consists of rockshelters that were used for habitation, burial, hunting, and fighting battles; a trail passed near them. While the site is not used today, it is considered sacred. The Upper Muddy Caves were also used for habitation, burial, plant gathering, and rock art; a trail passed near them. Private land ownership prevents use of this area at present.

Other Native American use areas occur in Pahranagat Wash, Delamar Hills, Delamar Valley, and Meadow Valley Wash, which occur more than 5 miles from the study area boundary.

6.4 POTENTIAL CULTURAL RESOURCES SITES

Even though almost no systematic cultural resources surveys have been conducted in and around the Coyote Spring Valley OB study area, a number of sites have been recorded within 5 miles of the study area boundary. Several kinds of archeological sites occur in the valley, bajada, and mountain areas, suggesting that systematic surveys will discover a large number of additional sites. Many of the discovered sites would likely contain information on the prehistoric occupation of the relatively little known area and thus would probably be eligible for the National Register of Historic Places. Relatively few

historical sites are expected, because few historical activities, except ranching and some prospecting, took place in the area. Work by Facilitators, Inc. has probably recorded all of the traditional and current Native American use areas, suggesting that few additional areas will be discovered.

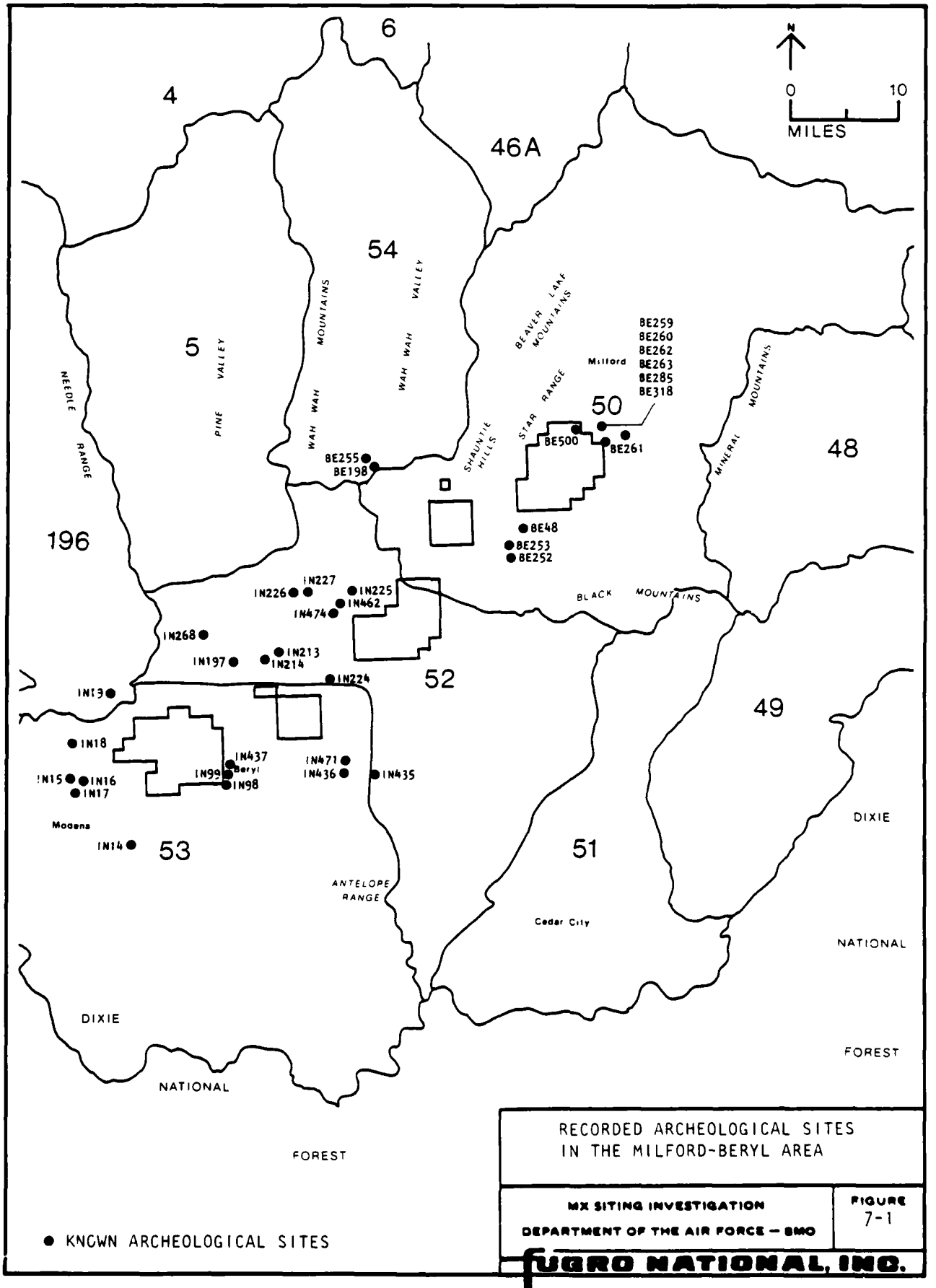
7.0 MILFORD-BERYL CULTURAL RESOURCES

7.1 ARCHEOLOGICAL SITES

Two sites near the Milford-Beryl OB study area are listed on the National Register of Historic Places. These include the Wildhorse Canyon obsidian quarry northeast of Milford and the Gold Spring site, approximately 9 miles northwest of Modena. Little archeological research has been undertaken in the study area (Berge 1974, 1979; Lindsay 1975; Nielson and Thompson 1977; Thompson 1975), and no archeological sites have been recorded in it; however, within the 5-mile area surrounding the study area boundary, 17 sites have been recorded in Beaver County and 22 in Iron County (Figure 7-1, Table 7-1).

The Beaver County sites include two isolated artifacts in the valley and mountain environments; no information is available on cultural affiliation or significance. One stone quarry is located in the mountains, but there is no information on its cultural affiliation or significance. The sites include nine lithic scatters (one with ceramics) in river valley, valley, bajada, and mountain environments; one is affiliated with the Sevier Fremont Culture, and no information is available on the significance of any of the lithic scatters.

The sites include three temporary campsites in river valley environments. Two of these sites are affiliated with the



RECORDED ARCHEOLOGICAL SITES
IN THE MILFORD-BERYL AREA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE
7-1

FUGRO NATIONAL, INC.

TABLE 7-1

ARCHEOLOGICAL SITES IN THE MILFORD-BERYL CB AREA

Site Number	Legal Description Township (S)	Range (W)	Section	Site Type	Environment	Cultural Affiliation	Significance
Within approximately 5 miles of study area boundary							
42BE3	28	10	13	Lithic/ceramic scatter, structure	River Valley	—	—
42BE7	28	10	17	Temporary campsite	River Valley	—	—
42BE48	30	12	10	Isolated artifact	Valley	—	—
42BE56	28	10	9	Temporary campsite	River Valley	Parowan Fremont	—
42BE83	29	14	12	Quarry	Mountains	—	—
42BE198	29	14	16	Lithic scatter	Mountains	—	—
42BE252	30	12	28	Lithic scatter	Valley	—	—
42BE253	30	12	21	Possible village	Valley	Parowan Fremont	Possible house mounds
42BE255	29	14	9	Isolated artifact	Mountains	—	—
42BE259	28	11	25	Possible village	River Valley	Sevier Fremont	House mounds & structure
42BE260	28	11	25	Lithic scatter	River Valley	—	—
42BE261	28	11	36	Lithic scatter	River Valley	—	—
42BE262	28	11	25	Lithic scatter	River Valley	Sevier Fremont	—
42BE263	28	11	25	Lithic scatter	River Valley	—	—
42BE285	28	11	25	Lithic scatter	River Valley	—	—
42BE318	28	11	25	Temporary campsite	River Valley	Parowan Fremont	—

TABLE 7-1 (Cont.)

Site Number	Legal Description Township (S)	Range (W)	Section	Site Type	Environment	Cultural Affiliation	Significance
42BE500	28	11	25	Lithic scatter	Bajada	—	—
42IN15	34	19	2	Temporary Campsite	Mountains	Parowan Fremont/ Paiute	Large
42IN16	34	19	2	Lithic scatter	Mountains	Parowan Fremont/ Paiute	—
42IN17	34	19	11	Lithic scatter	Mountains	--	—
42IN18	33	19	26	Lithic/ Ceramic scatter	Mountains	Parowan Fremont/ Paiute	—
42IN19	32	18	28	Lithic/ Ceramic scatter	Bajada	Parowan Fremont/ Paiute	—
42IN28	34	16	6	Lithic scatter	Valley	—	—
42IN99	34	16	6	Lithic scatter	Valley	Anasazi	—
42IN197	32	16	8	Temporary campsite	Mountains	--	—
42IN213	32	16	12	Temporary campsite	Mountains	Sevier Fremont/ Paiute	—
42IN214	32	16	11	Temporary campsite	Mountains	Sevier Fremont/ Paiute	—
42IN224	32	15	22	Rockshelter	Bajada	—	—
42IN225	31	14	7	Possible village	Mountains	Parowan Fremont/ Paiute	—
42IN226	31	15	6	Lithic scatter	Mountains	--	--
42IN227	31	15	5	Quarry	Mountains	--	—
42IN228	31	17	35	Lithic/Ceramic Scatter,pictograph	Mountains	--	—

TABLE 7-1 (Cont.)

Site Number	Legal Description Township (S)	Range (W)	Section	Site Type	Environment	Cultural Affiliation	Significance
42IN435	—	—	—	—	—	—	—
42IN436	33	15	24	Temporary campsite		Sevier Fremont	—
42IN437	33	16	31	Temporary campsite	Valley	—	—
42IN462	31	15	13	Lithic scatter	Mountains	Paleoindian	Great age, rare
42IN471	33	15	23	Lithic scatter	Bajada	—	—
42IN474	31	15	13	Temporary campsite	Mountains	Archaic/ Parowan Fremont/ Paiute	Multi-component
42IN500	35	18	3	Temporary campsite	Valley	Paiute	—

Fremont Cultures, one of which has been identified with the Parowan geographic variant of the culture. No information is available on the significance of these temporary campsites.

The sites include two possible villages in river valley and valley environments. Both are affiliated with the Fremont Culture, one with the Parowan geographic variant and the other with Sevier. Both sites may contain significant remains in the form of house mounds or structures.

In addition, work in the Wah Wah Mountains and Milford Flat has revealed large numbers of archeological sites. Because these sites lie more than 5 miles from the study area boundary, they are not discussed.

The Iron County sites include one quarry in the mountains and one rockshelter in the bajada environment; no information is available on the cultural affiliation or significance of these sites. The sites include 10 lithic scatters, three of which contain ceramics, located primarily in the mountains but also in the bajadas and valleys. Three are associated with the Parowan Fremont and Paiute cultures, one with the Anasazi Tradition, and one with the Paleoindian Tradition. The Paleoindian site is significant for its great age and because such sites are quite rare.

The sites include eight temporary campsites located primarily in the mountains but also in the valley environments. Three of these are associated with the Sevier Fremont and Paiute cul-

tures, two with Parowan Fremont and Paiute cultures, and one with the Paiute Culture. While little information is available on the significance of the temporary campsites, one is large (covering almost 18 acres) and one contains multiple cultural components.

The sites include one possible village located in the mountains. This site is associated with the Parowan Fremont and Paiute cultures, and no information is available on its signficance.

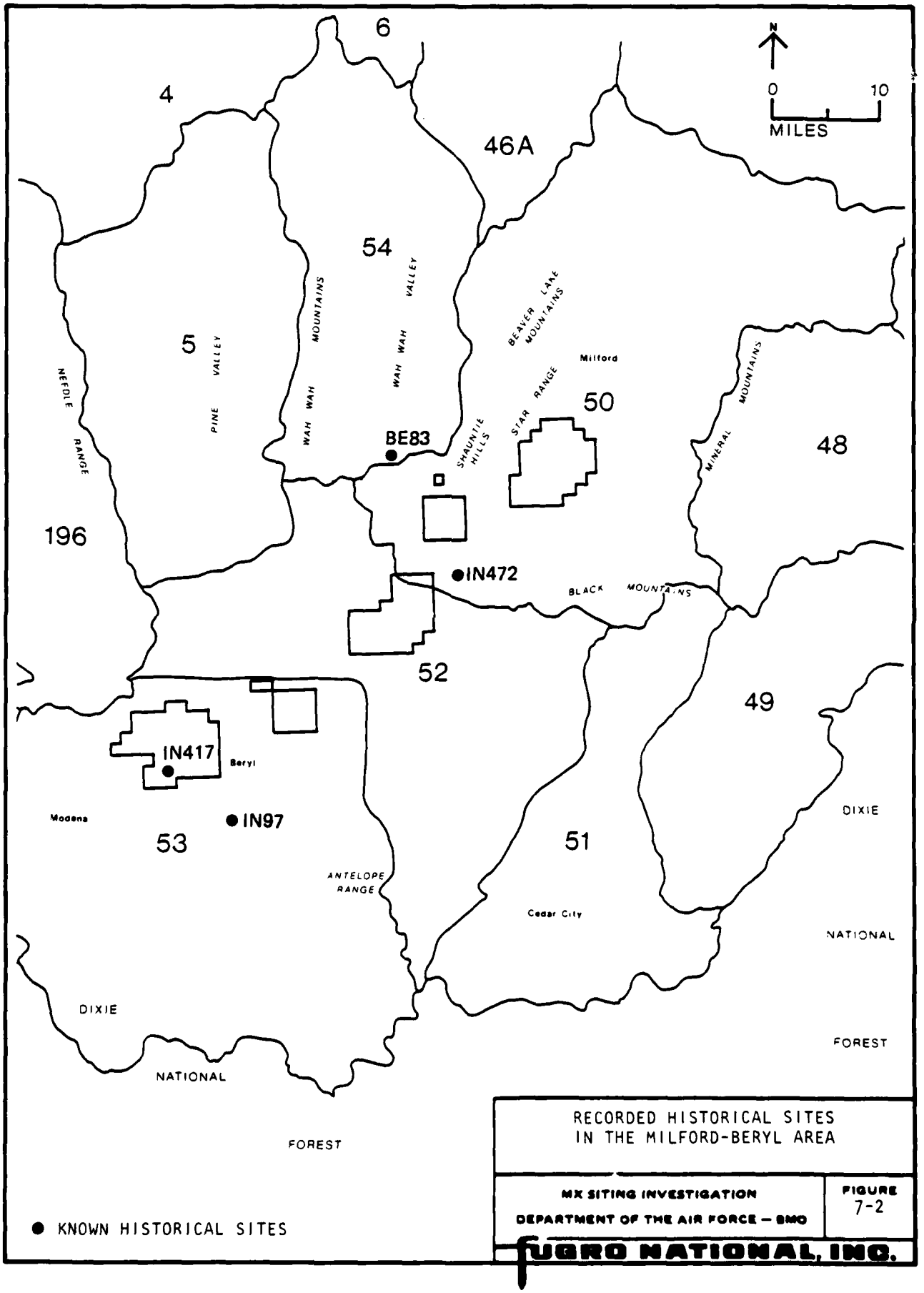
No information is available on one of the Iron County Sites, 42IN435.

7.2 HISTORICAL SITES

Little historical research has been conducted in the Milford-Beryl OB study area, and only one historical site has been recorded, as shown on Figure 7-2 and in Table 7-2. This site consists of a structure for which no information is available. Three sites have been recorded within about 5 miles of the study area boundary. These include an early 20th century sheep camp and two dumps, one associated with farming or ranching and the other with a railroad siding dated about 1900.

7.3 NATIVE AMERICAN CULTURAL AREAS

No Native American cultural areas have been identified within or close to the Milford-Beryl OB area (Ostanik and Ostanik 1980). The closest areas are located in the Indian Peak and Black



RECORDED HISTORICAL SITES
IN THE MILFORD-BERYL AREA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

FIGURE 7-2

FUGRO NATIONAL, INC.

TABLE 7-2

HISTORICAL SITES IN THE MILFORD-BERYL OB AREA

Site Number	Legal Description Township (S)	Range (W)	Section	Site Type	Comments
Sites Within Study Area Boundary:					
42IN417	34	17	5	Structure	--
Sites Within Approximately 5 Miles of Study Area Boundary:					
42BE83	29	14	12	Sheep camp	Early 20th century
42IN97	34	16	30	Dump	Remains include glass, china, crockery, metal, and cans; a small water or trash hole; associated with farming or ranching
42IN472	31	13	1	Dump	Associated with railroad siding; remains include chamberpot, cans, jars, bottles, kerosene lamp fragments, circa 1900

Mountain ranges, which were used for economic and religious activities.

7.4 POTENTIAL CULTURAL RESOURCES SITES

Even though little cultural resources survey work has been conducted in and around the Milford-Beryl OB study area, numerous archeological sites have been recorded within 5 miles of the study area boundary. Several kinds of archeological sites occur in river valley, valley, bajada, and mountain areas, suggesting that systematic surveys will discover a large number of additional sites. These sites will probably include numerous lithic scatters and temporary campsites, many associated with the Fremont and Paiute cultures. Many of the discovered sites would likely contain information on the prehistoric occupation of this relatively little-known area and thus would probably be eligible for the National Register of Historic Resources.

Even though few historical sites have been recorded, a number of such sites would be expected as a result of the long tradition of mining in the mountains and of farming and ranching in the lowlands, particularly at developed springs.

Work by Facilitators, Inc. probably has recorded all of the traditional and current Native American use areas, suggesting that additional areas are unlikely to be discovered.

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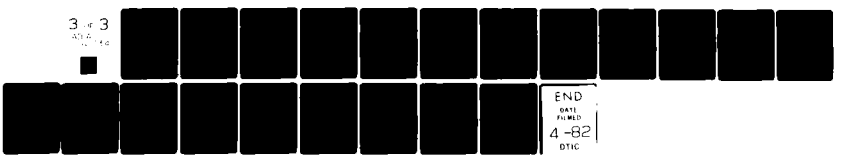

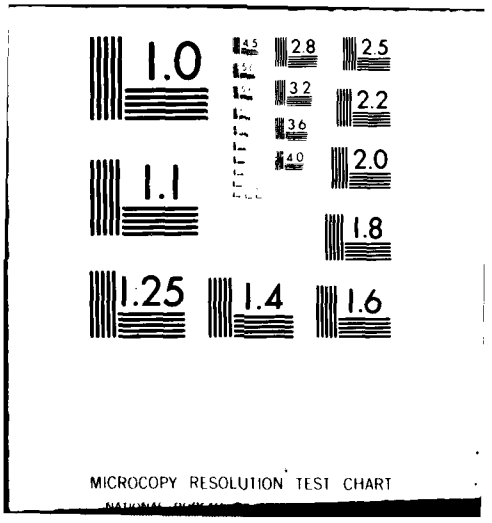
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APPENDIX A

Federal Register Listings of Threatened and Endangered Plant and Animal Species

PLANT TAXA CURRENTLY LISTED
IN UTAH AND NEVADA
(Federal Register, December 15, 1980)

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

TAXA CURRENTLY UNDER REVIEW
(Federal Register December 15, 1980)

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 douglasii var. perstrictus	1	NV
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

Taxon	Category	Historic Distribution
Astragalus lentiginosus var. micans	1	NV
Astragalus lentiginosus var. sesquimetralis	1	NV
Astragalus lentiginosis var sierrae		
Astragalus lentiginosus var. ursinus	1	UT
Astragalus limnocharis	1	UT
Astragalus lutosus	2	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
Atriplex 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

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

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 corymbosum 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

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

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

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

Taxon	Category	Historic Distribution
Townsendia alpigena 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

THREATENED AND ENDANGERED WILDLIFE EXPECTED IN NEVADA AND UTAH (a)

Species	Historic Range	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	E
Arctic peregrine falcon (Falco Peregrinus tundrius)	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
Colorado 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, May 20, 1980

APPENDIX B

Biological Forms

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 C

Definitions of Cultural Resources Site Types

Artifact - An occurrence of a single artifact or cultural features that does not conform to other site types are documented with this category. This includes isolated flaked stone tools, cores, manos, and other artifacts not covered by other site types. Cultural features included in this site type are single rock rings or single sleeping circles with no associated artifacts or other cultural features.

Quarry - A quarry site is a location where lithic material has been extracted from a larger mass (usually crypto-crystalline), such as a seam, vein or outcrop, for the purpose of tool manufacture. Such sites are characterized by an abundance of flakes, cores, occasional hammerstones, preforms, blanks or rejects.

Lithic Scatter - These sites are characterized exclusively by the presence of flaked stone tools, chipping waste, cores, retouched and utilized flakes, and/or flake material such as chalcedony, chert, jasper, opal, rhyolite, or obsidian. Other cultural material is absent. Since this general site type often constitutes a major percentage of the archaeological site inventory, five sub-types are used to allow a closer assessment of this type's variability.

Temporary Campsite - Temporary campsites are sites that were occupied for a short length of time (e.g., one day to one month) by a few people (from an individual to several families). These sites can be identified archaeologically by scattered artifacts, tool manufacturing debris, fire-affected rocks and possibly features. They differ from the first site type by size and frequency of cultural remains. This type is somewhat a catch-all category. It includes sites that reflect a range of artifacts and/or cultural features that in combination do not allow the site to be typed in another category (e.g., pottery with flakes). The inferred function of the site is limited camping (i.e., limited subsistence and maintenance activities). However, an open site with any combination of flaked stone artifacts, ground stone, fire-affected rocks, and/or ceramics could fit in this site type.

Village - This site type represents long-term or seasonal activity, usually identified as a village or base camp. A village would be identified archaeologically by primary and secondary tools (that is, tools used in the manufacture of other tools) and a variety of other artifacts, as well as floral and faunal remains which represented subsistence activities. Such a site would be characterized by extensive scatters and quantities of debris such as potsherds, fire-affected rock, whole and broken flaked stone tools, chipping waste, charred bone, milling tools, house structures, hearths, rock rings, and sometimes rock art or burials and cremations. A well developed midden is usually a component of this site type.

APPENDIX D

Study Area Sections

TABLE D-1

LEGAL DESCRIPTIONS OF THE COYOTE SPRING VALLEY OPERATING BASE SITE

Range 63 East, Township 11 South, Sections 23, 24, 25, 26, 35, 36

Range 63 East, Township 12 South, Sections 1, 2, 10, 11, 13, 14, 15, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36

Range 63 East, Township 13 South, Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36

Range 63 East, Township 13-1/2 South, Sections 31, 32, 33

Range 63 East, Township 14 South, Sections 4, 5, 6, 7, 8, 9, 16, 17, 18

Range 64 East, Township 11 South, Sections 19, 20, 30, 31

Range 64 East, Township 12 South, Sections 6, 31

Range 64 East, Township 13 South, Sections 6, 7, 17, 18, 19, 20, 29, 30

TABLE D-2

LEGAL DESCRIPTIONS OF THE MILFORD-BERYL OPERATING BASE SITE

Range 11 West, Township 28 South, Sections 31, 32, 33

Range 11 West, Township 29 South, Sections 3, 4, 5, 6, 7, 8, 9, 10, 11, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 27, 28, 29, 30, 31, 32, 33

Range 11 West, Township 30 South, Sections 5, 6

Range 12 West, Township 29 South, Sections 1, 11, 12, 13, 14, 23, 24, 25, 26, 27, 34, 35, 36

Range 12 West, Township 30 South, Sections 1, 2, 3

Range 13 West, Township 29 South, Section 28

Range 13 West, Township 30 South, Sections 2, 3, 4, 5, 8, 9, 10, 11, 14, 15, 16, 17, 20, 21, 22, 23

Range 13 West, Township 31 South, Sections 7, 8, 17, 18, 19, 20, 29, 30, 31, 32

Range 13 West, Township 32 South, Section 6

Range 14 West, Township 31 South, Sections 11, 12, 13, 14, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36

Range 14 West, Township 32 South, Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

Range 15 West, Township 32 South, Sections 17, 31, 32, 33

Range 15 West, Township 33 South, Sections 4, 5, 6, 7, 8, 9, 16, 17, 18

Range 16 West, Township 32 South, Sections 26, 27, 36

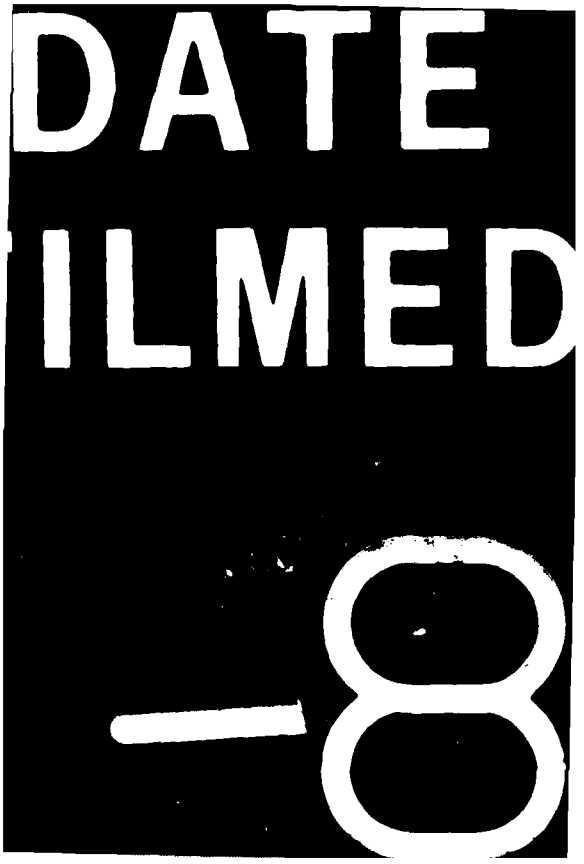
Range 16 West, Township 33 South, Sections 1, 12, 13

Range 17 West, Township 33 South, Sections 4, 5, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36

Range 17 West, Township 34 South, Sections 1, 2, 3, 4, 5, 6, 7, 8

Range 18 West, Township 33 South, Sections 11, 12, 13, 14, 22, 23, 24, 25, 26, 27, 28(?)

Range 18 West, Township 34 South, Sections 1, 12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