



NEVADA TEST AND TRAINING RANGE (NTTR)

Land Withdrawal Application Packages/
Case File and Legislative EIS



PLANT COMMUNITY MAPPING FOR THE NEVADA TEST AND TRAINING RANGE AND PROPOSED EXPANSION ALTERNATIVES



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PLANT COMMUNITY MAPPING FOR THE NEVADA TEST AND TRAINING RANGE AND PROPOSED EXPANSION ALTERNATIVES Final Report

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List of Appendices

Appendix A - List of Scientific and Common Names of Plants Mentioned in the Text of the Report

Acronyms and Abbreviations

99 CES/CEIEA	99th Civil Engineering Squadron/Installation Management Environmental Assessments Section
ACC	Air Combat Command
AFI	Air Force Instruction
BLM	Bureau of Land Management
CAFB	Creech Air Force Base
CWA	Clean Water Act
DNWR	Desert National Wildlife Range
DoD	U.S. Department of Defense
DOI	U.S. Department of the Interior
EC	Electronic Combat Range
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
GIS	Geographic Information Systems
GPS	Global Positioning System
INRMP	Integrated Natural Resources Management Plan
MSL	Mean Sea Level
NAFB	Nellis Air Force Base
NDCNR	Nevada Department of Conservation and Natural Resources
NDF	Nevada Division of Forestry
NDOW	Nevada Department of Wildlife
NDWR	Nevada Division of Water Resources
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NNHP	Nevada Natural Heritage Program
NNRP	Nellis Natural Resources Program
NNSS	Nevada National Security Site
NRCS	Natural Resources Conservation Service
NTTR	Nevada Test and Training Range. Also, the new name for 98th Range Wing
NWAP	Nevada's Wildlife Action Plan
NWHR	Nevada Wild Horse Range
SAR	Small Arms Range
SSURGO	Soil Survey Geographic Database
USACE	U.S. Army Corps of Engineers

USAF	United States Air Force
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

Introduction

The United States Air Force (USAF) is in the process of extending the withdrawal of land for military operations and training on the Nevada Test and Training Range (NTTR). In addition to extending the current withdrawal, the USAF is evaluating three proposed expansion areas. The current withdrawal will expire on November 6, 2021, unless Congress enacts legislation to extend it. In accordance with Section 3016 of the Military Land Withdrawal Act (MLWA), the USAF, in coordination with Department of Defense (DoD), has notified Congress of a continuing military need for the NTTR withdrawal. Furthermore, the USAF plans to submit a Legislative Environmental Impact Statement (LEIS) that supports a legislative proposal through the Department of the Interior (DOI) to extend the withdrawal. The National Environmental Policy Act of 1969, United States Code [USC] Sections 18 4321-4370h (NEPA) requires agencies to include an environmental impact statement (EIS) with any proposal for legislation that may significantly affect the quality of the human environment. The land withdrawal renewal includes actions that present potential impacts to wildlife and plants on the study area. Plant communities are an important component of the natural environment and play a major role in determining where wildlife and sensitive plant species may reside. This report provides a comprehensive overview of the vegetation survey data that has been collected for the study area and creates a plant community map of the study area using past data and mapping efforts on the NTTR and the Desert National Wildlife Refuge (DNWR).

Description of the Study Area

The study area for this report includes the NTTR and potential expansion areas designated as Alternatives 3A, 3B, and 3C. The NTTR consists of 2,949,603 acres, in rural portions of Nye, Lincoln, and Clark Counties, Nevada. The potential expansion areas are shown in Figure 1 and consist of about 302,000 acres. Alternative 3A is 18,000 acres lying along the southwest boundary of the North Range of the NTTR. Alternative 3B is 57,000 acres located immediately south of the South Range of the NTTR. Alternative 3C is 227,000 acres immediately east of the South Range of the NTTR in the DNWR. Geology varies from limestone/dolomite in the south to volcanic fields in the north. The South Range Study Area lies in the eastern Mojave Desert and the North Range Study Area lies in the southern Great Basin (Figure 2).

Natural sources of water are scarce across most of the study area. Annual precipitation varies from 3 to 5 inches in the basins to 16 inches in upper elevations of mountains. Vegetation composition is strongly influenced by the levels of precipitation. Most of the active springs are found in the North Range Study Area, especially in the Kawich, Belted, and Cactus ranges and Stonewall Mountain. Only five natural springs are found in the South Range Study Area. Most water sources in the South Range Study Area are provided by wildlife water developments, which collect water from storm events and store it in water tanks.

The South Range Study Area is typical of the Mojave Desert. Except for the higher elevations, most of the mountains are covered by scattered populations of various desert brush and cactus species. Typical physiography of the area consists of mountain ranges which drain into bajadas (collections of alluvial fans) which eventually drain into playas. Most of these areas are considered basins which are self-contained and do not drain into any of the major rivers in the area. Playas tend to have sparse or no vegetation while bajadas are often dominated by creosote bush (*Larrea tridentata*) and bursage (*Ambrosia dumosa*) in the lower bajadas and blackbrush (*Coleogyne ramosissima*) and Joshua tree (*Yucca brevifolia*) in the upper bajadas. Mountain ranges support scattered populations of bitterbrush (*Purshia spp.*), matchweed

(*Gutierrezia spp.*), and shadscale (*Atriplex confertifolia*). At higher elevations, plant communities may be dominated by Utah juniper (*Juniperus osteosperma*) and pinyon pine (*Pinus monophylla*).

The North Range Study Area is typical of the southern portions of the Great Basin Desert. Again, the physiography of the area is comprised of mountains and closed basins similar to the South Range Study Area. However, rainfall is slightly higher in the North Range Study Area resulting in denser plant communities. Similar to the South Range Study Area playas in the North Range Study Area contain little or no vegetation. From the boundaries of the playas to the base of mountains, plant communities are typically dominated by greasewood (*Sarcobatus spp.*) and shadscale (*Atriplex spp.*) in lower elevations and sagebrush (*Artemisia spp.*) in higher elevations. The uppermost elevations in the mountains are dominated by Utah juniper (*Juniperus osteosperma*) and pinyon pine (*Pinus monophylla*).

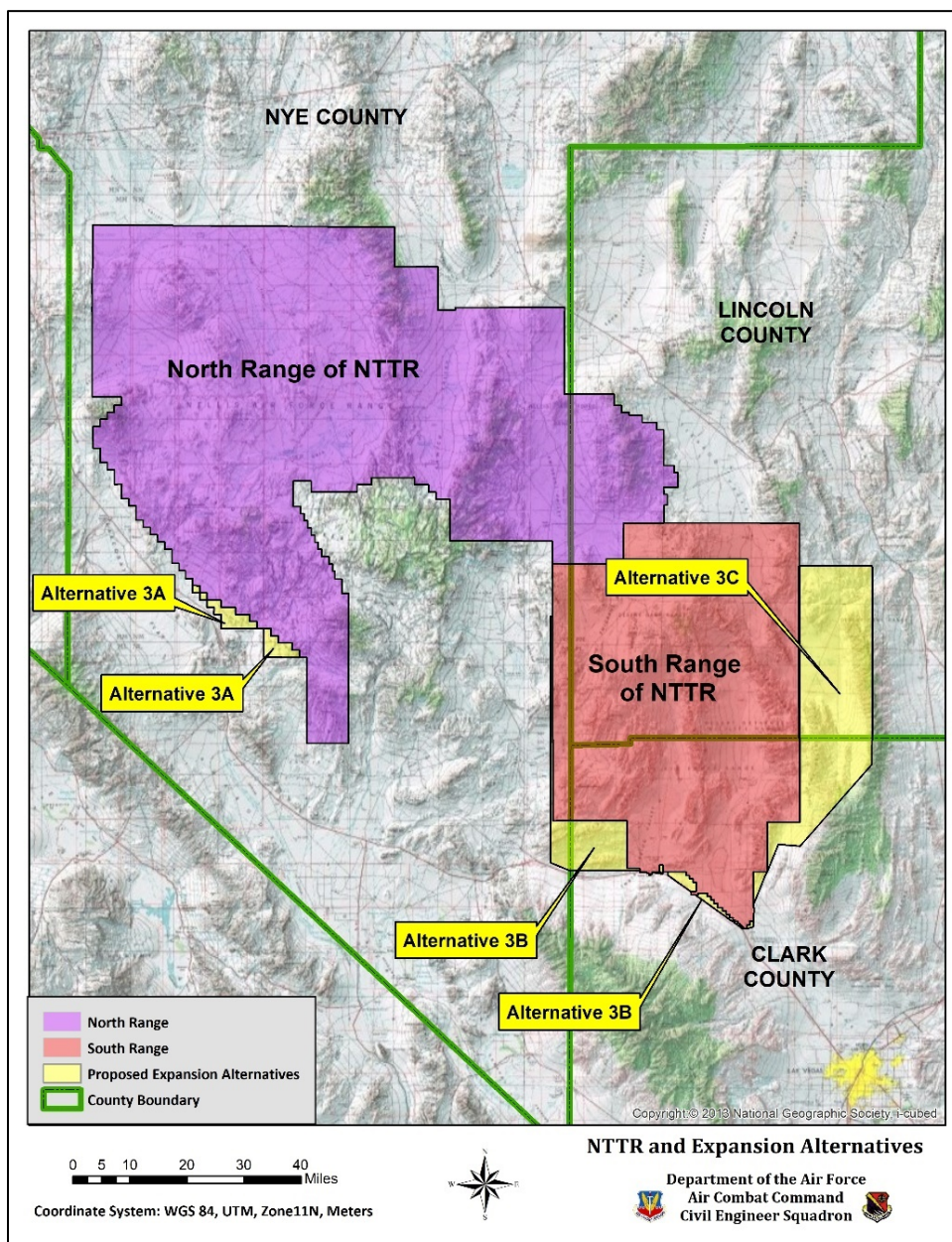


Figure 1. Location of the North and South Ranges of the NTTR as well as Alternatives 3A, 3B, and 3C

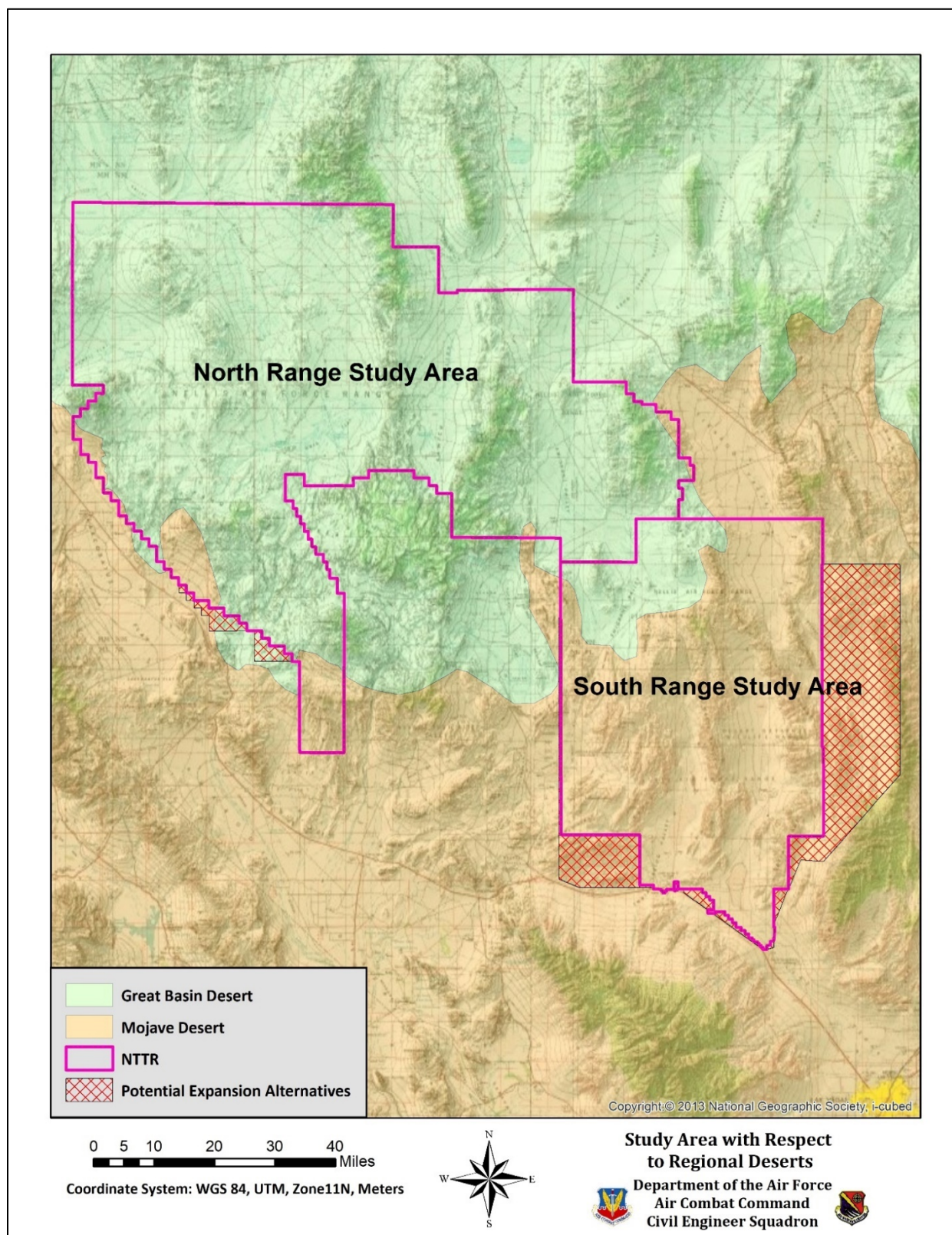


Figure 2. Location of the study area with respect to the Great Basin Desert and the Mojave Desert.

Background Information

This report was prepared by summarizing and analyzing historical and current (2012 – 2016) vegetation surveys. This report has been prepared to support a programmatic analysis of vegetation data for the LEIS and is based on data collected for proper management and monitoring of wildlife and vegetation, not for scientific research. The data collected for this report is part of a larger project that is in progress (anticipated completion 2020) and, therefore, the results presented in this report should be considered interim. Maps created by the vegetation model for this report are based on interim data and still require additional surveys to be finalized. Some portions of the plant community descriptions have been copied from previous USAF reports and are used verbatim to maintain consistency between this report and those reports, where appropriate.

Rare plant and vegetation surveys were conducted on the NTTR from 1993-2009 prior to the implementation of formal plant community surveys by the Nellis Natural Resources Program (NNRP) beginning in 2012 (Table 1) to be used for mapping vegetation communities. During the period from 2005 to 2011, findings of rare plant and vegetation surveys were documented in the NAFB Annual Reports (Nellis Natural Resources Program, 2005-2011). Most of the historical surveys provide excellent information on plant community composition and other details but were not fully compatible with methodology used for formal surveys conducted after 2010. Data from the surveys conducted prior to 2003 were not in electronic format and were entered into the NNRP Geodatabase (Nellis Natural Resources Program, 2016B) using coordinates provided in project reports or by scanning and rectifying maps from project reports and determining coordinates from points on the rectified maps. Because the data collected by surveys conducted prior to formal mapping surveys initiated in 2012 did not use the same methodology as the formal mapping surveys, this data was only used to supplement characterization and location of plant communities in areas that had not been surveyed as of 2016.

The map created for the study area in this report covers approximately 3.4 million acres, of which, about 40% has not been formally surveyed to date. The vegetation community map presented in this report uses probabilistic modeling to fill in these data gaps, basing the model on data points collected in adjacent areas. In the North Range Study Area, sufficient data was available in gap areas to allow for manual classification of plant communities in those areas. However, on the South Range Study Area, because data was insufficient for manual analysis, a probabilistic model was used to map plant communities. Methodology used to classify polygons and assign names for plant communities is discussed in detail in the methods section. Please note that these maps are interim results that will be much more refined when surveys for the project are completed in 2020. This map was prepared using currently available data to assist the USAF in the determination of impacts to natural resources by the renewal and expansion of the land withdrawal.

Table 1 provides a list of the surveys conducted on the study area with citations for the project reports prepared for those surveys. Data collected by these studies was used to assist with the mapping of vegetation on the study area. The reader is encouraged to refer to those reports for details on methodology and results from those projects.

Table 1. List of surveys conducted on the study

Report Title	Survey Location	Year	Surveyors	Citation
An Inventory for Rare, Threatened, Endangered, and Endemic Plants and Unique Communities on Nellis Air Force Bombing and Gunnery Range, Clark, Lincoln, and Nye Counties, Nevada (Volume 4)	NTTR	1993-1997	D. Prichett and F. J. Smith	(Knight, 1997)

Report Title	Survey Location	Year	Surveyors	Citation
1999 Vegetation Sampling at the Nellis Air Force Bombing and Gunnery Range, Clark, Lincoln, and Nye County, Nevada	Three Lakes Valley and Indian Springs Valley	1999	D. Prichett and F. J. Smith	(Pritchett, D. and F.J. Smith, 2000B)
1999 Monitoring of <i>Arctomecon merriamii</i> at the Nellis Air Force Bombing and Gunnery Range, Clark, Lincoln, and Nye County, Nevada	Spotted Range, Desert Range, Ranger Mountains	1999	D. Prichett and F. J. Smith	(Pritchett, D. and F.J. Smith, 2000)
1999 Monitoring of <i>Phacelia parishii</i> at Nellis Air Force Bombing and Gunnery Range, Clark, Lincoln, and Nye County, Nevada	Three Lakes Valley and Indian Springs Valley	1999	D. Prichett and F. J. Smith	(Pritchett, D. and F.J. Smith, 2000A)
Initiation of Long Term Monitoring of <i>Arctomecon merriamii</i> at the Nellis Air Force Bombing and Gunnery Range, Clark, Lincoln, and Nye County, Nevada	Spotted Range, Desert Range, Ranger Mountains	1999	D. Prichett and F. J. Smith	(Pritchett, D. and F.J. Smith, 1999)
Initiation of Long Term Monitoring of <i>Phacelia parishii</i> at the Nellis Air Force Bombing and Gunnery Range, Clark, Lincoln, and Nye County, Nevada	Three Lakes Valley and Indian Springs Valley	1999	D. Prichett and F. J. Smith	(Pritchett, D. and F.J. Smith, 1999A)
An Overlooked <i>Phacelia</i> from Southern Nevada	Three Lakes Valley and Indian Springs Valley	1999	D. Prichett and F. J. Smith	(Smith, 1999)
2000 Monitoring of <i>Arctomecon merriamii</i> at Nellis Air Force Bombing and Gunnery Range, Clark, Lincoln, and Nye County, Nevada	Spotted Range, Desert Range, Ranger Mountains	2000	D. Prichett and F. J. Smith	(Pritchett, D. and F.J. Smith, 2001)
2000 Monitoring of <i>Phacelia parishii</i> at Nellis Air Force Bombing and Gunnery Range, Clark, Lincoln, and Nye County, Nevada	Three Lakes Valley and Indian Springs Valley	2000	D. Prichett and F. J. Smith	(Pritchett, D. and F.J. Smith, 2001A)
2000 Vegetation Sampling at Nellis Air Force Bombing and Gunnery Range, Clark, Lincoln, and Nye County, Nevada	Three Lakes Valley and Indian Springs Valley	2000	D. Prichett and F. J. Smith	(Pritchett, D. and F.J. Smith, 2001B)
2001 Vegetation Mapping at Nellis Air Force Bombing and Gunnery Range, Clark, Lincoln, and Nye County, Nevada, Indian Springs and Indian Springs Valley NW 7.5 Minute Quads	Indian Springs and Indian Springs Valley NW 7.5 Minute Quads	2001	D. Prichett and F. J. Smith	(Pritchett, D. and F.J. Smith, 2001C)
2002 Vegetation Mapping at Nellis Air Force Bombing and Gunnery Range, Clark, Lincoln, and Nye County, Nevada, Indian Springs SE and Black Hills SW 7.5 Minute Quads	Indian Springs SE and Black Hills SW 7.5 Minute Quads	2002	D. Prichett and F. J. Smith	(Pritchett, D. and F.J. Smith, 2003)
Botanical Survey of Dog Bone Lake	Dog Bone Lake in Three Lakes Valley	2004	D. Charlton, P. Woodman, and L. Kitchen	(Charlton, 2004)
Nellis Air Force Base: Rare Plant Surveys on the North Ranges, Year 2005	North Range of NTTR	2005	Alice Karl	(Karl, 2005)
Survey for Rare Plant Species on the Nevada Test and Training Range 2005 and 2006 Results	NTTR	2005-2006	Alice Karl and L. Kitchen	(Karl, A.E. and L.M. Kitchen, 2007)
Summaries of Surveys for Rare Plant Species and Plant Communities on the Nevada Test and Training Range and NAFB 2005-2011	NTTR	2005-2011	Nellis Natural Resources Program	(Nellis Natural Resources Program, 2005-2011)
Vegetation Map of Desert National Wildlife Refuge, Clark and Lincoln Counties, Nevada	DNWR	2010-2012	D. A. Charlet and C.W. Westenberg	(Charlet, D.A. and C. Westenberg, 2013; Charlet, D.A., P.J. Leary, and C.W. Westenberg, 2013)
2012 Final Report: Unique Habitat and Rare Plants	NTTR and NAFB	2012	Nellis Natural Resources Program	(Nellis Natural Resources Program, 2013)
2013 Final Report: Unique Habitat and Rare Plants	NTTR and NAFB	2013	Nellis Natural Resources Program	(Nellis Natural Resources Program, 2014)

Report Title	Survey Location	Year	Surveyors	Citation
Final Biological Assessment Cedar Peak Project Study Area, Wildland Fire Plan, Nevada Test and Training Range	Cedar Peak, Kawich Mountain Range	2013	Nellis Natural Re- sources Program	(Nellis Natural Resources Program, 2013A)
Plant Communities of Range EC-West and Range 64A Final Report	NTTR	2013	AMEC Environ- mental and Infrastructure, Inc.	(AMEC Environmental and Infrastructure, Inc., 2014)
2014 Final Report: Unique Habitat and Rare Plants	NTTR and NAFB	2014	Nellis Natural Re- sources Program	(Nellis Natural Resources Program, 2015A)
2014 Vegetation Database Final Project Report	NTTR and NAFB	2014	Nellis Natural Re- sources Program	(Nellis Natural Resources Program, 2015)
Plant Communities of Range 64B Final Re- port	NTTR	2014	Nellis Natural Re- sources Program	(Nellis Natural Resources Program, 2015B)
Plant Communities of Range 71N Final Re- port	NTTR	2014	Nellis Natural Re- sources Program	(Nellis Natural Resources Program, 2015C)
Plant Communities of Range 71S Final Re- port	NTTR	2014	Nellis Natural Re- sources Program	(Nellis Natural Resources Program, 2015D)
Plant Communities of Range EC-South Final Report	NTTR	2015	Nellis Natural Re- sources Program	(Nellis Natural Resources Program, 2016)
Plant Communities of Range 64C-F and Range 65 Final Report	NTTR	2015	Nellis Natural Re- sources Program	(Nellis Natural Resources Program, 2016A)

Methodology

FIELD SURVEYS PRIOR TO 2012

Prior to 2012, field surveys for vegetation classification were conducted using a variety of methods. Because surveys conducted prior to 2012 used methods that were not consistent to the formal surveys conducted in 2012-2016, those data were only used to supplement characterization and location of plant communities in “gap” areas that have not been formally surveyed as of 2016. Details on the methodology is documented in each of the references listed in Table 1. In general, a study area was selected and then surveyed for plant composition. Selection of points was determined in the field where a uniform area representative of the plant community being surveyed was depicted by the point. Plant species found within approximately 50-100 ft. radius of the point were identified and recorded. Depending on the project, foliar cover of the plant community, as a whole or by each species, was visually determined. In some surveys, dominant, subdominant, and common plants were listed in lieu of foliar cover. For rare plant surveys, plant species were inventoried and hierarchy was not always noted. Information on the physical environment such as soil texture, gravel and rock size class, aspect, and slope were recorded in many of the studies. Species were identified in the field and if a species could not be identified, a sample of the species was either pressed or stored in a plastic bag. The sample was taken to a lab where the botanist that collected the sample identified the specimen using appropriate plant keys. Data was recorded in separate reports and sometimes included maps that were usually drawn by hand on topographic maps or prepared using remote sensing software. Details on these studies can be found in each individual report.

The NNRP later obtained the data from these reports and entered the plant species location and identification information into the NNRP geodatabase. All data entries also included a field which identified the authors of the report. Please note that this data was added to the database for documentation of historic

studies and was not used in vegetation mapping models. Some of the historic data was used to confirm mapped communities and provide some level of accuracy analysis but could not be used in the formal mapping process.

PLANT COMMUNITY STUDIES CONDUCTED 2012-2015

Beginning in 2012, the NNRP plant community surveys were formalized and a standard operating procedure detailing the field methodology to be used for the surveys was developed to ensure consistency throughout the duration of the NTTR vegetation mapping project. Field procedures were not changed during the period from 2012 to 2015, but mapping procedures were altered to accommodate new software programs that became available for plant community mapping.

From 2012 to 2013, polygons were manually drawn for maps by having biologists or GIS (Geographic Information Systems) analysts visually determine boundaries between areas of uniform color and texture (patterns) on high resolution satellite imagery (GeoEye July 2009, 60 cm resolution imagery). This manual procedure was used because ERDAS, ArcMap, and eCognition were tried for the process with no satisfactory results. This procedure was used for mapping polygons on Military Air Space Ranges 64A, EC (Electronic Combat Range)-West, 71N and 71S (Figure 3). From 2013 to 2015, eCognition was successfully used to segment satellite imagery into small polygons having uniform texture and color. An effort was made to identify a satisfactory polygon classification method using remote sensing program, but none with acceptable accuracy as visually evaluated by GIS analysts could be found. Thus, polygons were classified manually according to color and texture by biologists or GIS analysts after they were segmented by eCognition. These procedures were used to segment and classify polygons in Military Air Space Ranges 64B, 64C, 64D, 64E, 64F, 65C, and EC-South (Figure 3). It is important to note that manual classification of maps and polygons is a qualitative process and can lead to potential bias due to the possible differences in visual perception or knowledge of the biologists or GIS analysts. This potential was minimized to some extent by having all maps of classified polygons carefully reviewed and revised as necessary by an independent group of biologists and GIS analysts not involved in the original segmentation and classification process. A general description of the procedures used for mapping plant communities in these ranges is provided in the paragraphs that follow. Because it was standardized for these surveys, this methodology was summarized with some editing from the plant community reports prepared for the NNRP from 2012 – 2015 (Nellis Natural Resources Program, 2015B; Nellis Natural Resources Program, 2015C; Nellis Natural Resources Program, 2016; Nellis Natural Resources Program, 2015D; Nellis Natural Resources Program, 2016A; AMEC Environmental and Infrastructure, Inc., 2014). In the paragraphs that follow, the methodology used for the plant community surveys conducted from 2012 – 2015 is discussed.

Review of Existing/Historic Vegetation Data

Historic and current literature relevant to vegetation of the region, GIS data sources, and data from past vegetation surveys by the NNRP and other sources were carefully reviewed by NNRP. Documentation of vegetation mapping in Nevada and adjacent regions of nearby states was reviewed. Names for the plant communities were derived using the International Vegetation Classification (IVC) prepared by NatureServe, and detailed in a document prepared by the Nevada Natural Heritage Program (NNHP) to describe plant alliances and associations of Nevada (Peterson, 2008). Available imagery and existing data for each study area was reviewed to assist with gaining an understanding of the specific physical characteristics of the NTTR. Other sources reviewed for each study area included:

- July 2009 High Resolution (60 cm) Satellite Imagery (GeoEye)
- Nevada Natural Heritage Program Database (NNHP) (Nevada Natural Heritage Program Database, 2016)

- USA Topographic Maps (National Geographic Society, 2013)
- NDOW Key Habitat Data (Wildlife Action Plan Team, 2006)
- Geology (Keck Library)
- Soils (Natural Resources Conservation Service—SSURGO)

The background information was used to prepare project base maps, a list of potential plant species, a field guide to potential rare plants, field protocols, field maps, and data collection forms to be discussed in the sections that follow.

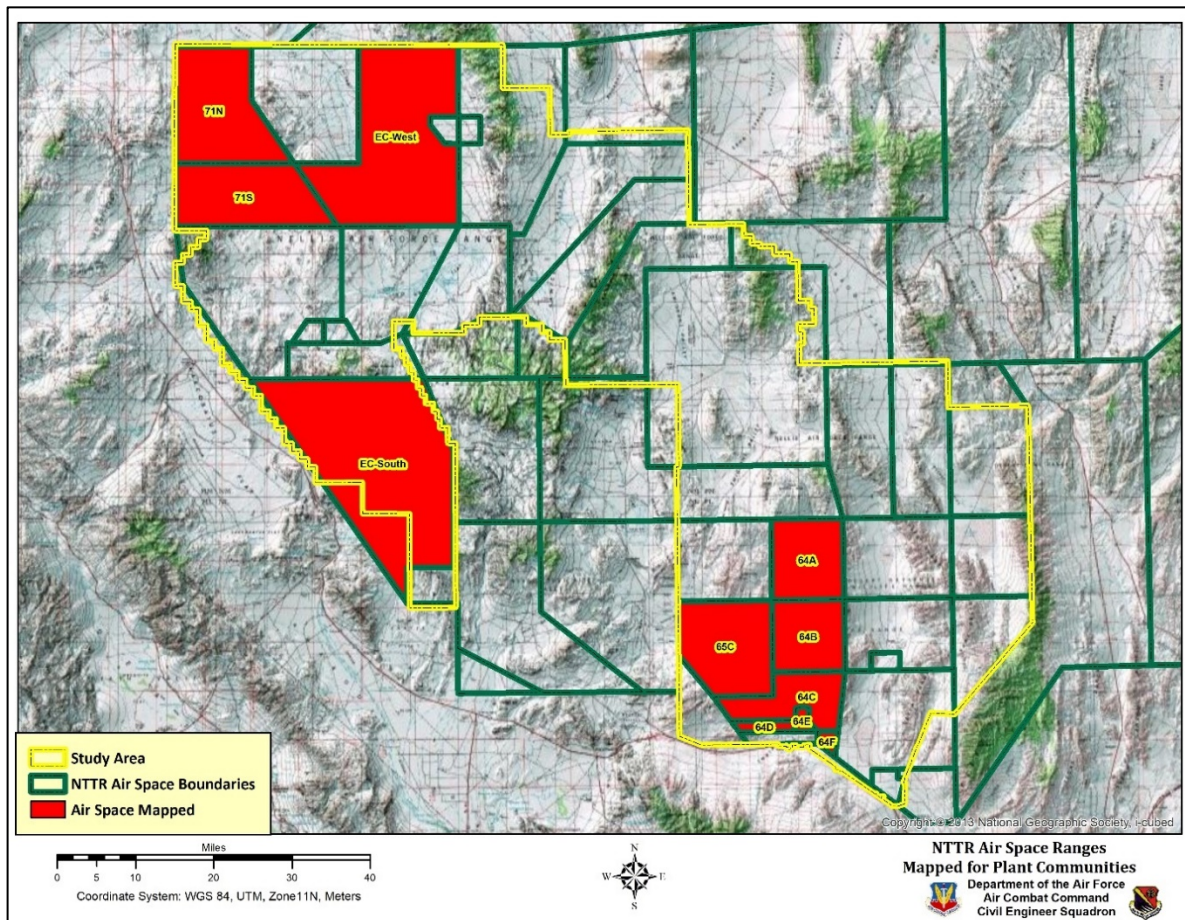


Figure 3. NTTR Air Space Ranges mapped for plant communities from 2013-2015.

Polygon Classification

Polygons for Ranges 64A, 71N, 71S, and EC-West were drawn and classified manually. High resolution satellite imagery (60 cm resolution) was obtained for the NTTR in July 2009 from GeoEye to develop the vegetation maps. Within each of these mapping areas, the polygons were drawn around areas having uniform texture (patterns of dots or shapes) and color. All polygons having the same, unique texture and color were then provided an identifying number or descriptive name. This process was continued for the area until all polygons had been drawn and classified.

An effort was made to use ArcGIS or eCognition to segment and classify these polygons from 2012 to 2015 via several remote sensing programs (eCognition, ArcMap, ERDAS). For Ranges 65C, 64B, 64C, 64D, 64E,

64F, and EC-South, eCognition Remote Sensing software was selected to segment the ranges into polygons. Note that segmentation is a process that divides high-resolution satellite imagery into polygons based on differences in texture and color patterns in the satellite imagery. This process typically divided each Military Air Space Range into 10,000 to over 100,000 polygons containing uniform color and texture characteristics within each polygon. However, no satisfactory classification program with acceptable levels of accuracy (based on visual analysis of results) was found for this analysis. Therefore, the segmented polygons were classified manually.

For classification, polygon features were reviewed by a GIS analyst or biologist to identify polygons within the study area with similar characteristics in imagery that may indicate a potential vegetation community as previously described. Once all polygons were classed, the boundaries were dissolved by ArcGIS when polygons of the same class shared boundaries. This reduced the total number of polygons within each class. Sample points were selected for some of the classed and dissolved polygons and subjected to ground truth surveys to identify the composition of the plant communities found at each sample point within each polygon class.

Pre-Field Mapping

The number of classed polygons was quite large given the size of the respective study areas, and it was not feasible to field-sample vegetation for each polygon. Before initiation of field work, a field plan was developed to ensure that an appropriate distribution of sample points was assigned within each study area. Approximately four to six representative points were selected within each polygon class to be characterized via field surveys. These points were selected as randomly as possible, but accessibility and range safety were important considerations during the selection process. To the extent feasible, data sampling points were selected near the polygon centroid. Because off-road access by vehicles is not allowed on the NTTR, most of the points were located within approximately one to two miles of roads. Additionally, helicopters were used to access points that were located in areas that could not be practically accessed by ground. In those cases, helicopters landed where practical, but, in many cases, were forced to hover over the point (approximately 5-20 ft. above ground level) for identification and field analysis because of obstructions to safe landing (brush, trees, boulders, slopes, etc.). In these cases, binoculars were used to identify dominant and subdominant plants and common species, if possible. Because the surveys were conducted by qualified botanists with many years' experience in the Mojave and Great Basin deserts, identification of shrubs and most grasses from the helicopter was feasible and accurate.

Once sampling points were selected, maps showing areas and points to be surveyed were submitted to the NTTR staff for approval based on safety, access, and other range restrictions. This draft dataset was also reviewed and approved by the Natural Resources Database Manager of the NNRP, and later loaded on GPS (Global Positioning System) units and Panasonic Toughbooks for use during the field surveys.

Field Surveys

Surveys were conducted by one to two survey teams per day. Each team consisted of two biologists and one security escort. Survey points were accessed by foot, 4-wheel drive vehicles, all-terrain vehicles, or helicopter. The composition of field crews was consistent throughout each sampling period to maintain the same biologists on a team for uniformity across the season. The field staff was briefed on the survey methods and range safety prior to conducting the surveys. Species data, relative dominance, composition, elevation, and GPS coordinates were recorded on standardized data forms. Photos of the plant community, ground surface, and close-ups of plants of interest were taken at each sample point by the security escort. An example of the field data form is provided in Figure 4. Field surveys were usually conducted from late March to June on the South Range and late May to mid-July on the North Range. If additional

work was required because of range schedule issues, surveys were conducted from September to mid-November.

Survey Protocol

Each survey team was assigned sample points for each field day, with additional points if time allowed. The following protocol was used during all field survey activities:

1. Field days commenced at 0700 hours (as dictated by range time constraints) with transport to the first sampling point and typically continued until 1700 hours.
2. Data collection points and polygons were uploaded on GPS units and Panasonic Toughbooks for navigation purposes prior to field work. Upon reaching the chosen data point in the field, its suitability as representative of that vegetation class was judged visually and was adjusted in the field as necessary to allow for a uniform plant community in the survey area. This usually involved moving the point to a more central location in the plant community.
3. All field data were recorded on the Plant Community Short Form (Figure 4).
4. A waypoint was taken with the GPS unit at the actual data point location and the waypoint number and coordinates recorded on the data sheet.
5. Photographs of the data form showing the data point number and coordinates of the data collection point were taken to ensure that the field photographs were properly labelled with the correct site. Additionally, the surrounding plant community and soils were photographed. Photos were time and date-stamped and did not show landscape horizons, as required by the NTTR security guidance. Cameras were required to be in the possession of the security escort, who served as the photographer.
6. Plant species were identified and recorded at each point. Samples of unknown plants were collected, if they could not be keyed to species in the field. Each species was classified with a frequency class assignment: *D* - *dominant*, *S* - *subdominant*, *C* - *common*, *O* - *occasional*, *U* - *understory-dominant*. At a minimum, the dominant and subdominant plant species and any observed rare plants were recorded. A relatively comprehensive plant list was collected for each point, although due to scheduling constraints, only 15-30 minutes were spent collecting data at each point. Because the intent of the survey was to determine plant communities based on dominant, subdominant and common species and not develop a full inventory of plants, 15-30 minutes with a team of three was adequate.
7. Samples and diagnostic photographs of unknown species were taken. Samples were stored in either refrigerated plastic bags or a plant press. The species were keyed to species by project botanists as soon as possible after field surveys were completed. Keys used for species identification included:
 - a. Intermountain Flora, Vascular Plants of the Intermountain West, U.S.A. (Cronquist, 1972-2017)
 - b. Flora of Nevada (Kartesz, 1988)
 - c. The Jepson Manual: Vascular Plants of California (Baldwin, et al., 2012)
8. Total foliar cover of the plant community was estimated by pacing four 100-foot transects extending in different directions from the sampling point. The length in feet (based on paces) of intercepted foliage was determined. This was an estimate of foliar cover and measurement precision was about 0.5 feet. The foliar cover percentage for each direction was recorded and then averaged during data entry.

9. Incidental observations of wildlife were recorded, noting the species, number of individuals, and their activity.
10. For any plant or wildlife special status species encountered, a GPS waypoint was recorded and the number of individuals was recorded or the size (number or area) of the population was estimated.

Plant Community Short Form			
Date:		Surveyors:	
Site No.:		Location:	
UTM WGS 1984 Zone 11N Meters			
Northing:		Foliar Cover (%):	
Easting:		Soil Texture:	
Elevation:			
Species		Class	
Species		Class	
Date:		Surveyors:	
Site No.:		Location:	

Figure 4. Field data form used to collect survey data.

Data Processing and Database Management

After completion of each field survey, collected data points were provided to GIS analysts for data entry. A geodatabase was created in ArcGIS for entry of all data collected on field data forms. Data review and QA/QC of the entered data was conducted according to the following protocol:

- Field data sheets containing raw data were scanned as pdf files and stored in the field data file.
- Data was entered from field data sheets into the ArcGIS Geodatabase using the data forms.
- Entered data was compiled into QA/QC reports and printed.
- QA/QC reports were then submitted to a team member not involved with the original data entry for checking against the original data sheets to detect any syntax errors.
- Syntax errors were noted on the QA/QC reports and then corrected.
- The entered and corrected data points were converted into ArcGIS shapefiles based on the coordinates and displayed graphically on maps in ArcMap.
- The maps and QA/QC reports were submitted to the project botanist that conducted the survey to inspect for any technical errors such as point placement (coordinates originally transcribed wrong), outlier data that may have been transcribed incorrectly in the field, and questionable plant species identification.
- Final corrections were made and the database fully approved for the evaluated dates and surveys.

Data Analysis and Plant Community Designation

Data for each sampling point were summarized and placed on standard forms for further analysis. Plant communities were assigned to the points based on the following procedure:

1. Sample points were placed in groups based on dominant and subdominant plants characteristic of specific plant alliances or association as described by the IVC (Peterson, 2008).
2. Polygon classes represented by each sampling point were then assigned to each plant communities.
3. In cases where a polygon class represented more than one plant community, other factors were used to determine the boundaries of that plant community within the class. These other factors included soils, geology, topography, elevation, and annual precipitation. These patterns in distribution of plant communities within a class were visually identified using GIS overlays. For example, one class might be found to represent two plant communities. Further analysis may indicate that the class can be divided into two subclasses based on soil with each of the subclasses now containing only one plant community.
4. The polygon class was then divided into different plant communities based on the layer analysis.
5. Once all of the polygons and classes were provided with plant community names, the polygon boundaries within common plant communities were dissolved to simplify the layer and allow for more efficient computer processing.

Vegetation communities were named according to IVC rules, using the dominant and subdominant species and matching those combinations to the formal names of plant communities documented by the NNHP (Peterson, 2008). According to this classification system, the highest level is a “Class”. Classes include Forest, Woodland, Shrubland, Dwarf-shrubland, Herbaceous Vegetation, and Sparse Vegetation. Most of the plant communities found on the NTTR are in the Woodland, Shrubland, Dwarf-shrubland or Sparse Vegetation classes. Alliances are the next level in this classification system and are usually named according to the dominant species present. Within alliances are associations. This is the most specific level of classification and usually is named by the dominant and subdominant species and may include physical environment parameters such as “Intermittently Flooded” or “Sparsely Vegetated”. The IVC rules used for the nomenclature of plant communities were used to name communities that did not fit the plant communities currently documented by the NNHP in Nevada (Peterson, 2008) and included the following:

- Dominant plant species are separated by a “-” and listed in order of dominance. Latin names were used for naming plants. For example, if an association is named the *Artemisia tridentata* – *Ephedra nevadensis* Shrubland Association, this would indicate that *Artemisia tridentata* is the most dominant species with *Ephedra nevadensis* as a codominant.
- A “/” between species indicates that the species to the right of the “/” is a sub-dominant in this plant community. According to the rules, this also means that the species may be found at a different stratum or layer in the plant community. In the desert community, most plant communities have two stratum-- shrubs and herbaceous plants. Therefore, the “/” indicates the presence of subdominant species based on abundance or stratum.
- If a species is listed within parentheses, this indicates that the species is not consistently found in a plant community.

In some cases, mapped polygon classes were comprised of more than one plant community and could not be further separated into more classes based on characteristics of the imagery or other physical attributes as previously discussed. In such cases, the plant community would be named according to the physical feature. For example, washes often contain a variety of plant communities that could not be separated by mapping. Thus, the wash would be considered a physical feature that would contain a variety of plant species combinations.

PLANT COMMUNITY FIELD SURVEY METHODOLOGY IN 2016

In 2016, plant community survey methodology used was similar to 2012-2015 with minor changes in data analysis. High resolution, 4-band satellite imagery (50 cm resolution) was obtained through Airbus Defense and Space (formerly Spot Image Corporation). Imagery was photographed on April 2-3, 2016 during a relatively wet spring. Survey points from past plant surveys by Charlet et al. (Charlet, D.A. and C. Westenburg, 2013) were mapped on the imagery to prevent overlap between field survey points evaluated by Charlet and placement of new points to be surveyed by Adams Ecology. New points were also placed in areas that had not been surveyed by Charlet to fill in potential data gaps. Previous surveys by Charlet were conducted on the DNWR, which includes Alternative 3C, from 2010-2012 (Charlet, D.A. and C. Westenburg, 2013). No previous surveys had been conducted on Alternatives 3A and 3B. Unlike the 2012-2015 vegetation surveys, the areas to be surveyed were not segmented and classed into polygons prior to fieldwork. Experience from the past surveys indicated that biologists should select transects of 8-20 points crossing areas of diverse patterns on satellite imagery. An effort was made to obtain 4-6 points for similar patterns to determine if that pattern was indicative of a unique plant community. Because of accessibility issues and time constraints, field survey points

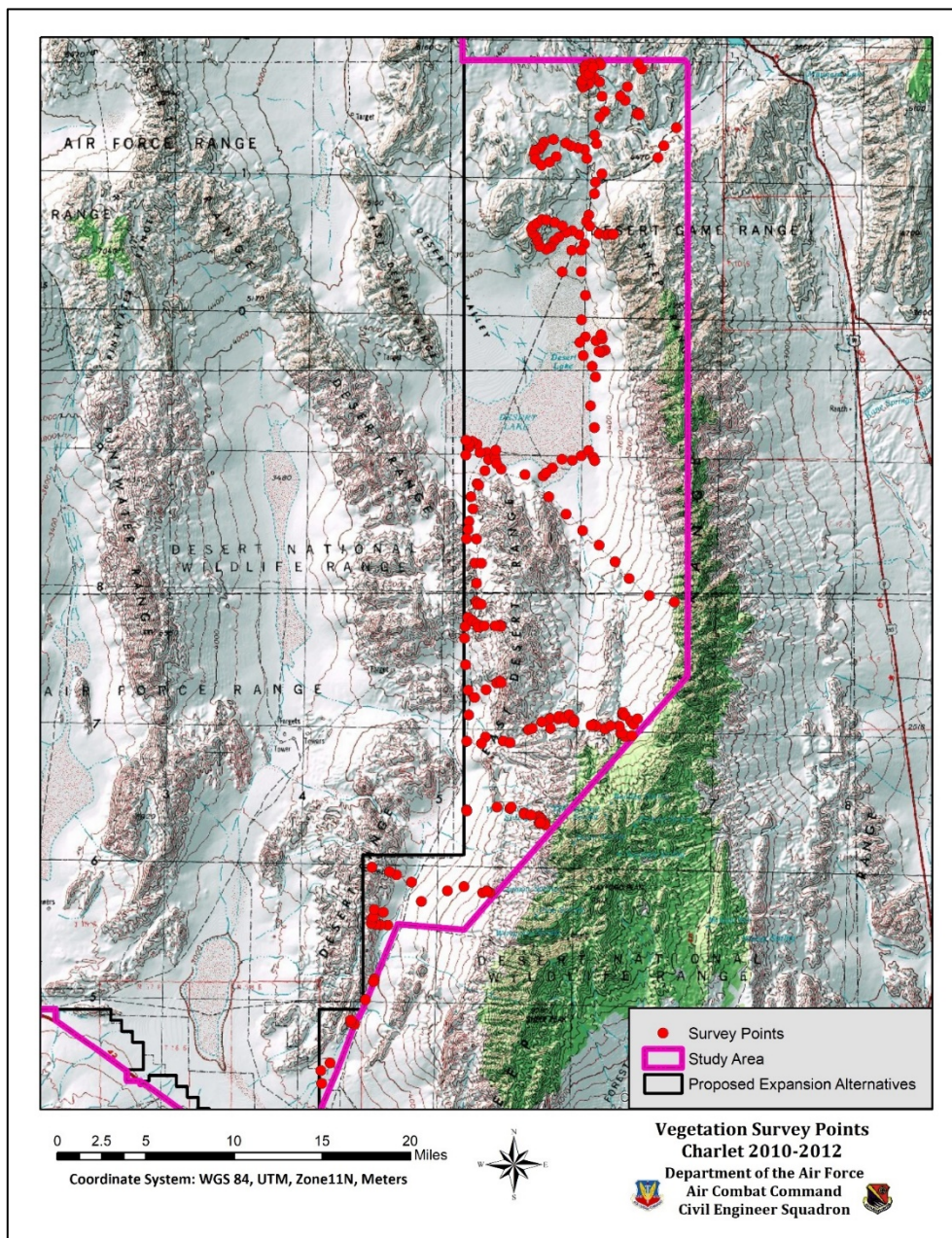


Figure 5. Locations where Charlet (Charlet, D.A. and C. Westenburg, 2013) surveyed Alternative 3C for vegetation in 2010-2012.

and transects were selected by locating diverse imagery patterns within one to four miles of roads. Survey points were selected along the transects where imagery changed, indicating a potential change in the plant community. Approximately 246 points were surveyed by Charlet in 2010-2012 (Figure 5) in Alternative 3C and 902 points were surveyed in 2016 by Adams Ecology in Alternatives 3A, 3B, and 3C (Figures 6, 7, and 8).

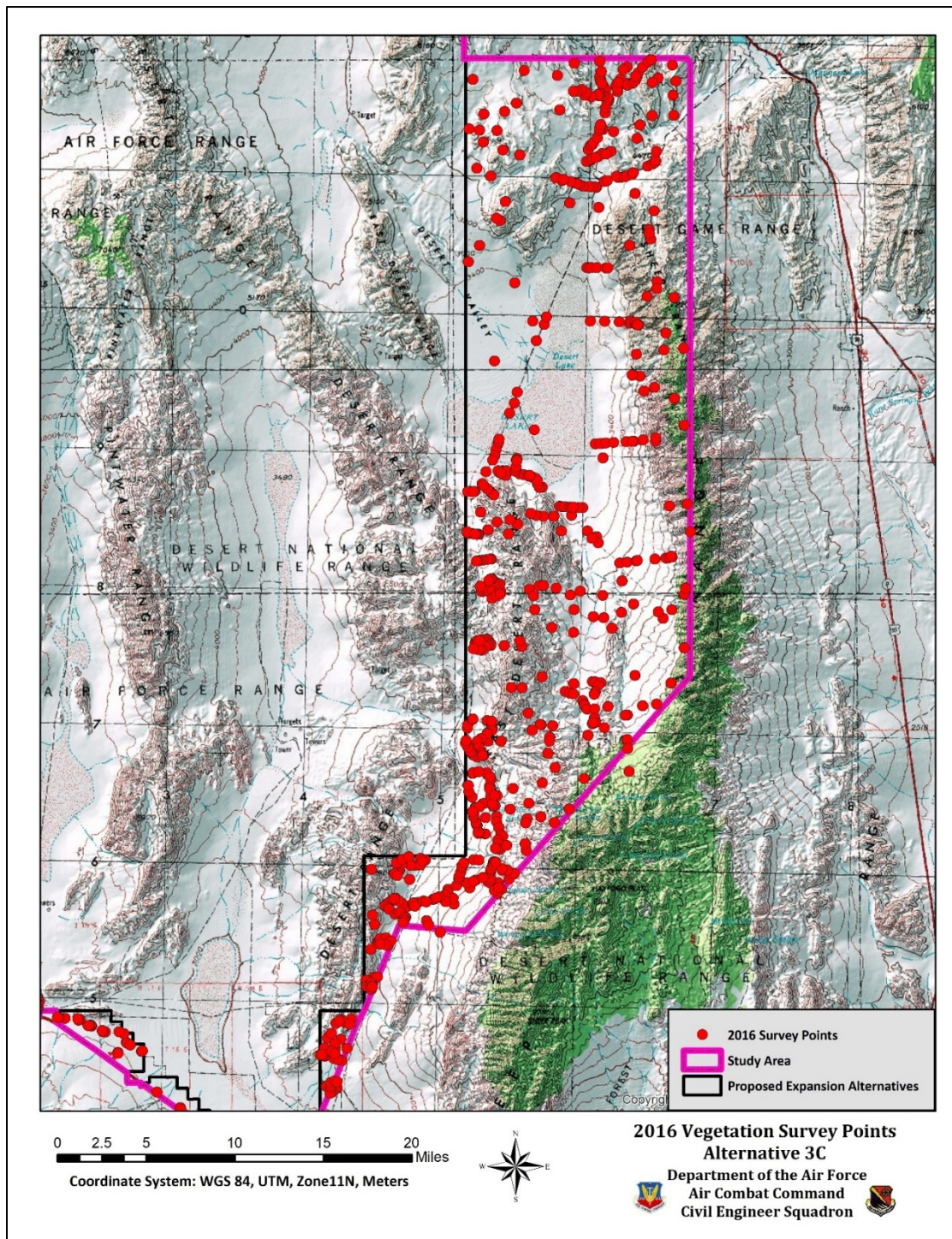


Figure 6. Locations where Adams Ecology surveyed Alternative 3C for vegetation in 2016.

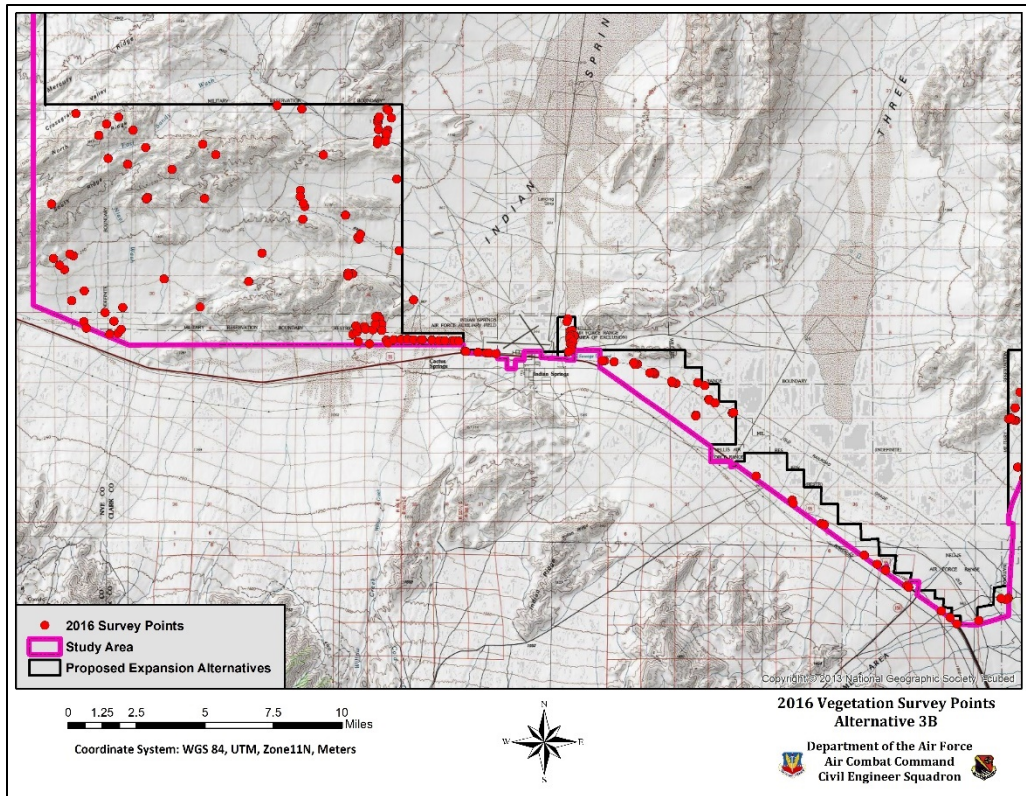


Figure 7. Locations where Adams Ecology surveyed Alternative 3B for vegetation composition in 2016.

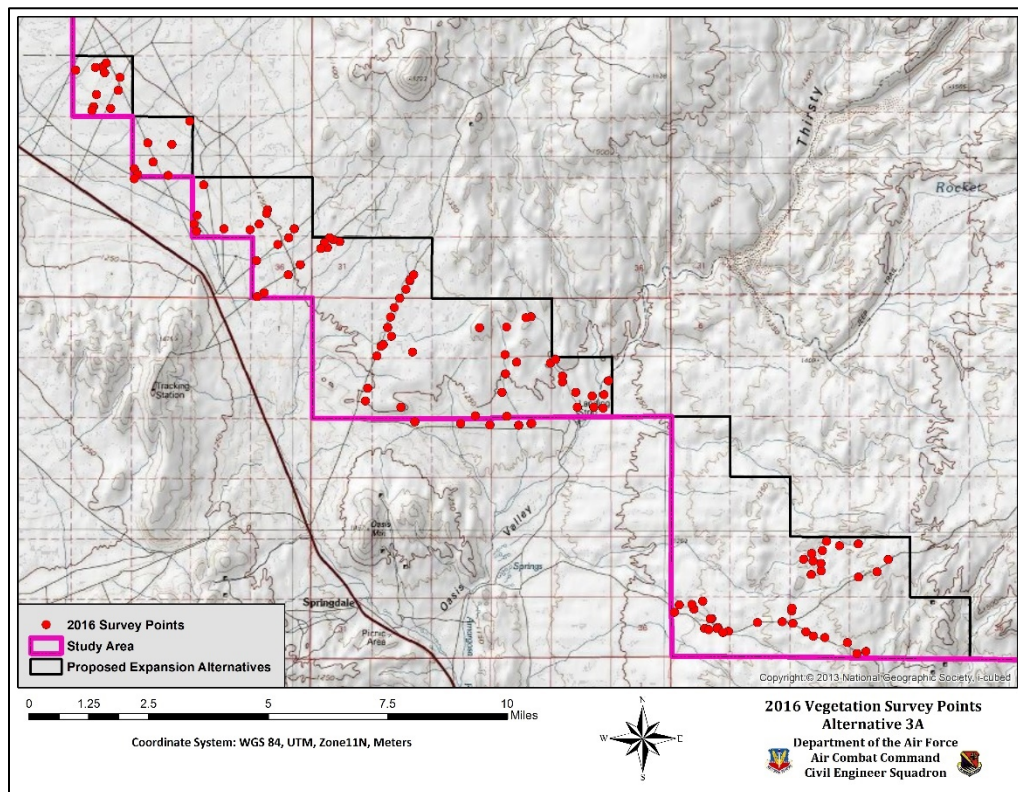


Figure 8. Locations where Adams Ecology surveyed Alternative 3A for vegetation composition in 2016.

Initial Classification of Satellite Imagery

Feature Analyst is a software product distributed by Textron Systems that is used to automatically extract and classify objects in high-resolution imagery. For this project, Feature Analyst was used for the purposes of classifying vegetation communities on the North Range Study Area and South Range Study Area. High resolution 4-band imagery (RGBN 50-cm spatial resolution) was acquired from Airbus Defense & Space at the initiation of the project. This imagery covered the proposed expansion areas and was taken on April 3 and 4, 2016.

Several trials were completed using Feature Analyst to achieve the best segmentation and classification of plant communities. The software allows for a multitude of inputs, and classification can be completed via either supervised or unsupervised training. With supervised training, a user must manually identify classes of satellite imagery patterns and create training polygons for each class. A sample area was subset from the imagery and a minimum of ten training polygons were created for each class within the sample area. A variety of different supervised classification methods were attempted, but none achieved the desired results, which was uniform patterns and color within a class.

Unsupervised classification was also attempted. This method allows for the software to classify the imagery based on color, texture, and other attributes without training sample input from the user. This removes the bias of the analyst and allows the program to find uniform areas of imagery. After various unsupervised classification techniques were tested and modified, an output was achieved that provided classified polygons with uniform characteristics superior to that produced through supervised classification efforts. It was determined that this method would be used for further classification.

Assignment of Plant Community Names for Proposed Alternatives

Following the analysis of satellite imagery to create classes of polygons with uniform characteristics, field survey points were individually assigned plant community names based on USNVC rules and plant communities. USNVC rules were used to assign proposed names if the vegetation community at a point did not match any of the communities that have been previously named and described by USNVC (USNVC, 2016).

When all survey points were assigned plant community names, they were intersected with the classed polygons. Plant communities associated with each class were determined in this manner. In some cases, only one plant community was associated with a polygon class, but in most cases, more than one plant community was associated with a polygon class. In those cases, additional parameters were investigated to determine if points within one polygon class and one plant community could be separated from other points based on those parameters. The most common environmental parameters that were used to further segregate plant communities within a polygon class included topography, geology, soils, precipitation, latitude, and the general pattern of point distribution. Using this information, polygons within classes were assigned plant community names. In the future, the map should be subjected to accuracy surveys and modified as required to further improve accuracy.

The final map for the proposed alternatives was prepared at the alliance level of plant community classification where appropriate. When the initial plant community mapping effort is completed for NTTR in 2020, accuracy surveys will be conducted to further refine and correct maps in the future to eventually meet an acceptable level of accuracy.

Model Used to Define Plant Communities for Gap Areas in the North Range Study Area

Four-band imagery of the same spatial resolution for the entire NTTR was obtained in 2009 during previous work with the Nellis Natural Resources Management Program. This satellite imagery was provided by GeoEye (RGBN 60-cm spatial resolution) and was taken in July 2009. To allow for manageable delivery by the imagery distributor, the imagery was divided into tiles measuring approximately 45 square miles in area. The imagery of the NTTR was taken in 2009 and the imagery of the expansion alternatives was taken in 2016, making them incompatible for mapping together because spectral signatures were significantly different. Therefore, the areas were modelled separately and then the resulting maps were combined after spectral analysis.

A significant portion of the North Range Study Area was previously classified and mapped by vegetation projects conducted from 2012-2015. However, some areas were not mapped in these projects. Mapped areas were used to determine plant communities in the unmapped areas based on unsupervised classification. Polygons in unmapped areas were classified to match the classes of polygons in adjacent mapped areas. Historic data was used to spot check the accuracy of mapping in these previously unmapped areas.

The entirety of the North Range Study Area imagery was mosaicked into one contiguous raster. Unsupervised classification was performed using Feature Analyst and using the same input parameters that were used for the most successful trial of the sample area classification. It was then determined that the area was too large for the software to process. Thus, the North Range was split into three smaller mapping areas to expedite processing and minimize computer errors. The areas were designed to overlap each other by one imagery tile to allow the subsets to be uniformly combined into one map after classification was completed. With overlapping, the classifications of the subsets can be relabeled to allow for uniform polygon classes across subset boundaries. Upon completion of this activity, the subset areas were then combined in ArcGIS. If polygon edges did not meet precisely across subset areas, vertices were manually edited to create a seamless final map layer.

Some of the plant communities in the North Range Study Area had been previously mapped. It was determined to use those maps to assign plant communities to polygons prepared by the unsupervised classification process. This was accomplished by using a spatial join to extract plant community names from the previously classified vegetation communities and add that information as a new field to the classified polygons. This was accomplished by extracting the attribute based on the largest area of overlap between the two inputs using the Spatial Join - Largest Overlap script (downloaded from the ArcGIS website).

Those polygons outside of the mapped areas that matched the class of polygons in mapped areas were assigned plant community names based on the plant communities in the mapped areas. Some classes could not be tied to previously mapped plant communities created by formal vegetation surveys. In those cases, information from historic data points was used to name these communities. If no other information was available, the polygons were manually assigned plant community names based on adjacent polygons, geology, soils, elevation, and topographic location. It is acknowledged that because of differences in methodology and potential changes in plant communities over time, this classification could be inaccurate to some degree. However, until further surveys are conducted in the future, this data will be used with a healthy respect for some level of unassessed inaccuracy.

Model Used to Define Plant Communities for Gap Areas in the South Range Study Area

About 40% of the South Range Study Area did not contain an adequate number of historic or formal vegetation survey data points to allow for vegetation mapping. Therefore, it was determined that this gap area would be subjected to a probabilistic model, Maxent, based on spatial data layers and vegetation

survey points in adjacent areas where formal surveys were conducted. Maxent, a software program provided by the Princeton University Department of Computer Science, is based on the principle of the “maximum entropy” approach to habitat modeling. This approach uses field-collected sample points and extracts distribution information from environmental layers that were inputted by a user. The object of the method is to predict the probability of a plant community occurring in an area based on the location of observation points where that community was identified. Observation points in the South Range Study Area were labelled according to dominant plant species and that information was entered as the observation points for Maxent. The method described below is a new method that was created to handle the interim data created by the surveys for the South Range Study Area. Once surveying is completed, standard methodology or a modification of this method may be used.

For the purposes of this study, in addition to the observation points, the input ecological/physical layers included:

- Elevation – 10m elevation data downloaded from the USGS National Elevation Dataset (NED)
- Precipitation – Nellis Natural Resources Program
- Habitat – Ecological systems or Key Habitat information as created by the NDOW for the Wildlife Action Plan (Wildlife Action Plan Team, 2006)
- Geology – Parent material information downloaded from USGS through the Keck Library
- Soils – SSURGO information from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS)
- Segmented Imagery Polygons – Extracted using Feature Analyst as outlined above.

Field sampling data was obtained from previous formal plant community surveys (2012-2015) on the NTTR and proposed expansion areas. Data was collected from the Nellis Natural Resources Program geodatabase and another geodatabase containing DNWR data and 2016 vegetation survey data for the expansion alternatives. The data was combined to create a single shapefile for use in the Maxent model. A total of 1,727 points were used for the final model (Figure 9).

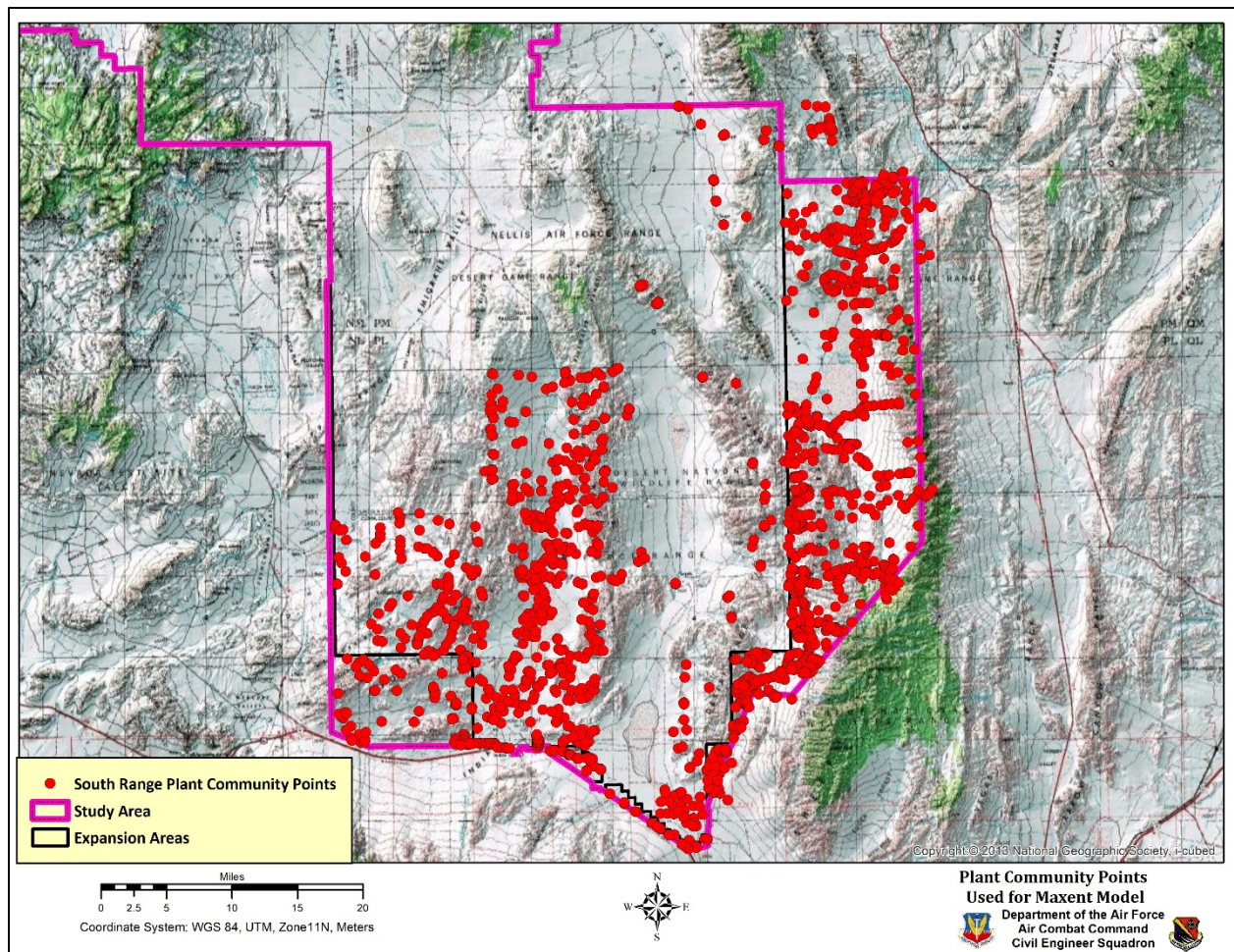


Figure 9. Points designating various plant communities on the South Range Study Area and used for the Maxent Model for vegetation mapping.

The environmental layers listed in the Maxent section above were compiled and clipped within the boundary of the South Range Study Area. Maxent requires the layers to have the same extent and be perfectly aligned. Resulting rasters are required to be in ASCII file type. A user-created script titled *PrepareRastersforMaxent* was used to automate this process for all environmental layers.

Field observation point data were converted into comma-separated value (CSV) files that included only the dominant plants and the longitude and latitude for each point. The Maxent software was then run using the CSV file and processed environmental layers as inputs. The output resulted in a raster for each community that depicted the probability of that community being located in different areas of the South Range with values ranging from 0 (unlikely presence of habitat) to 1 (likely presence of habitat). Because each community output had its own individual probability raster, it was necessary to combine them into one seamless raster containing all plant communities. This was accomplished by using a “Maximum” variable. This method combines all of the dominant plant group rasters and removes all probabilities associated with each dominant plant group at each pixel except for the highest value or probability for that pixel. The resulting raster was called “Max” and was comprised of numbers ranging from 0-1 (equating to probabilities of 0-100%). To identify which dominant plant group had the highest probability at any pixel, the rasters for each dominant plant group were subtracted (using the ArcGIS Raster Calculator) from Max. If the subtraction of the pixel value for a dominant plant group resulted in a value of 0, then it was

the dominant plant group with the highest probability at that pixel. The pixel was assigned that dominant plant group name (Figure 10).



Figure 10. Illustration showing the results of the subtraction of a vegetation community Maxent raster (ephne) from the maximum merged (Max) raster. The resulting zero-values (or green squares) represent pixels where ephne had the highest probability of being at that point.

This subtraction was completed for all vegetation communities. The resulting rasters were then reclassified using the following schema:

Old Value	New Value
0	(Dominant Plant Group Name)
>0	NoData
NoData	NoData

Pixels classified as “NoData” resulted in their removal from the raster layer. The resulting rasters were then merged together, resulting in a seamless overall raster in which each vegetation community was only represented by pixels where Maxent determined that the community had higher probability than any other community. The resulting raster was then converted to a shapefile which was then merged to the previously classified areas in the South Range Study Area. Figure 11 below shows a flow chart of this process.

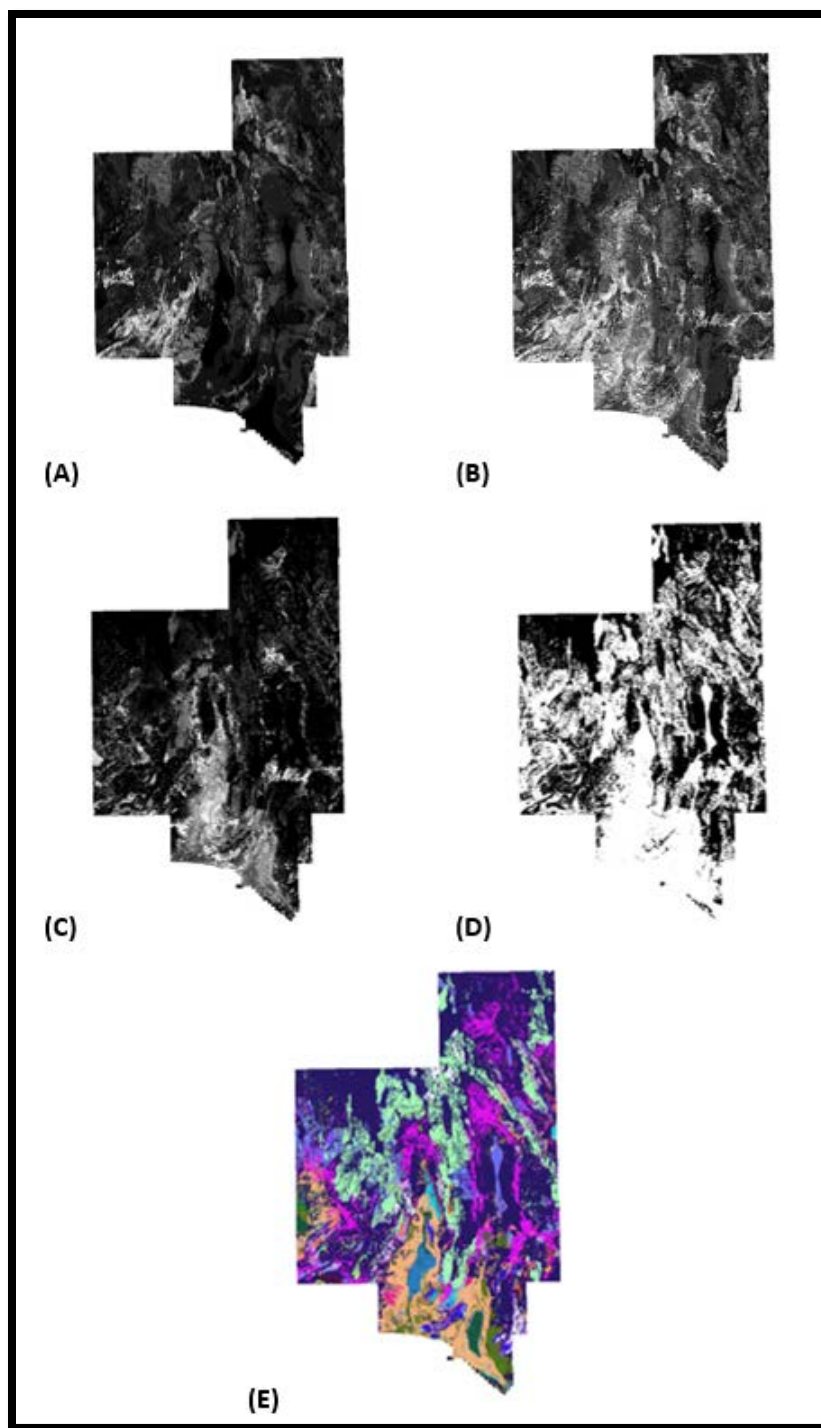


Figure 11. The process of combining Maxent Outputs. First, Maxent is run for each individual community (A). Next, the communities are all combined using a “Maximum” variable, thus creating “Max” (B). Following this, each individual vegetation community Maxent output is subtracted from “Max” using the raster calculator (C). Then, the subtracted raster is reclassified, leaving behind only areas that Maxent deemed the community was more likely to be found than any other communities (D). Finally, all the reclassified rasters are combined and subsequently converted into one contiguous shapefile (E).

Results

GENERAL

Vegetation maps created for this report were prepared using interim data from a project that is about 60% complete. As such, these maps will require revision and improvement when the project is 100% complete. In this interim period, it was vital to use the available data to create an interim vegetation map that could be used to determine areas potentially impacted by military actions associated with the proposed land withdrawal. Future plans are to complete vegetation mapping for the study area and subject the final map to formal accuracy assessment and adjustment of plant community boundaries and/or names to accommodate acceptable levels of accuracy. The names of plant alliances have been assigned using the 2016 U.S. National Vegetation Classification (USNVC) where possible. In some cases, unique plant community names are assigned because the USNVC did not have a good fit for that plant community. This map is being prepared to provide information vital to wildlife management and not to necessarily formally categorize plant alliances or groups at this stage of the project. When the project is completed, formal assignment of plant alliances, associations, or groups can be made and will be useful on a regional scale. However, on a local scale for the purposes of natural resources management on the study area, assignment of unique alliance or association names may be required. These will be designated as “proposed” alliances or associations, with the understanding that the names are only being used to designate a plant community that has not been identified by the USNVC, but is considered a plant community that can be mapped and identified as a separate entity with unique composition on the study area.

The vegetation map created for the North Range Study Area was segmented and classified as described in the methodology section. Actual assignment of plant community names to polygon classes was accomplished manually for gap areas. An attempt was made to use Maxent for the North Range Study Area, but manual mapping was considered superior because historic survey points could be used to assist in the process. Historic data points did not contain dominant plant data that was required for running Maxent. The process of assigning polygons plant community names in areas that were previously mapped was successful by using a spatial join between the mapped plant communities and the map of plant classes created by Feature Analyst. This successfully created a map that was seamless between the actual mapped areas and gap areas.

Gap areas on the North Range Study Area can be observed on Figure 3 as those areas that have not been formally mapped prior to this project. Plant communities in the gap areas were carefully assigned based on the classes designated by Feature Analyst and the plant communities in that class. As mentioned in the methodology section, this sometimes resulted in several plant communities being designated for the same class. Location of the points for the different plant communities within a class were inspected and any trends of those communities associated with soils, geology, topography, elevation, etc. were noted. This information was used to assign the plant communities to polygons. Manual mapping was conducted by biologists familiar with the North Range Study Area and the general knowledge of the area also played a role in assignment of plant communities.

It is important to note that the accuracy of vegetation classification has not been assessed for this project or any of the previous vegetation mapping projects on the study area. This is an ongoing project that will be completed in the next few years. Once the initial plant community surveys have been completed, formal accuracy assessments will be conducted to test, modify, and refine the vegetation map to improve accuracy, if required.

On the South Range Study Area, several areas, including the alternative expansion areas, have been mapped and surveyed using the methodology described in the above sections. These maps were directly

incorporated into the map and used with no changes, unlike the North Range Study Area where a spatial join was used to generalize the layer. The spatial join technique was not successful in mimicking the previous maps without a significant number of unexplainable artifacts, anomalies, and errors occurring. Thus, those maps were unioned with the gap areas with some minor adjustments to match plant community polygons between different maps and the gap area map.

Maxent was used as described in the methodology section to create the map for the gap areas. Points from the formally mapped areas were used for Maxent to map the gap areas where no survey points had been taken. Some minor adjustments were required to finalize the gap map, but Maxent appeared to create a map that depicted the plant communities based on their preferences for various physical attributes of the area. This map will eventually be modified, if required, as new areas are formally mapped in the future.

The maps for Expansion Alternatives 3A, 3B, and 3C were successfully mapped using a total of 1,148 survey points. Future work should include an accuracy assessment of the maps and modification of the maps, where required.

For the North Range Study Area, 32 plant alliances were mapped, while 38 different plant alliances were mapped for the South Range Study Area. These alliances and their acreages are listed in Table 2. Overall maps for the North Range Study Area and South Range Study Area are provided in Figures 12 and 13. In the pages that follow, detailed information on these plant communities is provided as well as maps of each individual plant community. This information will be used in the future to assist in natural resources management of withdrawn land. It will also be used to assist with assessing potential impacts to the current withdrawn land as well as potential expansion alternatives. Again, it is acknowledged that these maps are preliminary in nature and based on an interim plant community mapping effort that is approximately 60% complete. Accuracy of these maps will be improved as future mapping efforts on NTTR and the expansion alternatives is continued. However, the current maps will still provide an excellent guide for management of the natural resources of these areas.

Table 2. Mapped plant alliances and the acreage mapped in the North and South Range Study Areas.

Plant Community	Area (acres)	
	North Range Study Area	South Range Study Area
G310 Intermountain Semi-Desert Steppe & Shrubland		
A3144 <i>Coleogyne ramosissima</i> Mojave Desert Scrub Alliance	0	165,603
A3196 <i>Ericameria nauseosa</i> Steppe & Shrubland Alliance	13,980	17
A3202 <i>Krascheninnikovia lanata</i> Steppe & Dwarf-shrubland Alliance	73,800	347
A3203 <i>Gutierrezia sarothrae</i> - <i>Gutierrezia microcephala</i> Dwarf-shrubland Alliance	637	23,198
<i>Ericameria</i> spp. Shrubland Alliance (Place Holder)	9,857	0
G541 Warm Semi-Desert Shrub & Herb Dry Wash & Colluvial Slope		
A1044 <i>Chilopsis linearis</i> - <i>Psoralea argophylla</i> Desert Wash Scrub Alliance	0	452
A4185 <i>Prunus fasciculata</i> - <i>Salazaria mexicana</i> Northern Mojave Desert Wash Scrub Alliance	0	118
A4186 <i>Psoralea argophylla</i> - <i>Psoralea polydenia</i> Desert Wash Scrub Alliance	1,930	124
A4188 <i>Hymenoclea salsola</i> - <i>Bebbia juncea</i> Mojave-Sonoran Desert Wash Scrub Alliance	3,107	855
A3259 <i>Fallugia paradoxa</i> Desert Wash Scrub Alliance	0	69
G246 Colorado Plateau-Great Basin Juniper Open Woodland		
A3496 <i>Juniperus osteosperma</i> / Shrub Understory Woodland Alliance	2,629	0
G247 Great Basin Pinyon - Juniper Woodland Group		
A2108 <i>Pinus monophylla</i> - <i>Juniperus osteosperma</i> / Shrub Understory Woodland Alliance	50,884	14,998
CEGL000825 <i>Pinus monophylla</i> Woodland	28,408	0
G295 Mojave-Sonoran Bajada & Valley Desert Scrub		
A3277 <i>Larrea tridentata</i> - <i>Ambrosia dumosa</i> Bajada & Valley Desert Scrub Alliance	14,179	268,258
A3279 <i>Ambrosia dumosa</i> Desert Dwarf Scrub Alliance	0	24,383
G296 Mojave Mid-Elevation Mixed Desert Scrub		
A0833 <i>Purshia stansburiana</i> Scrub Alliance	569	12,064

Plant Community	Area (acres)	
	North Range Study Area	South Range Study Area
A2515 <i>Menodora spinescens</i> Scrub Alliance	76,456	388
A3147 <i>Yucca schidigera</i> Scrub Alliance	0	11,584
A3148 <i>Yucca brevifolia</i> Wooded Scrub Alliance	47,927	124,277
CEGL005294 <i>Yucca brevifolia</i> / <i>Coleogyne ramosissima</i> Wooded Shrubland	0	99,851
CEGL005777 <i>Yucca brevifolia</i> / <i>Larrea tridentata</i> - <i>Yucca schidigera</i> / <i>Pleuraphis rigida</i> Wooded Shrubland	0	183,101
A3195 <i>Chrysothamnus viscidiflorus</i> Steppe & Shrubland Alliance	2,280	0
A4167 <i>Eriogonum wrightii</i> - <i>Eriogonum heermannii</i> - <i>Buddleja utahensis</i> Scrub Alliance	0	136
A4245 <i>Ephedra nevadensis</i> - <i>Lycium andersonii</i> - <i>Grayia spinosa</i> Scrub Alliance	56,322	13,969
CEGL005751 <i>Ephedra nevadensis</i> - (<i>Salazaria mexicana</i> , <i>Hymenoclea salsola</i>) Shrubland	81	10,242
<i>Lycium (andersonii, shockleyi)</i> Shrubland (Place Holder)	13,772	663
G300 Intermountain Shadscale – Saltbrush Scrub		
A0869 <i>Atriplex canescens</i> Scrub Alliance	65,805	20,423
A0870 <i>Atriplex confertifolia</i> Scrub Alliance	123,205	113,906
CEGL001315 <i>Atriplex confertifolia</i> / <i>Tetradymia glabrata</i> Shrubland	3,637	0
CEGL001452 <i>Picrothamnus desertorum</i> Shrubland	242,108	0
A3171 <i>Grayia spinosa</i> Scrub Alliance	5,084	2,074
G303 Intermountain Tall Sagebrush Steppe & Shrubland		
A3198 <i>Artemisia tridentata</i> - Mixed Shrub Dry Steppe & Shrubland Alliance	234,192	0
G308 Intermountain Low & Black Sagebrush Steppe & Shrubland		
A3219 <i>Artemisia arbuscula ssp. arbuscula</i> Steppe & Shrubland Alliance	192,656	13,455
A3222 <i>Artemisia nova</i> Steppe & Shrubland Alliance	68,753	7,207
G312 Colorado Plateau Blackbrush – Mormon Tea Shrubland Group		
A2572 <i>Ephedra torreyana</i> Shrubland Alliance	0	2,784
G537 North American Desert Alkaline-Saline Wet Scrub		
A1046 <i>Sarcobatus vermiculatus</i> Intermountain Wet Shrubland Alliance	20,665	0
A3880 Mojave Seablite - Red Swampfire Alkaline Wet Scrub Alliance		
CEGL001991 <i>Suaeda moquinii</i> Wet Shrubland	0	2,133
G569 North American Warm Semi-Desert Cliff, Scree & Pavement Sparse Vegetation	0	11,263
G570 Intermountain Basins Cliff, Scree & Badland Sparse Vegetation	227	0
G675 North American Warm Semi-Desert Dune and Sand Flats		
A3170 <i>Pleuraphis rigida</i> Desert Grassland Alliance	0	1,245
G775 Intermountain Sparsely Vegetated Dune Scrub & Grassland Group		
<i>Achnatherum hymenoides</i> Vegetation Alliance (Proposed)	183	565
NNHP Classification (Peterson, 2008)		
A.858 <i>Ephedra viridis</i> Shrubland Alliance	4,460	0
B.007 Microphytic Playa Alliance	19,684	38,006
No Current Classification		
Developed or Disturbed Land	17,803	21,306
<i>Sarcobatus baileyi</i> Shrubland Alliance	237,178	0

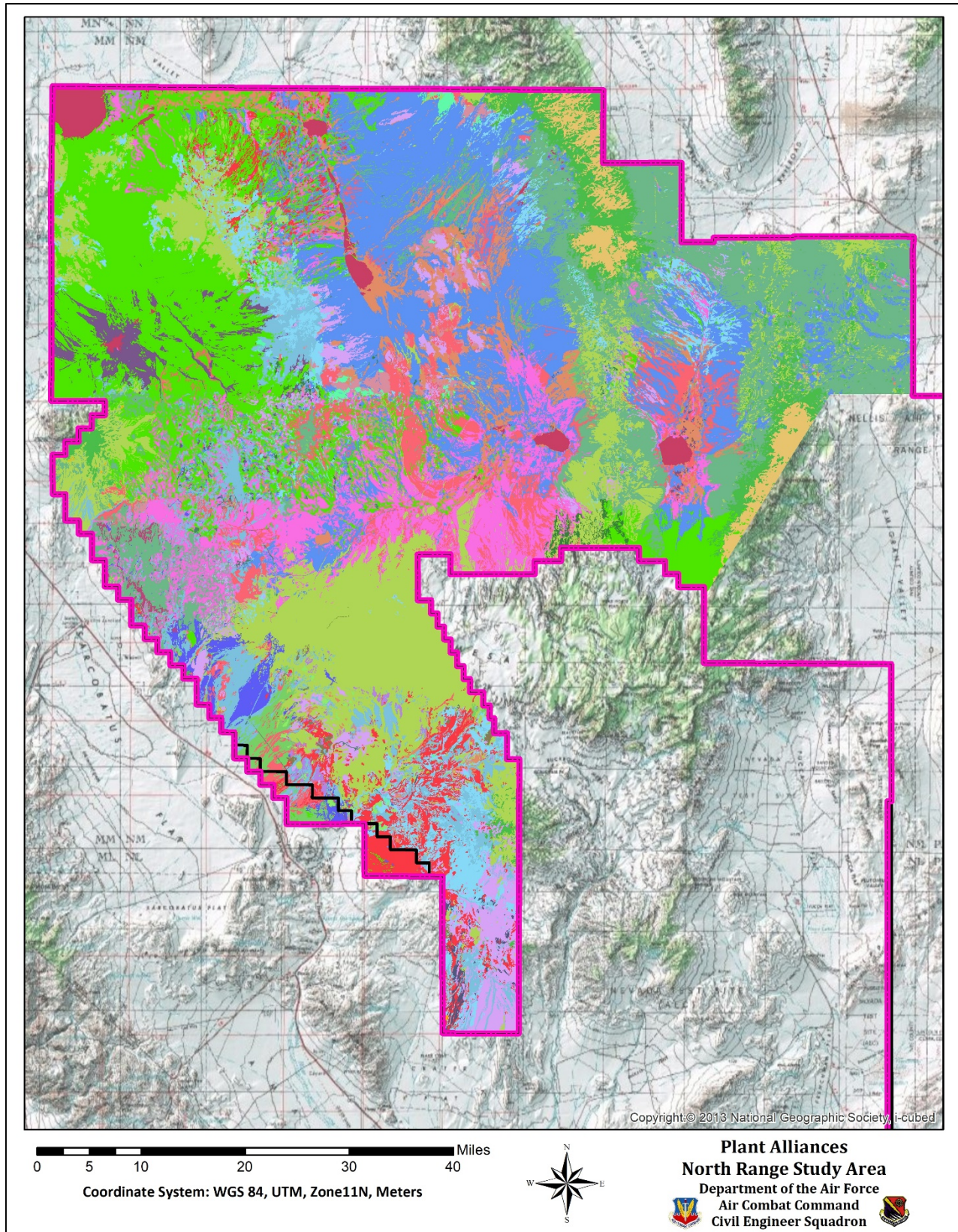
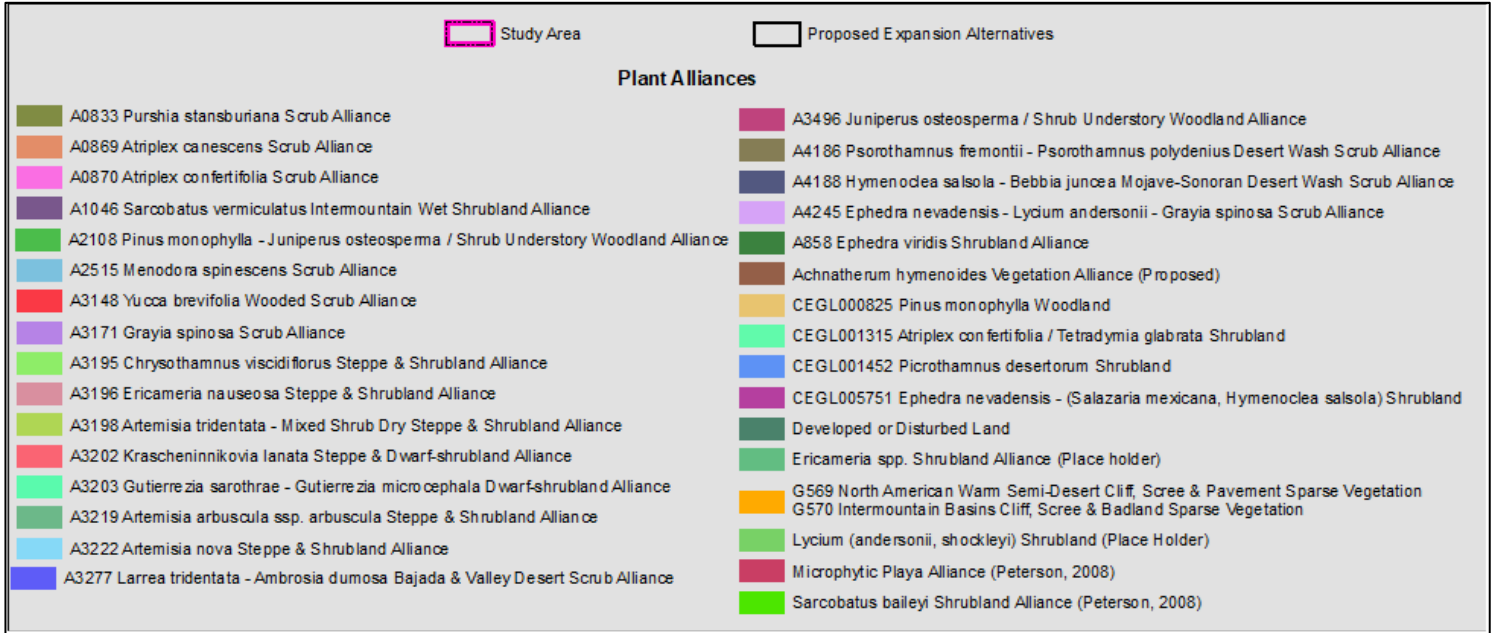


Figure 12. Plant alliances mapped for the North Range Study Area.



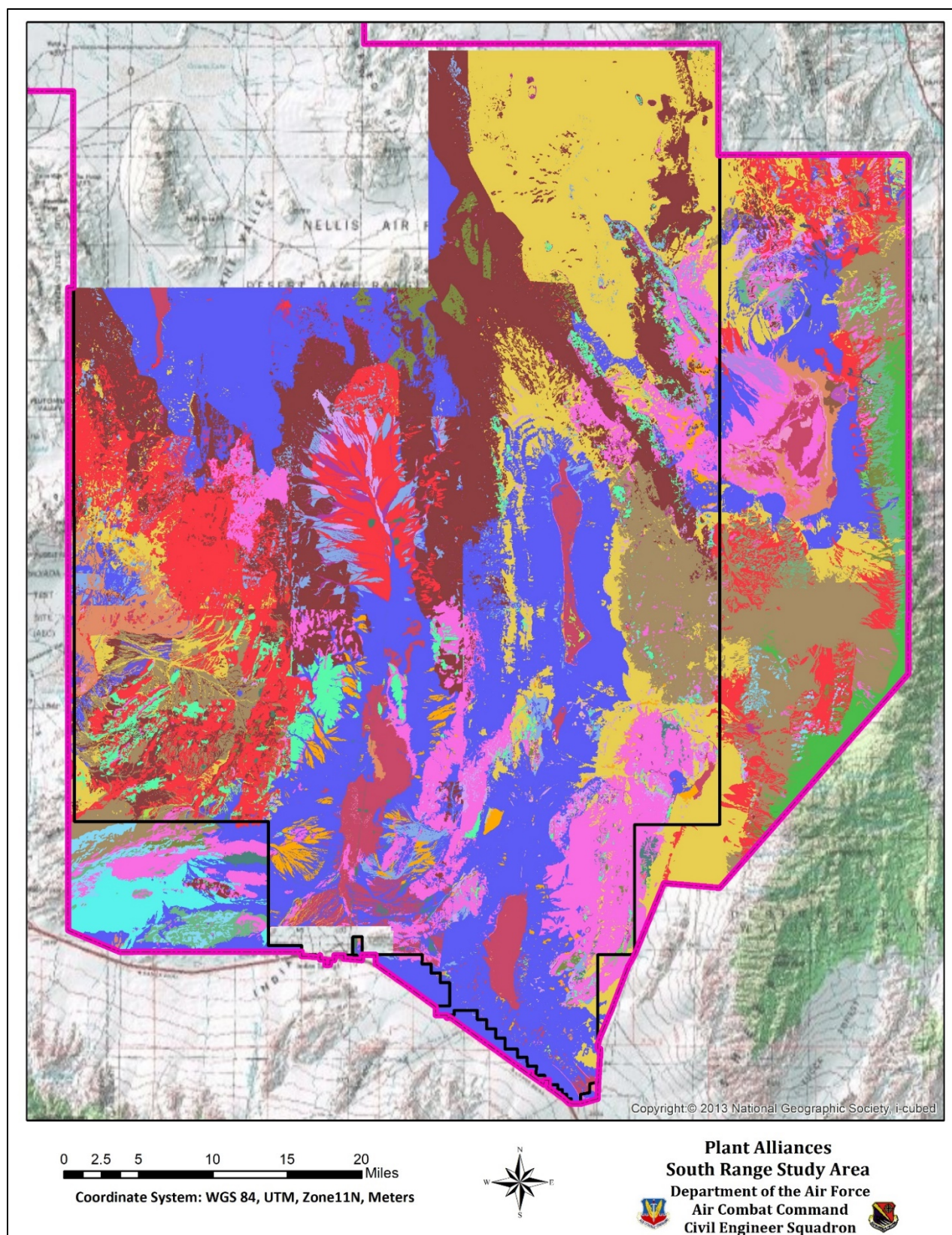
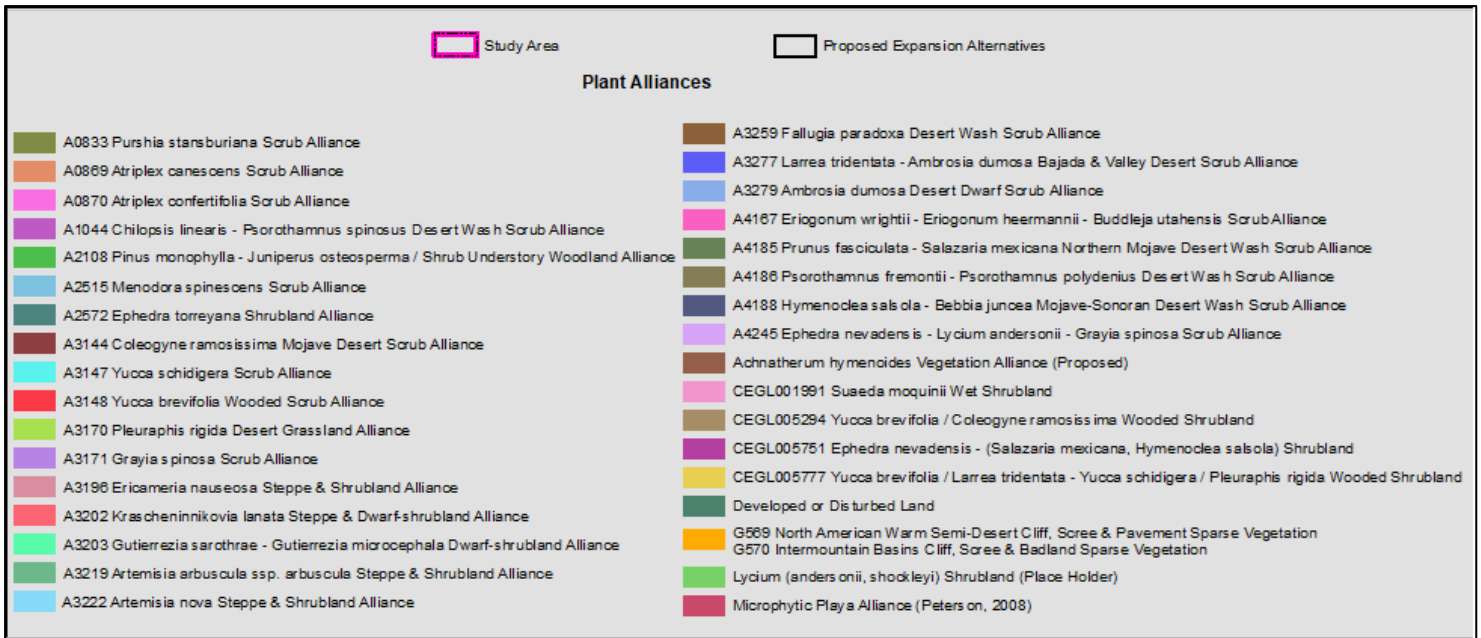


Figure 13. Plant alliances mapped for the South Range Study Area.



A3144 *Coleogyne ramosissima* Mojave Desert Scrub Alliance

According to the NNHP (Peterson, 2008), this alliance is most common in the transition ecosystems between the Mojave and Great Basin Deserts on mountain slopes, mesas, or bajadas bordering intermountain basins. The USNVC places this alliance in G296 Mojave Mid-Elevation Mixed Desert Scrub group (USNVC, 2016). The communities in this alliance are dominated by a sparse to moderately dense population of *Coleogyne ramosissima*. Soils are highly variable, but are usually shallow, coarse-textured and well-drained fine gravelly, sandy loams often covered with fine to coarse gravels. The alliance is found on the upper bajadas and mountains on the South Range Study Area (Figure 14). This alliance is not found on the North Range Study Area, but *Coleogyne ramosissima* is a codominant or subdominant with other species. On the study area, subdominants may be present and include *Ambrosia dumosa* and *Psoralea fremontii* (Table 3). Common shrub species associated with this alliance may include *Menodora spinescens*, *Ephedra nevadensis*, *Krascheninnikovia lanata*, *Atriplex confertifolia*, *Grayia spinosa*, and *Larrea tridentata*. *Yucca brevifolia* and other *Yucca* spp. are present in some stands. A wide variety of grasses tend to dominate the herbaceous strata. Brush height averages 1.6 ft. and foliar cover averages 9%. The alliance is found at elevations ranging from 3,900 to 6,800 ft. MSL.



Typical *Coleogyne ramosissima* Mojave Desert Scrub Alliance

Table 3. List of plant species and characteristics of the *Coleogyne ramosissima* Shrubland Alliance

Attribute	Detail		
Dominants	<i>Coleogyne ramosissima</i>		
Subdominants	<i>Ambrosia dumosa</i>	<i>Psoralea fremontii</i>	
Common	<i>Acamptopappus shockleyi</i> <i>Achnatherum hymenoides</i> <i>Achnatherum speciosum</i> <i>Amsinckia tessellata</i> <i>Atriplex canescens</i> <i>Atriplex confertifolia</i> <i>Baileya multiradiata</i> <i>Bromus madritensis ssp. rubens</i> <i>Chaenactis carphoclinia</i> <i>Chorizanthe brevicornu</i> <i>Chorizanthe rigida</i> <i>Cryptantha circumsissa</i> <i>Cylindropuntia ramosissima</i> <i>Dasyochloa pulchella</i> <i>Descurainia pinnata</i> <i>Echinocactus polycephalus</i>	<i>Ephedra viridis</i> <i>Eriogonum deflexum</i> <i>Eriogonum inflatum</i> <i>Eriogonum nidularium</i> <i>Escobaria vivipara</i> <i>Grayia spinosa</i> <i>Halogeton glomeratus</i> <i>Krameria erecta</i> <i>Krameria grayi</i> <i>Krascheninnikovia lanata</i> <i>Larrea tridentata</i> <i>Lepidium fremontii</i> <i>Loeseliastrum matthewsii</i> <i>Lycium andersonii</i> <i>Menodora spinescens</i> <i>Mirabilis laevis</i>	<i>Opuntia basilaris</i> <i>Opuntia polyacantha</i> <i>Opuntia polyacantha var. erinacea</i> <i>Oxytheca perfoliata</i> <i>Phacelia cryptantha</i> <i>Phacelia fremontii</i> <i>Pinus monophylla</i> <i>Plantago ovata</i> <i>Prenanthes exigua</i> <i>Psoralea polydenius</i> <i>Purshia tridentata</i> <i>Sphaeralcea ambigua</i> <i>Stanleya elata</i> <i>Stephanomeria pauciflora</i> <i>Xylorhiza tortifolia</i> <i>Yucca baccata</i>

Attribute	Detail		
	<i>Echinocereus engelmannii</i> <i>Encelia virginensis</i>	<i>Ephedra nevadensis</i> <i>Ephedra torreyana</i>	<i>Yucca brevifolia</i> <i>Yucca schidigera</i>
Occasional	<i>Bouteloua gracilis</i> <i>Castilleja angustifolia</i> var. <i>dubia</i> <i>Chaenactis stevioides</i>	<i>Erodium cicutarium</i> <i>Glossopetalon pungens</i> var. <i>pungens</i> <i>Gutierrezia microcephala</i>	<i>Phacelia crenulata</i>
Average Height	1.5 ft.		
Area	North Range Study Area: 0 acres	South Range Study Area: 165,603 acres	
Elevation	3,900-6,800 ft. MSL		
Average Foliar Cover	9%		

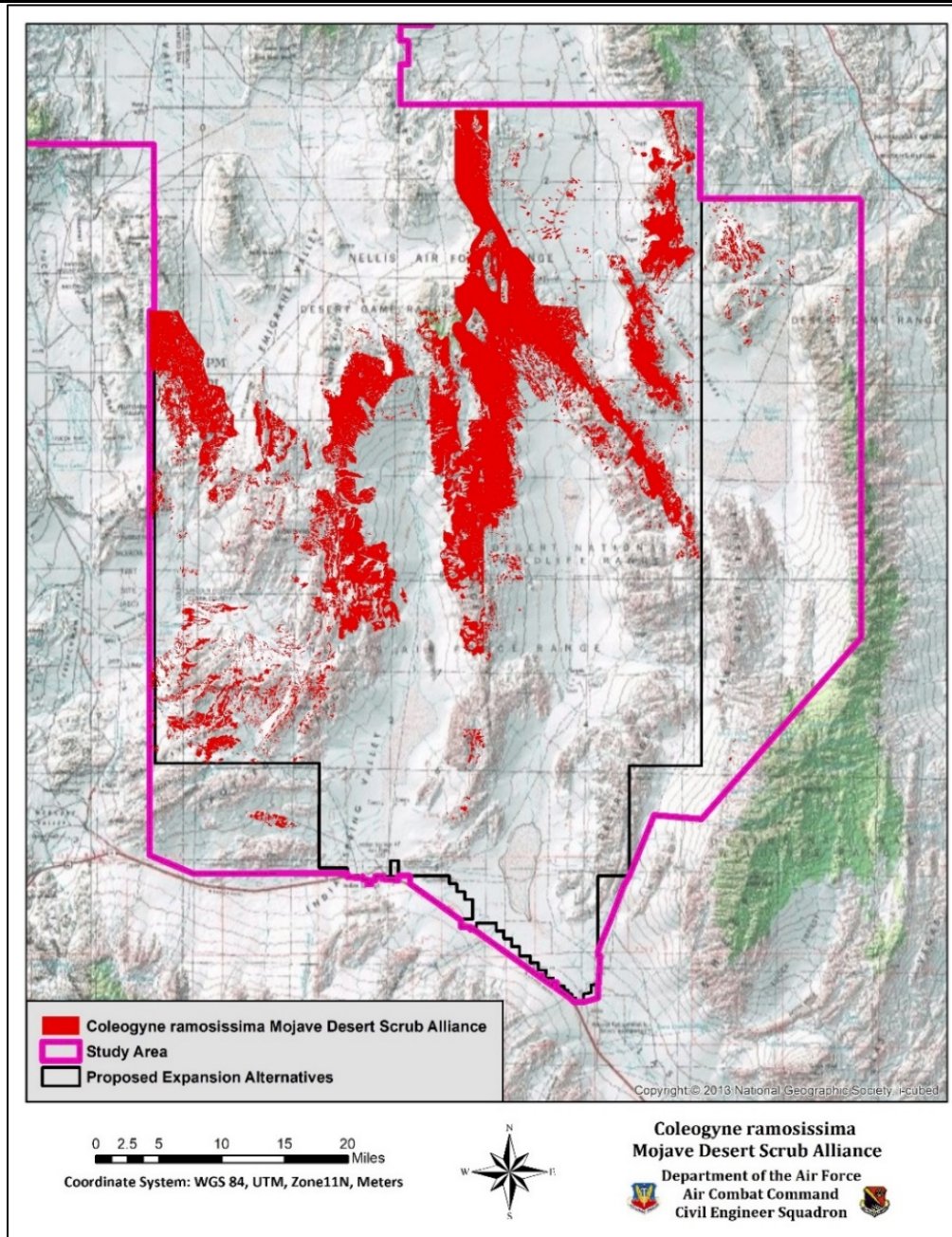


Figure 14. Location of *Coleogyne ramosissima* Shrubland Alliance on the South Range Study Area

A3196 *Ericameria nauseosa* Steppe & Shrubland Alliance

The *Ericameria nauseosa* Steppe & Shrubland Alliance is a member of the G310 Intermountain Semi-Desert Steppe and Shrubland group (USNVC, 2016). On the North Range Study Area, it is a plant alliance dominated by *Ericameria nauseosa* and occurs on the foothills and slopes of the Cactus Range, Gold Mountain, Pahute Mesa and Stonewall Mountain (Figure 15). Foliar cover can range from 5-60% and is often found on areas around water sources that have been impacted by heavy grazing by wild horses as well as other disturbed areas. On the South Range Study Area, it was only identified in three isolated populations on the East Desert Range (Figure 16). The alliance consists of shallow, well-drained soils often derived from volcanic



Ericameria nauseosa Steppe & Shrubland Alliance

rock. Soil texture ranges from gravelly, fine sandy loams to gravelly, sandy clay loams with the occasional rock outcrop (Peterson, 2008). The most common subdominant on the study area is *Atriplex confertifolia* (Table 4). Other shrubs that are associated with this alliance include *Picrothamnus desertorum*, *Atriplex canescens*, and *Artemisia tridentata*. The herbaceous layer commonly includes *Pleuraphis jamesii*, *Bromus tectorum*, and *Achnatherum hymenoides*. Common herbaceous plants include *Sphaeralcea ambigua*, and *Eriogonum inflatum*. The alliance will occasionally support scattered populations of *Juniperus osteosperma* or *Yucca brevifolia*. The shrub layer in this alliance averages 3 ft. tall with 18% foliar cover.

Table 4. List of plant species and characteristics of the *Ericameria nauseosa* Steppe & Shrubland Alliance

Attribute	Detail	
Dominants	<i>Ericameria nauseosa</i>	
Subdominants	<i>Atriplex confertifolia</i>	
Common	<i>Ambrosia eriocentra</i> <i>Amsonia tomentosa</i> <i>Artemisia tridentata</i> <i>Atriplex canescens</i> <i>Atriplex polycarpa</i> <i>Bromus tectorum</i> <i>Camissonia brevipes</i> <i>Chamaesyce albomarginata</i> <i>Cryptantha circumscissa</i> <i>Elymus elymoides</i> <i>Encelia farinosa</i> <i>Encelia virginensis</i> <i>Ephedra nevadensis</i> <i>Ephedra torreyana</i> <i>Ericameria cooperi</i> <i>Eriogonum fasciculatum</i>	<i>Eriogonum inflatum</i> <i>Eriogonum nidularium</i> <i>Eriogonum reniforme</i> <i>Hedeoma nana</i> <i>Loeseliastrum matthewsii</i> <i>Opuntia phaeacantha</i> <i>Picrothamnus desertorum</i> <i>Prunus andersonii</i> <i>Psoralea polydenius</i> <i>Salvia columbariae</i> <i>Sphaeralcea ambigua</i> <i>Stanleya elata</i> <i>Stephanomeria pauciflora</i> <i>Thamnosma montana</i> <i>Yucca baccata</i> <i>Yucca brevifolia</i>
Occasional	<i>Pinus monophylla</i>	<i>Juniperus osteosperma</i>
Average Height	3 ft.	
Area	North Range Study Area: 13,980 acres	South Range Study Area: 17 acres
Elevation	3,900-6,900 ft. MSL	
Average Foliar Cover	18%	

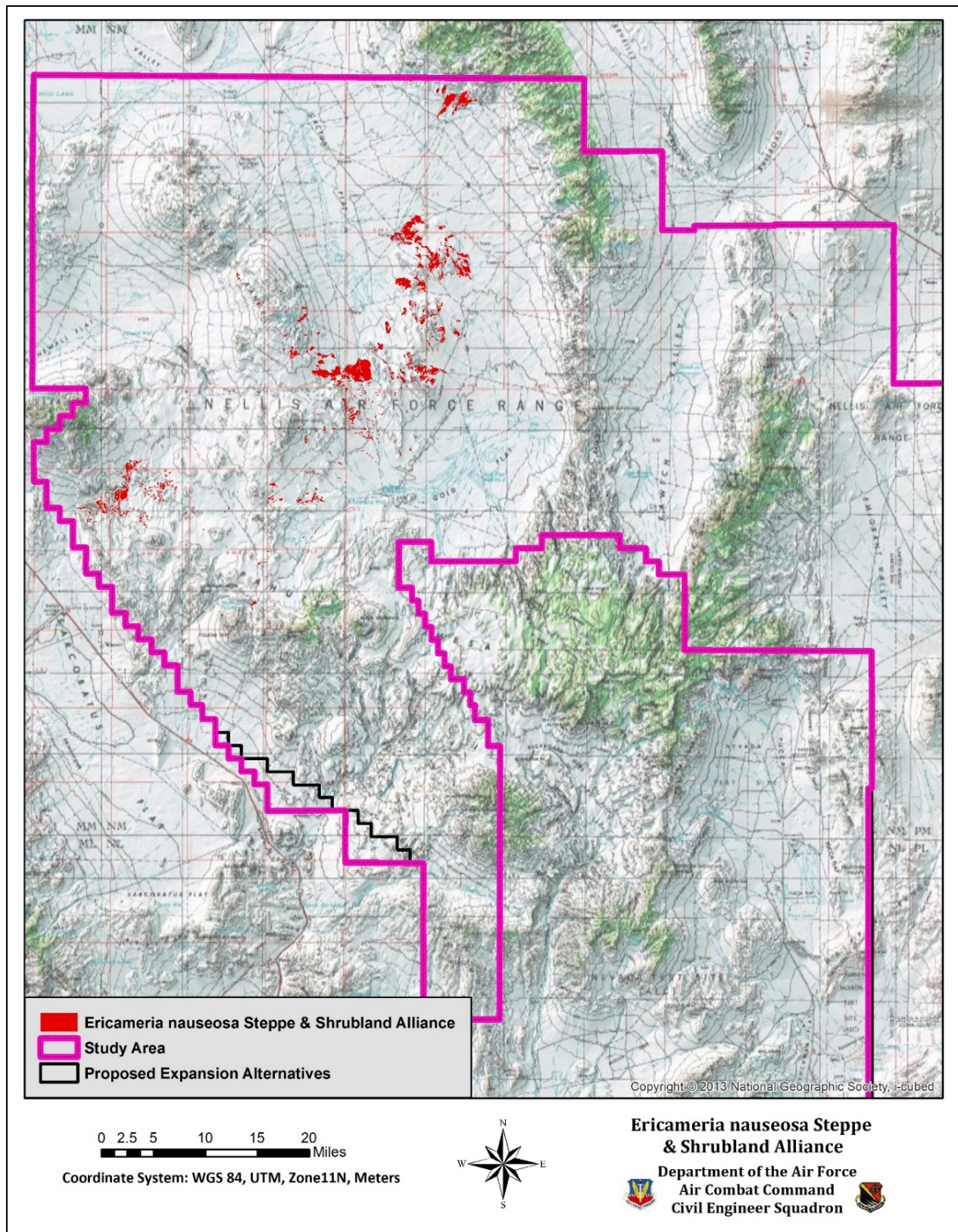


Figure 15. Location of *Ericameria nauseosa* Steppe & Shrubland Alliance on the North Range Study Area.

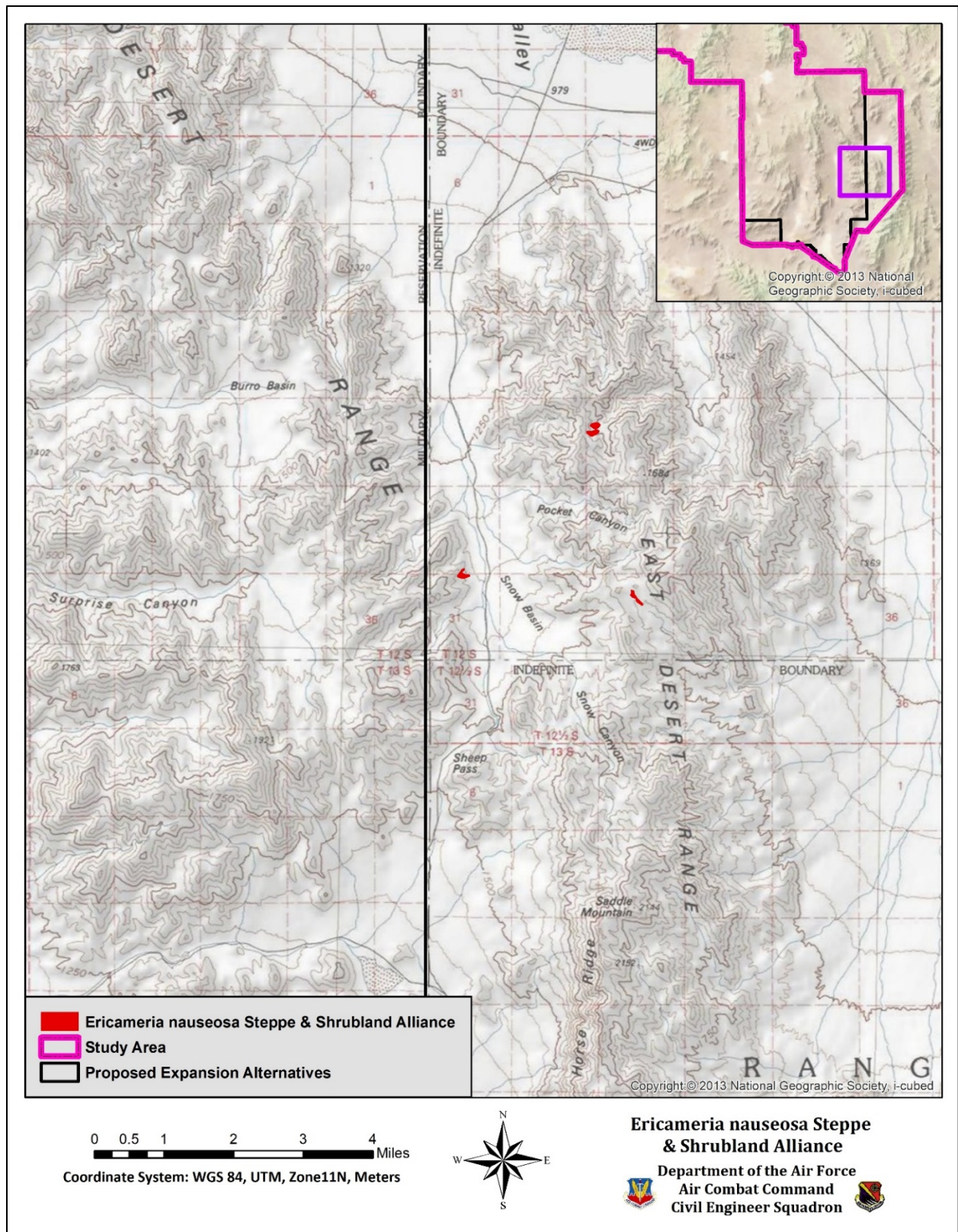


Figure 16. Location of *Ericameria nauseosa* Steppe & Shrubland Alliance on the South Range Study Area.

A3202 *Krascheninnikovia lanata* Steppe & Dwarf-shrubland Alliance

The *Krascheninnikovia lanata* Steppe & Dwarf-shrubland Alliance is a member of the G310 Intermountain Semi-Desert (USNVC, 2016) and is found on the basins of the North Range Study Area, especially Pahute Mesa, Cactus Flats, and Stonewall Flats (Figure 17). On the South Range Study Area, it is not as common, but has been observed upgradient of the Desert Lake on the Expansion Alternative 3C (Figure 18). On the study area, the alliance appears to prefer plateaus, plains, mesas and alkaline flats around dry lakes. This alliance is dominated by *Krascheninnikovia lanata* with subdominants including *Atriplex confertifolia*, *Ephedra nevadensis*, *Lycium andersonii*, and *Picrothamnus desertorum* (Table 5). Common grasses in this alliance are *Achnatherum hymenoides* and *Pleuraphis jamesii*. The average height of the shrub layer is 1.3 ft. with 10% average foliar cover. Elevations range from 4,000 to 6,200 ft. MSL.



Krascheninnikovia lanata Steppe & Dwarf-shrubland Alliance

Table 5. List of plant species and characteristics of the *Krascheninnikovia lanata* Steppe & Dwarf-shrubland Alliance

Attribute	Detail	
Dominants	<i>Krascheninnikovia lanata</i>	
Subdominants	<i>Atriplex confertifolia</i> <i>Ephedra nevadensis</i>	<i>Lycium andersonii</i> <i>Picrothamnus desertorum</i>
Common	<i>Achnatherum hymenoides</i> <i>Amsinckia tessellata</i> <i>Astragalus lentiginosus</i> <i>Baileya multiradiata</i> <i>Bromus madritensis ssp. rubens</i> <i>Bromus tectorum</i> <i>Chaenactis stevioides</i> <i>Chorizanthe brevicornu</i> <i>Chorizanthe rigida</i> <i>Cryptantha circumscissa</i> <i>Ephedra nevadensis</i> <i>Eriastrum eremicum</i> <i>Ericameria cooperi</i> <i>Eriogonum deflexum</i> <i>Eriogonum inflatum</i> <i>Eriogonum nidularium</i> <i>Eriophyllum pringlei</i> <i>Gilia cana</i>	<i>Grayia spinosa</i> <i>Gutierrezia microcephala</i> <i>Lepidium densiflorum</i> <i>Lepidium fremontii</i> <i>Lepidium nitidum</i> <i>Loeseliastrum matthewsii</i> <i>Malacothrix glabrata</i> <i>Monoptilon bellidiforme</i> <i>Mucronea perfoliata</i> <i>Phacelia fremontii</i> <i>Polygala heterorhyncha</i> <i>Psoralea polydenius</i> <i>Salsola tragus</i> <i>Sphaeralcea ambigua</i> <i>Sporobolus contractus</i> <i>Stephanomeria exigua</i> <i>Tetradymia glabrata</i> <i>Yucca brevifolia</i>
Occasional	<i>Baileya pleniradiata</i> <i>Camissonia boothii</i> <i>Chaenactis stevioides</i> <i>Cryptantha micrantha</i> <i>Cylindropuntia echinocarpa</i> <i>Delphinium parishii</i> <i>Elymus elymoides</i> <i>Ephedra nevadensis</i> <i>Erodium cicutarium</i> <i>Hymenoclea salsola</i>	<i>Larrea tridentata</i> <i>Lycium cooperi</i> <i>Oxytheca perfoliata</i> <i>Phacelia crenulata</i> <i>Picrothamnus desertorum</i> <i>Rafinesquia neomexicana</i> <i>Stanleya pinnata</i> <i>Stipa speciosa</i> <i>Tetradymia</i> <i>Tetradymia axillaris</i>

Attribute	Detail	
	<i>Langloisia setosissima</i>	<i>Xylorhiza tortifolia</i>
Average Height	1.3 ft.	
Area	North Range Study Area: 73,800 acres	South Range Study Area: 347 acres
Elevation	4,000-6,200 ft. MSL	
Average Foliar Cover	10%	

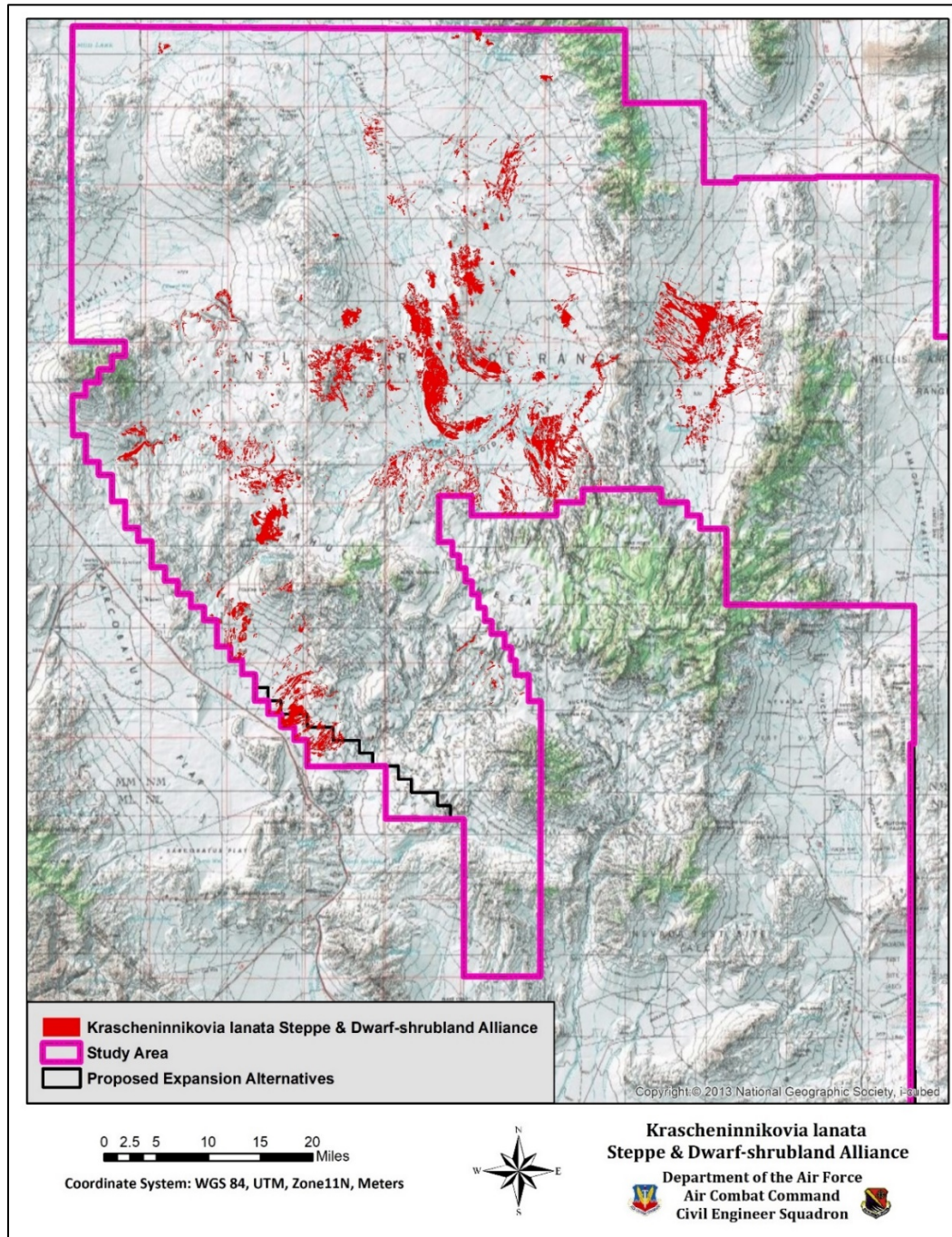


Figure 17. Location of *Krascheninnikovia lanata* Steppe & Dwarf-shrubland Alliance on the North Range Study Area.

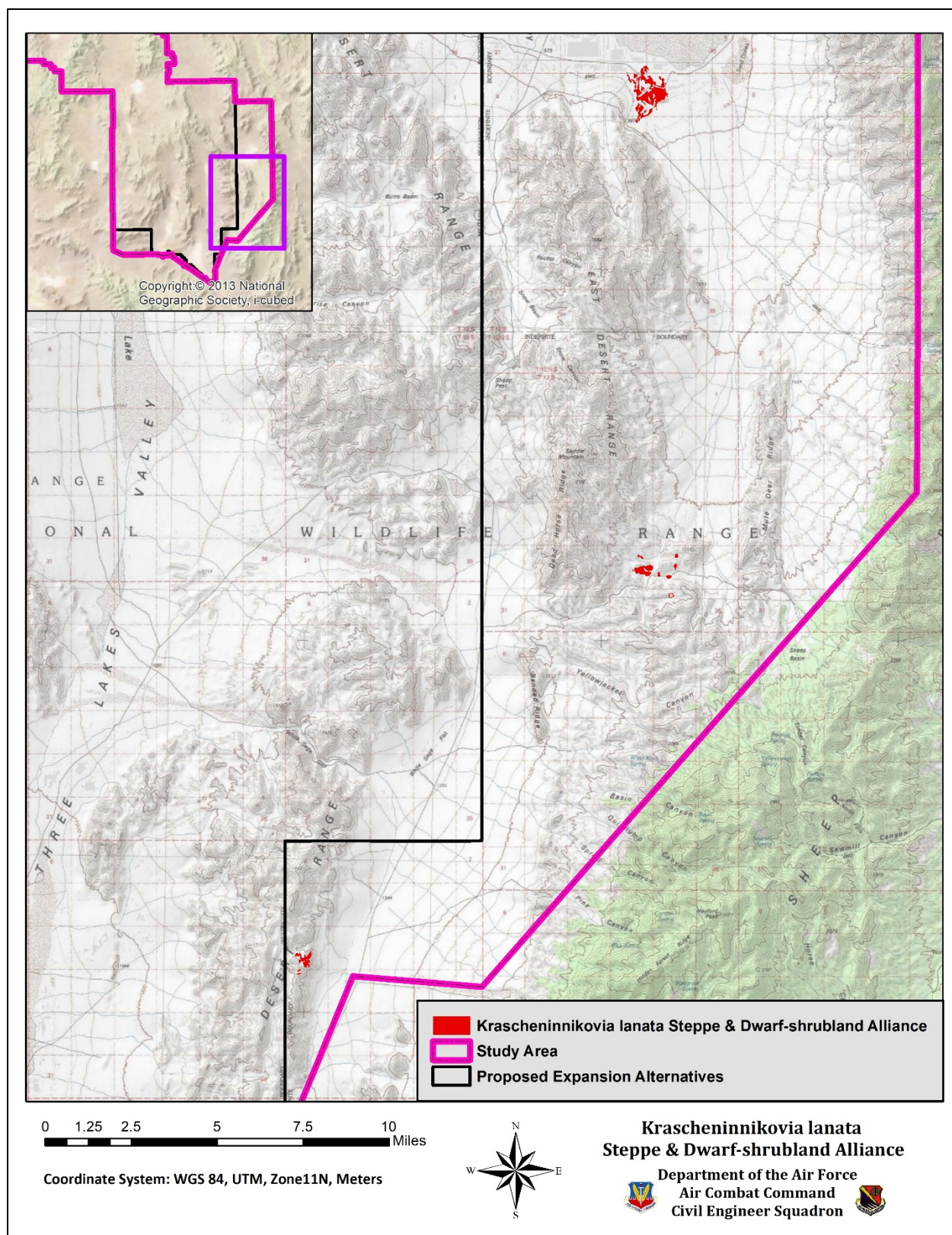


Figure 18. Location of *Krascheninnikovia lanata* Steppe & Dwarf-shrubland Alliance on the South Range Study Area.

A3203 *Gutierrezia sarothrae* - *Gutierrezia microcephala* Dwarf-shrubland Alliance

The *Gutierrezia sarothrae* - *Gutierrezia microcephala* Dwarf-shrubland Alliance is a member of the G310 Intermountain Semi-Desert Steppe and Shrubland group and mostly found in rugged terrain along cliffs, mountain slopes, and canyons (USNVC, 2016). On the North Range Study Area, the alliance is found along the canyon walls and rocky slopes of Thirsty Canyon and areas north of Mount Helen (Figure 19). On the South Range Study Area, the alliance is found relatively widespread on the rugged slopes of the Desert, Spotted, Pintwater, and Sheep Ranges (Figure 20). The alliance appears to establish on soils that are shallow, rocky, and gravelly with a substantial exposure of bedrock surface and often steep slopes.



Gutierrezia sarothrae - *Gutierrezia microcephala* Dwarf-shrubland Alliance

Soils will accumulate in the cracks and crevices of ledges where plants will take root. Most of the soils are gravelly, fine sandy loams. The vegetation is dominated by *Gutierrezia microcephala* or *Gutierrezia sarothrae*. Subdominants include *Artemisia nova* and *Atriplex canescens* (Table 6). Common brush species observed in this alliance include *Krascheninnikovia lanata*, *Lycium andersonii*, *Salazaria mexicana*, *Psoralea arborescens*, and *Krameria erecta*. Grass species are sparse to moderately dense and include *Pleuraphis jamesii*, *Bromus madritensis*, and *Dasyochloa pulchella*. *Larrea tridentata* and *Yucca brevifolia* will occur in this alliance occasionally. The height of the shrub layer averages between 1 - 2 ft. with 10% foliar cover. Elevations range from 3,600 to 6,500 ft. MSL.

Table 6. List of plant species and characteristics of the *Gutierrezia sarothrae* - *Gutierrezia microcephala* Dwarf-shrubland Alliance

Attribute	Detail	
Dominants	<i>Gutierrezia microcephala</i>	<i>Gutierrezia sarothrae</i>
Subdominants	<i>Artemisia nova</i>	<i>Atriplex canescens</i>
Common	<i>Achnatherum hymenoides</i> <i>Achnatherum speciosum</i> <i>Agave utahensis</i> var. <i>eborispina</i> <i>Amsinckia tessellata</i> <i>Artemisia arbuscula</i> <i>Atriplex confertifolia</i> <i>Bassia americana</i> <i>Brickellia atractyloides</i> <i>Bromus madritensis</i> ssp. <i>rubens</i> <i>Bromus tectorum</i> <i>Buddleja utahensis</i> <i>Chamaesyce albomarginata</i> <i>Dasyochloa pulchella</i> <i>Echinocactus polycephalus</i> <i>Encelia virginensis</i> <i>Ephedra nevadensis</i> <i>Ephedra torreyana</i>	<i>Ephedra viridis</i> <i>Ericameria nauseosa</i> <i>Grayia spinosa</i> <i>Halogeton glomeratus</i> <i>Hesperostipa comata</i> <i>Krameria erecta</i> <i>Krascheninnikovia lanata</i> <i>Opuntia basilaris</i> <i>Physalis crassifolia</i> <i>Pleuraphis jamesii</i> <i>Sphaeralcea ambigua</i> <i>Stipa speciosa</i> <i>Suaeda moquinii</i> <i>Symphoricarpos longiflorus</i> <i>Yucca baccata</i> <i>Yucca brevifolia</i> <i>Yucca schidigera</i>
Occasional	<i>Ambrosia dumosa</i> <i>Chaetopappa ericoides</i> <i>Chamaesyce albomarginata</i> <i>Distichlis spicata</i> <i>Echinocereus engelmannii</i>	<i>Larrea tridentata</i> <i>Lepidium fremontii</i> <i>Oxytheca perfoliata</i> <i>Picrothamnus desertorum</i> <i>Psoralea fremontii</i>

Attribute	Detail	
	<i>Encelia farinosa</i> <i>Eriogonum fasciculatum</i> <i>Eriogonum heermannii</i> <i>Eriogonum inflatum</i> <i>Eriogonum ovalifolium</i> <i>Hymenoclea salsola</i> <i>Juniperus osteosperma</i>	<i>Purshia stansburiana</i> <i>Salazaria mexicana</i> <i>Sarcobatus baileyi</i> <i>Sporobolus flexuosus</i> <i>Stephanomeria parryi</i> <i>Tetradymia glabrata</i>
Height	1-2 ft.	
Area	North Range Study Area: 637 acres	South Range Study Area: 23,198 acres
Elevation	3,600-6,500 ft. MSL	
Average Foliar Cover	10%	

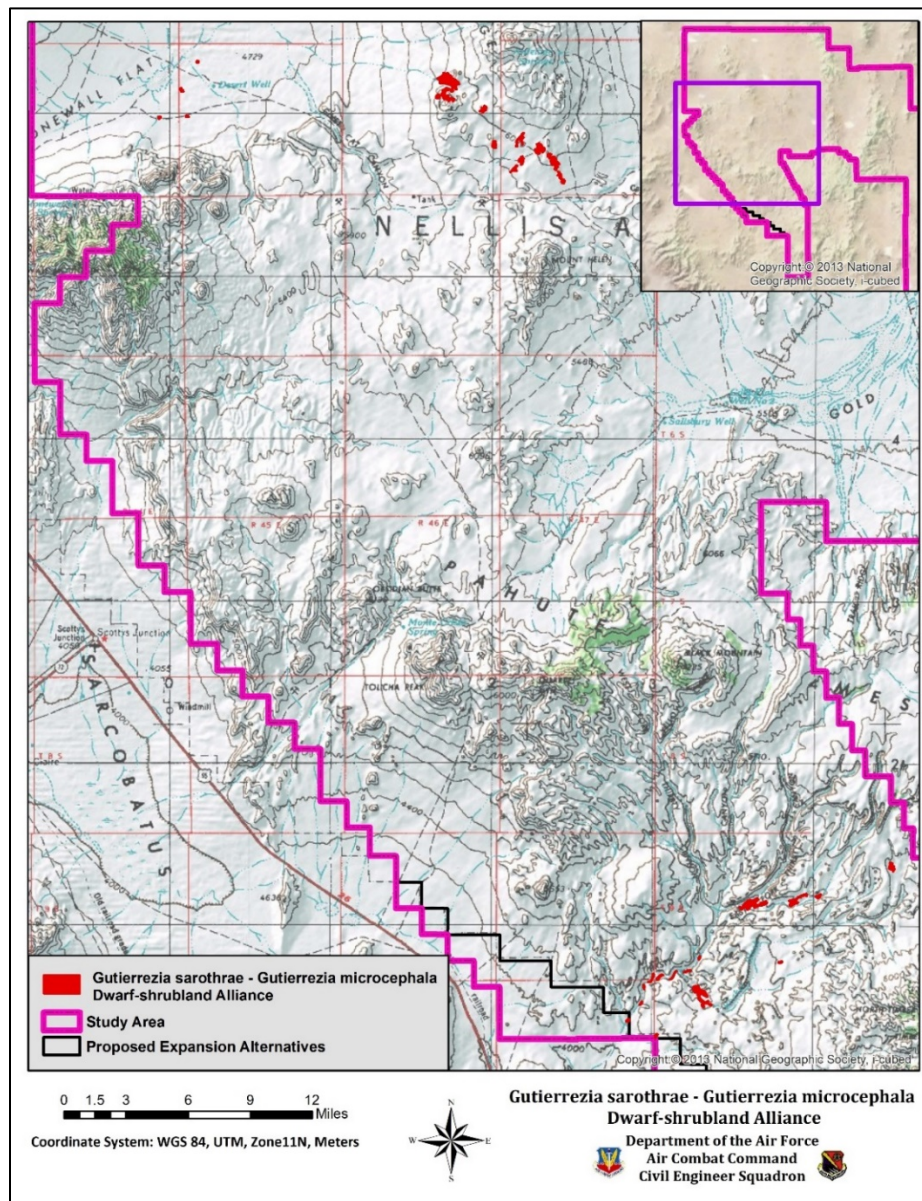


Figure 19. Location of the *Gutierrezia sarothrae* - *Gutierrezia microcephala* Dwarf-shrubland Alliance on the North Range Study Area.

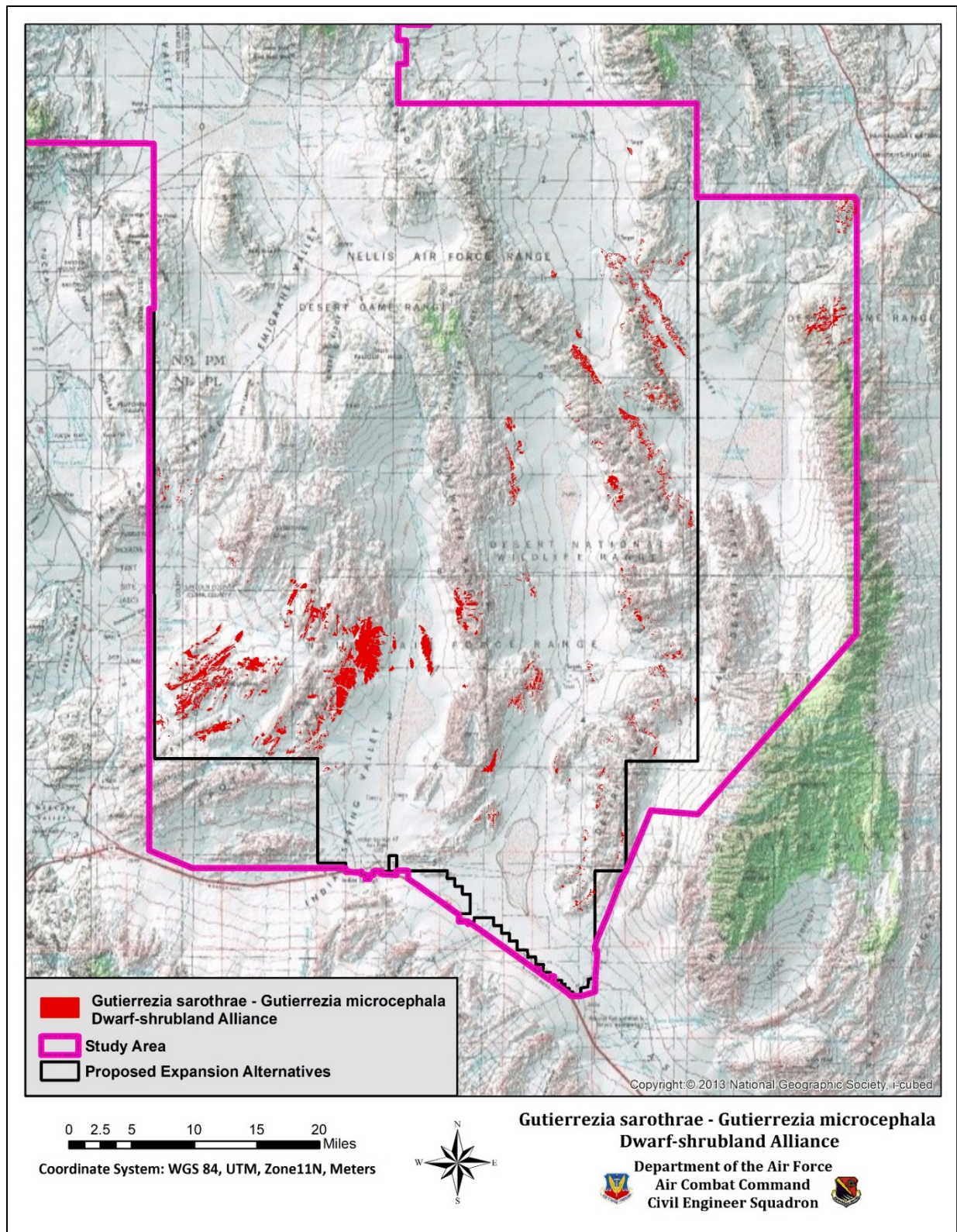


Figure 20. Location of the *Gutierrezia sarothrae* - *Gutierrezia microcephala* Dwarf-shrubland Alliance on the South Range Study Area.

***Ericameria* spp. Shrubland Alliance (Place Holder)**

This is a plant alliance dominated by *Ericameria* spp. that could not be identified to species. Because the species could not be identified, it was placed in its own “alliance” until further surveys could identify and confirm the species. It was the opinion of the botanists that the species was likely *Ericameria cooperi*, but it could not be verified because the plants were not in bloom. The alliance would likely be in the G310 Intermountain Semi-Desert Steppe & Shrubland group. The alliance is found in the lower elevations of Cactus Flats in the North Range Study Area and was not observed on the South Range Study Area (Figure 21). It is dominated by the *Ericameria* spp., but is found in communities associated with *Artemisia nova*, *Atriplex canescens*, *Krascheninnikovia lanata*, and *Picrothamnus desertorum* (Table 7). Plant height tends to be 1.5-2 ft. with foliar cover averaging 10%.



***Ericameria* spp. Shrubland Alliance**

Table 7. List of plant species and characteristics of the *Ericameria* spp. Shrubland Alliance

Attribute	Detail	
Dominants	<i>Ericameria</i> spp.	
Common	<i>Achnatherum hymenoides</i> <i>Artemisia nova</i> <i>Atriplex canescens</i> <i>Bromus madritensis</i> ssp. <i>rubens</i> <i>Encelia farinosa</i> <i>Ericameria nauseosa</i>	<i>Krascheninnikovia lanata</i> <i>Picrothamnus desertorum</i> <i>Pleuraphis jamesii</i> <i>Psoralea fremontii</i> <i>Tetradymia glabrata</i>
Occasional	<i>Ambrosia dumosa</i> <i>Atriplex confertifolia</i> <i>Bromus tectorum</i> <i>Chrysothamnus viscidiflorus</i> <i>Ephedra nevadensis</i>	<i>Ephedra viridis</i> <i>Eriogonum inflatum</i> <i>Sphaeralcea ambigua</i> <i>Sporobolus cryptandrus</i>
Height	1.5-2 ft.	
Area	North Range Study Area: 9,857 acres	South Range Study Area: 0 acres
Elevation	4,200-5,900 ft. MSL	
Average Foliar Cover	10%	

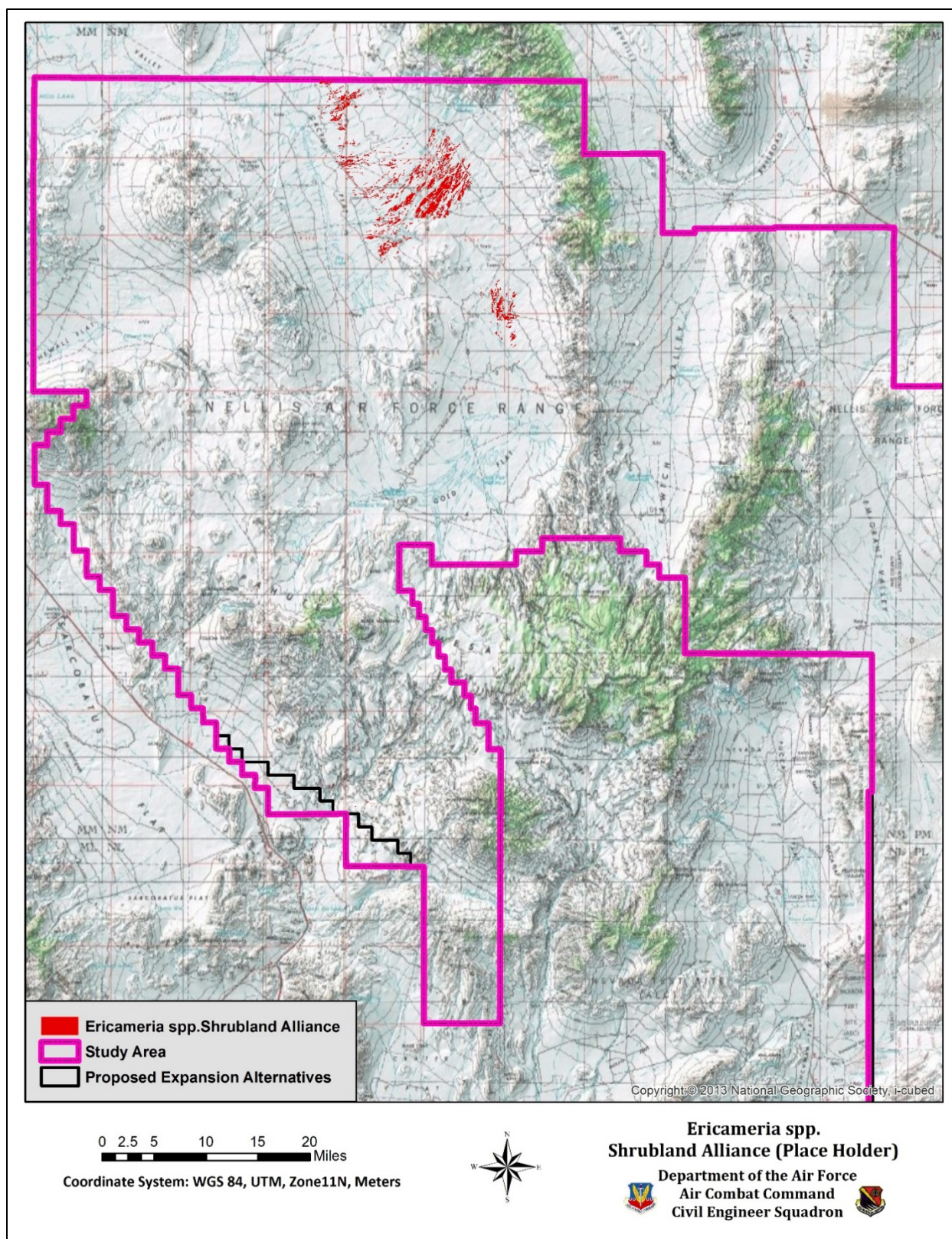


Figure 21. Location of *Ericameria* spp. Shrubland Alliance on the North Range Study Area.

A1044 *Chilopsis linearis* - *Psorothamnus spinosus* Desert Wash Scrub Alliance

The *Chilopsis linearis* - *Psorothamnus spinosus* Desert Wash Scrub Alliance is a member of the G541 Warm Semi-Desert Shrub & Herb Dry Wash & Colluvial Slope and is commonly found in washes on bajadas and mesas in the Mojave Desert. This alliance is approximately 73 acres and found west of the Desert Range and fits the classification by species and location in a sandy wash (Figure 22). There is a larger similar plant community on the east side of Desert Lake, approximately 379 acres, but is located on sand dunes and not a sandy wash. The USNVC currently does not have a plant alliance or association that is dominated by *Chilopsis linearis* and occurs on sand dunes. Until an appropriate alliance is named, this plant community will be placed in a proposed alliance. This alliance was identified by Charlet during the surveys conducted to map plant groups for the DNWR (Charlet, D.A. and C. Westenburg, 2013; Charlet, D.A., P.J. Leary, and C.W. Westenburg, 2013) and was given a proposed name of *Chilopsis linearis* Shrubland Alliance. Both of these alliances may be associated with *Acnatherum hymenoides*, *Psorothamnus fremontii*, and other species found on sand soils of dunes and washes. No further information or photos were available for this plant alliance.

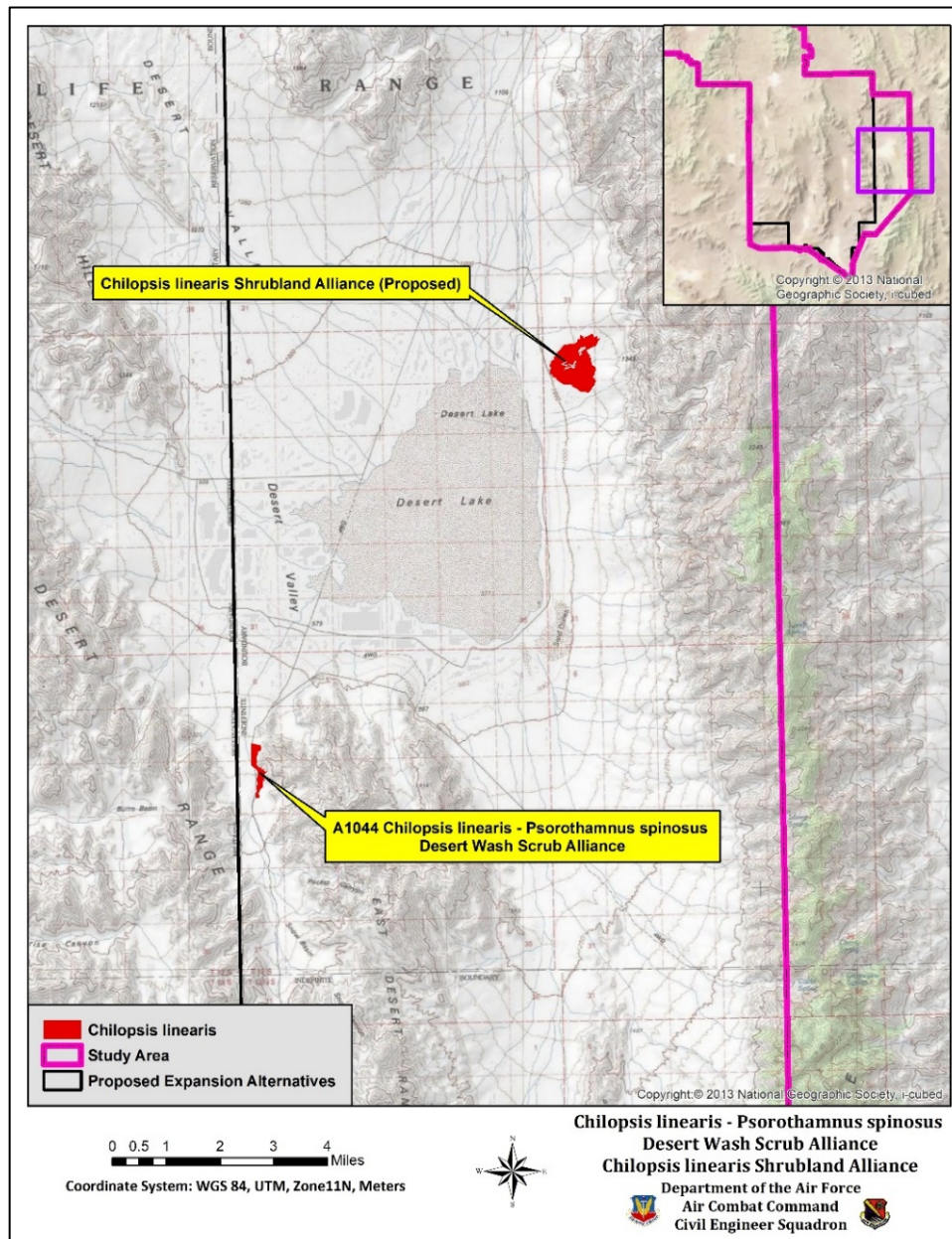


Figure 22. Location of *Chilopsis linearis* Shrubland Alliance and the *Chilopsis linearis* - *Psorothamnus spinosus* Desert Wash Scrub Alliance on the South Range Study Area.

A4185 *Prunus fasciculata* - *Salazaria mexicana* Northern Mojave Desert Wash Scrub Alliance

The *Prunus fasciculata* - *Salazaria mexicana* Northern Mojave Desert Wash Scrub Alliance occurs in a variety of habitats throughout the Mojave and Sonoran deserts. It is a member of the G541 Warm Semi-Desert Shrub & Herb Dry Wash & Colluvial Slope group (USNVC, 2016). Stands often occur in desert washes, arroyos, and canyon bottoms. Soils are generally alluvial and rocky or gravelly. Disturbance from intermittent flooding may be important to the maintenance of this alliance (Peterson, 2008). This alliance has only been found on the South Range Study Area in valleys, washes, and canyons along the west side of the Sheep Range, but additional surveys will probably find more locations (Figure 23). On the study area, the vegetation is characterized by a shrub layer dominated by *Prunus fasciculata*. Other shrubs and dwarf-shrubs present include *Atriplex confertifolia*, *Acamptopappus shockleyi*, *Ephedra nevadensis*, *Eriogonum fasciculatum*, *Grayia spinosa*, *Hymenoclea salsola*, *Krascheninnikovia lanata*, *Larrea tridentata*, *Lycium andersonii*, *Rhus trilobata*, *Salvia dorrii*, *Salazaria mexicana*, or *Thamnosma montana* (Table 8). Occasional emergent tall shrubs or small trees may be present. The herbaceous layer is typically sparse, but highly diverse. Foliar cover of this alliance averages 17% with an average height of shrubs being 6 ft.



Prunus fasciculata - *Salazaria mexicana* Northern Mojave Desert Wash Scrub Alliance

Table 8. List of plant species and characteristics of the *Prunus fasciculata* - *Salazaria mexicana* Northern Mojave Desert Wash Scrub Alliance

Attribute	Detail	
Dominants	<i>Prunus fasciculata</i>	
Common	<i>Acamptopappus shockleyi</i> <i>Achnatherum hymenoides</i> <i>Achnatherum speciosum</i> <i>Agave utahensis</i> var. <i>eborispina</i> <i>Allionia incarnata</i> <i>Amsonia tomentosa</i> <i>Argemone munita</i> <i>Aristida purpurea</i> <i>Atrichoseris platyphylla</i> <i>Atriplex canescens</i> <i>Atriplex confertifolia</i> <i>Baccharis salicifolia</i> <i>Baileya multiradiata</i> <i>Baileya pleniradiata</i> <i>Bouteloua gracilis</i> <i>Brickellia arguta</i>	<i>Gutierrezia microcephala</i> <i>Hedeoma nana</i> <i>Hymenoclea salsola</i> <i>Ipomopsis polycladon</i> <i>Juniperus osteosperma</i> <i>Krameria erecta</i> <i>Krascheninnikovia lanata</i> <i>Larrea tridentata</i> <i>Lepidium densiflorum</i> <i>Lepidium fremontii</i> <i>Malacothrix glabrata</i> <i>Marrubium vulgare</i> <i>Menodora spinescens</i> <i>Mimulus bigelovii</i> <i>Mirabilis laevis</i> <i>Muhlenbergia porteri</i>

Attribute	Detail	
	<i>Bromus madritensis ssp. madritensis</i> <i>Bromus tectorum</i> <i>Camissonia brevipes</i> <i>Chaenactis carphoclinia</i> <i>Chamaesyce albomarginata</i> <i>Chamaesyce polycarpa</i> <i>Coleogyne ramosissima</i> <i>Cryptantha circumscissa</i> <i>Cryptantha dumetorum</i> <i>Cryptantha recurvata</i> <i>Cryptantha setosissima</i> <i>Cuscuta salina</i> <i>Cylindropuntia echinocarpa</i> <i>Dasyochloa pulchella</i> <i>Descurainia pinnata</i> <i>Echinocereus engelmannii</i> <i>Encelia actonii</i> <i>Encelia virginensis</i> <i>Ephedra nevadensis</i> <i>Ephedra torreyana</i> <i>Ephedra viridis</i> <i>Eriastrum eremicum</i> <i>Eriogonum deflexum</i> <i>Eriogonum fasciculatum</i> <i>Eriogonum inflatum</i> <i>Eriogonum nidularium</i> <i>Eriogonum palmerianum</i> <i>Eriogonum reniforme</i> <i>Erodium cicutarium</i> <i>Euphorbia schizoloba</i> <i>Fallugia paradoxa</i> <i>Gilia flavocincta</i>	<i>Nemacladus rubescens</i> <i>Nicotiana obtusifolia</i> <i>Opuntia engelmannii</i> <i>Opuntia phaeacantha</i> <i>Opuntia polyacantha</i> <i>Oxytheca perfoliata</i> <i>Penstemon palmeri</i> <i>Phacelia crenulata</i> <i>Phacelia cryptantha</i> <i>Physalis hederifolia</i> <i>Pinus monophylla</i> <i>Prunus andersonii</i> <i>Prunus fasciculata</i> <i>Psathyrotes ramosissima</i> <i>Psoralea fremontii</i> <i>Rhus trilobata</i> <i>Salazaria mexicana</i> <i>Salvia dorrii</i> <i>Schismus barbatus</i> <i>Sphaeralcea ambigua</i> <i>Sporobolus cryptandrus</i> <i>Stanleya elata</i> <i>Stephanomeria pauciflora</i> <i>Tetradymia axillaris</i> <i>Tetradymia spinosa</i> <i>Thamnosma montana</i> <i>Thymophylla pentachaeta</i> <i>Tridens muticus</i> <i>Vulpia octoflora</i> <i>Yucca baccata</i> <i>Yucca brevifolia</i>
Average Height	6 ft.	
Area	North Range Study Area: 0 acres	South Range Study Area: 117 acres
Elevation	3,900-6,000 ft. MSL	
Average Foliar Cover	17%	

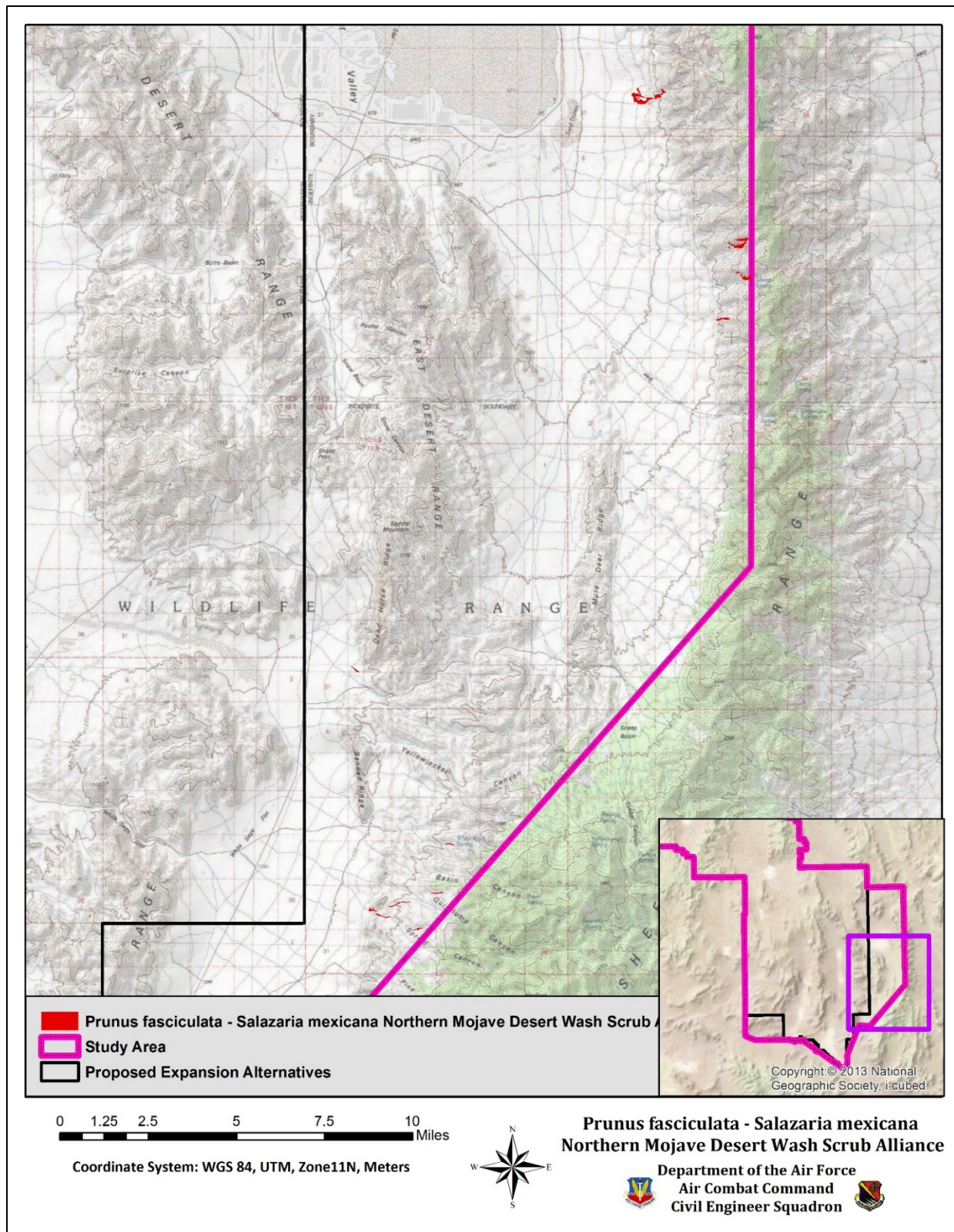


Figure 23. Location where *Prunus fasciculata* - *Salazaria mexicana* Northern Mojave Desert Wash Scrub Alliance Has been identified on the South Range Study Area.

A4186 *Psorothamnus fremontii* - *Psorothamnus polydenius* Desert Wash Scrub Alliance

The *Psorothamnus fremontii* - *Psorothamnus polydenius* Desert Wash Scrub Alliance is a member of G541 Warm Semi-Desert Shrub & Herb Dry Wash & Colluvial Slope group and is found in alluvial fans, washes, lower slopes and sand dunes of Arizona, California, and Nevada (USNVC, 2016). On the North Range Study Area, this alliance is mostly found in the washes of Thirsty Canyon (Figure 24). The alliance is also found scattered across the northern part of Alternative 3C in the South Range Study Area (Figure 25). This shrubland alliance is a



Psorothamnus fremontii

combination of two plant alliances that fill similar niches in the desert ecosystem and have been assigned to two different associations within this alliance. The soils tend to be well-drained, moderately deep and coarse-textured with a sandy surface over sandy loams. Stands have an open shrub layer dominated by *Psorothamnus polydenius* or *Psorothamnus fremontii*. On the study area, the stands often include *Hymenoclea salsola* and *Ephedra nevadensis* as subdominants. Other common shrubs include *Atriplex canescens*, *Krascheninnikovia lanata*, *Tetradymia glabrata*, and *Artemisia tridentata* (Table 9). The herbaceous layer is often sparse and includes species such as *Achnatherum hymenoides*, *Elymus elymoides*, *Sphaeralcea ambigua*, and *Bromus tectorum*. Elevation ranges from 3,800 to 4,900 ft. MSL. Foliar cover averages 8% with a shrub layer averaging 3 ft. tall.

Table 9. List of plant species and characteristics of the *Psorothamnus fremontii* - *Psorothamnus polydenius* Desert Wash Scrub Alliance

Attribute	Detail	
Dominants	<i>Psorothamnus fremontii</i>	<i>Psorothamnus polydenius</i>
Subdominants	<i>Hymenoclea salsola</i>	<i>Ephedra nevadensis</i>
Common	<i>Achnatherum hymenoides</i> <i>Ambrosia canescens</i> <i>Ambrosia dumosa</i> <i>Atriplex confertifolia</i> <i>Baileya multiradiata</i> <i>Bromus madritensis ssp. rubens</i> <i>Dasyochloa pulchella</i> <i>Echinocactus polycephalus</i> <i>Encelia farinosa</i> <i>Ephedra nevadensis</i> <i>Eriogonum inflatum</i> <i>Eriogonum microthecum</i> <i>Eriogonum trichopes</i> <i>Gutierrezia microcephala</i>	<i>Larrea tridentata</i> <i>Lepidium fremontii</i> <i>Lepidium virginicum</i> <i>Lycium andersonii</i> <i>Menodora spinescens</i> <i>Opuntia basilaris</i> <i>Phacelia crenulata</i> <i>Salsola tragus</i> <i>Schismus arabicus</i> <i>Sphaeralcea ambigua</i> <i>Sporobolus flexuosus</i> <i>Stephanomeria pauciflora</i> <i>Tetradymia glabrata</i> <i>Yucca brevifolia</i>
Occasional	<i>Krascheninnikovia lanata</i> <i>Machaeranthera canescens</i>	<i>Opuntia polyacantha</i>
Average Height	3 ft.	
Area	North Range Study Area: 1,930 acres	South Range Study Area: 124 acres

Attribute	Detail	
Elevation	3,800-4,900 ft. MSL	
Average Foliar Cover	8%	

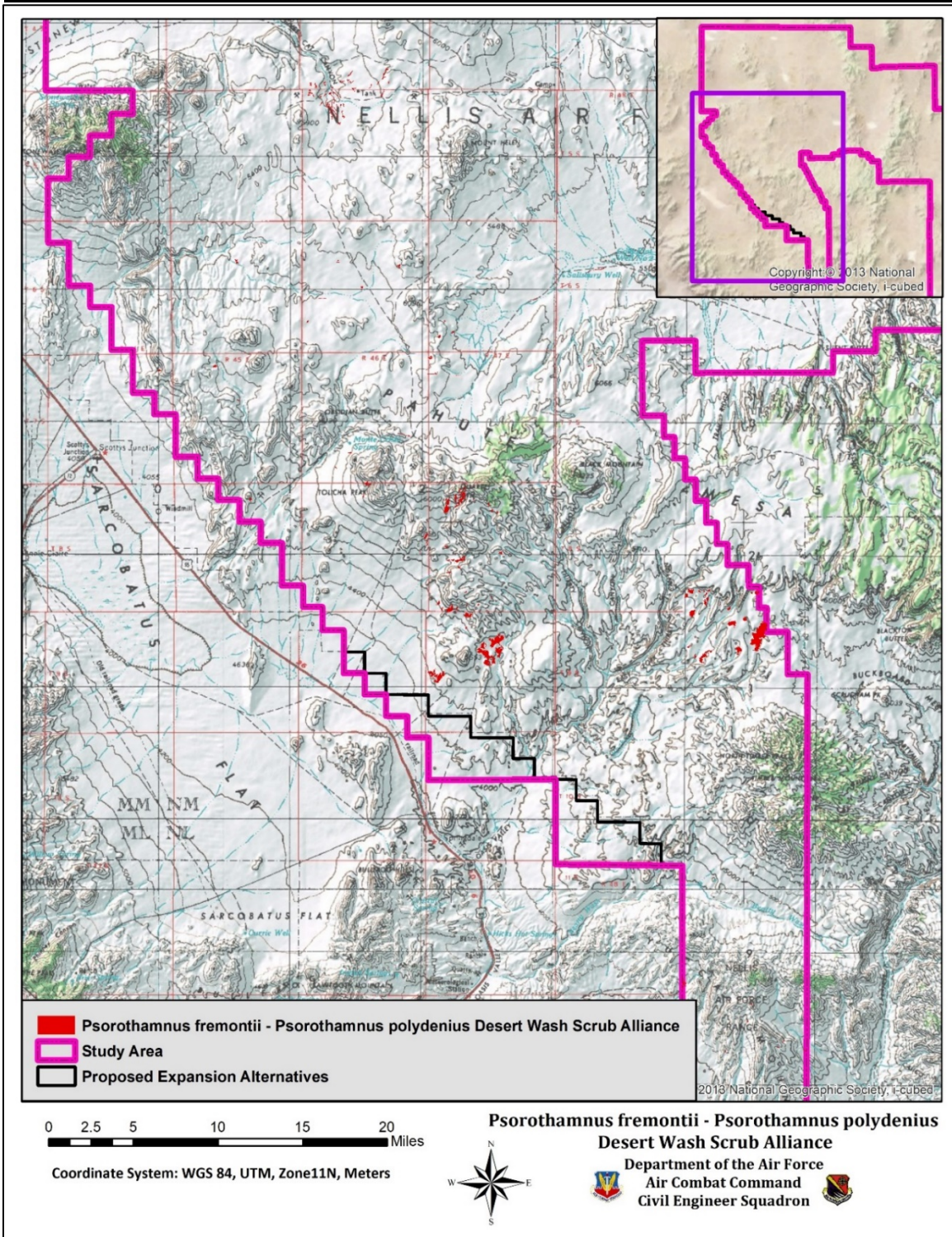


Figure 24. Location of the *Psorothamnus fremontii* - *Psorothamnus polydenius* Desert Wash Scrub Alliance on the North Range Study Area.

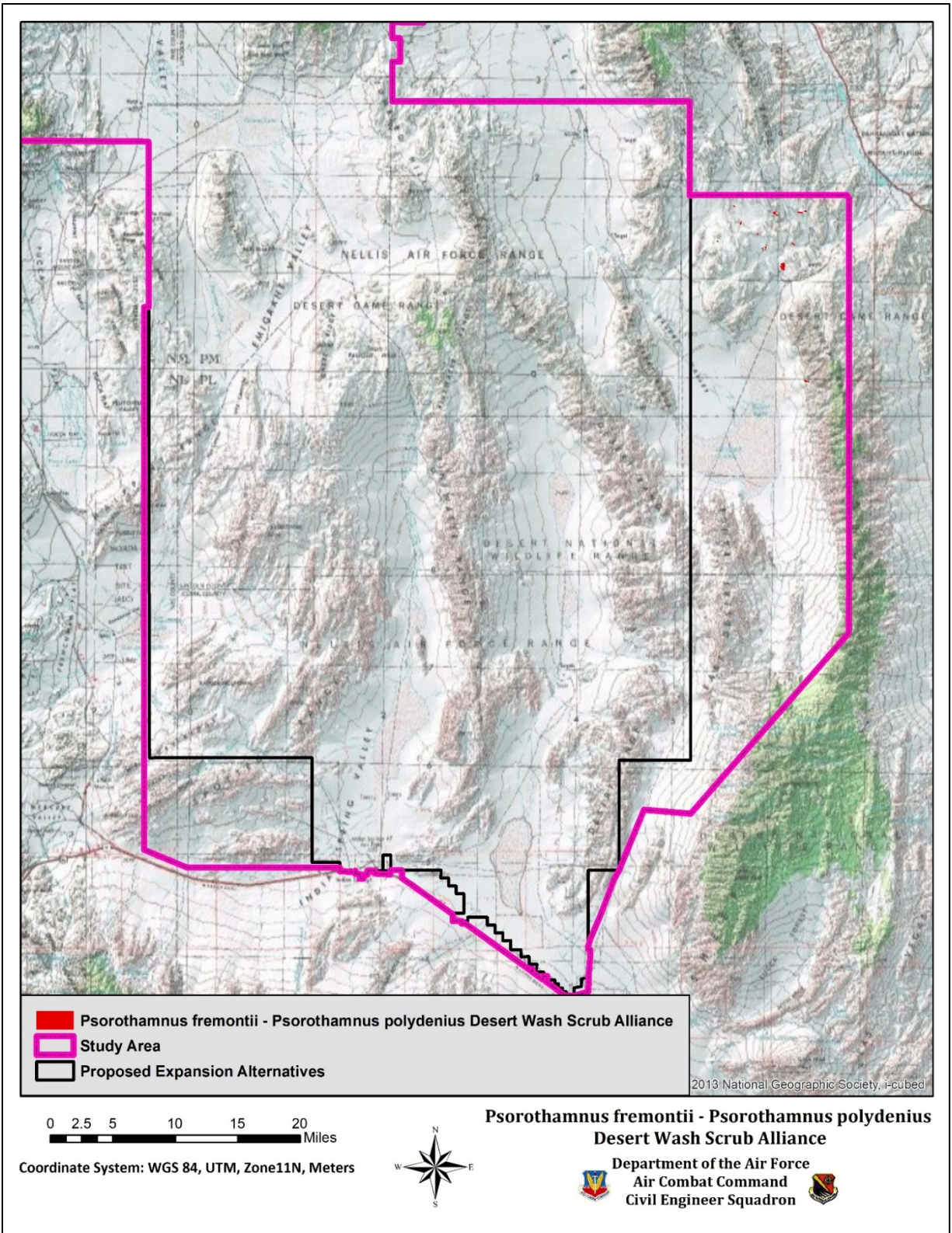


Figure 25. Location of the *Psorothamnus fremontii* - *Psorothamnus polydenius* Desert Wash Scrub Alliance on the South Range Study Area.

A4188 *Hymenoclea salsola* - *Bebbia juncea* Mojave-Sonoran Desert Wash Scrub Alliance

Hymenoclea salsola - *Bebbia juncea* Mojave-Sonoran Desert Wash Scrub Alliance is a member of the G541 Warm Semi-Desert Shrub & Herb Dry Wash & Colluvial Slope group. This scrub alliance is found in the Mojave Desert in southern Nevada (USNVC, 2016) in low topographic relief in washes, drainages, and along the edges of playas. The alliance is mainly found along the western edges of Thirsty Canyon as well as the north face of Yucca Mountain in EC South in the North Range Study Area (Figure 26). It is also found in the washes and valleys of the



Hymenoclea salsola - *Bebbia juncea* Mojave-Sonoran Desert Wash Scrub Alliance Sheep Range and Pahrangat Range in the South Range Study Area (Figure 27). It often occurs in washes associated with other plant alliances and too small to map. This alliance is dominated by *Hymenoclea salsola*. Typical subdominants include *Ephedra nevadensis*, *Ambrosia dumosa*, and *Lycium andersonii* (Table 10). Other common brush species found in this alliance on the study area include *Atriplex canescens*, *Purshia stansburiana* and *Salazaria mexicana*. Grasses, such as *Bromus tectorum* and *Schismus barbatus*, tend to dominate the herbaceous strata. Brush height can be as low as averages 2.8 ft. and foliar cover averages 13%. The alliance is found at elevations ranging from 3,300 to 6,200 ft. MSL.

Table 10. List of plant species and characteristics of the *Hymenoclea salsola* - *Bebbia juncea* Mojave-Sonoran Desert Wash Scrub Alliance

Attribute	Detail	
Dominants	<i>Hymenoclea salsola</i>	
Subdominants	<i>Ephedra nevadensis</i> <i>Ambrosia dumosa</i>	<i>Lycium andersonii</i>
Common	<i>Achnatherum hymenoides</i> <i>Allionia incarnata</i> <i>Amsonia tomentosa</i> <i>Argemone munita</i> <i>Aristida purpurea</i> <i>Atriplex canescens</i> <i>Atriplex confertifolia</i> <i>Baileya multiradiata</i> <i>Baileya pleniradiata</i> <i>Bebbia juncea</i> <i>Brickellia arguta</i> <i>Bromus madritensis</i> ssp. <i>rubens</i> <i>Bromus tectorum</i> <i>Camissonia brevipes</i> <i>Camissonia claviformis</i> <i>Chaenactis stevioides</i> <i>Chamaesyce albomarginata</i> <i>Cuscuta salina</i> <i>Cylindropuntia acanthocarpa</i> <i>Cylindropuntia echinocarpa</i>	<i>Gutierrezia microcephala</i> <i>Gutierrezia sarothrae</i> <i>Krameria erecta</i> <i>Larrea tridentata</i> <i>Lepidium densiflorum</i> <i>Lepidium fremontii</i> <i>Linanthus parryae</i> <i>Machaeranthera canescens</i> <i>Menodora spinescens</i> <i>Mentzelia albicaulis</i> <i>Mimulus bigelovii</i> <i>Mirabilis laevis</i> <i>Muhlenbergia porteri</i> <i>Nicotiana obtusifolia</i> <i>Oenothera suffrutescens</i> <i>Opuntia basilaris</i> <i>Opuntia polyacantha</i> <i>Opuntia polyacantha</i> var. <i>erinacea</i> <i>Oxytheca perfoliata</i> <i>Phacelia crenulata</i>

Attribute	Detail	
	<i>Cymopterus ripleyi</i> <i>Dasyochloa pulchella</i> <i>Descurainia pinnata</i> <i>Echinocactus polycephalus</i> <i>Echinocereus engelmannii</i> <i>Encelia farinosa</i> <i>Encelia virginensis</i> <i>Ephedra funerea</i> <i>Ephedra torreyana</i> <i>Erigeron concinnus</i> <i>Eriogonum deflexum</i> <i>Eriogonum fasciculatum</i> <i>Eriogonum inflatum</i> <i>Eriogonum microthecum</i> <i>Eriogonum nidularium</i> <i>Eriogonum trichopes</i> <i>Erodium cicutarium</i> <i>Euphorbia schizoloba</i> <i>Fallugia paradoxa</i> <i>Grayia spinosa</i>	<i>Phacelia fremontii</i> <i>Plantago erecta</i> <i>Pleuraphis jamesii</i> <i>Prunus fasciculata</i> <i>Psilostrophe cooperi</i> <i>Psorothamnus fremontii</i> <i>Salazaria mexicana</i> <i>Salsola tragus</i> <i>Schismus arabicus</i> <i>Sphaeralcea ambigua</i> <i>Sporobolus cryptandrus</i> <i>Stanleya pinnata</i> <i>Stephanomeria pauciflora</i> <i>Tetradymia</i> <i>Thamnosma montana</i> <i>Thymophylla pentachaeta</i> <i>Tridens muticus</i> <i>Yucca brevifolia</i>
Occasional	<i>Cryptantha tumulosa</i> <i>Psorothamnus polydenius</i>	<i>Purshia tridentata</i> <i>Yucca baccata</i>
Average Height	2.8 ft.	
Area	North Range Study Area: 3,107 acres	South Range Study Area: 855 acres
Elevation	3,300-6,200 ft. MSL	
Average Foliar Cover	13%	

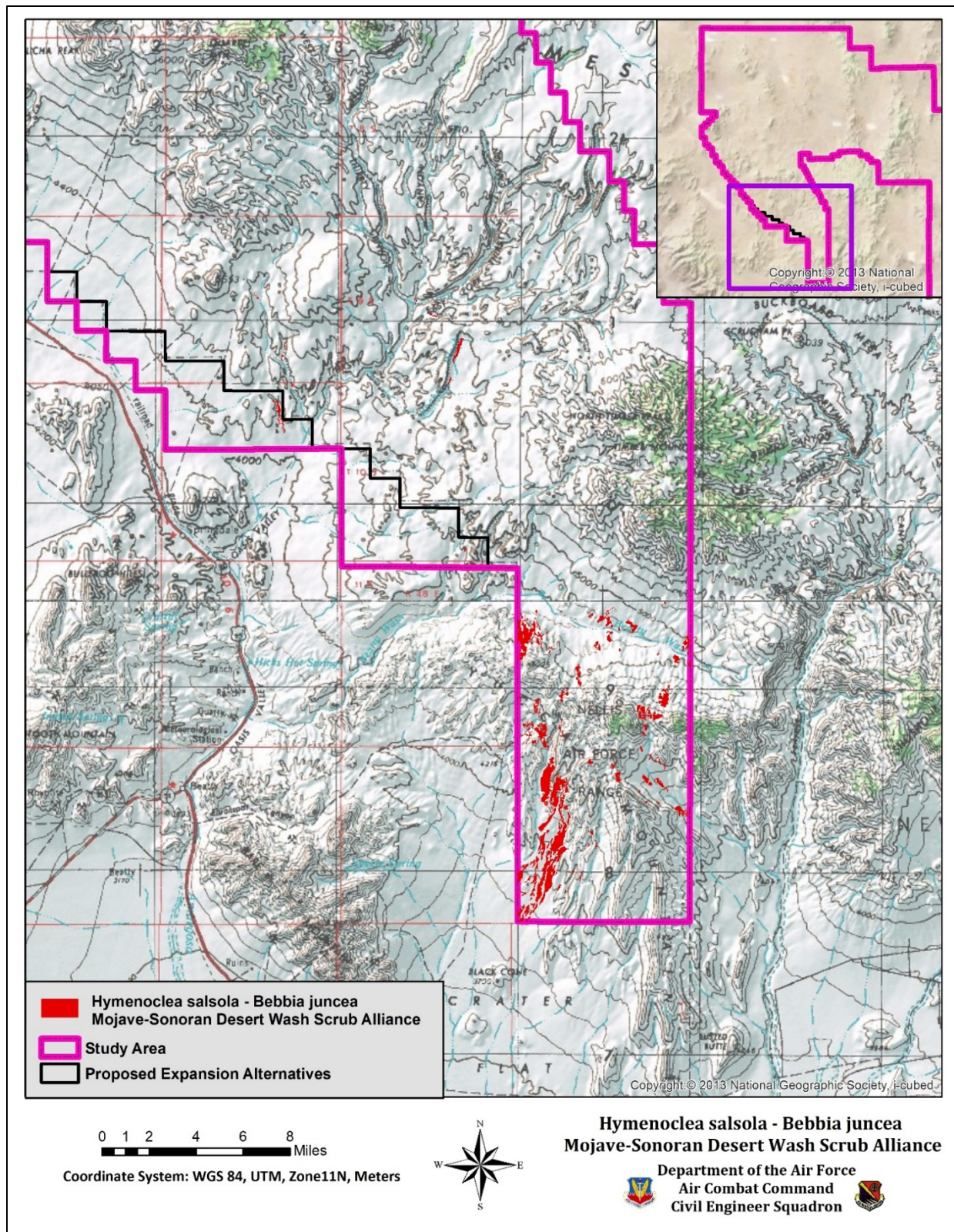


Figure 26. Location of *Hymenoclea salsola* - *Bebbia juncea* Mojave-Sonoran Desert Wash Scrub Alliance on the North Range Study Area.

A3259 *Fallugia paradoxa* Desert Wash Scrub Alliance

The *Fallugia paradoxa* Desert Wash Scrub Alliance is a member of the G541 Warm Semi-Desert Shrub & Herb Dry Wash & Colluvial Slope group and was observed in a valley in the foothills of the Sheep Range in Expansion Alternative 3C (USNVC, 2016). This alliance is probably more prevalent in washes in canyons of the South Range Study Area than the mapping indicates, but usually occurs in small isolated communities that would not be detected accurately by satellite imagery. The alliance is most commonly found in deep valleys of mountainous areas on



Fruit and flower of *Fallugia paradoxa*

the South Range Study Area (Figure 28). These areas tend to be gravelly or rocky soils typical of mountain washes. The alliance is dominated by *Fallugia paradoxa*, often paired with *Encelia virginensis* as a sub-dominant (Table 11). The average height of the plants is 1.5 - 3 ft., but it is common to find *Fallugia paradoxa* as tall as 8 - 10 ft. with a tree-like appearance. Overall foliar cover of the alliance averages 19%.

Table 11. List of plant species and characteristics of the *Fallugia paradoxa* Desert Wash Scrub Alliance

Attribute	Detail	
Dominants	<i>Fallugia paradoxa</i>	
Subdominants	<i>Encelia virginensis</i>	
Common	<i>Achnatherum hymenoides</i> <i>Artemisia ludoviciana</i> <i>Atriplex canescens</i> <i>Bromus madritensis ssp. rubens</i> <i>Bromus tectorum</i> <i>Dasyochloa pulchella</i> <i>Ephedra nevadensis</i>	<i>Ephedra viridis</i> <i>Eriogonum inflatum</i> <i>Gutierrezia microcephala</i> <i>Sphaeralcea ambigua</i> <i>Sporobolus cryptandrus</i> <i>Thamnosma montana</i> <i>Xylorhiza tortifolia</i>
Occasional	<i>Opuntia polyacantha</i>	<i>Yucca brevifolia</i>
Height	1.5-3 ft.	
Area	North Range Study Area: 0 acres	South Range Study Area: 69 acres
Elevation	4,000 – 5,000 ft. MSL	
Average Foliar Cover	19%	

G246 COLORADO PLATEAU-GREAT BASIN JUNIPER OPEN WOODLAND

A3496 *Juniperus osteosperma* / Shrub Understory Woodland Alliance

Juniperus osteosperma / Shrub Understory Woodland Alliance is a member of the G246 Colorado Plateau-Great Basin Juniper Open Woodland group (USNVC, 2016). The alliance is comprised of an open to moderately dense stand of *Juniperus osteosperma* with an understory of shrubs. This alliance is found south of Stonewall Mountain on the Pahute Mesa on the North Range Study Area (Figure 29) and has not been identified on the South Range Study Area, mostly due to the fact that areas supporting this alliance have not been surveyed to date. Vegetation of this alliance is dominated by *Juniperus osteosperma*, quite often in association with *Pinus monophylla*,



Juniperus osteosperma / Shrub Understory Woodland Alliance

Artemisia tridentata, *Ephedra viridis*, or *Purshia* spp. as subdominants (Table 12). The shrub layer may also include *Artemisia arbuscula*, *Artemisia nova*, or *Chrysothamnus* spp. The herbaceous understory, if present, is usually sparse and dominated by perennial grasses, including *Pleuraphis jamesii*, *Achnatherum hymenoides*, *Hesperostipa comata* and *Elymus elymoides*. *Pinus monophylla* often increases in density and becomes dominant in alliances that are at higher elevations. Overall, the average foliar cover of this alliance on the study area is 25% and the tree height is averages 10 ft. with an understory height of 1-3 ft.

Table 12. List of plant species and characteristics of the *Juniperus osteosperma* / Shrub Understory Woodland Alliance

Attribute	Detail	
Dominants	<i>Juniperus osteosperma</i>	
Subdominants	<i>Artemisia tridentata</i> <i>Purshia</i> spp.	<i>Ephedra viridis</i> <i>Pinus monophylla</i>
Common	<i>Achnatherum hymenoides</i> <i>Agave utahensis</i> var. <i>eborispina</i> <i>Atriplex confertifolia</i> <i>Atriplex spinifera</i> <i>Bassia americana</i> <i>Chrysothamnus greenei</i> <i>Ephedra nevadensis</i> <i>Ericameria nana</i> <i>Gutierrezia californica</i>	<i>Gutierrezia microcephala</i> <i>Menodora spinescens</i> <i>Mimulus guttatus</i> <i>Opuntia polyacantha</i> <i>Picrothamnus desertorum</i> <i>Pinus monophylla</i> <i>Pleuraphis jamesii</i> <i>Sarcobatus baileyi</i> <i>Yucca brevifolia</i>
Occasional	<i>Achnatherum speciosum</i> <i>Artemisia arbuscula</i> <i>Cylindropuntia echinocarpa</i> <i>Descurainia pinnata</i> <i>Elymus elymoides</i> <i>Ericameria nauseosa</i> <i>Eriogonum heermannii</i> <i>Eriogonum microthecum</i> <i>Eriogonum ovalifolium</i> <i>Hesperostipa comata</i> <i>Hymenoclea salsola</i>	<i>Juniperus osteosperma</i> <i>Krascheninnikovia lanata</i> <i>Linanthus pungens</i> <i>Lycium cooperi</i> <i>Rosa woodsii</i> <i>Sisymbrium orientale</i> <i>Sphaeralcea ambigua</i> <i>Stanleya elata</i> <i>Symphoricarpos longiflorus</i> <i>Tetradymia glabrata</i>
Average Height	Shrubs: 1-3 ft.	Trees: 10 ft.
Area	North Range Study Area: 2,629 acres	South Range Study Area: 0 acres
Elevation	4,700-7,100 ft. MSL	
Average Foliar Cover	25%	

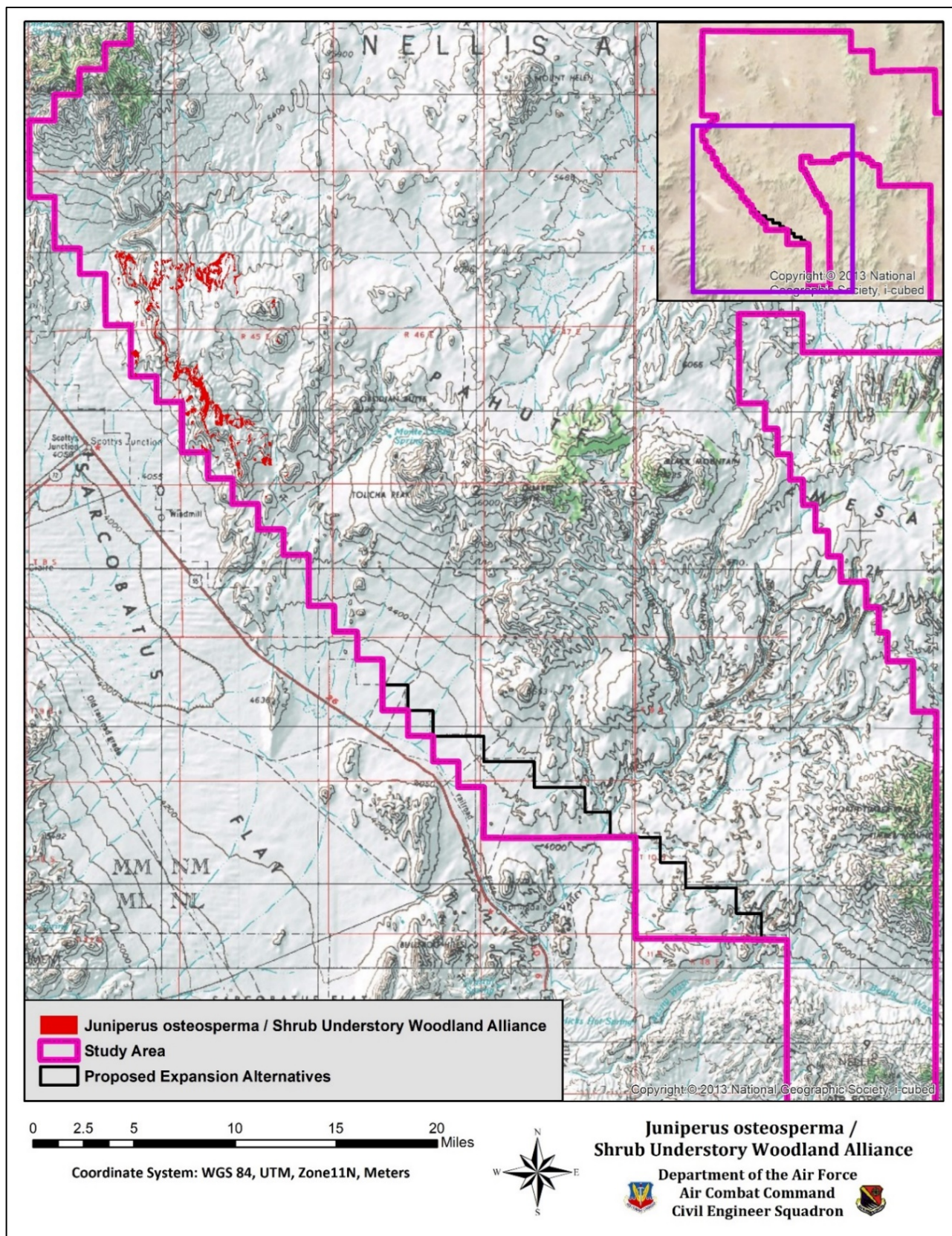


Figure 29. *Juniperus osteosperma* / Shrub Understory Woodland Alliance on the North Range Study Area.

A2108 *Pinus monophylla* - *Juniperus osteosperma* / Shrub Understory Woodland Alliance

The *Pinus monophylla* - *Juniperus osteosperma* / Shrub Understory Woodland Alliance is a member of the G247 Great Basin Pinyon – Juniper Woodland group (USNVC, 2016). This alliance occurs in dry mountain ranges of the Great Basin and southern California, usually on erosional terrain or upper alluvial slopes. Soils are variable, but generally coarse-textured and well-drained (Peterson, 2008). On the North Range Study Area, this alliance is found on the upper slopes of the Kawich and Belted Ranges and Stonewall Mountain and Timber Mountain (Figure 30). On the South Range Study Area, the alliance is found on the western slopes of the Sheep Range and scattered in the upper elevations of the East Desert Range (Figure 31). Vegetation included in this alliance is characterized by a mixture of *Pinus monophylla* and *Juniperus osteosperma*. *Pinus monophylla* may be the only species in some small areas, but usually *Juniperus osteosperma* is a codominant. The density of the shrub layer is dependent on the density of the tree foliage. On the study area, shrubs associated with this alliance may include *Artemisia tridentata*, *Artemisia arbuscula*, *Artemisia nova*, *Ephedra viridis*, and *Purshia tridentata* (Table 13). The herbaceous layer is usually sparse and comprised of mixtures of *Elymus elymoides*, *Schismus arabicus*, *Hesperostipa comata*, and *Bromus tectorum*. Elevations range from 4,600 ft. MSL to 7,900 ft. MSL on the study area. The height of the trees averages 9 ft. with an average foliar cover of 26%.



Pinus monophylla - *Juniperus osteosperma* / Shrub Understory Woodland Alliance

Table 13. List of plant species and characteristics of the *Pinus monophylla* - *Juniperus osteosperma* / Shrub Understory Woodland Alliance

Attribute	Detail	
Dominants	<i>Pinus monophylla</i>	<i>Juniperus osteosperma</i>
Common	<i>Achnatherum hymenoides</i> <i>Agave utahensis</i> var. <i>eborispina</i> <i>Allium nevadense</i> <i>Aristida purpurea</i> <i>Artemisia arbuscula</i> <i>Artemisia tridentata</i> <i>Atriplex canescens</i> <i>Atriplex confertifolia</i> <i>Baileya multiradiata</i> <i>Bouteloua gracilis</i> <i>Bromus madritensis</i> ssp. <i>rubens</i> <i>Bromus tectorum</i> <i>Chamaesyce albomarginata</i> <i>Cylindropuntia echinocarpa</i> <i>Echinocereus engelmannii</i>	<i>Fallugia paradoxa</i> <i>Glossopetalon spinescens</i> <i>Gutierrezia sarothrae</i> <i>Hymenoclea salsola</i> <i>Krascheninnikovia lanata</i> <i>Linum lewisii</i> <i>Menodora spinescens</i> <i>Mimulus bigelovii</i> <i>Opuntia polyacantha</i> <i>Opuntia polyacantha</i> var. <i>erinacea</i> <i>Penstemon eatonii</i> <i>Phacelia fremontii</i> <i>Prunus andersonii</i> <i>Sarcobatus baileyi</i> <i>Senecio multilobata</i>

	<i>Ephedra nevadensis</i> <i>Ephedra viridis</i> <i>Ericameria nauseosa</i> <i>Eriogonum concinnum</i> <i>Escobaria vivipara</i> var. <i>rosea</i>	<i>Sphaeralcea ambigua</i> <i>Thamnosma montana</i> <i>Townsendia jonesii</i> var. <i>tumulosa</i> <i>Xanthocephalum gymnospermoides</i>
Occasional	<i>Cylindropuntia ramosissima</i> <i>Cymopterus gilmanii</i> <i>Eriogonum inflatum</i> <i>Lycium andersonii</i> <i>Mimulus bigelovii</i> <i>Opuntia erincea</i>	<i>Physalis crassifolia</i> <i>Picrothamnus desertorum</i> <i>Purshia tridentata</i> <i>Quercus gambelii</i> . <i>Thamnosma montana</i> <i>Yucca brevifolia</i>
Average Height	9 ft. (trees)	1-2.5 ft (shrubs)
Area	North Range Study Area: 50,884 acres	South Range Study Area: 14,998 acres
Elevation	4,600-7,900 ft. MSL	
Average Foliar Cover	26%	

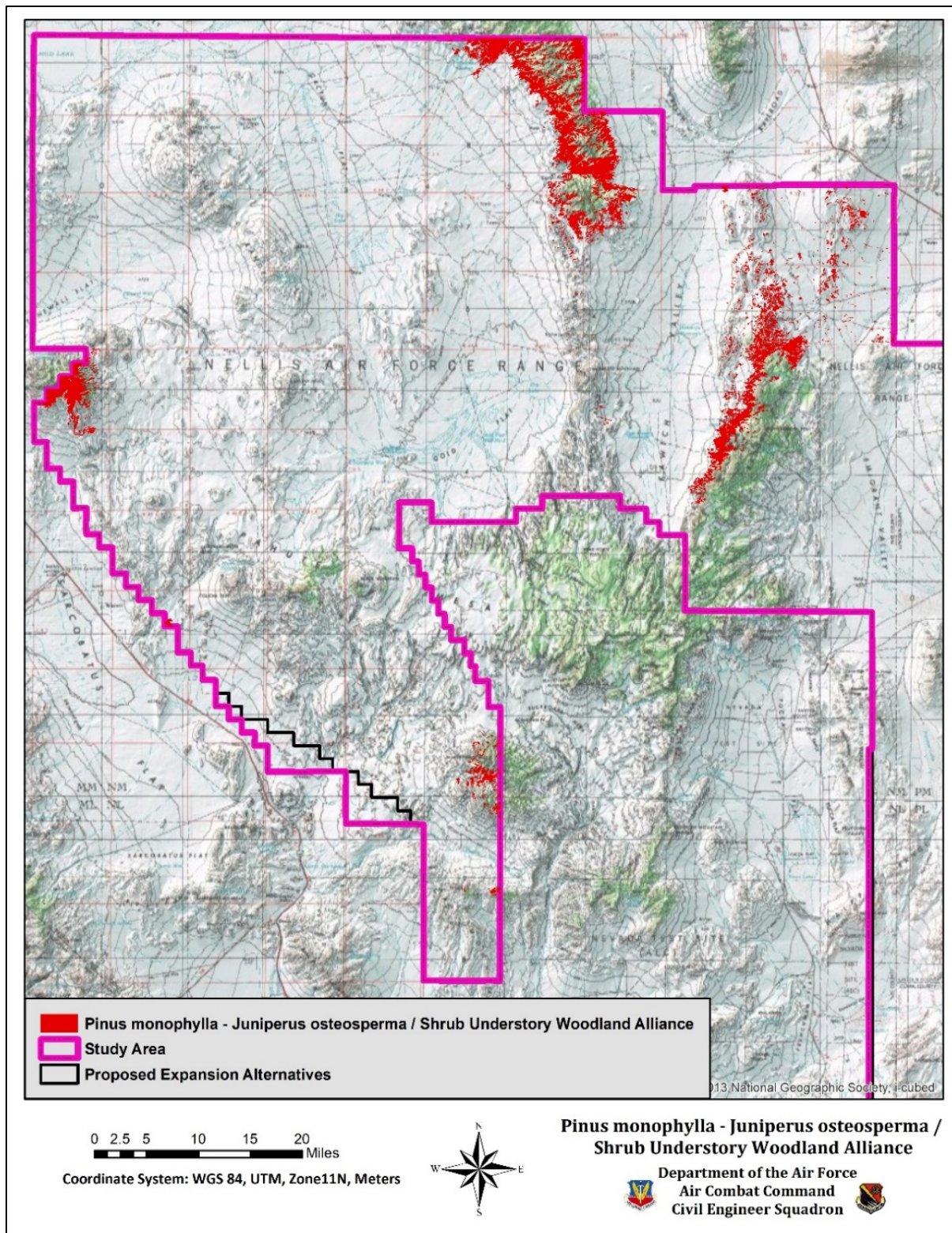


Figure 30. Location of the *Pinus monophylla* - *Juniperus osteosperma* / Shrub Understory Woodland Alliance on the North Range Study Area.

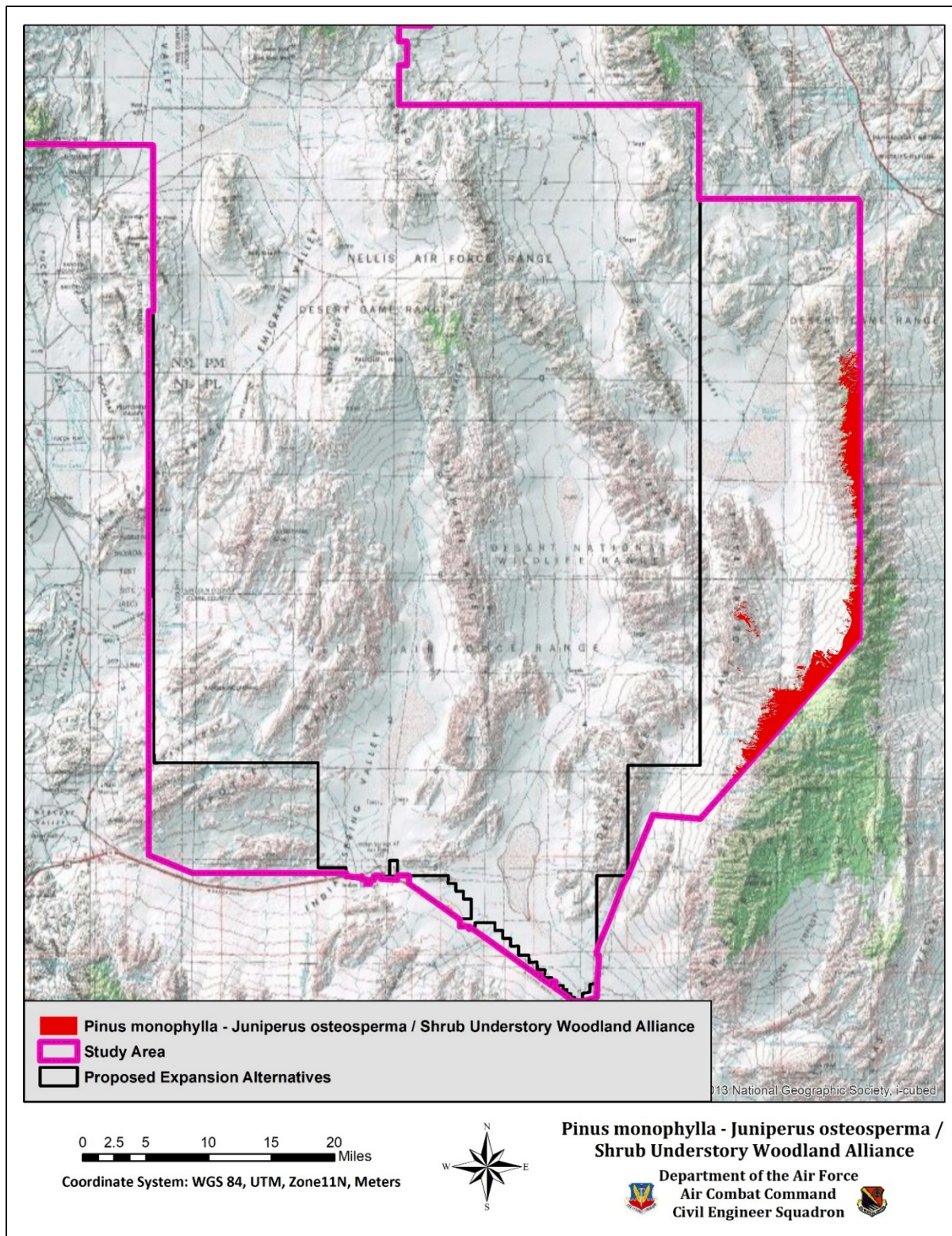


Figure 31. Location of the *Pinus monophylla* - *Juniperus osteosperma* / Shrub Understory Woodland Alliance on the South Range Study Area.

CEGL000825 *Pinus monophylla* Woodland

This plant association is found in the A2108 Great Basin Singleleaf Pinyon – Utah Juniper / shrub Woodland Alliance in the G247 Great Basin Pinyon - Juniper Woodland Group (USNVC, 2016). This association is recognized by the USNVC, but has no detailed description. It is found throughout the upper elevations of the Kawich and Belted Ranges on the North Range Study Area and is characterized by monocultures of *Pinus monophylla* (Figure 32). This association has not been observed on the South Range Study Area where mountain elevations are lower and most of the woodland plant communities are a mixture of *Pinus monophylla* and *Juniperus osteosperma*.



Pinus monophylla Woodland

This specific association typically supports an understory dominated by *Artemisia arbuscula*, *Artemisia tridentata*, *Bassia americana*, and *Ephedra nevadensis* and little or no *Juniperus osteosperma* (Table 14). In some areas, *Quercus gambelii* and *Cercocarpus ledifolius* or *Cercocarpus intricatus* may also be present. Foliar cover averages 22% but may range from 5-50%. Foliar cover of shrubs tends to be low, especially in areas where the tree foliage is dense. Tree heights generally range from seedlings at 0.5 ft. to mature trees that exceed 10 ft.

Table 14. List of plant species and characteristics of the *Pinus monophylla* Woodland Alliance

Attribute	Detail	
Dominants	<i>Pinus monophylla</i>	
Subdominants	<i>Artemisia arbuscula</i> <i>Artemisia tridentata</i>	<i>Bassia americana</i> <i>Ephedra nevadensis</i>
Common	<i>Achnatherum hymenoides</i> <i>Achnatherum speciosum</i> <i>Atriplex canescens</i> <i>Atriplex confertifolia</i> <i>Atriplex parryi</i> <i>Atriplex spinifera</i> <i>Bouteloua gracilis</i> <i>Bromus tectorum</i> <i>Castilleja angustifolia</i> <i>Cercocarpus ledifolius</i> <i>Cercocarpus intricatus</i> <i>Chrysothamnus Greenei</i> <i>Chrysothamnus viscidiflorus</i> <i>Dasyochloa pulchella</i> <i>Echinocereus engelmannii</i> <i>Elymus elymoides</i> <i>Ephedra viridis</i> <i>Ericameria cooperi</i> <i>Ericameria nauseosa</i> <i>Eriogonum caespitosum</i>	<i>Eriogonum ovalifolium</i> <i>Erodium cicutarium</i> <i>Grayia spinosa</i> <i>Gutierrezia microcephala</i> <i>Gutierrezia sarothrae</i> <i>Halogeton glomeratus</i> <i>Hymenoclea salsola</i> <i>Juniperus osteosperma</i> <i>Krascheninnikovia lanata</i> <i>Linanthus pungens</i> <i>Menodora spinescens</i> <i>Picrothamnus desertorum</i> <i>Pleuraphis jamesii</i> <i>Purshia stansburiana</i> <i>Quercus gambelii</i> <i>Salsola tragus</i> <i>Sarcobatus baileyi</i> <i>Sphaeralcea ambigua</i> <i>Suaeda moquinii</i> <i>Yucca baccata</i> <i>Yucca brevifolia</i>
Occasional	<i>Arenaria kingii</i> <i>Artemisia nova</i> <i>Astragalus lentiginosus</i>	<i>Linum lewisii</i> <i>Lycium cooperi</i> <i>Mammillaria tetrancistra</i>

Attribute	Detail	
	<i>Caulanthus crassicaulis</i> <i>Coleogyne ramosissima</i> <i>Cylindropuntia echinocarpa</i> <i>Ericameria nana</i> <i>Eriogonum fasciculatum</i> <i>Eriogonum heermannii</i> <i>Eriogonum inflatum</i> <i>Eriogonum microthecum</i> <i>Grusonia pulchella</i> <i>Gutierrezia californica</i> <i>Gutierrezia sarothrae</i> <i>Hesperostipa comata</i> <i>Juncus arcticus</i> <i>Lepidium fremontii</i>	<i>Opuntia polyacantha</i> var. <i>erinacea</i> <i>Pediocactus simpsonii</i> <i>Philadelphus microphyllus</i> <i>Pinus monophylla</i> <i>Poa fendleriana</i> <i>Prunus fasciculata</i> <i>Sarcobatus baileyi</i> <i>Sarcobatus vermiculatus</i> <i>Sporobolus cryptandrus</i> <i>Stanleya elata</i> <i>Stanleya pinnata</i> <i>Symphoricarpos longiflorus</i> <i>Tetradymia glabrata</i>
Average Height	7 ft.	
Area	North Range Study Area: 28,408 acres	South Range Study Area: 0 acres
Elevation	4,600-7,100 ft. MSL	
Average Foliar Cover	22%	

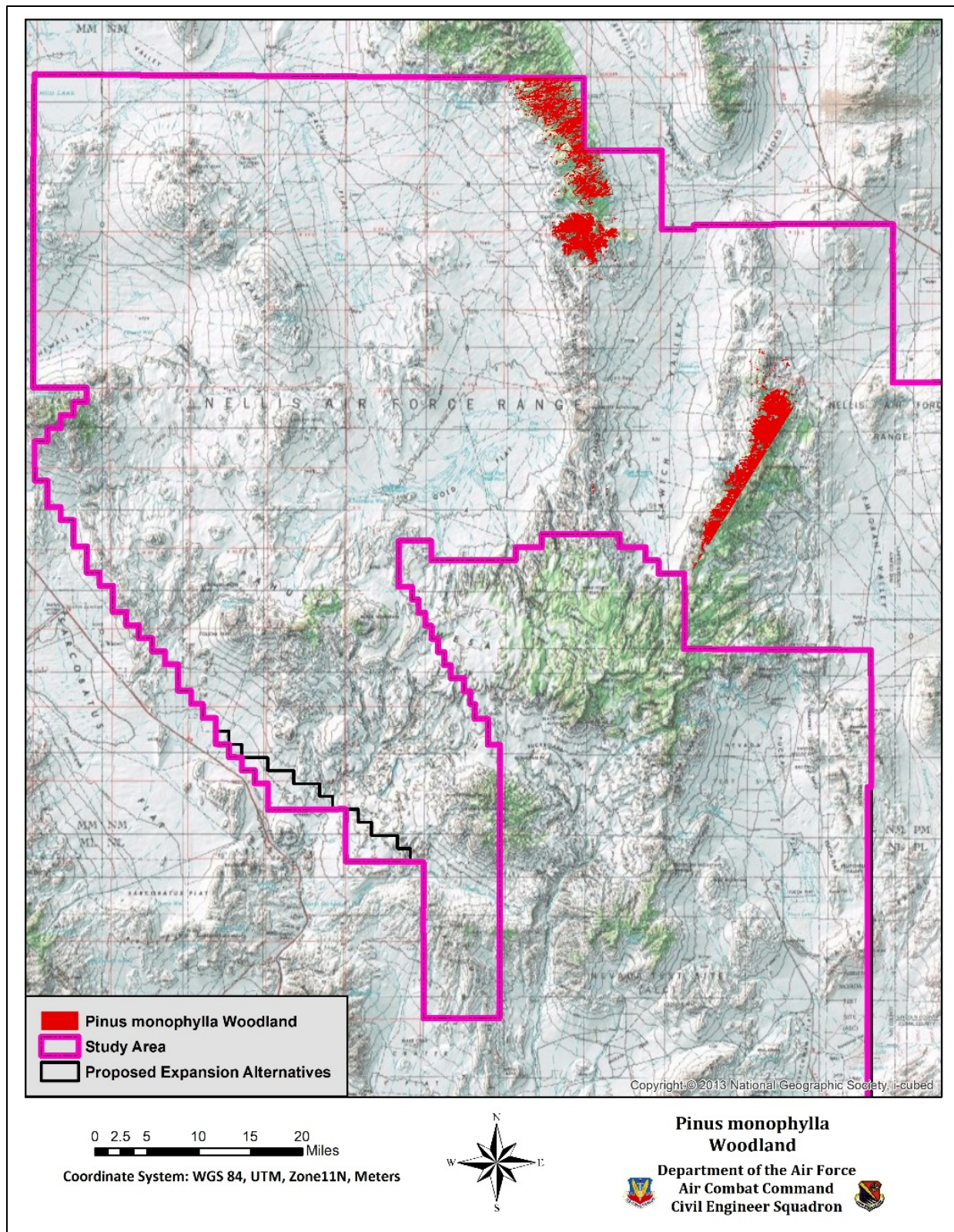


Figure 32. Location of *Pinus monophylla* Shrubland Alliance on the North Range Study Area.

A3277 *Larrea tridentata* - *Ambrosia dumosa* Bajada & Valley Desert Scrub Alliance

The *Larrea tridentata* - *Ambrosia dumosa* Bajada & Valley Desert Scrub Alliance is in the G295 Mojave-Sonoran Bajada & Valley Desert Scrub group and is a widespread alliance that occurs in the Mojave, Sonoran, and Colorado Deserts and extends into the transition zone of the Great Basin (Peterson, 2008; USNVC, 2016). The alliance is typified by a sparse to moderately dense shrub layer co-dominated by *Larrea tridentata* and *Ambrosia dumosa*. The cover of either species does not exceed that of the other species by more than twice. Stands occur on gently to moderately sloping bajadas, upland slopes, and minor washes, usually upgradient of dry lakes and playas. On the North Range Study Area, this alliance is found on the southwest boundary in Sarco-batus Flat, Pahute Mesa, and Thirsty Canyon (Figure 33). On the South Range Study Area, the alliance is widespread across the entire area and usually found upgradient of alliances dominated by *Atriplex canescens* along the periphery of playas and extend upgradient to the upper bajadas where soils become shallow and *Coleogyne ramosissima* becomes the dominant species (Figure 34). Other desert shrubs and dwarf-shrubs may be present as subdominants and include *Atriplex confertifolia*, *Ephedra nevadensis*, *Hy-menoclea salsola*, *Krameria erecta*, and *Yucca brevifolia* (Table 15). Abundant annuals may be seasonally present. *Larrea tridentata* tends to be 2 - 4 ft. high while other shrub species are shorter (1 - 2 ft. high). This plant community has excellent diversity. Soils are typical gravelly loams to very gravelly sandy loams common on the bajadas. In most cases, these soils are covered with fine to coarse gravel on lower bajadas or cobble and rocks on the upper bajadas. Foliar cover of the shrub layer averages 10%. The plant alliance occurs at elevations ranging from 3,100 – 5,600 ft. MSL on the study area.



Larrea tridentata - *Ambrosia dumosa* Bajada & Valley Desert Scrub Alliance

Included in this alliance is the CEGLO01261 *Larrea tridentata* Monotype Shrubland Association, which is dominated by *Larrea tridentata* but may have subdominants in the shrub layer in the lower canopy (USNVC, 2016). *Ambrosia dumosa* is more of a subdominant in this association and may share that role with other species. In many cases, *Ambrosia dumosa* is not even present. In less productive sites, the *Larrea tridentata* may be no taller than the associated shrubs resulting in only one layer of shrubs (Pritchett, D. and F.J. Smith, 2001C). On the study area, the *Larrea tridentata* Monotype Shrubland Association



Larrea tridentata Monotype Shrubland Association

commonly becomes established on the bajadas, sometime extending into the foothills of the surrounding mountains. The association is more common on the South Range Study Area. The subdominants of this association include *Ephedra nevadensis*, *Atriplex confertifolia*, *Ericameria spp.*, *Ambrosia dumosa*, and *Lycium andersonii*. Additional species commonly found in this association include *Echinocactus polycephalus*, *Sphaeralcea ambigua*, *Achnatherum hymenoides*, and *Pleuraphis rigida*. The rare plant *Sclerocactus polyancistrus* has been identified within this community as well. For the purposes of this report, the *Larrea tridentata* Monotype Shrubland Association is included in the *Larrea tridentata* - *Ambrosia dumosa* Bajada & Valley Desert Scrub Alliance.

Table 15. List of plant species and characteristics of the *Larrea tridentata* - *Ambrosia dumosa* Bajada & Valley Desert Scrub Alliance

Attribute	Detail	
Dominants	<i>Larrea tridentata</i>	<i>Ambrosia dumosa</i>
Subdominants	<i>Atriplex confertifolia</i> <i>Ephedra nevadensis</i> <i>Grayia spinosa</i> <i>Lycium andersonii</i>	<i>Hymenoclea salsola</i> <i>Krameria erecta</i> <i>Yucca brevifolia</i>
Common	<i>Acamptopappus shockleyi</i> <i>Achnatherum hymenoides</i> <i>Achnatherum speciosum</i> <i>Allionia incarnata</i> <i>Amsinckia tessellata</i> <i>Aristida purpurea</i> <i>Astragalus lentiginosus</i> <i>Aristida purpurea</i> <i>Atriplex canescens</i> <i>Atriplex hymenelytra</i> <i>Atriplex polycarpa</i> <i>Baileya multiradiata</i> <i>Bouteloua barbata</i> <i>Bromus madritensis ssp. rubens</i> <i>Bromus tectorum</i> <i>Buddleja utahensis</i> <i>Camissonia brevipes</i> <i>Chaenactis carphoclinia</i> <i>Chaenactis douglasii</i> <i>Chaenactis fremontii</i> <i>Chaenactis stevioides</i> <i>Chamaesyce albomarginata</i> <i>Chorizanthe brevicornu</i> <i>Chorizanthe rigida</i> <i>Chorizanthe watsonii</i> <i>Coleogyne ramosissima</i> <i>Cryptantha angustifolia</i> <i>Cryptantha circumscissa</i> <i>Cuscuta salina</i> <i>Cylindropuntia acanthocarpa</i> <i>Cylindropuntia echinocarpa</i> <i>Cylindropuntia ramosissima</i> <i>Dasyochloa pulchella</i> <i>Descurainia pinnata</i> <i>Echinocactus polycephalus</i> <i>Echinocereus engelmannii</i> <i>Elymus elymoides</i> <i>Encelia farinosa</i> <i>Encelia virginensis</i> <i>Ephedra torreyana</i> <i>Eriastrum eremicum</i> <i>Ericameria cooperi</i>	<i>Guillenia lasiophylla</i> <i>Gutierrezia microcephala</i> <i>Halogeton glomeratus</i> <i>Krameria erecta</i> <i>Krameria grayi</i> <i>Krascheninnikovia lanata</i> <i>Langloisia setosissima</i> <i>Lepidium fremontii</i> <i>Lepidium virginicum</i> <i>Linanthus demissus</i> <i>Linanthus parryae</i> <i>Loeseliastrum matthewsii</i> <i>Logfia depressa</i> <i>Lycium andersonii</i> <i>Lycium shockleyi</i> <i>Machaeranthera canescens</i> <i>Malacothrix glabrata</i> <i>Mammillaria tetrancistra</i> <i>Menodora spinescens</i> <i>Mentzelia albicaulis</i> <i>Mentzelia oreophila</i> <i>Monoptilon bellidifforme</i> <i>Muhlenbergia porteri</i> <i>Nama demissum</i> <i>Nicotiana obtusifolia</i> <i>Opuntia basilaris</i> <i>Opuntia polyacantha</i> <i>Oxytheca perfoliata</i> <i>Pectis papposa</i> <i>Peucephyllum schottii</i> <i>Phacelia crenulata</i> <i>Phacelia cryptantha</i> <i>Phacelia fremontii</i> <i>Picrothamnus desertorum</i> <i>Plantago ovata</i> <i>Pleuraphis jamesii</i> <i>Prenanthes exiguua</i> <i>Psathyrotes ramosissima</i> <i>Psoralea fremontii</i> <i>Psoralea polydenius</i> <i>Salazaria mexicana</i> <i>Salsola tragus</i>

Attribute	Detail	
	<i>Eriogonum deflexum</i> <i>Eriogonum fasciculatum</i> <i>Eriogonum heermannii</i> <i>Eriogonum inflatum</i> <i>Eriogonum nidularium</i> <i>Eriogonum reniforme</i> <i>Eriogonum trichopes</i> <i>Eriophyllum wallacei</i> <i>Erodium cicutarium</i> <i>Eschscholzia minutiflora</i> <i>Escobaria vivipara</i> var. <i>rosea</i> <i>Escobaria vivipara</i> <i>Eucnide urens</i> <i>Gilia clokeyi</i> <i>Gilia flavocincta</i> <i>Glyptopleura marginata</i> <i>Grusonia parishii</i>	<i>Schismus arabicus</i> <i>Schismus barbatus</i> <i>Sclerocactus polyancistrus</i> <i>Sphaeralcea ambigua</i> <i>Sporobolus cryptandrus</i> <i>Stanleya elata</i> <i>Stanleya pinnata</i> <i>Stephanomeria exigua</i> <i>Stephanomeria pauciflora</i> <i>Tetradymia axillaris</i> <i>Tetradymia glabrata</i> <i>Thymophylla pentachaeta</i> <i>Vulpia octoflora</i> <i>Xylorhiza tortifolia</i> <i>Yucca baccata</i> <i>Yucca schidigera</i>
Occasional	<i>Adenophyllum cooperi</i> <i>Atrichoseris platyphylla</i> <i>Baileya multiradiata</i> <i>Bouteloua barbata</i> <i>Brickellia arguta</i> <i>Camissonia claviformis</i> <i>Chaenactis macrantha</i> <i>Chaenactis stevioides</i> <i>Chorizanthe rigida</i> <i>Coleogyne ramosissima</i> <i>Delphinium parishii</i> <i>Erodium cicutarium</i> <i>Eschscholzia californica</i> <i>Ipomopsis polycladon</i>	<i>Lepidium lasiocarpum</i> <i>Lepidium nitidum</i> <i>Loeseliastrum matthewsii</i> <i>Lycium andersonii</i> <i>Malacothrix glabrata</i> <i>Mentzelia albicaulis</i> <i>Monoptilon bellidifforme</i> <i>Oenothera caespitosa</i> <i>Orobanche cooperi</i> <i>Phacelia fremontii</i> <i>Prunus fasciculata</i> <i>Rafinesquia neomexicana</i> <i>Sporobolus cryptandrus</i> <i>Yucca schidigera</i>
Average Height	Shrub Layer 1-2 ft.	<i>Larrea tridentata</i> : 2-4 ft.
Area	North Range Study Area: 14,179 acres	South Range Study Area: 268,258 acres
Elevation	3,100-5,600 ft. MSL	
Average Foliar Cover	10%	

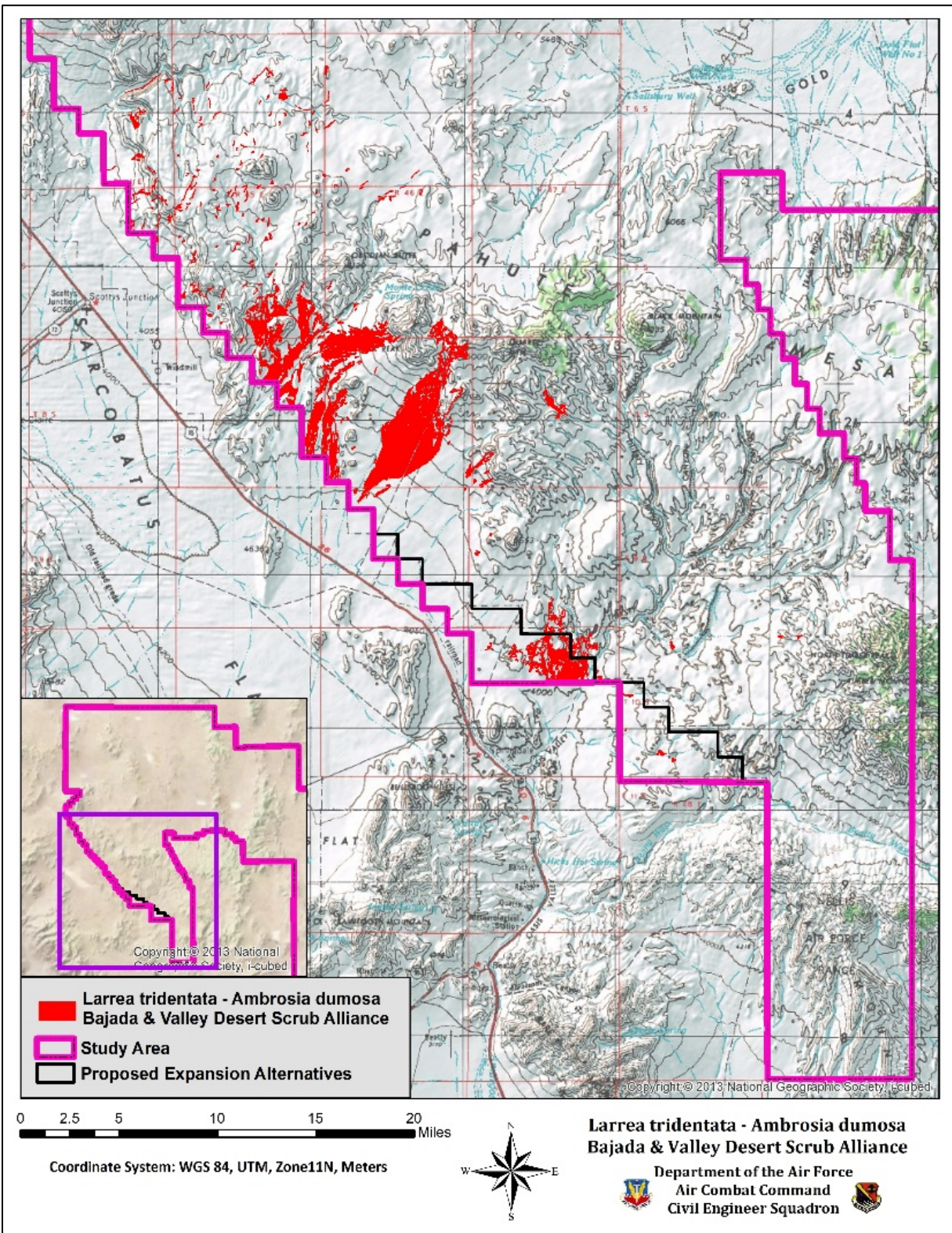


Figure 33. Location of *Larrea tridentata* - *Ambrosia dumosa* Bajada & Valley Desert Scrub Alliance on the North Range Study Area

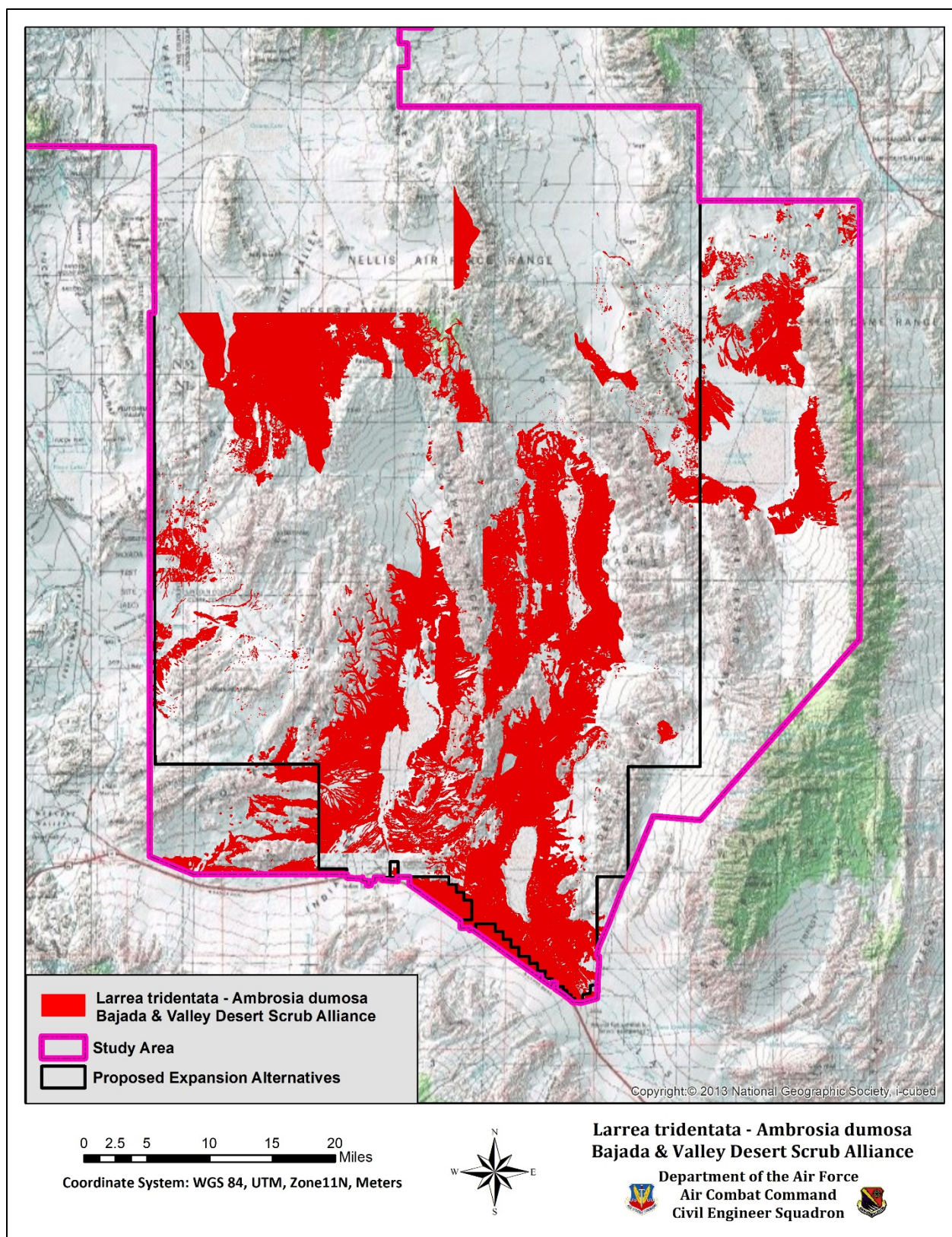


Figure 34. Location of *Larrea tridentata* - *Ambrosia dumosa* Bajada & Valley Desert Scrub Alliance on the South Range Study Area

A3279 *Ambrosia dumosa* Desert Dwarf Scrub Alliance

Across the South Range Study Area, *Ambrosia dumosa* dominates many plant communities and is often a codominant with *Larrea tridentata* as well as other plants (Figure 35). In the case of this alliance, *Ambrosia dumosa* is clearly the dominant plant, often forming plant communities that are nearly monocultures of the species. According to the USNVC, the official name of the alliance is A3279 *Ambrosia dumosa* Desert Dwarf Scrub Alliance, which is a member of the G295 Mojave-Sonoran Bajada & Valley Desert Scrub. This alliance is characterized as “an open dwarf shrub layer dominated by *Ambrosia dumosa*” with or without scattered populations of *Larrea tridentata* (USNVC, 2016).



***Ambrosia dumosa* Desert Dwarf Scrub Alliance**

Codominants and subdominants vary within this alliance, but the most common is *Ephedra nevadensis* (Table 16). The alliance is usually found on bajadas, extending from the vegetated edges of playas to the base of mountains. It often intermingles with the *Larrea tridentata* – *Ambrosia dumosa* Bajada and Valley Desert Scrub Alliance, where it will usually be found in washes. Foliar cover of this alliance averages 8%, with higher cover being found in washes. Subdominant plants in this alliance include *Atriplex confertifolia*, *Hymenoclea salsola*, *Lycium andersonii*, and *Psoralea fremontii*. The shrub layer in this alliance generally remains under 1.5 ft high, but may be as tall as 3 ft. in washes. This alliance was not identified on the North Range Study Area.

Table 16. List of plant species and characteristics of the *Ambrosia dumosa* Desert Dwarf Scrub Alliance as documented by field surveys on the study area.

Attribute	Detail	
Dominants	<i>Ambrosia dumosa</i>	<i>Ephedra nevadensis</i> (sporadically)
Subdominants	<i>Atriplex confertifolia</i> <i>Hymenoclea salsola</i>	<i>Lycium andersonii</i> <i>Psoralea fremontii</i>
Common	<i>Achnatherum hymenoides</i> <i>Atriplex canescens</i> <i>Baileya multiradiata</i> <i>Chorizanthe brevicornu</i> <i>Chorizanthe rigida</i> <i>Cryptantha barbigera</i> <i>Bromus madritensis ssp. rubens</i> <i>Bromus tectorum</i> <i>Dasyochloa pulchella</i> <i>Descurainia pinnata</i> <i>Encelia farinosa</i> <i>Encelia virginensis</i> <i>Ephedra nevadensis</i> <i>Eriogonum deflexum</i> <i>Eriogonum nidularium</i> <i>Gutierrezia microcephala</i> <i>Hymenoclea salsola</i> <i>Krascheninnikovia lanata</i> <i>Krameria erecta</i> <i>Larrea tridentata</i>	<i>Lepidium densiflorum</i> <i>Lepidium fremontii</i> <i>Lycium andersonii</i> <i>Menodora spinescens</i> <i>Monoptilon bellidiforme</i> <i>Oxytheca perfoliata</i> <i>Phacelia crenulata</i> <i>Phacelia fremontii</i> <i>Pleuraphis jamesii</i> <i>Psoralea fremontii</i> <i>Salazaria mexicana</i> <i>Salsola tragus</i> <i>Schismus arabicus</i> <i>Sphaeralcea ambigua</i> <i>Stanleya pinnata</i> <i>Stephanomeria pauciflora</i> <i>Tetradymia glabrata</i> <i>Thymophylla pentachaeta</i> <i>Yucca brevifolia</i>

Attribute	Detail	
Occasional	<i>Atriplex canescens</i> <i>Lepidium fremontii</i> <i>Lycium andersonii</i> <i>Machaeranthera canescens</i> <i>Achnatherum speciosum</i>	<i>Opuntia polyacantha</i> <i>Picrothamnus desertorum</i> <i>Yucca brevifolia</i> <i>Machaeranthera canescens</i>
Height	0.5-1.5 ft.	
Area	North Range Study Area: 0 acres	South Range Study Area: 24,383 acres
Elevation	3,100-4,300 ft. MSL	
Average Foliar Cover	8%	

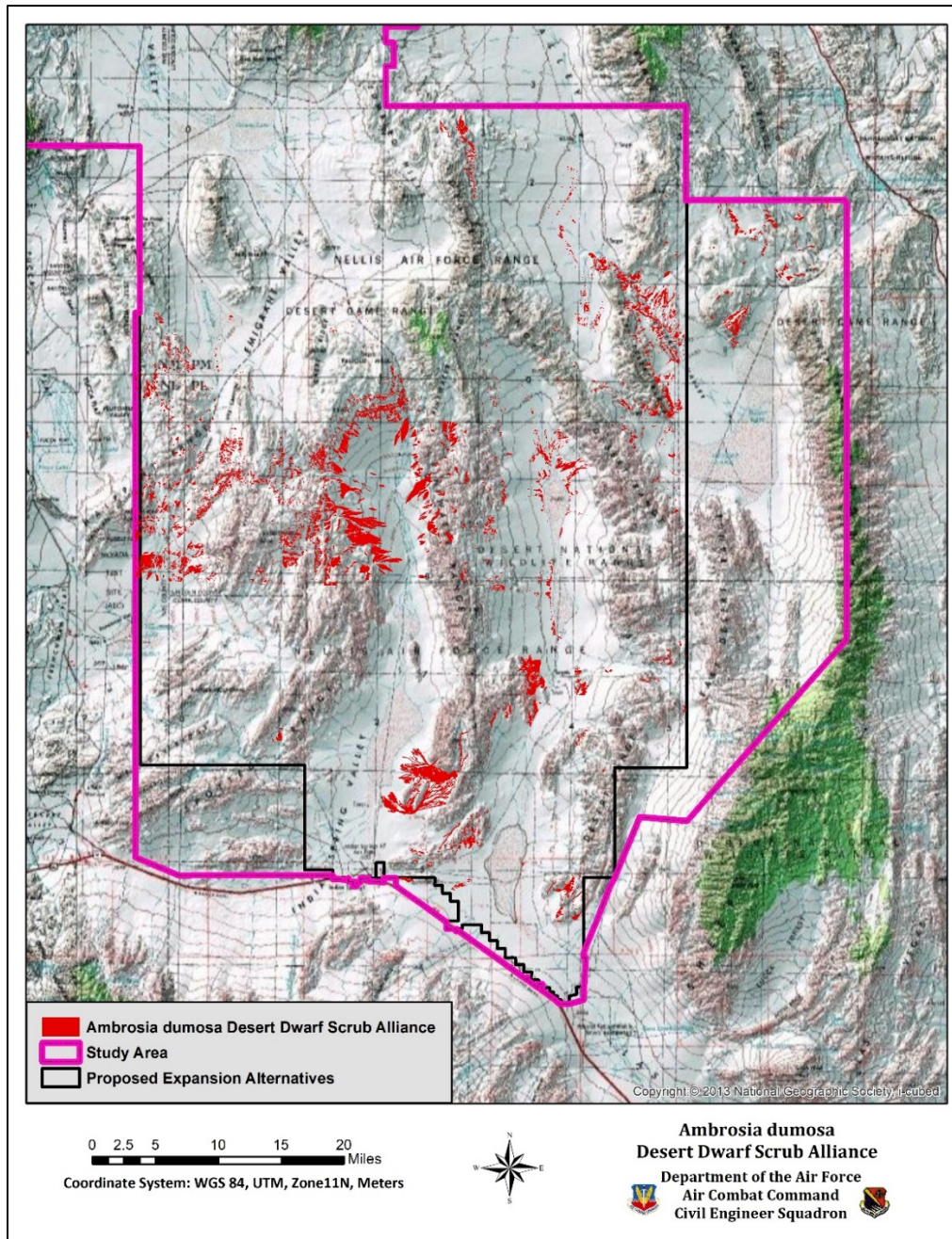


Figure 35. Location of *Ambrosia dumosa* Desert Dwarf Scrub Alliance on the South Range Study Area.

G296 MOJAVE MID-ELEVATION MIXED DESERT SCRUB

A0833 *Purshia stansburiana* Scrub Alliance

The *Purshia stansburiana* Scrub Alliance is a member of G296 Mojave Mid-Elevation Mixed Desert Scrub group and is comprised of shrublands dominated by *Purshia stansburiana* (USNVC, 2016). The alliance occurs at middle elevations of the Intermountain West, usually in washes, on cliffs, or on steep, rocky terrain (Peterson, 2008; USNVC, 2016). Most of the soil surface is bedrock and plants tend to be growing on ledges that accumulate shallow soils, on bases of cliffs, or in crevices. On the North Range Study Area, the alliance is found in the canyons and washes of Thirsty Canyon (Figure 36). On the South Range Study



Purshia stansburiana Scrub Alliance

Area, the alliance is found on the rugged slopes of the mountain ranges, especially the Pintwater and Sheep Ranges (Figure 37). Although not mentioned in the description, *Purshia mexicana* may also be present or dominant in this alliance on the study area. Further surveys are required to determine the extent of those populations and to validate the presence of that species. Associated shrubs include *Eriocameria nauseosa*, *Coleogyne ramosissima*, *Atriplex canescens*, *Ephedra viridis*, *Krasheninnikovia lanata*, *Artemisia tridentata*, and *Yucca baccata* (Table 17). Occasionally *Larrea tridentata* can be found within this alliance. On the study area, the alliance may have *Gutierrezia sarothrae* or *Gutierrezia microcephala* as subdominants. Typical native grass species found in this alliance include *Sporobolus cryptandrus*, *Poa secunda*, *Bromus tectorum* and *Achnatherum hymenoides*. The lower shrub layer ranges in brush height of 1 - 2 ft. with *Purshia stansburiana* being 2-5 ft. tall with an average height of 3.4 ft. Foliar cover ranges from 4 - 55% with an average of 15%. This alliance is found at elevations ranging from 4,300 to 6,300 ft. MSL.

Table 17. List of plant species and characteristics of the *Purshia stansburiana* Scrub Alliance

Attribute	Detail	
Dominants	<i>Purshia stansburiana</i>	<i>Purshia mexicana</i>
Subdominants	<i>Gutierrezia sarothrae</i>	<i>Gutierrezia microcephala</i>
Common	<i>Agave utahensis</i> var. <i>eborispina</i> <i>Amsonia tomentosa</i> <i>Artemisia arbuscula</i> <i>Artemisia nova</i> <i>Atriplex canescens</i> <i>Atriplex confertifolia</i> <i>Bromus madritensis</i> ssp. <i>rubens</i> <i>Coleogyne ramosissima</i> <i>Cylindropuntia echinocarpa</i> <i>Echinocactus polycephalus</i> <i>Ephedra nevadensis</i> <i>Ephedra viridis</i> <i>Eriogonum inflatum</i> <i>Glossopetalon spinescens</i>	<i>Hecastocleis shockleyi</i> <i>Hymenoclea salsola</i> <i>Juniperus osteosperma</i> <i>Krameria erecta</i> <i>Opuntia basilaris</i> <i>Opuntia polyacantha</i> <i>Penstemon palmeri</i> <i>Pleuraphis jamesii</i> <i>Prunus andersonii</i> <i>Salvia dorrii</i> <i>Sphaeralcea ambigua</i> <i>Thamnosma montana</i> <i>Thymophylla pentachaeta</i> <i>Yucca baccata</i>

Attribute	Detail	
	<i>Gutierrezia microcephala</i>	<i>Yucca brevifolia</i>
Occasional	<i>Achnatherum hymenoides</i> <i>Aristida purpurea</i> <i>Artemisia tridentata</i> <i>Cylindropuntia echinocarpa</i> <i>Ericameria nauseosa</i> <i>Eriogonum fasciculatum</i>	<i>Gutierrezia sarothrae</i> <i>Opuntia polyacantha</i> var. <i>erinacea</i> <i>Salsola tragus</i> <i>Sarcobatus baileyi</i> <i>Sporobolus cryptandrus</i>
Average Height	3.4 ft.	
Area	North Range Study Area: 569 acres	South Range Study Area: 12,064 acres
Elevation	4,300-6,300 ft. MSL	
Average Foliar Cover	15%	

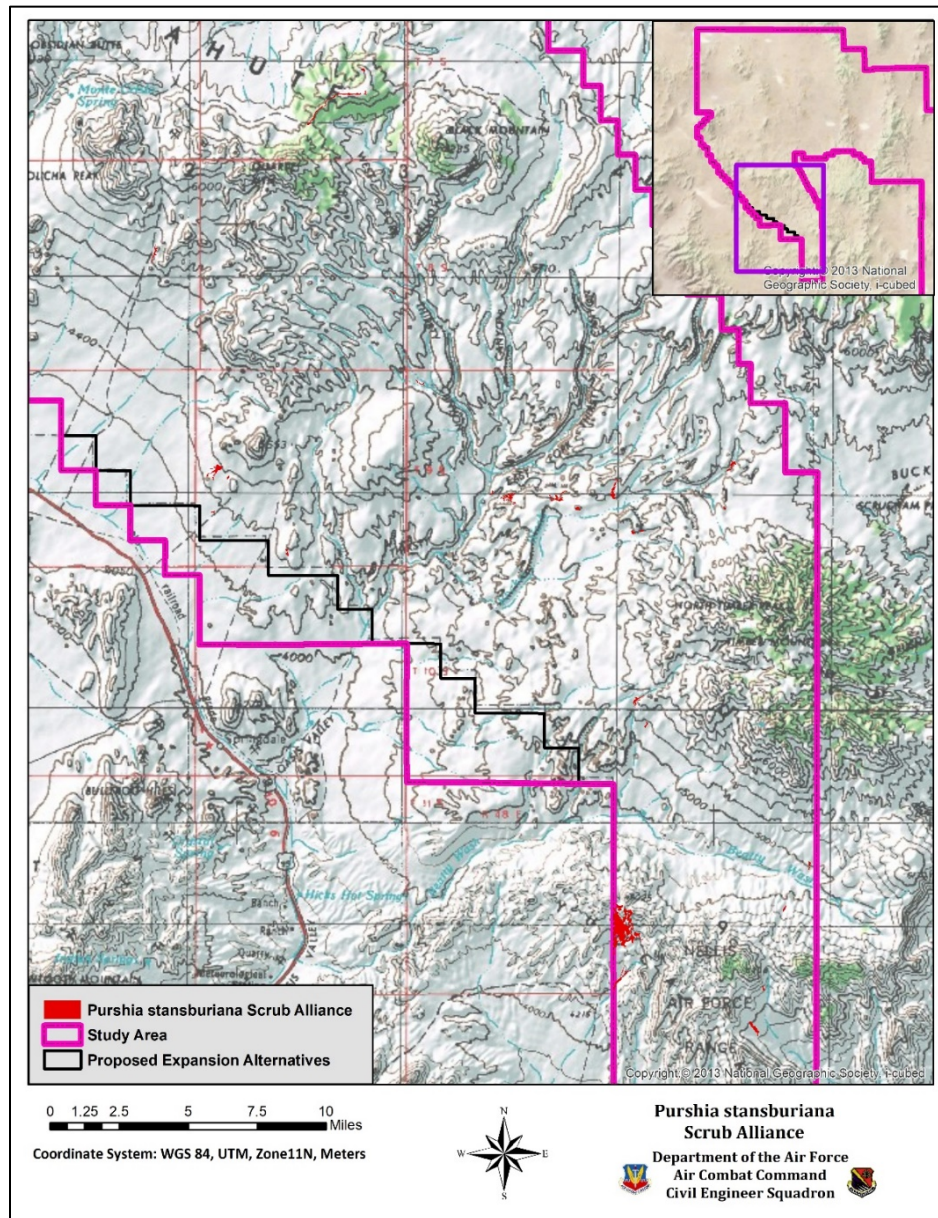


Figure 36. Location of the *Purshia stansburiana* Scrub Alliance on the North Range Study Area.

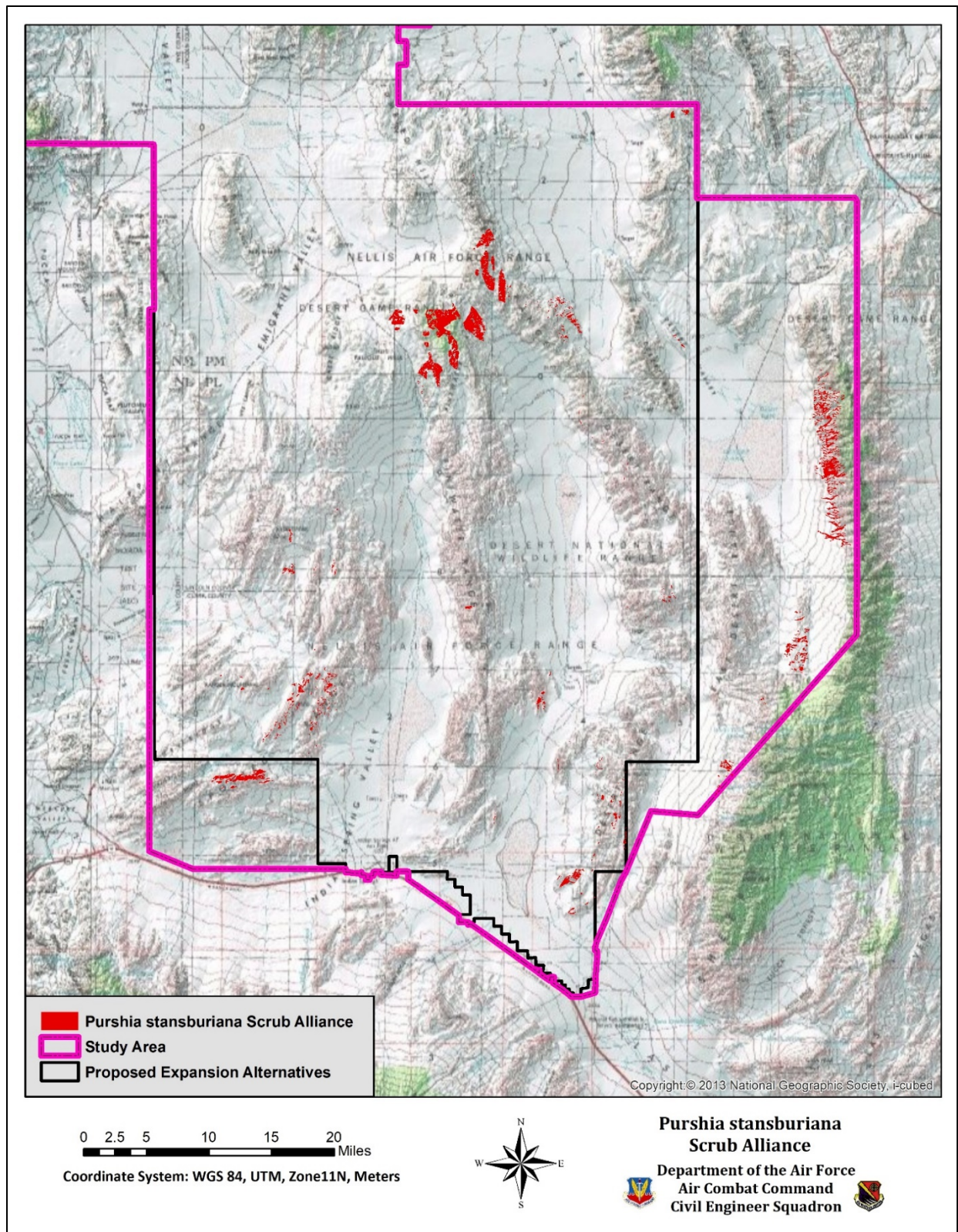


Figure 37. Location of the *Purshia stansburiana* Scrub Alliance on the South Range Study Area.

A2515 *Menodora spinescens* Scrub Alliance

The *Menodora spinescens* Scrub Alliance is in G296 Mojave Mid-Elevation Mixed Desert Scrub group that is found in the Mojave Desert and Great Basin (USNVC, 2016). The alliance is dominated by *Menodora spinescens* in an open, short scrub layer. The alliance is usually found on foothills, slopes, and upper bajadas. On the study area, it is widespread on hills, mesas, mountains, and plateaus of Pahute Mesa and Thirsty Canyon on the North Range Study Area (Figure 38). On the South Range Study Area, it is found on Dead Horse Ridge and the Desert Range



Menodora spinescens Scrub Alliance

in Alternative 3C (Figure 39). This alliance lies over shallow, well-drained soils derived from volcanic rock. Soil texture ranges from gravelly, fine sandy loams to gravelly, sandy clay loams with the occasional rock outcrop (Peterson, 2008). According to the NNHP (Peterson, 2008), this alliance is dominated by *Menodora spinescens* with no subdominants. However, on the study area, it was found to be associated with *Atriplex confertifolia*, *Ephedra nevadensis*, and *Krascheninnikovia lanata* as subdominants in agreement with the USNVC (USNVC, 2016). Common shrubs include *Purshia stansburiana*, *Larrea tridentata*, *Grayia spinosa*, various *Ericameria* species, and *Lycium andersonii* (Table 18). A variety of occasional shrub species are also present in this community. The herbaceous layer includes *Aristida purpurea*, *Achnatherum speciosum*, *Bromus madritensis*, *Machaeranthera canescens*, and *Stanleya pinnata*. The shrub layer in this alliance averages 1.3 ft. tall with 15% average foliar cover. Elevations range from 3,800 ft. MSL to 6,400 ft. MSL.

Table 18. List of plant species and characteristics of the *Menodora spinescens* Scrub Alliance

Attribute	Detail	
Dominants	<i>Menodora spinescens</i>	
Subdominants	<i>Atriplex confertifolia</i> <i>Ephedra nevadensis</i>	<i>Krascheninnikovia lanata</i>
Common	<i>Acamptopappus shockleyi</i> <i>Achnatherum hymenoides</i> <i>Achnatherum speciosum</i> <i>Ambrosia dumosa</i> <i>Aristida purpurea</i> <i>Artemisia nova</i> <i>Artemisia tridentata</i> <i>Astragalus amphioxys</i> var. <i>musimonum</i> <i>Atrichoseris platyphylla</i> <i>Atriplex canescens</i> <i>Atriplex spinifera</i> <i>Bassia americana</i> <i>Chaenactis stevioides</i> <i>Chorizanthe rigida</i> <i>Chrysothamnus Greenei</i> <i>Chrysothamnus viscidiflorus</i>	<i>Eriogonum fasciculatum</i> <i>Eriogonum inflatum</i> <i>Eriogonum microthecum</i> <i>Grayia spinosa</i> <i>Gutierrezia microcephala</i> <i>Gutierrezia sarothrae</i> <i>Halogeton glomeratus</i> <i>Hymenoclea salsola</i> <i>Juniperus osteosperma</i> <i>Larrea tridentata</i> <i>Lycium andersonii</i> <i>Machaeranthera canescens</i> <i>Opuntia basilaris</i> <i>Oxytheca perfoliata</i> <i>Phacelia crenulata</i> <i>Picrothamnus desertorum</i>

Attribute	Detail	
	<i>Coleogyne ramosissima</i> <i>Cylindropuntia echinocarpa</i> <i>Dasyochloa pulchella</i> <i>Elymus elymoides</i> <i>Enceliopsis nudicaulis</i> <i>Ephedra torreyana</i> <i>Ephedra viridis</i> <i>Ericameria cooperi</i> <i>Ericameria nana</i> <i>Ericameria nauseosa</i> <i>Ericameria teretifolia</i>	<i>Pleuraphis jamesii</i> <i>Psilostrophe cooperi</i> <i>Psoralea emoryi</i> <i>Purshia stansburiana</i> <i>Salazaria mexicana</i> <i>Salsola tragus</i> <i>Sarcobatus baileyi</i> <i>Stanleya pinnata</i> <i>Tetradymia axillaris</i> <i>Tetradymia glabrata</i> <i>Yucca brevifolia</i>
Occasional	<i>Artemisia arbuscula</i> <i>Boraginaceae</i> <i>Bouteloua gracilis</i> <i>Bromus madritensis ssp. rubens</i> <i>Bromus tectorum</i> <i>Caulanthus inflatus</i> <i>Chaetopappa ericoides</i> <i>Chamaesyce albomarginata</i> <i>Descurainia sophia</i> <i>Echinocereus engelmannii</i> <i>Encelia farinosa</i> <i>Eriogonum heermannii</i> <i>Eriogonum nidularium</i> <i>Eriogonum ovalifolium</i> <i>Grusonia pulchella</i> <i>Hesperostipa comata</i> <i>Lepidium fremontii</i> <i>Leymus cinereus</i>	<i>Linanthus pungens</i> <i>Linum lewisii</i> <i>Lycium cooperi</i> <i>Mammillaria tetrancistra</i> <i>Opuntia polyacantha var. erinacea</i> <i>Purshia stansburiana</i> <i>Salazaria mexicana</i> <i>Salvia columbariae</i> <i>Sarcobatus vermiculatus</i> <i>Sclerocactus polyancistrus</i> <i>Sphaeralcea ambigua</i> <i>Sphaeralcea grossulariifolia</i> <i>Sporobolus cryptandrus</i> <i>Stanleya elata</i> <i>Xylorhiza tortifolia</i> <i>Yucca baccata</i> <i>Yucca elata</i>
Average Height	1.3 ft.	
Area	North Range Study Area: 76,456 acres	South Range Study Area: 388 acres
Elevation	3,800-6,400 ft. MSL	
Average Foliar Cover	15%	

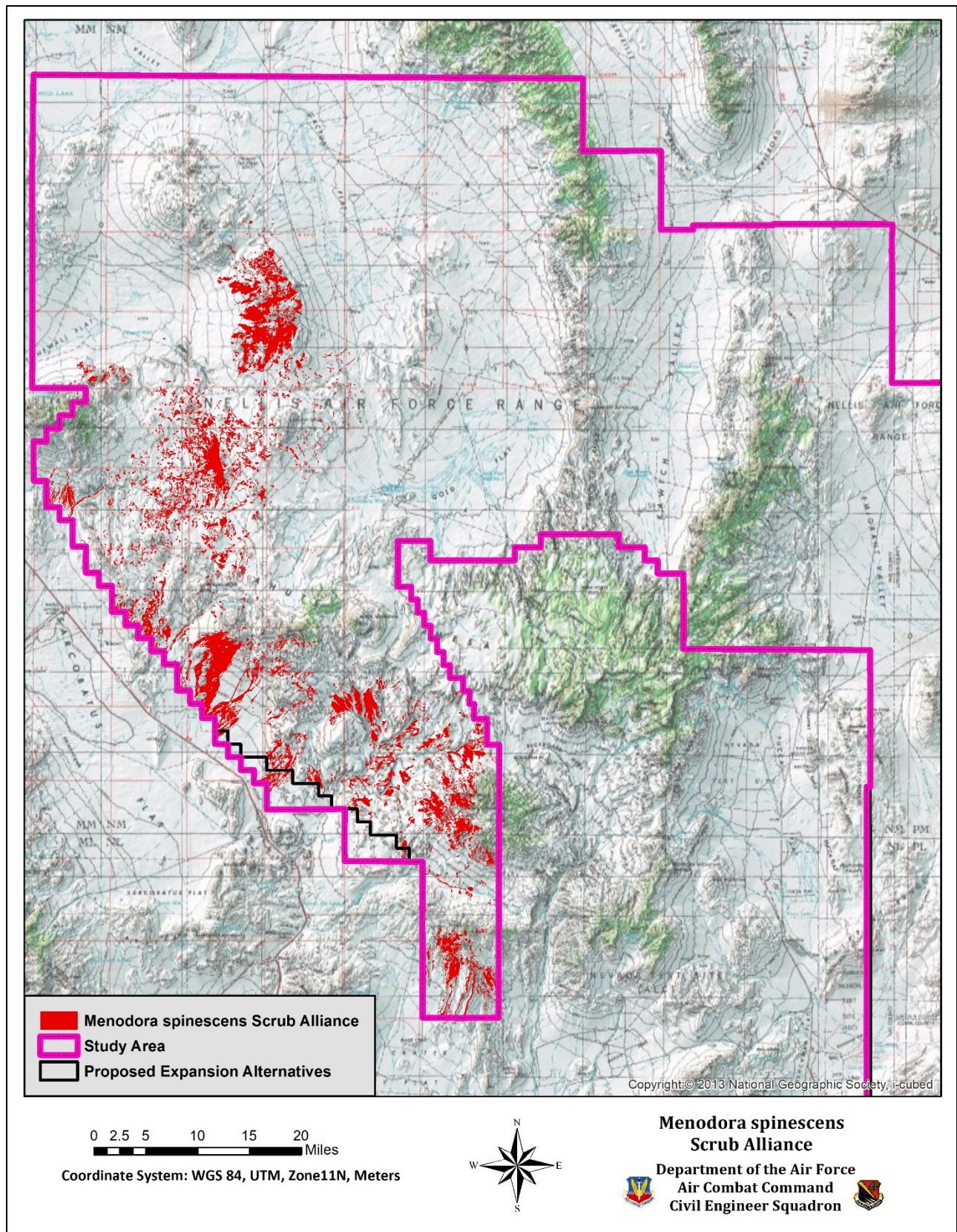


Figure 38. Location of *Menodora spinescens* Scrub Alliance on the North Range Study Area.

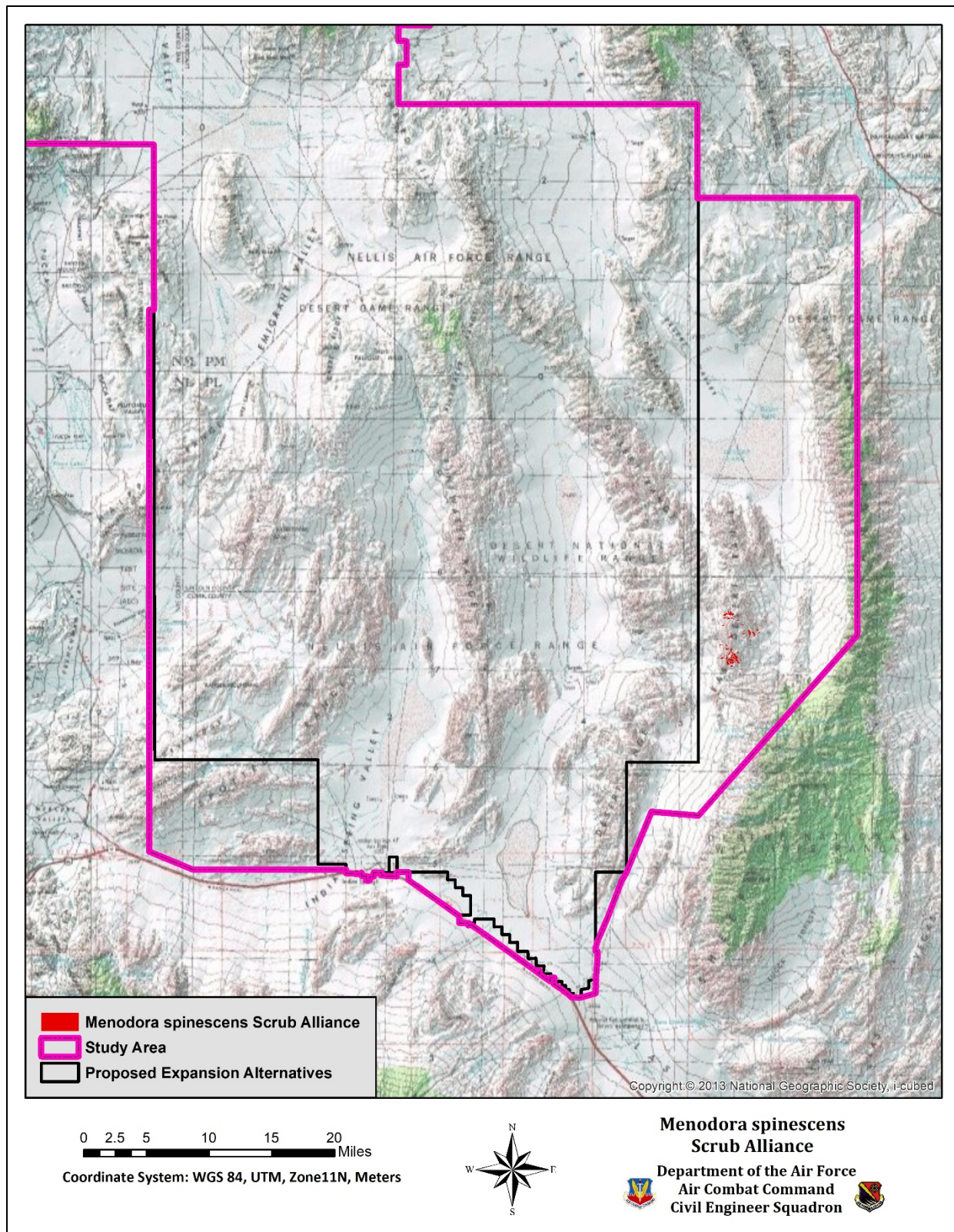


Figure 39. Location of *Menodora spinescens* Scrub Alliance on the South Range Study Area.

A3147 *Yucca schidigera* Scrub Alliance

The *Yucca schidigera* Scrub Alliance is a member of the G296 Mojave Mid-Elevation Mixed Desert Scrub group (USNVC, 2016). This desert scrub alliance of the Mojave and Colorado Deserts grows on rocky, well-drained slopes (Figure 40). Stands of this shrubland have a sparse, emergent tree layer of 3 - 5% total cover of *Yucca schidigera* over a shrub canopy (Peterson, 2008; USNVC, 2016). Subdominants or co-dominants in this alliance include *Larrea tridentata*, *Ambrosia dumosa*, *Atriplex confertifolia*, *Ephedra nevadensis*, and *Psoralea fremontii* (Table 19). A variety of other shrubs and herbaceous plants may be present, though typically in small amounts. Shrub height averages 3-6 ft. with *Yucca schidigera* occasionally exceeding 11 ft. in height. Across this alliance, the average foliar cover is 8%.



***Yucca schidigera* Scrub Alliance**

Table 19. List of plant species and characteristics of the *Yucca schidigera* Scrub Alliance

Attribute	Detail	
Dominants	<i>Yucca schidigera</i>	
Subdominants	<i>Larrea tridentata</i> <i>Ambrosia dumosa</i> <i>Atriplex confertifolia</i>	<i>Psoralea fremontii</i> <i>Ephedra nevadensis</i>
Common	<i>Acamptopappus shockleyi</i> <i>Achnatherum hymenoides</i> <i>Allionia incarnata</i> <i>Ambrosia dumosa</i> <i>Amsonia tomentosa</i> <i>Astragalus amphioxys</i> var. <i>musimonum</i> <i>Atrichoseris platyphylla</i> <i>Baileya multiradiata</i> <i>Baileya pleniradiata</i> <i>Bromus madritensis</i> ssp. <i>rubens</i> <i>Bromus tectorum</i> <i>Camissonia brevipes</i> <i>Chaenactis macrantha</i> <i>Chaenactis stevioides</i> <i>Chorizanthe rigida</i> <i>Cirsium mohavense</i> <i>Coleogyne ramosissima</i> <i>Cryptantha tumulosa</i> <i>Cylindropuntia echinocarpa</i> <i>Dasyochloa pulchella</i> <i>Echinocactus polycephalus</i> <i>Echinocereus engelmannii</i> <i>Encelia farinosa</i> <i>Encelia virginensis</i> <i>Ephedra nevadensis</i> <i>Ephedra viridis</i> <i>Eriogonum deflexum</i>	<i>Krameria grayi</i> <i>Krascheninnikovia lanata</i> <i>Langloisia setosissima</i> <i>Larrea tridentata</i> <i>Lepidium flavum</i> <i>Lepidium fremontii</i> <i>Lepidium virginicum</i> <i>Linanthus parryae</i> <i>Lycium andersonii</i> <i>Menodora spinescens</i> <i>Mirabilis laevis</i> <i>Nama demissum</i> <i>Opuntia basilaris</i> <i>Opuntia polyacantha</i> var. <i>erinacea</i> <i>Opuntia basilaris</i> <i>Oxytheca perfoliata</i> <i>Phacelia crenulata</i> <i>Phacelia fremontii</i> <i>Plantago erecta</i> <i>Pleuraphis jamesii</i> <i>Prunus fasciculata</i> <i>Psilostrophe cooperi</i> <i>Psoralea fremontii</i> <i>Psoralea arborescens</i> <i>Salazaria mexicana</i> <i>Salvia dorrii</i> <i>Schismus arabicus</i> <i>Senecio multilobata</i>

Attribute	Detail	
	<i>Eriogonum inflatum</i> <i>Eriogonum trichopes</i> <i>Eschscholzia minutiflora</i> <i>Escobaria vivipara</i> var. <i>rosea</i> <i>Gutierrezia microcephala</i> <i>Hymenoclea salsola</i> <i>Krameria erecta</i>	<i>Sphaeralcea ambigua</i> <i>Stanleya elata</i> <i>Stanleya pinnata</i> <i>Stephanomeria exigua</i> <i>Stephanomeria pauciflora</i> <i>Thamnosma montana</i> <i>Vulpia octoflora</i>
Height	Shrubs: 0.5-4 ft.	<i>Yucca schidigera</i> : 3-11 ft.
Area	North Range Study Area: 0 acres	South Range Study Area: 11,584 acres
Elevation	3,900-4,200 ft. MSL	
Foliar Cover	8%	

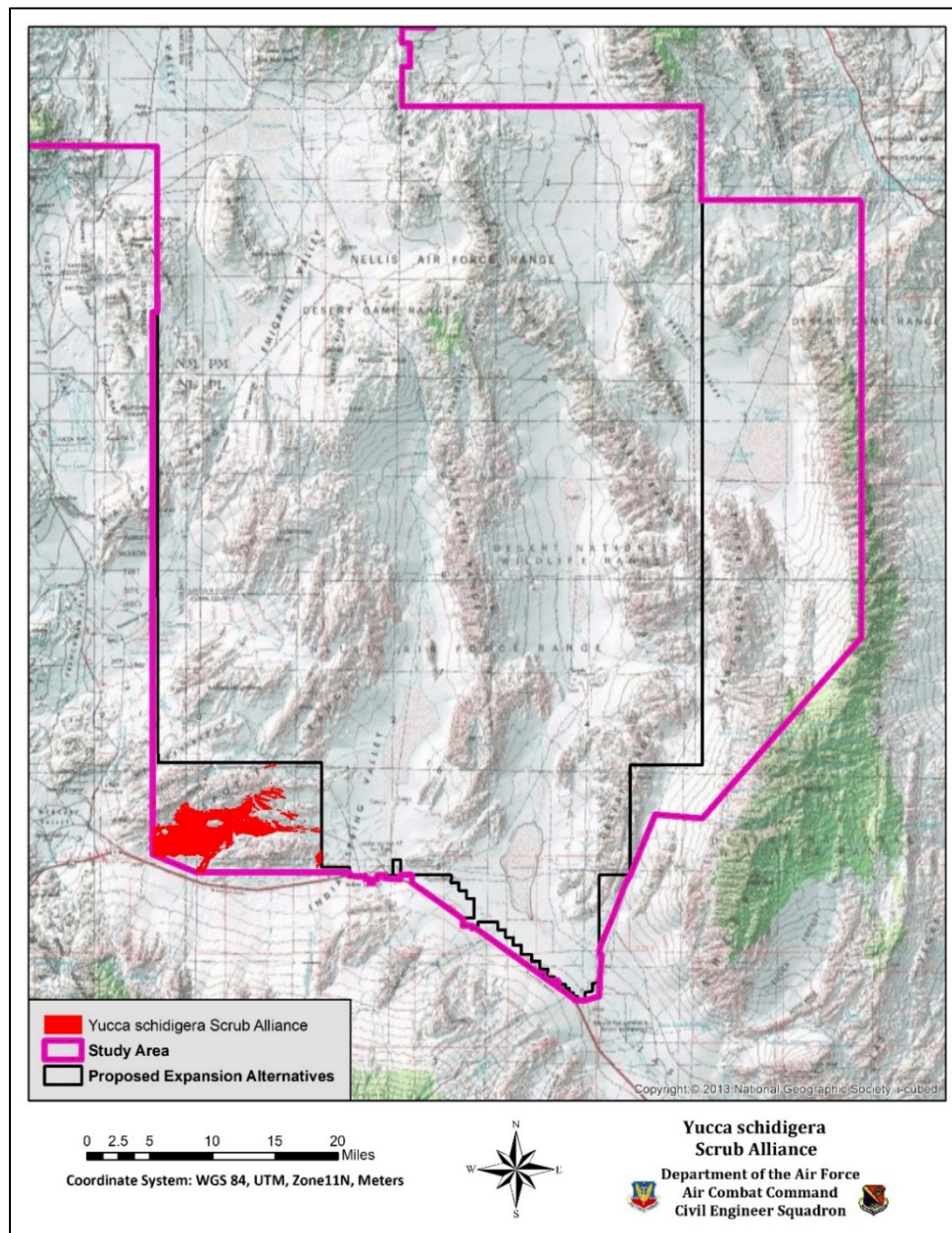


Figure 40. Location of the *Yucca schidigera* Scrub Alliance on the South Range Study Area.

A3148 *Yucca brevifolia* Wooded Scrub Alliance

The *Yucca brevifolia* Wooded Scrub Alliance is a member of the G296 Mojave Mid-Elevation Mixed Desert Scrub group and actually includes the two other associations that have been separated from this plant community for this report (USNVC, 2016). This plant community is a common alliance found throughout the Study Area at the upper elevations of bajadas extending onto the foothills of the surrounding mountains. On the North Range Study Area, the alliance is found in the foothills and upper basins of the Cactus Range, Yucca Range, and Thirsty Canyon (Figure 41). On the



***Yucca brevifolia* Wooded Scrub Alliance**

South Range Study Area, the alliance occurs in the upper parts of bajadas and the foothills of the Sheep, Desert, Pintwater, and Spotted Ranges (Figure 42). This alliance is dominated by *Yucca brevifolia*; with subdominants including *Larrea tridentata*, *Ambrosia dumosa*, *Ephedra nevadensis*, *Menodora spinescens*, and *Lycium andersonii* (Table 20). Common brush species observed in this alliance are *Atriplex confertifolia*, *Krascheninnikovia lanata*, *Hymenoclea salsola*, and *Grayia spinosa*. Grasses are sparse in this alliance and include *Achnatherum hymenoides*, *Dasyochloa pulchella* and *Hesperostipa comata*. The alliance supports a highly diverse community of herbaceous and woody plants. The height of the shrub layer averages 1 - 4 ft. while the *Yucca brevifolia* will reach 12 ft. high. This alliance has an average foliar cover of 11% and is found at elevations ranging from 3,200 to 6,600 ft. MSL.

Table 20. List of plant species and characteristics of the *Yucca brevifolia* Wooded Scrub Alliance.

Attribute	Detail	
Dominants	<i>Yucca brevifolia</i>	
Subdominants	<i>Larrea tridentata</i> <i>Ambrosia dumosa</i> <i>Ephedra nevadensis</i>	<i>Menodora spinescens</i> <i>Lycium andersonii</i>
Common	<i>Acamptopappus shockleyi</i> <i>Achnatherum aridum</i> <i>Achnatherum hymenoides</i> <i>Achnatherum speciosum</i> <i>Adenophyllum cooperi</i> <i>Allionia incarnata</i> <i>Ambrosia dumosa</i> <i>Ambrosia eriocentra</i> <i>Ambrosia psilostachya</i> <i>Amsinckia tessellata</i> <i>Amsonia tomentosa</i> <i>Antheropeas wallacei</i> <i>Arabis pulchra</i> <i>Arenaria kingii</i> <i>Argemone munita</i> <i>Aristida adscensionis</i> <i>Aristida purpurea</i> <i>Artemisia bigelovii</i> <i>Artemisia ludoviciana</i>	<i>Escobaria vivipara</i> var. <i>rosea</i> <i>Escobaria vivipara</i> <i>Fallugia paradoxa</i> <i>Gaillardia arizonica</i> <i>Gaillardia pinnatifida</i> <i>Gilia cana</i> <i>Gilia clokeyi</i> <i>Gilia flavocincta</i> <i>Glyptopleura marginata</i> <i>Grayia spinosa</i> <i>Grusonia parishii</i> <i>Guillenia lasiophylla</i> <i>Gutierrezia microcephala</i> <i>Gutierrezia sarothrae</i> <i>Hedeoma nana</i> <i>Hymenoclea salsola</i> <i>Hymenoxys cooperi</i> <i>Ipomopsis polycladon</i> <i>Juniperus osteosperma</i>

Attribute	Detail	
	<i>Astragalus amphioxys</i> var. <i>musimonum</i> <i>Atrichoseris platyphylla</i> <i>Atriplex canescens</i> <i>Atriplex confertifolia</i> <i>Atriplex hymenelytra</i> <i>Baileya multiradiata</i> <i>Baileya pleniradiata</i> <i>Bassia americana</i> <i>Bouteloua gracilis</i> <i>Brassica tournefortii</i> <i>Brickellia microphylla</i> <i>Bromus madritensis</i> ssp. <i>madritensis</i> <i>Bromus madritensis</i> ssp. <i>rubens</i> <i>Bromus tectorum</i> <i>Buddleja utahensis</i> <i>Calochortus flexuosus</i> <i>Calycoseris parryi</i> <i>Camissonia boothii</i> <i>Camissonia brevipes</i> <i>Camissonia claviformis</i> <i>Camissonia walkeri</i> <i>Castilleja angustifolia</i> <i>Caulanthus cooperi</i> <i>Chaenactis carphoclinia</i> <i>Chaenactis douglasii</i> <i>Chaenactis macrantha</i> <i>Chaenactis stevioides</i> <i>Chamaesyce albomarginata</i> <i>Chamaesyce polycarpa</i> <i>Chorizanthe brevicornu</i> <i>Chorizanthe rigida</i> <i>Chorizanthe watsonii</i> <i>Cirsium mohavense</i> <i>Coleogyne ramosissima</i> <i>Cryptantha angustifolia</i> <i>Cryptantha barbigera</i> <i>Cryptantha circumscissa</i> <i>Cryptantha confertiflora</i> <i>Cryptantha dumetorum</i> <i>Cryptantha flavoculata</i> <i>Cryptantha micrantha</i> <i>Cryptantha nevadensis</i> <i>Cryptantha pterocarya</i> <i>Cryptantha recurvata</i> <i>Cryptantha setosissima</i> <i>Cryptantha tumulosa</i> <i>Cryptantha virginensis</i> <i>Cuscuta salina</i> <i>Cylindropuntia acanthocarpa</i> <i>Cylindropuntia echinocarpa</i> <i>Cylindropuntia ramosissima</i> <i>Cymopterus gilmanii</i> <i>Dalea searlsiae</i> <i>Dasyochloa pulchella</i> <i>Delphinium parishii</i> <i>Descurainia pinnata</i> <i>Draba cuneifolia</i> <i>Echinocactus polycephalus</i> <i>Echinocereus engelmannii</i> <i>Elymus elymoides</i> <i>Elymus multisetus</i>	<i>Krameria erecta</i> <i>Krameria grayi</i> <i>Krascheninnikovia lanata</i> <i>Langloisia setosissima</i> <i>Larrea tridentata</i> <i>Lepidium densiflorum</i> <i>Lepidium fremontii</i> <i>Lepidium lasiocarpum</i> <i>Lepidium nitidum</i> <i>Lepidium virginicum</i> <i>Linanthus demissus</i> <i>Linanthus parryae</i> <i>Loeseliastrum matthewsii</i> <i>Lycium andersonii</i> <i>Lycium cooperi</i> <i>Lycium shockleyi</i> <i>Machaeranthera canescens</i> <i>Malacothrix glabrata</i> <i>Menodora spinescens</i> <i>Mentzelia albicaulis</i> <i>Mentzelia oreophila</i> <i>Mimulus bigelovii</i> <i>Mirabilis laevis</i> <i>Muhlenbergia porteri</i> <i>Nama demissum</i> <i>Nama hispidum</i> <i>Nemacladus gracilis</i> <i>Nemacladus rubescens</i> <i>Nicotiana obtusifolia</i> <i>Oenothera caespitosa</i> <i>Oenothera suffrutescens</i> <i>Opuntia basilaris</i> <i>Opuntia engelmannii</i> <i>Opuntia phaeacantha</i> <i>Opuntia polyacantha</i> <i>Opuntia polyacantha</i> var. <i>erinacea</i> <i>Orobanche cooperi</i> <i>Oxytheca perfoliata</i> <i>Pectis papposa</i> <i>Pectocarya penicillata</i> <i>Penstemon bicolor</i> <i>Penstemon palmeri</i> <i>Phacelia crenulata</i> <i>Phacelia cryptantha</i> <i>Phacelia fremontii</i> <i>Phacelia vallis-mortae</i> <i>Picrothamnus desertorum</i> <i>Plantago ovata</i> <i>Pleiocanthus spinosus</i> <i>Pleuraphis jamesii</i> <i>Pleuraphis rigida</i> <i>Poa secunda</i> <i>Prenanthes exiguus</i> <i>Prunus andersonii</i> <i>Prunus fasciculata</i> <i>Psathyrotes ramosissima</i> <i>Psilostrophe cooperi</i> <i>Psoralea arborescens</i> <i>Psoralea fremontii</i> <i>Psoralea polydenius</i> <i>Purshia stansburiana</i>

Attribute	Detail	
	<i>Encelia actonii</i> <i>Encelia farinosa</i> <i>Encelia virginensis</i> <i>Enceliopsis covillei</i> <i>Enceliopsis nudicaulis</i> <i>Ephedra nevadensis</i> <i>Ephedra torreyana</i> <i>Ephedra viridis</i> <i>Eriastrum eremicum</i> <i>Ericameria cooperi</i> <i>Ericameria nauseosa</i> <i>Erigeron concinnus</i> <i>Eriogonum concinnum</i> <i>Eriogonum deflexum</i> <i>Eriogonum fasciculatum</i> <i>Eriogonum inflatum</i> <i>Eriogonum microthecum</i> <i>Eriogonum nidularium</i> <i>Eriogonum plumatella</i> <i>Eriogonum reniforme</i> <i>Eriogonum trichopes</i> <i>Erioneuron pilosum</i> <i>Eriophyllum pringlei</i> <i>Eriophyllum wallacei</i> <i>Erodium cicutarium</i> <i>Eschscholzia californica</i>	<i>Rafinesquia neomexicana</i> <i>Rhus aromatica</i> <i>Salazaria mexicana</i> <i>Salsola tragus</i> <i>Salvia dorrii</i> <i>Schismus arabicus</i> <i>Schismus barbatus</i> <i>Senecio flaccidus</i> var. <i>douglasii</i> <i>Senecio multilobata</i> <i>Sphaeralcea ambigua</i> <i>Sporobolus cryptandrus</i> <i>Stanleya elata</i> <i>Stanleya pinnata</i> <i>Stephanomeria exigua</i> <i>Stephanomeria parryi</i> <i>Stephanomeria pauciflora</i> <i>Stipa speciosa</i> <i>Tetradymia axillaris</i> <i>Tetradymia spinosa</i> <i>Thamnosma montana</i> <i>Thymophylla pentachaeta</i> <i>Tridens muticus</i> <i>Vulpia octoflora</i> <i>Xylorhiza tortifolia</i> <i>Yucca baccata</i> <i>Yucca schidigera</i>
Occasional	<i>Agave utahensis</i> var. <i>eborispina</i> <i>Allionia incarnata</i> <i>Arctomecon merriamii</i> <i>Astragalus lentiginosus</i> <i>Chaenactis fremontii</i> <i>Cymopterus ripleyi</i>	<i>Eriogonum heermannii</i> <i>Opuntia erincea</i> <i>Purshia tridentata</i> <i>Sclerocactus polyancistrus</i> <i>Sporobolus cryptandrus</i>
Height	Shrub: 1-4 ft.	Joshua tree: 8-12 ft.
Area	North Range Study Area: 47,927 acres	South Range Study Area: 124,277 acres
Elevation	3,200-6,600 ft. MSL	
Average Foliar Cover	11%	

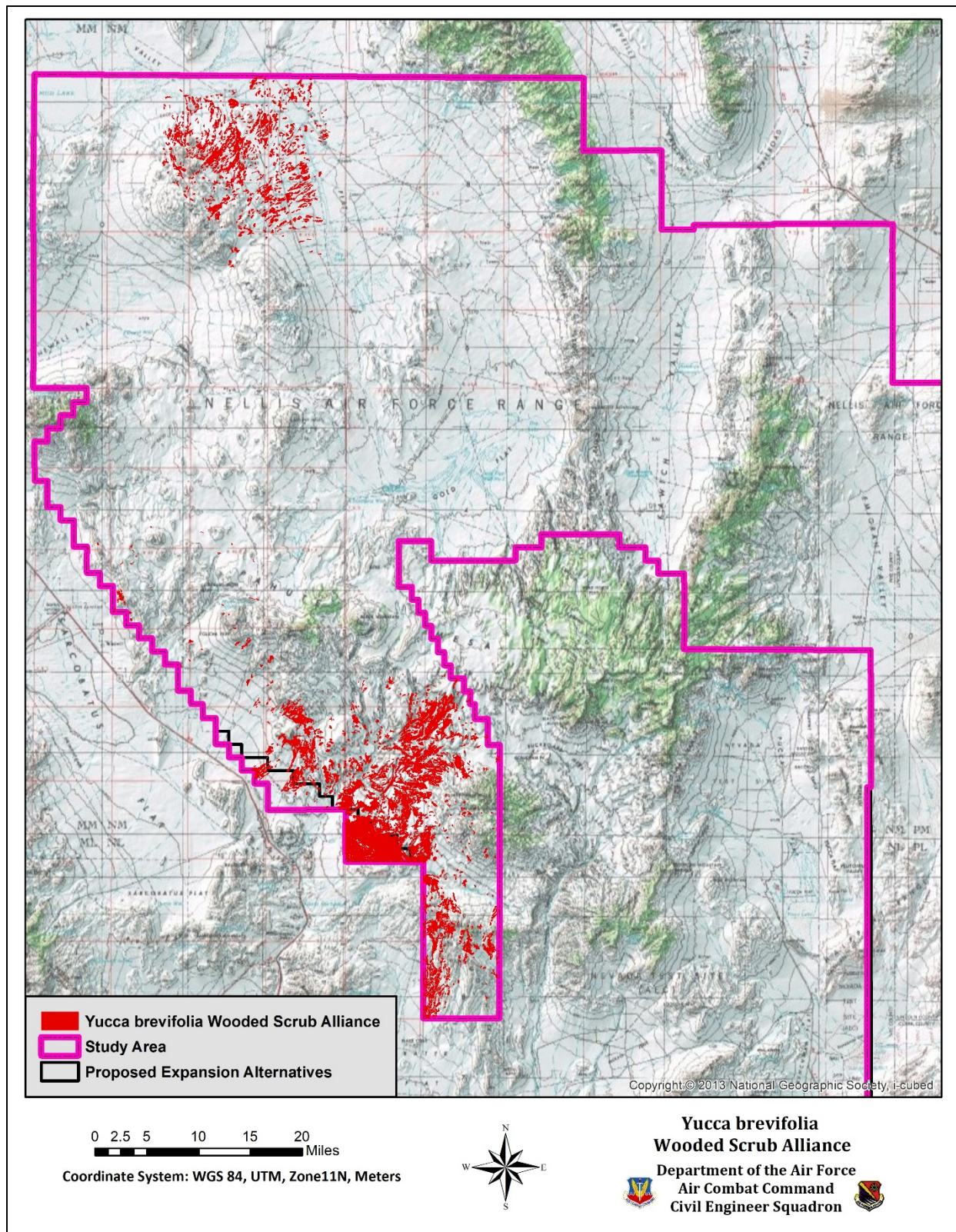


Figure 41. Location of the *Yucca brevifolia* Wooded Scrub Alliance on the North Range Study Area.

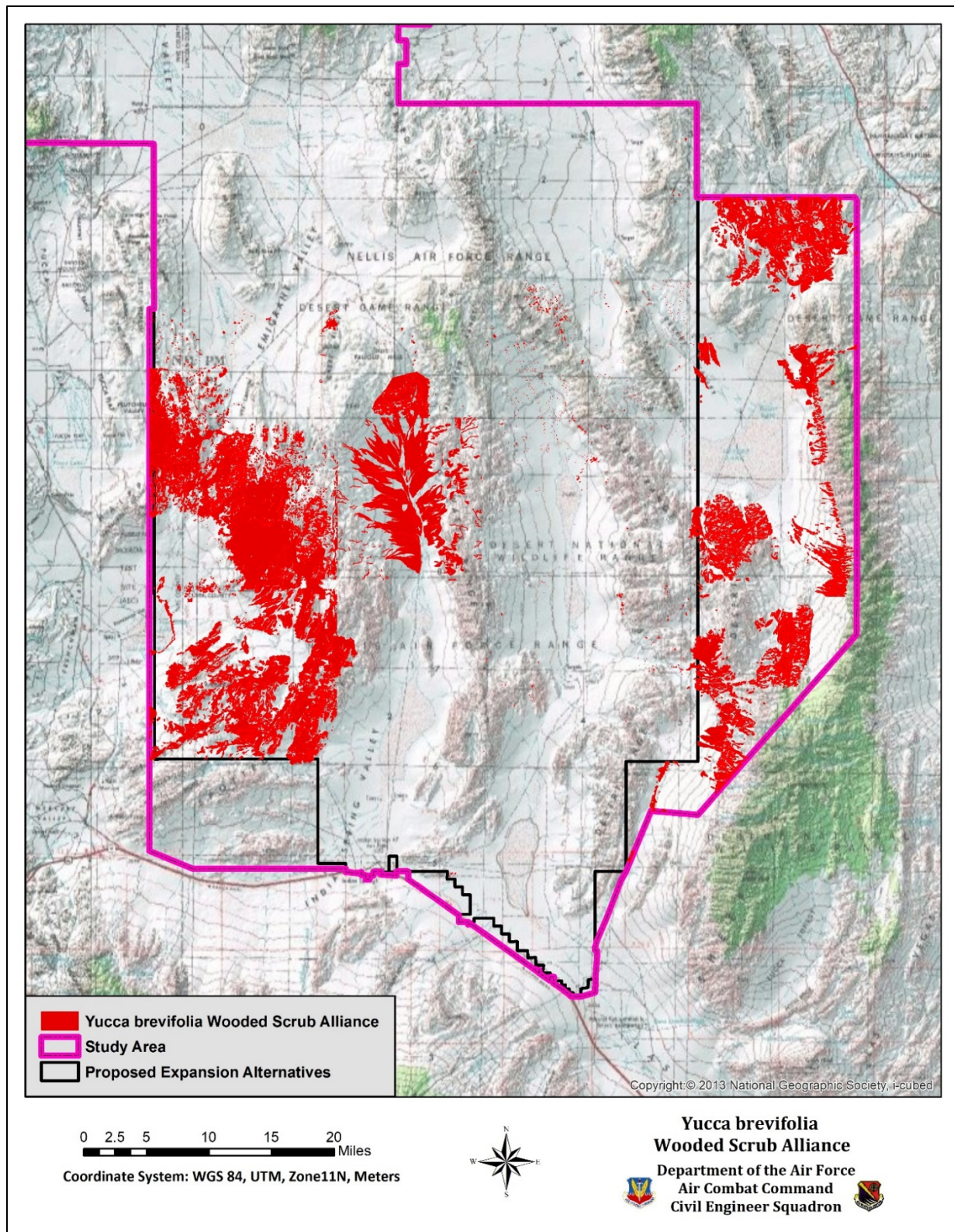


Figure 42. Location of the *Yucca brevifolia* Wooded Scrub Alliance on the South Range Study Area.

CEGL005294 *Yucca brevifolia* / *Coleogyne ramosissima* Wooded Shrubland

The *Yucca brevifolia* - *Coleogyne ramosissima* Wooded Shrubland is an association that is in the A3148 Joshua Tree Wooded Scrub Alliance which is a member of the G296 Mojave Mid-Elevation Mixed Desert Scrub group (USNVC, 2016). According to the USNVC, this association is only found in southern California and northern Arizona, but field surveys on the NTTR indicate that it is present in southern Nevada. This association is prevalent throughout the upper elevations of the bajadas of the South Range Study Area and is often mixed with other associations in the Joshua Tree Wooded Scrub Alliance (Figure 43). This association is important for the delineation of desert tortoise habitat on the South Range Study Area and was therefore treated separately in that area. On the study area, the shrubland is dominated by *Yucca brevifolia* and *Coleogyne ramosissima* with *Yucca brevifolia* contributing at least 2 - 3% of the foliar cover of the community (Table 21). The majority of the foliar cover is contributed by *Coleogyne ramosissima*. Subdominants on the study area include *Ephedra nevadensis* and *Menodora spinescens*. The alliance is supported by a high diversity of common and occasional plants. The height of the shrub layer ranges from 0.5 ft. - 3.0 ft. with *Yucca brevifolia* ranging from 8 to 12 ft. tall. Average foliar cover is 21% and the association is typically found at 4,000 to 6,700 ft. MSL on the study area.



Yucca brevifolia - *Coleogyne ramosissima* Wooded Shrubland

association is important for the delineation of desert tortoise habitat on the South Range Study Area and was therefore treated separately in that area. On the study area, the shrubland is dominated by *Yucca brevifolia* and *Coleogyne ramosissima* with *Yucca brevifolia* contributing at least 2 - 3% of the foliar cover of the community (Table 21). The majority of the foliar cover is contributed by *Coleogyne ramosissima*. Subdominants on the study area include *Ephedra nevadensis* and *Menodora spinescens*. The alliance is supported by a high diversity of common and occasional plants. The height of the shrub layer ranges from 0.5 ft. - 3.0 ft. with *Yucca brevifolia* ranging from 8 to 12 ft. tall. Average foliar cover is 21% and the association is typically found at 4,000 to 6,700 ft. MSL on the study area.

Table 21. List of plant species and characteristics of the *Yucca brevifolia* - *Coleogyne ramosissima* Wooded Shrubland

Attribute	Detail	
Dominants	<i>Yucca brevifolia</i>	<i>Coleogyne ramosissima</i>
Subdominants	<i>Ephedra nevadensis</i>	<i>Menodora spinescens</i>
Common	<i>Achnatherum hymenoides</i> <i>Achnatherum thurberianum</i> <i>Agave utahensis</i> var. <i>eborispina</i> <i>Ambrosia dumosa</i> <i>Amsinckia tessellata</i> <i>Arctomecon merriamii</i> <i>Arenaria kingii</i> <i>Aristida purpurea</i> <i>Artemisia arbuscula</i> <i>Artemisia nova</i> <i>Atrichoseris platyphylla</i> <i>Atriplex canescens</i> <i>Atriplex confertifolia</i> <i>Baileya multiradiata</i> <i>Boechera pulchra</i> <i>Bromus madritensis</i> ssp. <i>rubens</i> <i>Bromus tectorum</i> <i>Buddleja utahensis</i> <i>Camissonia brevipes</i> <i>Castilleja angustifolia</i> <i>Chaenactis macrantha</i>	<i>Gutierrezia sarothrae</i> <i>Hecastocleis shockleyi</i> <i>Hymenoclea salsola</i> <i>Ipomopsis polycladon</i> <i>Juniperus osteosperma</i> <i>Krameria erecta</i> <i>Krameria grayi</i> <i>Krascheninnikovia lanata</i> <i>Langloisia setosissima</i> <i>Larrea tridentata</i> <i>Lepidium fremontii</i> <i>Lepidium lasiocarpum</i> <i>Linanthus parryae</i> <i>Linum lewisii</i> <i>Lycium andersonii</i> <i>Mentzelia albicaulis</i> <i>Mentzelia oreophila</i> <i>Muhlenbergia porteri</i> <i>Nama demissum</i> <i>Oenothera caespitosa</i> <i>Oenothera suffrutescens</i>

Attribute	Detail	
	<i>Chaenactis stevioides</i> <i>Chamaesyce albomarginata</i> <i>Chorizanthe rigida</i> <i>Cirsium mohavense</i> <i>Cryptantha confertiflora</i> <i>Cylindropuntia acanthocarpa</i> <i>Cylindropuntia echinocarpa</i> <i>Dasyochloa pulchella</i> <i>Delphinium parishii</i> <i>Echinocactus polycephalus</i> <i>Echinocereus engelmannii</i> <i>Echinocereus mojavensis</i> <i>Encelia virginensis</i> <i>Ephedra torreyana</i> <i>Ephedra viridis</i> <i>Ericameria nauseosa</i> <i>Eriogonum concinnum</i> <i>Eriogonum heermannii</i> <i>Eriogonum inflatum</i> <i>Eriogonum nummulari</i> <i>Eriogonum ovalifolium</i> <i>Eriogonum plumatella</i> <i>Eriogonum trichopes</i> <i>Eriophyllum pringlei</i> <i>Erodium cicutarium</i> <i>Escobaria vivipara</i> var. <i>rosea</i> <i>Fallugia paradoxa</i> <i>Gilia cana</i> <i>Glossopetalon spinescens</i> <i>Grayia spinosa</i> <i>Gutierrezia microcephala</i>	<i>Opuntia basilaris</i> <i>Opuntia phaeacantha</i> <i>Opuntia polyacantha</i> <i>Opuntia polyacantha</i> var. <i>erinacea</i> <i>Orobanche fasciculata</i> <i>Penstemon palmeri</i> <i>Penstemon petiolatus</i> <i>Phacelia crenulata</i> <i>Phacelia fremontii</i> <i>Phacelia vallis-mortae</i> <i>Picrothamnus desertorum</i> <i>Pinus monophylla</i> <i>Pleuraphis jamesii</i> <i>Prunus andersonii</i> <i>Prunus fasciculata</i> <i>Psathyrotes ramosissima</i> <i>Psorothamnus fremontii</i> <i>Purshia stansburiana</i> <i>Rafinesquia neomexicana</i> <i>Rhus aromatica</i> <i>Salazaria mexicana</i> <i>Salvia dorrii</i> <i>Sphaeralcea ambigua</i> <i>Stanleya pinnata</i> <i>Symphoricarpos longiflorus</i> <i>Tetradymia axillaris</i> <i>Thamnosma montana</i> <i>Thymophylla pentachaeta</i> <i>Xylorhiza tortifolia</i> <i>Yucca baccata</i> <i>Yucca schidigera</i>
Occasional	<i>Arabis pulchra</i> <i>Artemisia tridentata</i> <i>Astragalus lentiginosus</i> <i>Astragalus mohavensis</i> <i>Chorizanthe brevicornu</i> <i>Descurainia pinnata</i> <i>Draba cuneifolia</i> <i>Eriogonum fasciculatum</i> <i>Eriogonum nidularium</i> <i>Escobaria vivipara</i> <i>Glyptopleura marginata</i> <i>Lepidium nitidum</i>	<i>Lepidium virginicum</i> <i>Linum lewisii</i> <i>Loeseliastrum matthewsii</i> <i>Loeseliastrum schottii</i> <i>Malacothrix glabrata</i> <i>Oxytheca perfoliata</i> <i>Prunus fasciculata</i> <i>Psorothamnus polydenius</i> <i>Purshia tridentata</i> <i>Tetradymia glabrata</i> <i>Vulpia octoflora</i>
Height	Shrub: 0.5-3 ft.	Joshua tree: 8-12 ft.
Area	North Range Study Area: 0 acres	South Range Study Area: 99,851 acres
Elevation	4,000-6,700 ft. MSL	
Foliar Cover	21%	

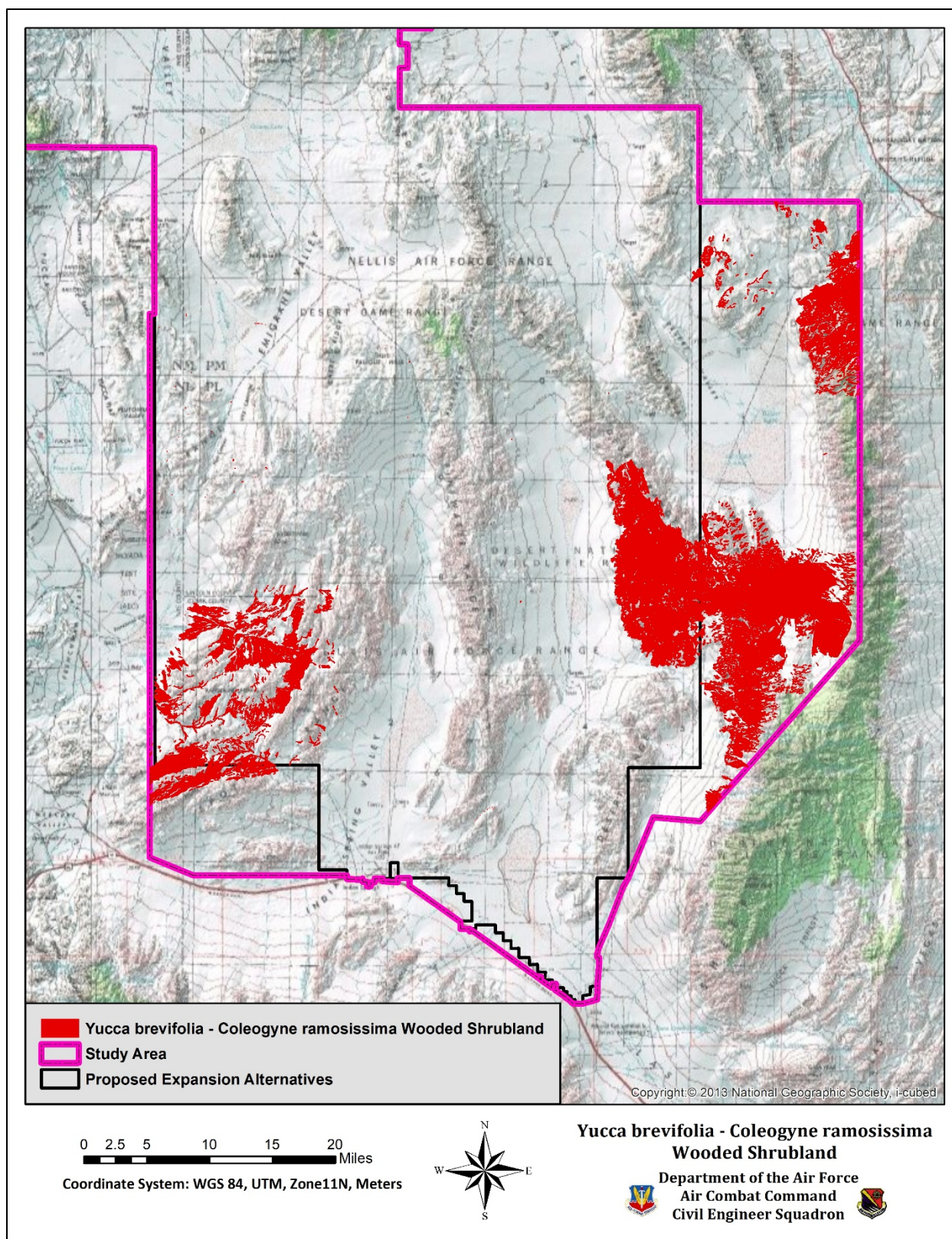


Figure 43. Location of the *Yucca brevifolia* - *Coleogyne ramosissima* Wooded Shrubland on the South Range Study Area.

CEGL005777 *Yucca brevifolia* / *Larrea tridentata* - *Yucca schidigera* / *Pleuraphis rigida* Wooded Shrubland

Yucca brevifolia / *Larrea tridentata* - *Yucca schidigera* / *Pleuraphis rigida* Wooded Shrubland association is in the A3148 Joshua Tree Wooded Scrub Alliance in the G296 Mojave Mid-Elevation Mixed Desert Scrub group (USNVC, 2016). The association has been found in southern California and northern Arizona, but has not been found in Nevada. Field surveys on the NTTR indicate that it is present in southern Nevada. The plant community on the NTTR may be a different, unnamed association because *Yucca schidigera* is not a codominant or subdominant and *Pleuraphis rigida* is not present. However, the association description indicates that *Larrea tridentata* can be the only codominant present with *Yucca brevifolia* (USNVC, 2016). The association is commonly found on the bajadas of the South Range Study Area where *Yucca brevifolia* is a dominant and *Larrea tridentata* is beginning to decrease in dominance, giving way to *Coleogyne ramosissima* (Figure 44). It is an important component of desert tortoise habitat in the South Range Study Area and is separated from the *Yucca brevifolia* Woodland Alliance for that reason. On the study area, common subdominants include *Ambrosia dumosa*, *Atriplex confertifolia*, *Ephedra nevadensis*, *Hymenoclea salsola*, *Krameria erecta*, and *Menodora spinescens* (Table 22). This alliance has a high level of diversity in its common and occasional plant species populations. The height of the shrub layer is 1.5 - 3 ft. with foliar cover averaging 10%. Height of *Yucca brevifolia* ranges from 8-12 ft. In general, the shrubland is found at 3,200 to 5,200 ft. MSL on the study area. The association has not been found on the North Range Study Area.



***Yucca brevifolia* / *Larrea tridentata* - *Yucca schidigera* / *Pleuraphis rigida* Wooded Shrubland**

Table 22. List of plant species and characteristics of the *Yucca brevifolia* / *Larrea tridentata* - *Yucca schidigera* / *Pleuraphis rigida* Wooded Shrubland

Attribute	Detail	
Dominants	<i>Yucca brevifolia</i>	<i>Larrea tridentata</i>
Subdominants	<i>Ambrosia dumosa</i> <i>Atriplex confertifolia</i> <i>Ephedra nevadensis</i>	<i>Hymenoclea salsola</i> <i>Krameria erecta</i> <i>Menodora spinescens</i>
Common	<i>Acamptopappus shockleyi</i> <i>Achnatherum hymenoides</i> <i>Achnatherum speciosum</i> <i>Allionia incarnata</i> <i>Ambrosia eriocentra</i> <i>Ambrosia psilostachya</i> <i>Amsonia tomentosa</i> <i>Argemone munita</i> <i>Aristida purpurea</i> <i>Astragalus amphioxys</i> var. <i>musimonum</i> <i>Atrichoseris platyphylla</i> <i>Atriplex canescens</i> <i>Baileya multiradiata</i> <i>Baileya pleniradiata</i>	<i>Gaillardia arizonica</i> <i>Gaillardia pinnatifida</i> <i>Grayia spinosa</i> <i>Grusonia parishii</i> <i>Gutierrezia microcephala</i> <i>Ipomopsis polycladon</i> <i>Krascheninnikovia lanata</i> <i>Langloisia setosissima</i> <i>Lepidium densiflorum</i> <i>Lepidium fremontii</i> <i>Lepidium lasiocarpum</i> <i>Lepidium latifolium</i> <i>Lepidium nitidum</i> <i>Lepidium virginicum</i>

Attribute	Detail	
	<i>Bouteloua barbata</i> <i>Bromus madritensis</i> ssp. <i>madritensis</i> <i>Bromus madritensis</i> ssp. <i>rubens</i> <i>Bromus tectorum</i> <i>Calochortus flexuosus</i> <i>Camissonia brevipes</i> <i>Chaenactis carphoclinia</i> <i>Chaenactis fremontii</i> <i>Chaenactis stevioides</i> <i>Chenopodium incanum</i> <i>Chorizanthe rigida</i> <i>Cirsium mohavense</i> <i>Coleogyne ramosissima</i> <i>Cryptantha circumscissa</i> <i>Cryptantha dumetorum</i> <i>Cryptantha flavoculata</i> <i>Cryptantha pterocarya</i> <i>Cryptantha recurvata</i> <i>Cryptantha setosissima</i> <i>Cylindropuntia acanthocarpa</i> <i>Cylindropuntia echinocarpa</i> <i>Cylindropuntia ramosissima</i> <i>Dasyochloa pulchella</i> <i>Delphinium parishii</i> <i>Descurainia pinnata</i> <i>Echinocactus polycephalus</i> <i>Echinocereus engelmannii</i> <i>Elymus elymoides</i> <i>Encelia farinosa</i> <i>Encelia virginensis</i> <i>Enceliopsis covillei</i> <i>Ephedra torreyana</i> <i>Epilobium ciliatum</i> <i>Erigeron concinnus</i> <i>Eriogonum deflexum</i> <i>Eriogonum inflatum</i> <i>Eriogonum nidularium</i> <i>Eriogonum plumatella</i> <i>Eriogonum reniforme</i> <i>Eriogonum trichopes</i> <i>Erodium cicutarium</i> <i>Escobaria vivipara</i> var. <i>rosea</i> <i>Escobaria vivipara</i> <i>Fallugia paradoxa</i>	<i>Linanthus parryae</i> <i>Loeseliastrum matthewsii</i> <i>Lycium andersonii</i> <i>Lycium cooperi</i> <i>Mimulus bigelovii</i> <i>Mirabilis laevis</i> <i>Monoptilon bellidifforme</i> <i>Muhlenbergia porteri</i> <i>Nemacladus rubescens</i> <i>Nicotiana obtusifolia</i> <i>Oenothera caespitosa</i> <i>Oenothera suffrutescens</i> <i>Opuntia basilaris</i> <i>Opuntia engelmannii</i> <i>Opuntia polyacantha</i> <i>Oxytheca perfoliata</i> <i>Pectocarya peninsularis</i> <i>Penstemon palmeri</i> <i>Phacelia crenulata</i> <i>Phacelia fremontii</i> <i>Picrothamnus desertorum</i> <i>Plantago erecta</i> <i>Plantago ovata</i> <i>Pleuraphis jamesii</i> <i>Prenanthes exiguua</i> <i>Psoralea fremontii</i> <i>Psoralea polydenius</i> <i>Salazaria mexicana</i> <i>Salsola tragus</i> <i>Schismus arabicus</i> <i>Schismus barbatus</i> <i>Senecio flaccidus</i> var. <i>douglasii</i> <i>Sphaeralcea ambigua</i> <i>Sporobolus cryptandrus</i> <i>Stanleya pinnata</i> <i>Stephanomeria pauciflora</i> <i>Stipa speciosa</i> <i>Tetradymia axillaris</i> <i>Thymophylla pentachaeta</i> <i>Tridens muticus</i> <i>Vulpia octoflora</i> <i>Yucca baccata</i> <i>Yucca schidigera</i>
Occasional	<i>Arabis pulchra</i> <i>Astragalus mohavensis</i> <i>Camissonia boothii</i> <i>Camissonia claviformis</i> <i>Chorizanthe brevicornu</i> <i>Encelia actonii</i> <i>Enceliopsis nudicaulis</i> <i>Eschscholzia californica</i> <i>Gaura coccinea</i> <i>Gilia cana</i> <i>Lycium pallidum</i>	<i>Malacothrix glabrata</i> <i>Mirabilis alipes</i> <i>Nama demissum</i> <i>Opuntia erincea</i> <i>Prunus fasciculata</i> <i>Psilostrophe cooperi</i> <i>Rafinesquia neomexicana</i> <i>Salvia dorrii</i> <i>Xylorhiza tortifolia</i> <i>Yucca elata</i>
Height	Shrub: 0.5-3 ft.	Joshua tree: 8-12 ft.
Area	North Range Study Area: 0 acres	South Range Study Area: 183,101 acres
Elevation	3,200-5,200 ft. MSL	
Foliar Cover	9.5%	

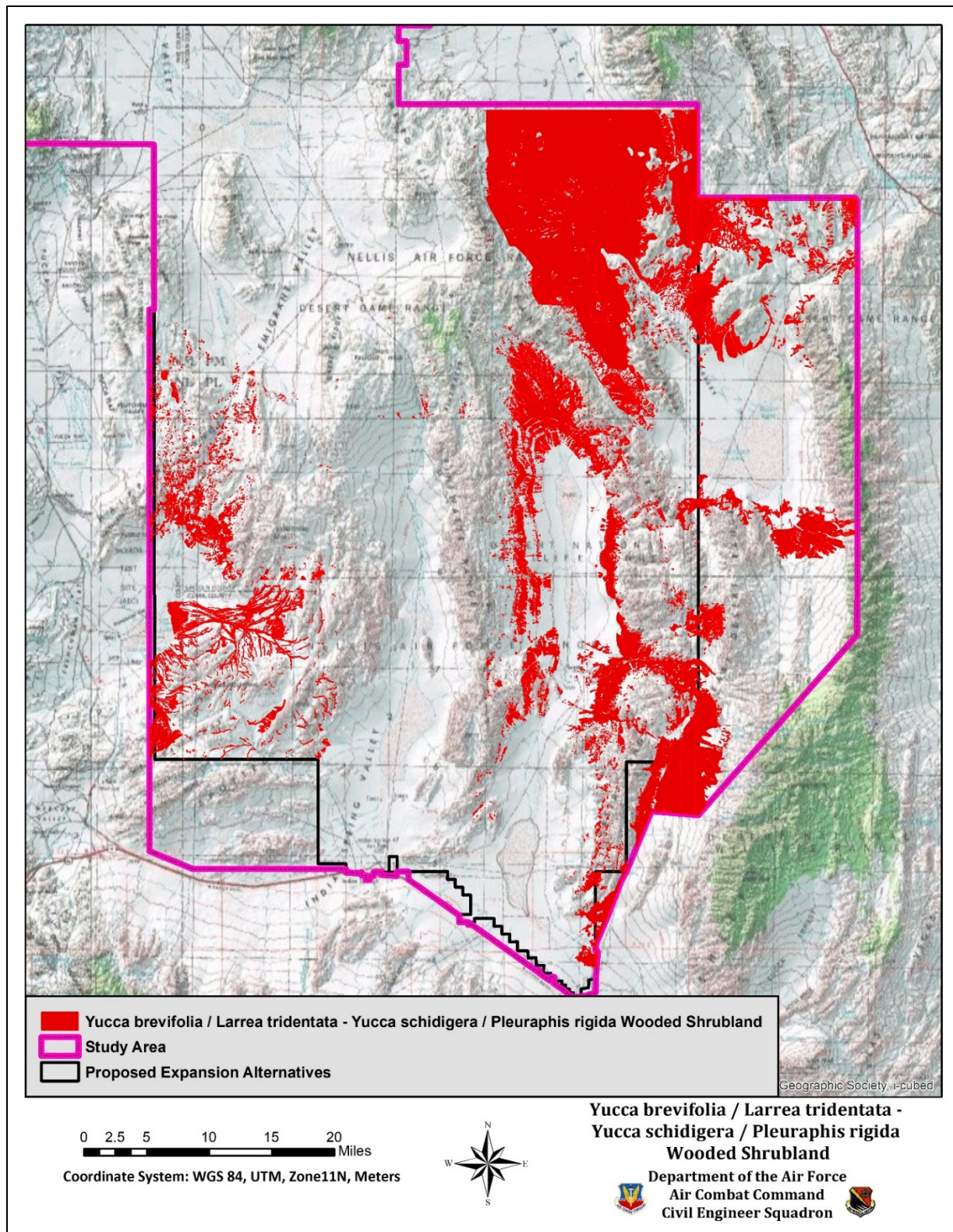


Figure 44. Location of the *Yucca brevifolia* / *Larrea tridentata* - *Yucca schidigera* / *Pleuraphis rigida* Wooded Shrubland on the South Range Study Area.

A3195 *Chrysothamnus viscidiflorus* Steppe & Shrubland Alliance

The *Chrysothamnus viscidiflorus* Steppe & Shrubland Alliance is a member of the G310 Intermountain Semi-Desert Steppe and Shrubland Group. It is found in the Southern Great Basin Desert in Nevada and north and east of Nevada in Utah and Wyoming (USNVC, 2016). On the study area, this alliance occurs in elevations ranging from 4,600 to 5,300 ft. MSL. It has only been identified on the North Range Study Area on the east side of the southern Kawich Range and on the plateaus around Thirsty Canyon (Figure 45). On the study area, the alliance is dominated by and *Chrysothamnus viscidiflorus* and occasionally, *Chrysothamnus greenei*, with *Ephedra nevadensis*, *Picrothamnus desertorum*, and *Krascheninnikovia lanata* as the subdominants (Table 23). Common grasses in this alliance are *Pleuraphis jamesii* and *Achnatherum hymenoides*. This alliance may be found on a variety of sites with level to moderate slopes on disturbed areas on ridges and in valleys (USNVC, 2016). The soil underlying this steppe and shrubland on the study area is the Stewval Rock Outcrop Gabbvally association. The height of the shrub layer averages 2.0 ft. with an average of 9% foliar cover. This plant alliance was not identified on the South Range Study Area.



Chrysothamnus viscidiflorus Steppe & Shrubland Alliance

Table 23. List of plant species and characteristics of the *Chrysothamnus viscidiflorus* Steppe & Shrubland Alliance

Attribute	Detail	
Dominants	<i>Chrysothamnus viscidiflorus</i>	<i>Chrysothamnus greenei</i>
Subdominants	<i>Ephedra nevadensis</i>	<i>Krascheninnikovia lanata</i> <i>Picrothamnus desertorum</i>
Common	<i>Achnatherum hymenoides</i> <i>Achnatherum speciosum</i> <i>Agave utahensis</i> var. <i>eborispina</i> <i>Aristida purpurea</i> <i>Artemisia arbuscula</i> <i>Artemisia tridentata</i> <i>Atriplex canescens</i> <i>Atriplex confertifolia</i> <i>Atriplex spinifera</i> <i>Bromus madritensis</i> ssp. <i>rubens</i> <i>Bromus tectorum</i> <i>Cercocarpus ledifolius</i> <i>Echinocactus polycephalus</i> <i>Ephedra viridis</i> <i>Ericameria nauseosa</i> <i>Ericameria teretifolia</i>	<i>Eriogonum anemophilum</i> <i>Grayia spinosa</i> <i>Halogeton glomeratus</i> <i>Larrea tridentata</i> <i>Lepidium fremontii</i> <i>Menodora spinescens</i> <i>Peucephyllum schottii</i> <i>Pleuraphis jamesii</i> <i>Prunus andersonii</i> <i>Purshia stansburiana</i> <i>Salazaria mexicana</i> <i>Sarcobatus baileyi</i> <i>Schismus arabicus</i> <i>Sphaeralcea ambigua</i> <i>Tetradymia glabrata</i> <i>Yucca brevifolia</i>
Occasional	<i>Ambrosia dumosa</i> <i>Artemisia nova</i> <i>Astragalus lentiginosus</i> <i>Bassia americana</i> <i>Chamaesyce albomarginata</i> <i>Chrysothamnus viscidiflorus</i> <i>Coleogyne ramosissima</i> <i>Cylindropuntia echinocarpa</i> <i>Dasyochloa pulchella</i> <i>Descurainia pinnata</i>	<i>Gutierrezia microcephala</i> <i>Hymenoclea salsola</i> <i>Juniperus osteosperma</i> <i>Lycium andersonii</i> <i>Mirabilis alipes</i> <i>Opuntia polyacantha</i> var. <i>erinacea</i> <i>Phacelia viscida</i> <i>Pleiocanthus spinosus</i> <i>Sarcobatus baileyi</i> <i>Sarcobatus vermiculatus</i>

Attribute	Detail	
	<i>Echinocereus engelmannii</i> <i>Elymus elymoides</i> <i>Ephedra viridis</i> <i>Eriogonum inflatum</i> <i>Eriogonum ovalifolium</i> <i>Grusonia pulchella</i>	<i>Sclerocactus polyancistrus</i> <i>Sisymbrium orientale</i> <i>Sporobolus contractus</i> <i>Stanleya elata</i> <i>Stanleya pinnata</i> <i>Tetradymia axillaris</i>
Average Height	2 ft.	
Area	North Range Study Area: 2,280 acres	South Range Study Area: 0 acres
Elevation	4,600-5,300 ft. MSL	
Average Foliar Cover	9%	

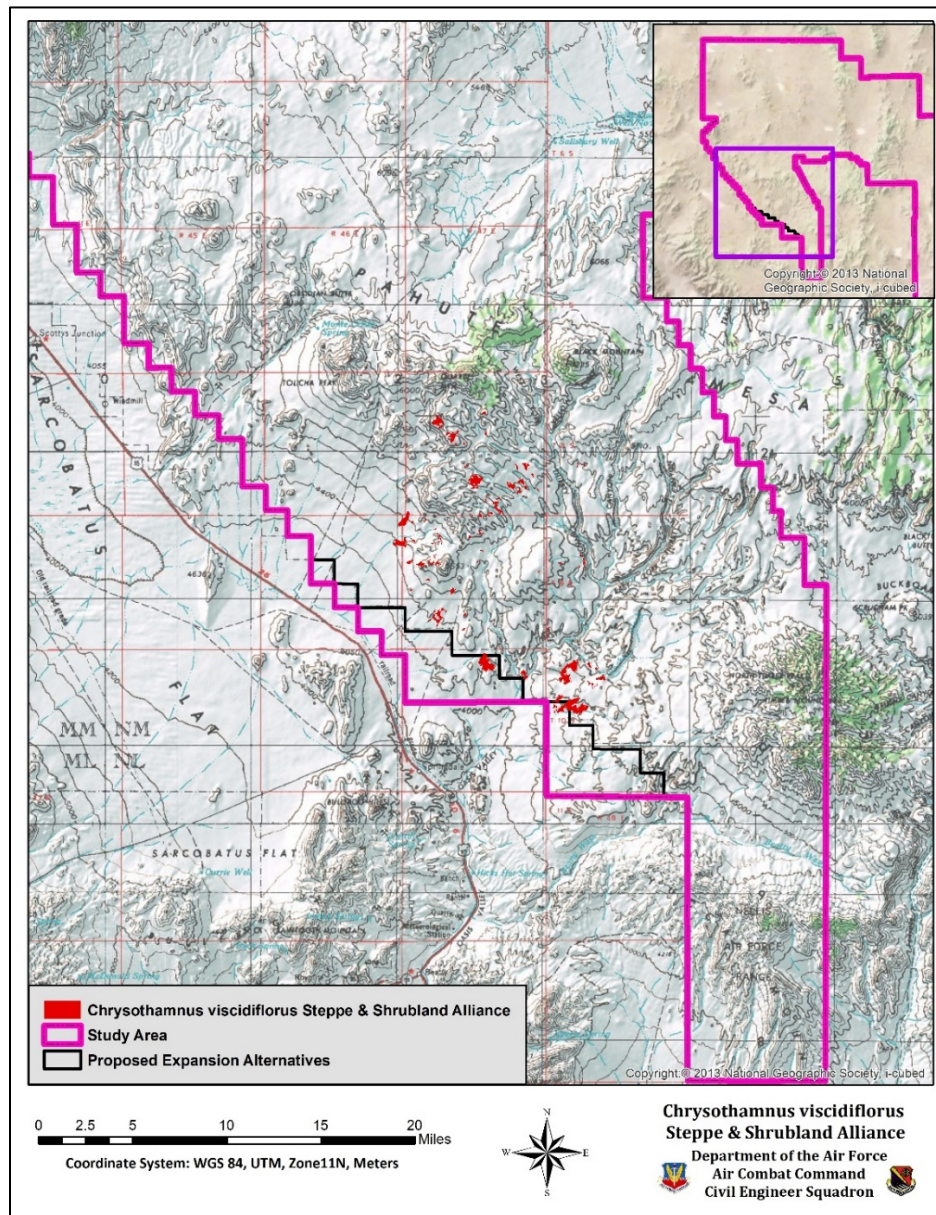


Figure 45. Location of the *Chrysothamnus viscidiflorus* Steppe & Shrubland Alliance on the North Range Study Area.

A4167 *Eriogonum wrightii* - *Eriogonum heermannii* - *Buddleja utahensis* Scrub Alliance

The *Eriogonum wrightii* - *Eriogonum heermannii* - *Buddleja utahensis* Scrub Alliance is found on rocky, mountain slopes on the South Range Study Area in the DNWR. According to the USNVC, this alliance is a member of the G296 Mojave Mid-Elevation Mixed Desert Scrub and only occurs in Arizona and California (USNVC, 2016), but since Nevada lies partially between the two states, it is possible that it may be on the South Range Study Area (Figure 46). This alliance was not identified on the North Range Study Area.



Eriogonum wrightii - *Eriogonum heermannii* - *Buddleja utahensis* Scrub Alliance

Field observations indicate that the alliance has composition and physical characteristics similar to that described by the USNVC. On the study area, this alliance is dominated by *Buddleja utahensis* and can be associated with *Ephedra nevadensis*, *Yucca brevifolia*, *Larrea tridentata*, or *Gutierrezia microcephala* (Table 24). A wide variety of common plants may be found in this plant community, but do not comprise a significant proportion of the foliar cover. Grasses such as *Bouteloua gracilis* and *Aristida purpurea* are present in this alliance. The alliance was observed on bedrock outcrops, ridge-tops and stony slopes of mostly sedimentary substrates at elevations of 3,600 to 4,400 ft. MSL. Plant height averaged 2-4 ft. and foliar cover averaged 7%.

Table 24. List of plant species and characteristics of the *Eriogonum wrightii* - *Eriogonum heermannii* - *Buddleja utahensis* Scrub Alliance as observed during field surveys of the study area.

Attribute	Detail	
Dominants	<i>Buddleja utahensis</i>	
Subdominants	<i>Ephedra nevadensis</i> <i>Yucca brevifolia</i>	<i>Larrea tridentata</i> <i>Gutierrezia microcephala</i>
Common	<i>Achnatherum hymenoides</i> <i>Agave utahensis</i> var. <i>eborispina</i> <i>Aristida purpurea</i> <i>Atriplex confertifolia</i> <i>Bouteloua gracilis</i> <i>Bromus madritensis</i> ssp. <i>rubens</i> <i>Bromus tectorum</i> <i>Echinocactus polycephalus</i>	<i>Eucnide urens</i> <i>Krascheninnikovia lanata</i> <i>Lepidium fremontii</i> <i>Peucephyllum schottii</i> <i>Pleuraphis jamesii</i> <i>Prunus andersonii</i> <i>Salazaria mexicana</i> <i>Sphaeralcea ambigua</i>
Average Height	2-4 ft.	
Area	North Range Study Area: 0 acres	South Range Study Area: 136 acres
Elevation	3,600-4,400 ft. MSL	
Average Foliar Cover	7%	

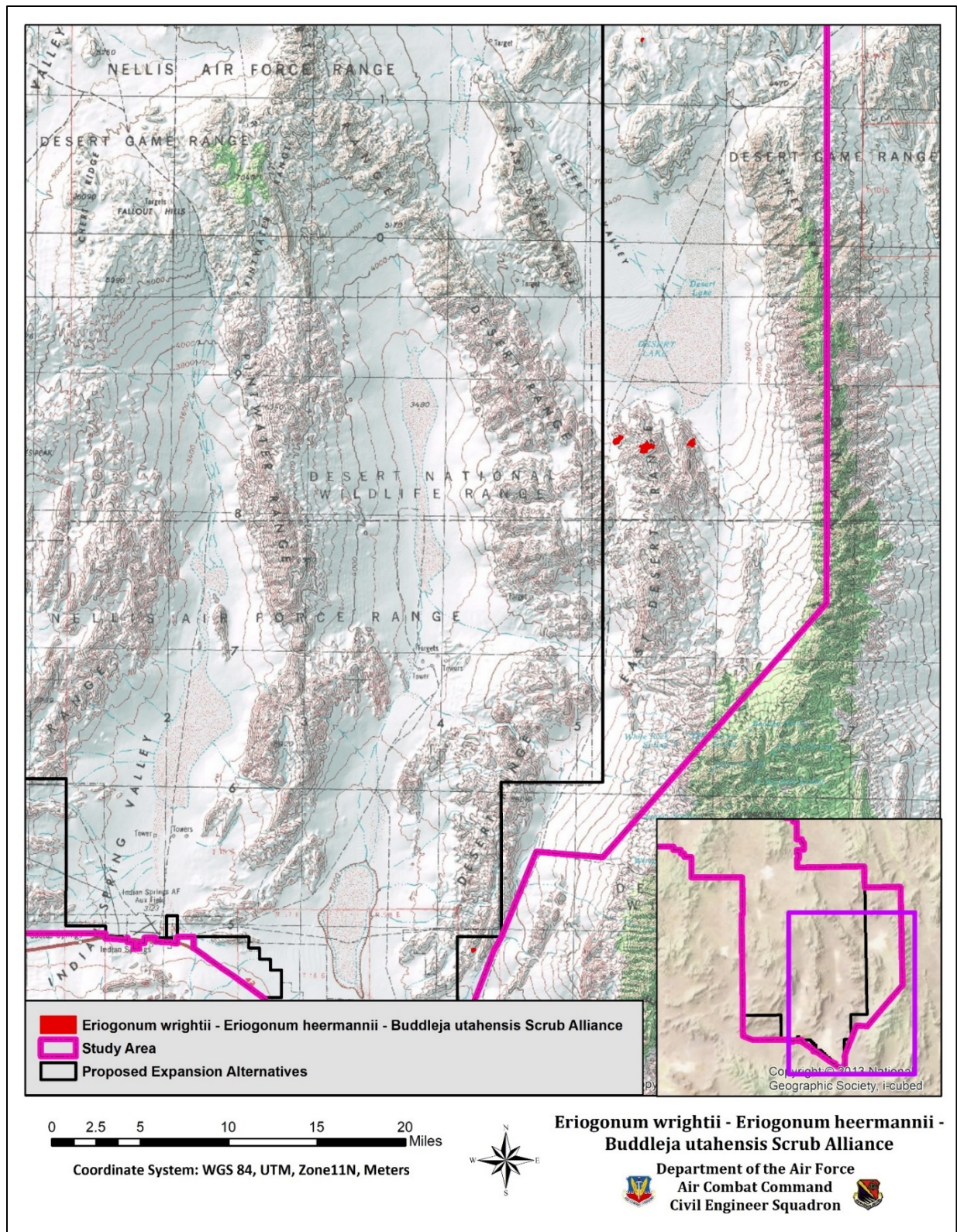


Figure 46. Location of *Eriogonum wrightii* - *Eriogonum heermannii* - *Buddleja utahensis* Scrub Alliance on the South Range Study Area.

A4245 *Ephedra nevadensis* - *Lycium andersonii* - *Grayia spinosa* Scrub Alliance

The *Ephedra nevadensis* - *Lycium andersonii* - *Grayia spinosa* Scrub Alliance is a semi-arid shrubland alliance that is a member of the G296 Mojave Mid-Elevation Mixed Desert Scrub group in the Mojave and Great Basin deserts (USNVC, 2016). It is characterized by a sparse to moderate cover of mixed shrubs and some herbaceous plant cover. In general, the alliance is dominated by all three species, but on the study area, this alliance appears to be dominated by *Ephedra nevadensis* with *Lycium andersonii* and *Grayia spinosa* as subdominants (Table 25). Other species observed as subdominants include *Ambrosia dumosa*, *Psoralea argemone*, *Atriplex confertifolia*, *Hymenoclea salsola*, and *Yucca brevifolia*.



Ephedra nevadensis - *Lycium andersonii* - *Grayia spinosa* Scrub Alliance

The alliance is especially evident in washes, basins, and bajadas of both the North and South Range Study Areas (Figures 47 and 48). The alliances have also been observed on mountain slopes and relatively rugged areas of the South Range Study Area. Soil textures range from sandy loams to loamy sands usually covered by coarse gravel and rocks. Common species that tend to dominate the herbaceous strata include *Bromus tectorum*, *Achnatherum hymenoides* and *Pleuraphis jamesii*. Brush height can be as low as 1 ft. and averages 2 ft. Foliar cover averages 12% and can be as high as 35-40%. This alliance is found at elevations ranging from 3,100 to 6,400 ft. MSL.

Table 25. List of plant species and characteristics of the *Ephedra nevadensis* - *Lycium andersonii* - *Grayia spinosa* Scrub Alliance

Attribute	Detail	
Dominants	<i>Ephedra nevadensis</i>	
Subdominants	<i>Ambrosia dumosa</i> <i>Atriplex confertifolia</i> <i>Grayia spinosa</i>	<i>Hymenoclea salsola</i> <i>Lycium andersonii</i> <i>Psoralea argemone</i> <i>Yucca brevifolia</i>
Common	<i>Acamptopappus shockleyi</i> <i>Achnatherum hymenoides</i> <i>Agave utahensis</i> var. <i>eborispina</i> <i>Ambrosia psilostachya</i> <i>Amsonia tomentosa</i> <i>Astragalus lentiginosus</i> <i>Atriplex canescens</i> <i>Baileya multiradiata</i> <i>Baileya pleniradiata</i> <i>Brickellia arguta</i> <i>Brickellia atractylodes</i> <i>Bromus madritensis</i> ssp. <i>madritensis</i> <i>Bromus madritensis</i> ssp. <i>rubens</i> <i>Bromus tectorum</i> <i>Buddleja utahensis</i> <i>Chaenactis stevioides</i> <i>Chorizanthe brevicornu</i> <i>Chorizanthe rigida</i> <i>Coleogyne ramosissima</i> <i>Cylindropuntia echinocarpa</i>	<i>Krameria erecta</i> <i>Krascheninnikovia lanata</i> <i>Langloisia setosissima</i> <i>Lepidium densiflorum</i> <i>Lepidium fremontii</i> <i>Lepidium nitidum</i> <i>Lepidium virginicum</i> <i>Lycium pallidum</i> <i>Machaeranthera canescens</i> <i>Menodora spinescens</i> <i>Mentzelia albicaulis</i> <i>Monoptilon bellidifforme</i> <i>Muhlenbergia porteri</i> <i>Opuntia basilaris</i> <i>Opuntia polyacantha</i> <i>Opuntia polyacantha</i> var. <i>erinacea</i> <i>Oxytheca perfoliata</i> <i>Phacelia crenulata</i> <i>Phacelia fremontii</i> <i>Picrothamnus desertorum</i>

Attribute	Detail	
	<i>Dasyochloa pulchella</i> <i>Descurainia pinnata</i> <i>Echinocactus polycephalus</i> <i>Echinocereus engelmannii</i> <i>Encelia farinosa</i> <i>Encelia virginensis</i> <i>Ephedra viridis</i> <i>Ericameria nauseosa</i> <i>Eriogonum inflatum</i> <i>Eriogonum microthecum</i> <i>Eriogonum nidularium</i> <i>Eriogonum reniforme</i> <i>Eriogonum trichopes</i> <i>Eriophyllum pringlei</i> <i>Ferocactus cylindraceus</i> <i>Gutierrezia microcephala</i> <i>Gutierrezia sarothrae</i> <i>Ipomopsis polycladon</i>	<i>Pleuraphis jamesii</i> <i>Prunus andersonii</i> <i>Psoralea polydenius</i> <i>Salazaria mexicana</i> <i>Salsola tragus</i> <i>Schismus arabicus</i> <i>Sphaeralcea ambigua</i> <i>Sporobolus cryptandrus</i> <i>Stanleya pinnata</i> <i>Stephanomeria exigua</i> <i>Symphoricarpos longiflorus</i> <i>Tetradymia axillaris</i> <i>Thamnosma montana</i> <i>Thymophylla pentachaeta</i> <i>Vulpia octoflora</i> <i>Xylorhiza tortifolia</i> <i>Yucca baccata</i> <i>Yucca schidigera</i>
Occasional	<i>Amsinckia tessellata</i> <i>Arabis pulchra</i> <i>Astragalus mohavensis</i> <i>Camissonia boothii</i> <i>Camissonia brevipes</i> <i>Camissonia claviformis</i> <i>Descurainia pinnata</i> <i>Descurainia pinnata</i> <i>Echinocactus polycephalus</i> <i>Erodium cicutarium</i> <i>Eschscholzia californica</i> <i>Escobaria vivipara</i>	<i>Gilia cana</i> <i>Larrea tridentata</i> <i>Mirabilis alipes</i> <i>Monoptilon bellidiforme</i> <i>Oenothera caespitosa</i> <i>Phacelia crenulata</i> <i>Phacelia fremontii</i> <i>Picrothamnus desertorum</i> <i>Purshia tridentata</i> <i>Rafinesquia neomexicana</i> <i>Rhus trilobata</i>
Average Height	2 ft.	
Area	North Range Study Area: 56,322 acres	South Range Study Area: 13,969 acres
Elevation	3,100-6,400 ft. MSL	
Average Foliar Cover	12%	

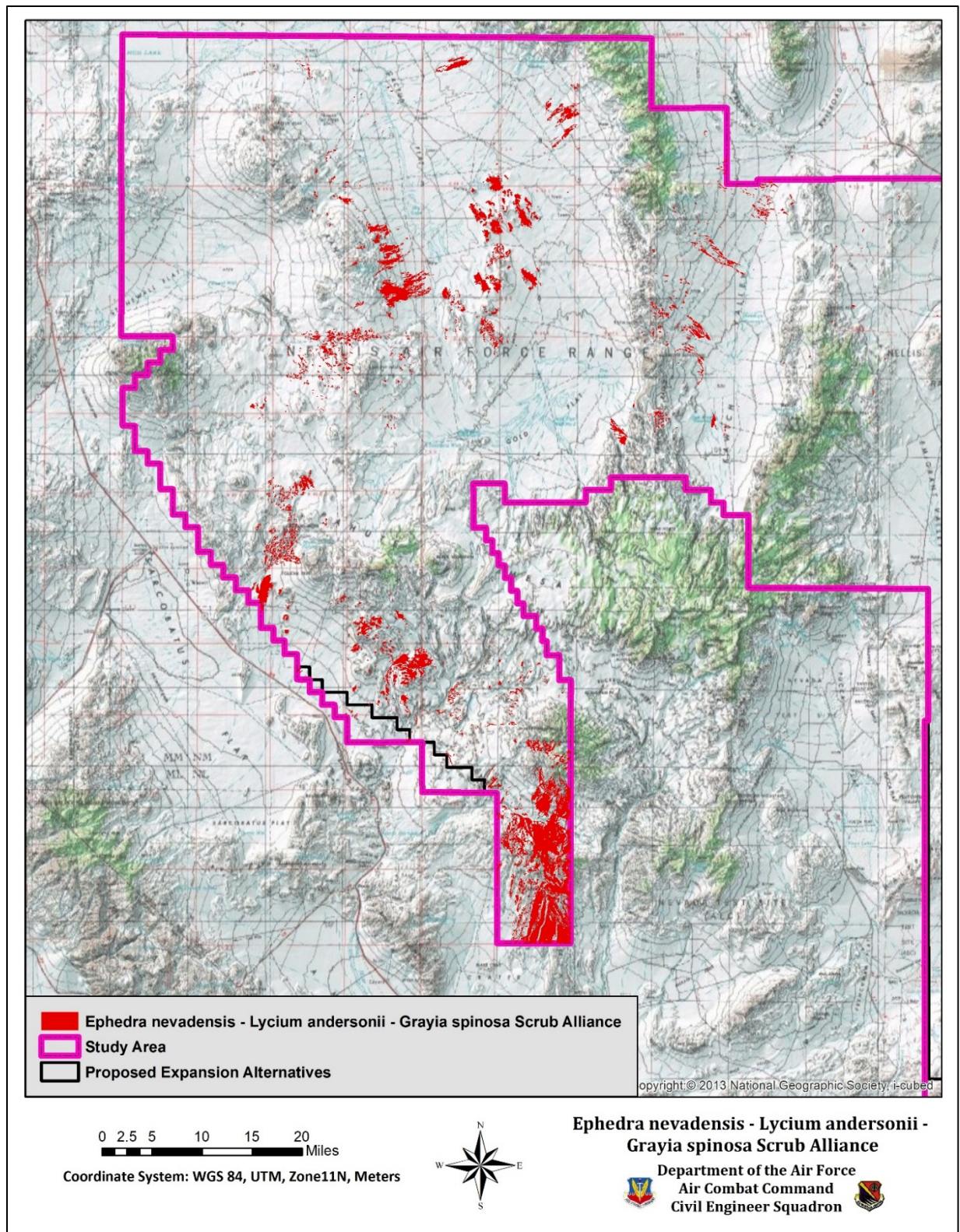


Figure 47. Location of *Ephedra nevadensis* - *Lycium andersonii* - *Grayia spinosa* Scrub Alliance on the North Range Study Area.

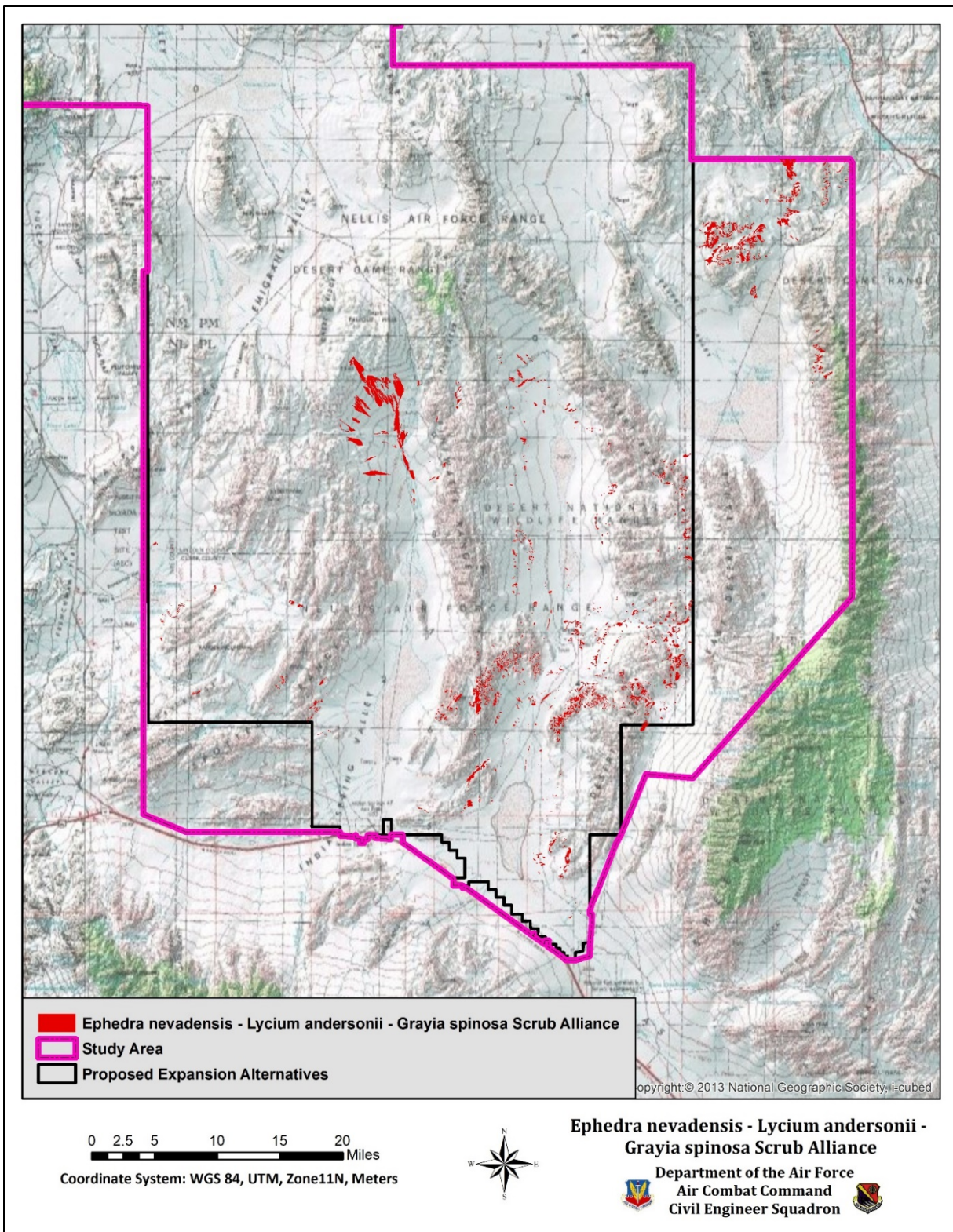


Figure 48. Location of *Ephedra nevadensis* - *Lycium andersonii* - *Grayia spinosa* Scrub Alliance on the South Range Study Area.

CEGL005751 *Ephedra nevadensis* - (*Salazaria mexicana*, *Hymenoclea salsola*) Shrubland

The *Ephedra nevadensis* - (*Salazaria mexicana*, *Hymenoclea salsola*) Shrubland is an association occurring in the A4245 Nevada Joint-fir - Desert-thorn - Spiny Hopsage Scrub Alliance which is a member of the G296 Mojave Mid-Elevation Mixed Desert Scrub group (USNVC, 2016). On the study area, the plant community is dominated by *Salazaria mexicana* with *Ephedra nevadensis* and *Hymenoclea salsola* being subdominants or codominants (Table 26). The description shows *Ephedra nevadensis* as the dominant species and *Salazaria mexicana* and *Hymenoclea salsola* being subdominants or codominants. Further surveys should be conducted to clarify the hierarchy of



Ephedra nevadensis - (*Salazaria mexicana*, *Hymenoclea salsola*) Shrubland

species on the study area. The association occurs in a variety of disturbed habitats throughout the Mojave Desert. Stands often occur in washes, but may be found on upland sites such as hillslopes, bajadas, or alluvial fans. On the North Range Study Area, the shrubland is typically found in canyons and valleys of Timber Mountain and the Yucca Range (Figure 49). The shrubland is found in washes and canyons throughout the South Range Study Area, especially in the upper bajadas and foothills in Indian Springs Valley (Figure 50). The vegetation is dominated by *Salazaria mexicana* (Peterson, 2008). Common brush species that occur in this association on the study area include *Larrea tridentata*, *Lycium andersonii*, *Atriplex canescens*, and *Grayia spinosa*. Brush height averages 1.6 ft. with an average foliar cover of 11%. This alliance is found at elevations ranging from 4,300 to 5,000 ft. MSL.

Table 26. List of plant species and characteristics of the *Ephedra nevadensis* - (*Salazaria mexicana*, *Hymenoclea salsola*) Shrubland

Attribute	Detail	
Dominants	<i>Salazaria mexicana</i>	
Subdominants	<i>Ephedra nevadensis</i>	<i>Hymenoclea salsola</i>
Common	<i>Eriogonum fasciculatum</i>	<i>Schismus arabicus</i>
Occasional	<i>Achnatherum speciosum</i> <i>Ambrosia dumosa</i> <i>Atriplex canescens</i> <i>Bromus madritensis ssp. rubens</i> <i>Bromus tectorum</i> <i>Dasyochloa pulchella</i> <i>Ephedra viridis</i> <i>Grayia spinosa</i>	<i>Gutierrezia microcephala</i> <i>Hymenoclea salsola</i> <i>Larrea tridentata</i> <i>Lycium andersonii</i> <i>Menodora spinescens</i> <i>Sarcobatus baileyi</i> <i>Yucca brevifolia</i>
Average Height	1.6 ft.	
Area	North Range Study Area: 81 acres	South Range Study Area: 10,242 acres
Elevation	4,300-5,000 ft. MSL	
Average Foliar Cover	11%	

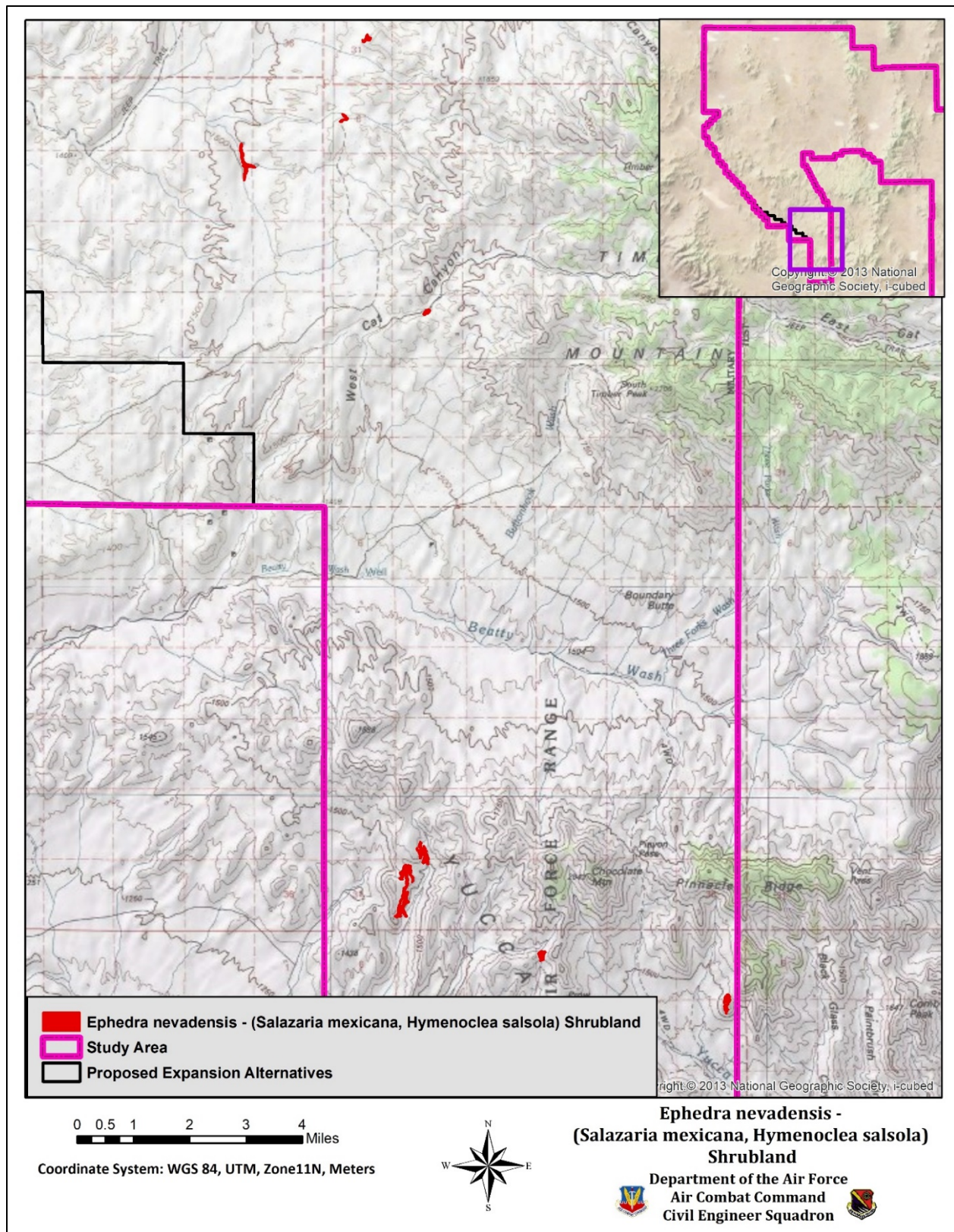


Figure 49. Location of the *Ephedra nevadensis* - (*Salazaria mexicana*, *Hymenoclea salsola*) Shrubland on the North Range Study Area.

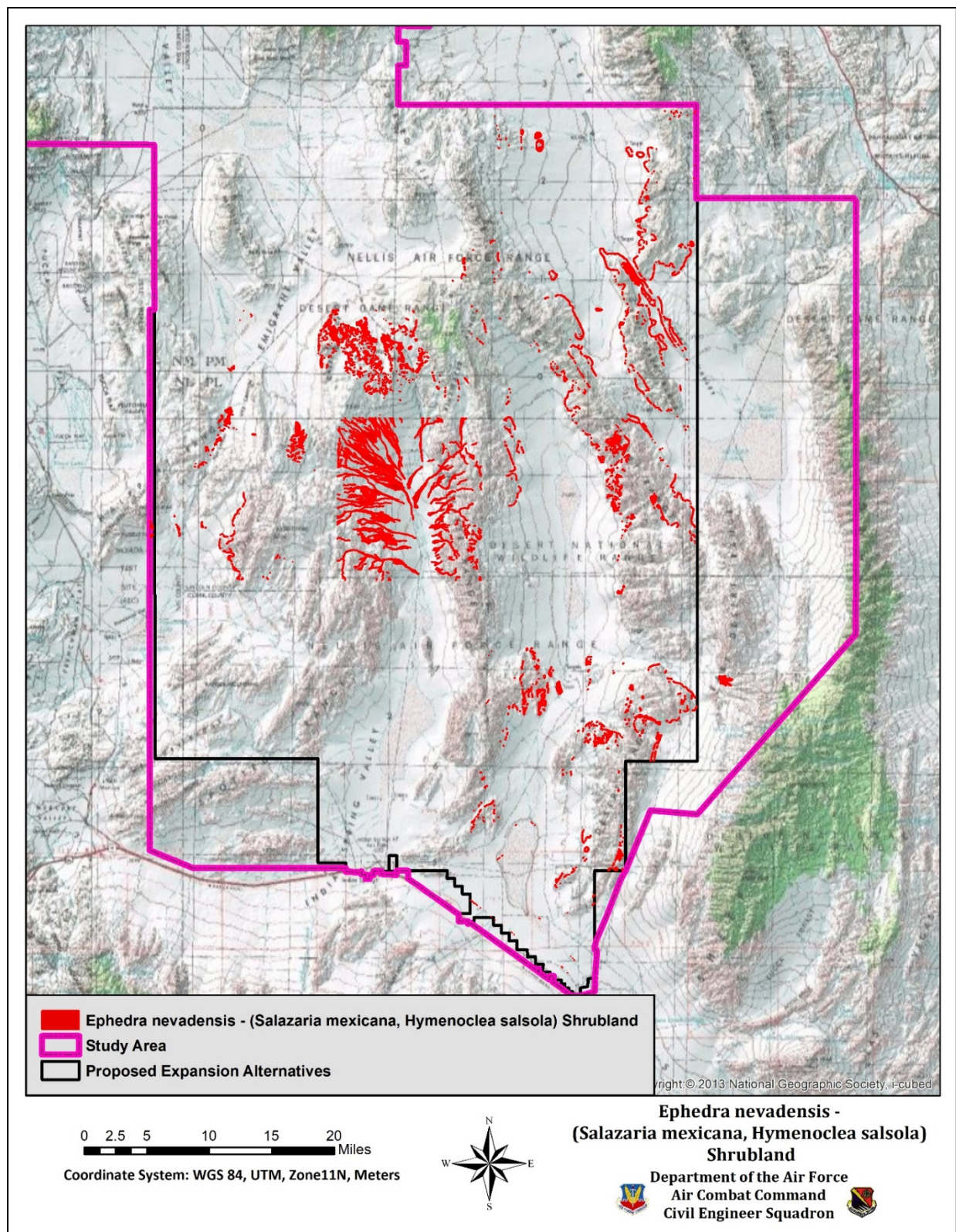


Figure 50. Location of the *Ephedra nevadensis* - (*Salazaria mexicana*, *Hymenoclea salsola*) Shrubland on the South Range Study Area.

***Lycium (andersonii, shockleyi)* Shrubland (Place Holder)**

Because of the similarity in structure and associated plants, this plant community was determined to be a combination of two associations dominated by *Lycium andersonii* and *Lycium shockleyi*. The 2016 USNVC does not have an alliance that fits this mapped community. The plant community dominated by *Lycium andersonii* could fall into the CEGLO06857 *Lycium andersonii* Shrubland association, which falls under A4245 Nevada Joint-fir – Desert-thorn – Spiny Hopsage Alliance in G296 Mojave Mid-Elevation Mixed Desert Scrub group. This association is found in the Mojave Desert in California and southern Nevada. It is



***Lycium (andersonii, shockleyi)* Shrubland**

described as an open shrub canopy dominated by *Lycium andersonii* with subdominants being *Ambrosia dumosa*, *Atriplex confertifolia*, and *Larrea tridentata*. The plant community dominated by *Lycium shockleyi* could fit into CEGLO01310 *Atriplex confertifolia* – *Lycium shockleyi* Shrubland association, which is in the A0870 Shadscale Saltbush Scrub alliance in G300 Intermountain Shadscale – Saltbush Scrub group. This association currently has no detailed description (USNVC, 2016).

On the study area, the *Lycium (andersonii, shockleyi)* Shrubland is scattered in small patches across the North Range Study Area, with an extensive area located on the southwest end of Thirsty Canyon and a smaller area on the west side of the Kawich Range (Figure 51). On the South Range Study Area, the alliance is found in canyons and washes along the east side of the Sheep Range and west side of the Desert Range (Figure 52). This alliance is dominated by *Lycium andersonii* or *Lycium shockleyi* with *Ephedra nevadensis*, *Atriplex confertifolia*, *Hymenoclea salsola*, *Grayia spinosa*, *Ericameria cooperi*, and *Krascheninnikovia lanata* as subdominants (Table 27). The alliance includes occasional populations of grasses such as *Achnatherum hymenoides*, *Elymus elymoides*, *Bromus tectorum*, *Achnatherum speciosum*, and *Hesperostipa comata*. The average height of the shrub layer is 1.7 ft. with an average of 10% foliar cover. Elevations range from 3,200 ft. MSL to 6,000 ft. MSL.

Table 27. List of plant species and characteristics of the *Lycium (andersonii, shockleyi)* Shrubland Alliance

Attribute	Detail	
Dominants	<i>Lycium andersonii</i>	<i>Lycium shockleyi</i>
Subdominants	<i>Atriplex confertifolia</i> <i>Ephedra nevadensis</i> <i>Ericameria cooperi</i>	<i>Grayia spinosa</i> <i>Hymenoclea salsola</i> <i>Krascheninnikovia lanata</i> <i>Lycium andersonii</i>
Common	<i>Acamptopappus shockleyi</i> <i>Achnatherum hymenoides</i> <i>Achnatherum speciosum</i> <i>Ambrosia dumosa</i> <i>Amsinckia tessellata</i> <i>Amsonia tomentosa</i> <i>Arabis pulchra</i> <i>Astragalus lentiginosus</i> <i>Atriplex canescens</i> <i>Atriplex hymenelytra</i> <i>Baileya multiradiata</i> <i>Bromus madritensis ssp. rubens</i>	<i>Gilia flavocincta</i> <i>Glyptopleura marginata</i> <i>Guillenia lasiophylla</i> <i>Gutierrezia microcephala</i> <i>Halogeton glomeratus</i> <i>Hedeoma nana</i> <i>Lepidium densiflorum</i> <i>Lepidium fremontii</i> <i>Linanthus demissus</i> <i>Loeseliastrum matthewsii</i> <i>Malacothrix coulteri</i> <i>Malacothrix glabrata</i>

Attribute	Detail	
	<i>Bromus tectorum</i> <i>Camissonia boothii</i> <i>Chaenactis carphoclinia</i> <i>Chaenactis stevioides</i> <i>Chamaesyce albomarginata</i> <i>Chorizanthe brevicornu</i> <i>Chorizanthe rigida</i> <i>Chorizanthe watsonii</i> <i>Cryptantha circumscissa</i> <i>Cylindropuntia echinocarpa</i> <i>Dasyochloa pulchella</i> <i>Descurainia pinnata</i> <i>Echinocereus engelmannii</i> <i>Eriastrum eremicum</i> <i>Ericameria viscidiflorus</i> <i>Eriogonum deflexum</i> <i>Eriogonum fasciculatum</i> <i>Eriogonum inflatum</i> <i>Eriogonum nidularium</i> <i>Eriogonum reniforme</i> <i>Eriogonum trichopes</i> <i>Eriophyllum pringlei</i> <i>Gilia cana</i> <i>Gilia clokeyi</i>	<i>Menodora spinescens</i> <i>Mentzelia albicaulis</i> <i>Monoptilon bellidiforme</i> <i>Opuntia basilaris</i> <i>Oxytheca perfoliata</i> <i>Pectocarya penicillata</i> <i>Peucephyllum schottii</i> <i>Phacelia crenulata</i> <i>Phacelia cryptantha</i> <i>Phacelia fremontii</i> <i>Picrothamnus desertorum</i> <i>Pleuraphis jamesii</i> <i>Prenanthes exiguus</i> <i>Psoralea polydenius</i> <i>Rafinesquia neomexicana</i> <i>Salazaria mexicana</i> <i>Salsola tragus</i> <i>Schismus barbatus</i> <i>Sisymbrium irio</i> <i>Sphaeralcea ambigua</i> <i>Stanleya pinnata</i> <i>Stephanomeria pauciflora</i> <i>Tetradymia axillaris</i> <i>Vulpia octoflora</i> <i>Xylorhiza tortifolia</i>
Occasional	<i>Astragalus mohavensis</i> <i>Calochortus flexuosus</i> <i>Camissonia brevipes</i> <i>Cryptantha pterocarya</i> <i>Cylindropuntia acanthocarpa</i> <i>Delphinium parishii</i>	<i>Eriophyllum pringlei</i> <i>Langloisia setosissima</i> <i>Larrea tridentata</i> <i>Lepidium nitidum</i> <i>Stipa speciosa</i> <i>Tetradymia glabrata</i>
Height	1.7 ft.	
Area	North Range Study Area: 13,772 acres	South Range Study Area: 663 acres
Elevation	3,200-6,000 ft. MSL	
Foliar Cover	10%	

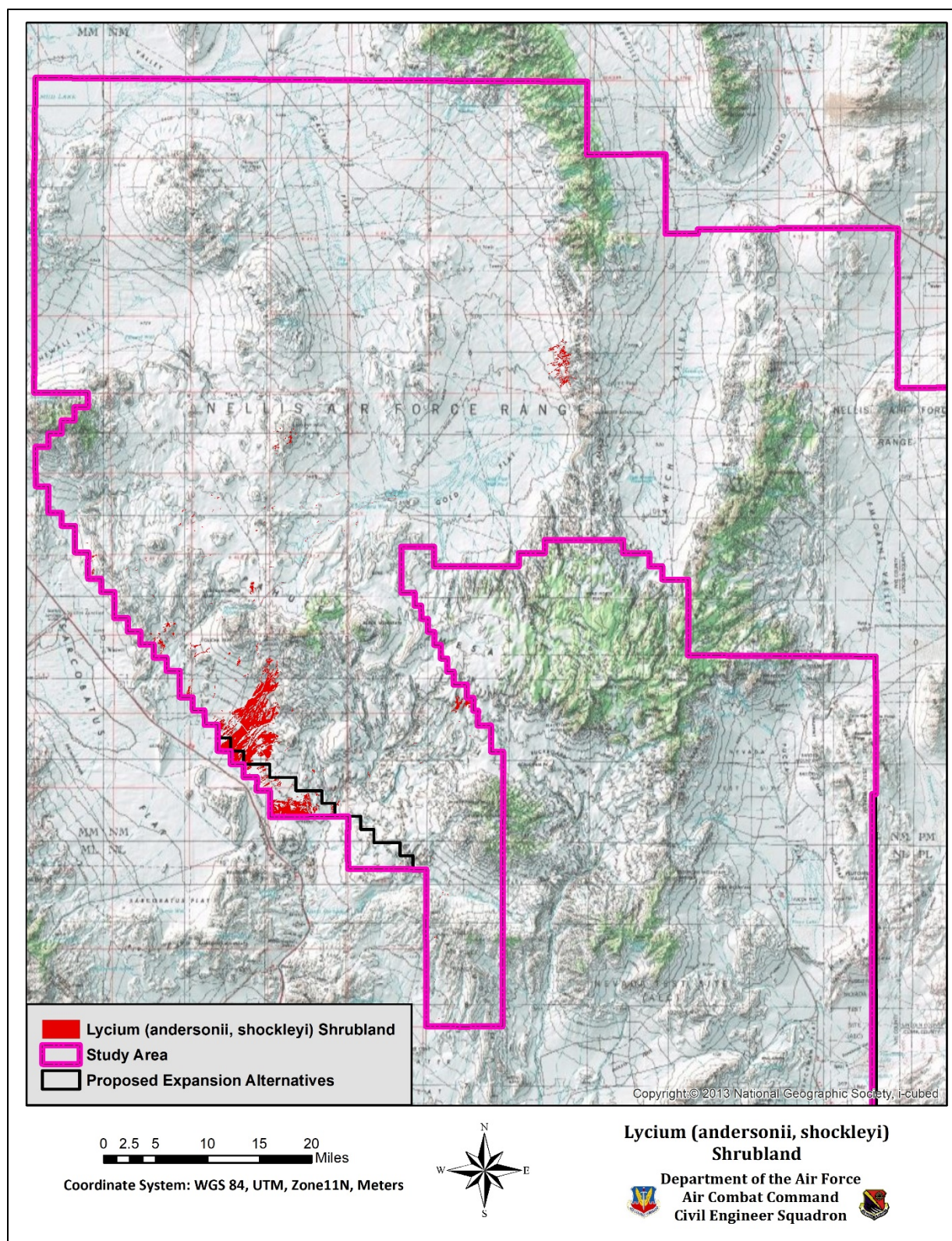


Figure 51. Location of *Lycium (andersonii, shockleyi)* Shrubland Alliance on the North Range Study Area.

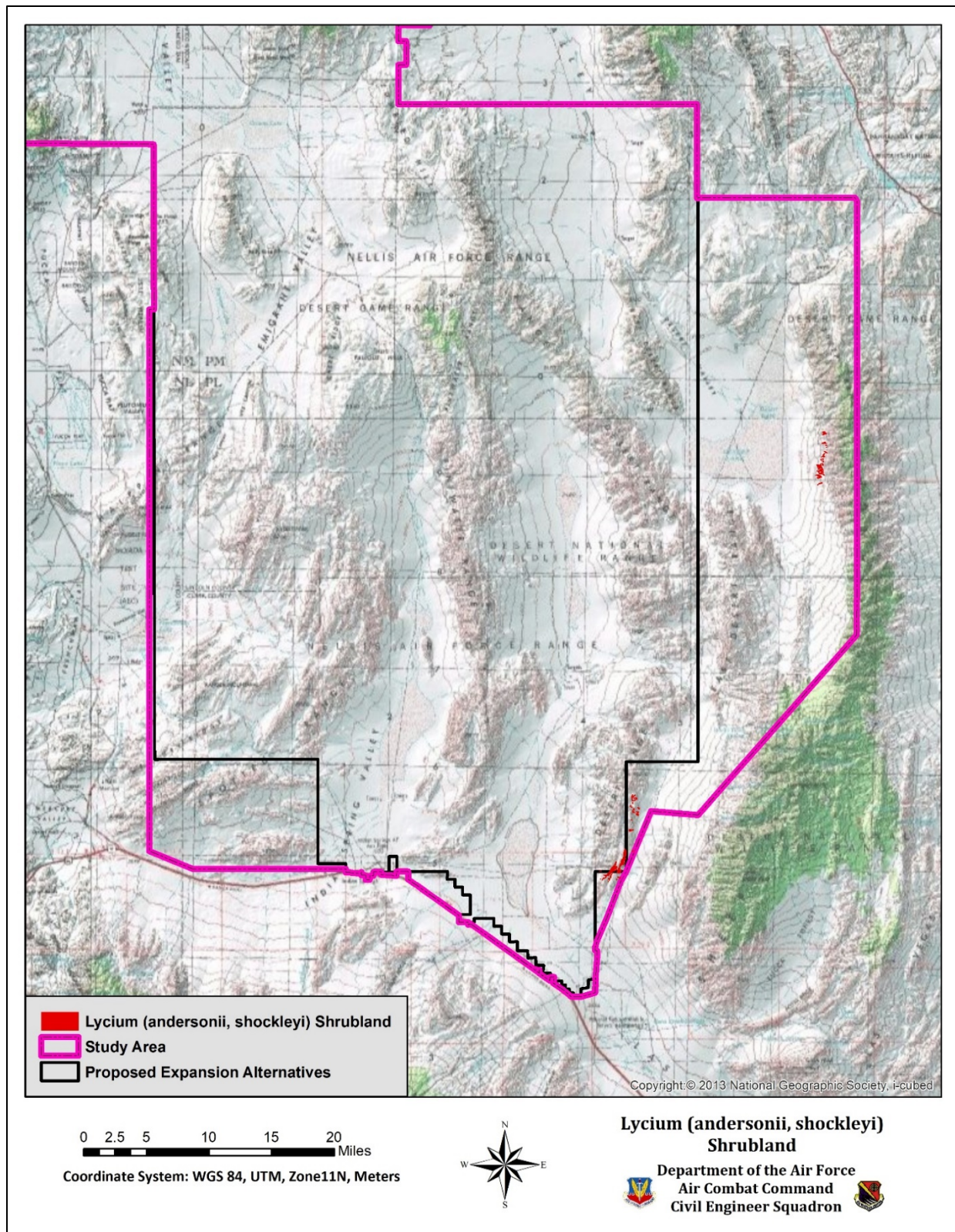


Figure 52. Location of *Lycium (andersonii, shockleyi)* Shrubland Alliance on the South Range Study Area.

A0869 *Atriplex canescens* Scrub Alliance

The *Atriplex canescens* Scrub Alliance occurs primarily in arid and semi-arid areas of the southwestern U.S. (USNVC, 2016). It is a member of G300 Intermountain Shadscale – Saltbrush Scrub group. Stands have been observed on all aspects, including cliffs, gentle slopes, and steep hillsides. Soils may be shallow to moderately deep, and range from sands to loams to clays (USNVC, 2016). On the North Range Study Area, the alliance is found in Cactus Flats and Kawich Valley (Figure 53). On the South Range Study Area, it is found around Frenchman Dry Lake, Desert Lake, and Indian Springs Valley (Figure 54). On the study area, this plant community is dominated by *Atriplex canescens* and commonly associated with subdominants including *Atriplex confertifolia*, *Lycium andersonii*, *Picrothamnus desertorum*, *Krascheninnikovia lanata*, and *Hymenoclea salsola* (Table 28). The plant community is typified by a rather diverse mixture of brush species and may include invasives such as *Salsola tragus* and *Halogeton glomeratus*. Grasses commonly found in this plant community include *Achnatherum hymenoides*, *Pleuraphis jamesii*, and *Bromus tectorum*. The alliance may often occur in monoculture stands, especially along the periphery of playas or dry lakes. Height of the shrub layer averages 2 ft. with an average foliar cover of 11%. Foliar covers were observed as high as 70% in some monoculture stands upgradient of dry lakes. This community occurs in elevations from 2,900 ft. MSL to 6,400 ft. MSL.



Atriplex canescens Scrub Alliance

Table 28. List of plant species and characteristics of the *Atriplex canescens* Scrub Alliance

Attribute	Detail	
Dominants	<i>Atriplex canescens</i>	
Subdominants	<i>Atriplex confertifolia</i> <i>Lycium andersonii</i> <i>Hymenoclea salsola</i>	<i>Picrothamnus desertorum</i> <i>Krascheninnikovia lanata</i>
Common	<i>Achnatherum hymenoides</i> <i>Ambrosia dumosa</i> <i>Atriplex polycarpa</i> <i>Bromus madritensis ssp. rubens</i> <i>Bromus tectorum</i> <i>Camissonia brevipes</i> <i>Chaenactis stevioides</i> <i>Coleogyne ramosissima</i> <i>Cylindropuntia echinocarpa</i> <i>Dasyochloa pulchella</i> <i>Descurainia pinnata</i> <i>Ephedra nevadensis</i> <i>Eriogonum nidularium</i> <i>Eriogonum trichopes</i> <i>Fallugia paradoxa</i> <i>Grayia spinosa</i> <i>Gutierrezia microcephala</i>	<i>Linanthus parryae</i> <i>Machaeranthera canescens</i> <i>Mirabilis laevis</i> <i>Muhlenbergia porteri</i> <i>Oenothera caespitosa</i> <i>Phacelia crenulata</i> <i>Pleuraphis rigida</i> <i>Psoralea fremontii</i> <i>Salazaria mexicana</i> <i>Salsola tragus</i> <i>Schismus arabicus</i> <i>Sphaeralcea ambigua</i> <i>Stanleya elata</i> <i>Stanleya pinnata</i> <i>Suaeda moquinii</i> <i>Tetradymia</i> <i>Tiquilia plicata</i>

Attribute	Detail	
	<i>Halogeton glomeratus</i> <i>Hymenoclea salsola</i> <i>Ipomopsis polycladon</i> <i>Larrea tridentata</i>	<i>Vulpia octoflora</i> <i>Yucca baccata</i> <i>Yucca brevifolia</i>
Occasional	<i>Ambrosia psilostachya</i> <i>Amsonia tomentosa</i> <i>Arabis pulchra</i> <i>Baileya multiradiata</i> <i>Bassia americana</i> <i>Camissonia brevipes</i> <i>Cryptantha pterocarya</i> <i>Encelia virginensis</i> <i>Erodium cicutarium</i> <i>Eschscholzia californica</i> <i>Hesperostipa comata</i> <i>Lepidium virginicum</i> <i>Malacothrix glabrata</i>	<i>Menodora spinescens</i> <i>Mimulus bigelovii</i> <i>Mirabilis alipes</i> <i>Monoptilon bellidifforme</i> <i>Nama demissum</i> <i>Opuntia polyacantha</i> var. <i>erinacea</i> <i>Pinus monophylla</i> <i>Psoralea polydenius</i> <i>Sarcobatus baileyi</i> <i>Stephanomeria parryi</i> <i>Tetradymia glabrata</i> <i>Yucca elata</i>
Average Height	2 ft.	
Area	North Range Study Area: 65,805 acres	South Range Study Area: 20,423 acres
Elevation	2,900-6,400 ft. MSL	
Average Foliar Cover	11%	

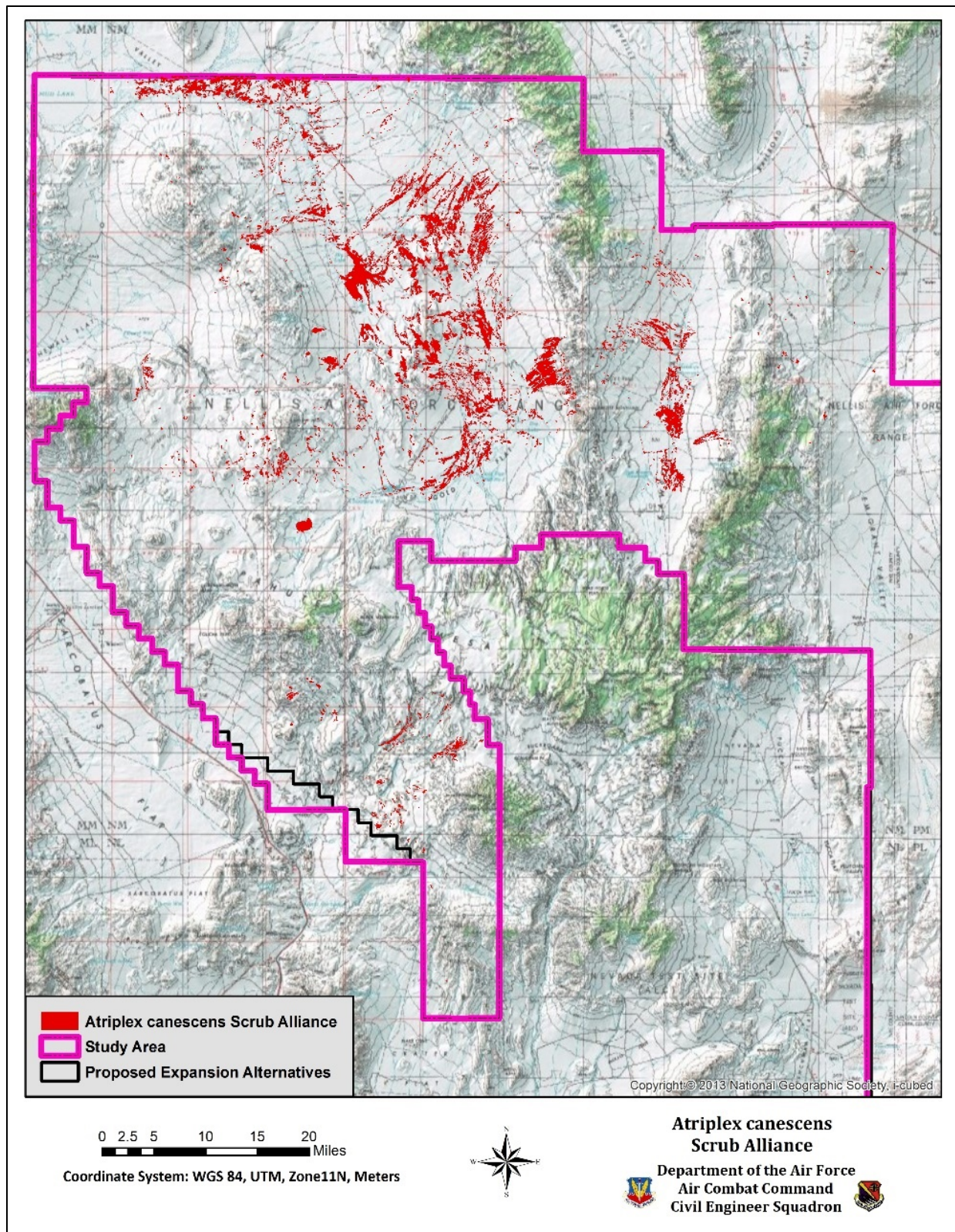


Figure 53. Location of *Atriplex canescens* Scrub Alliance on the North Range Study Area.

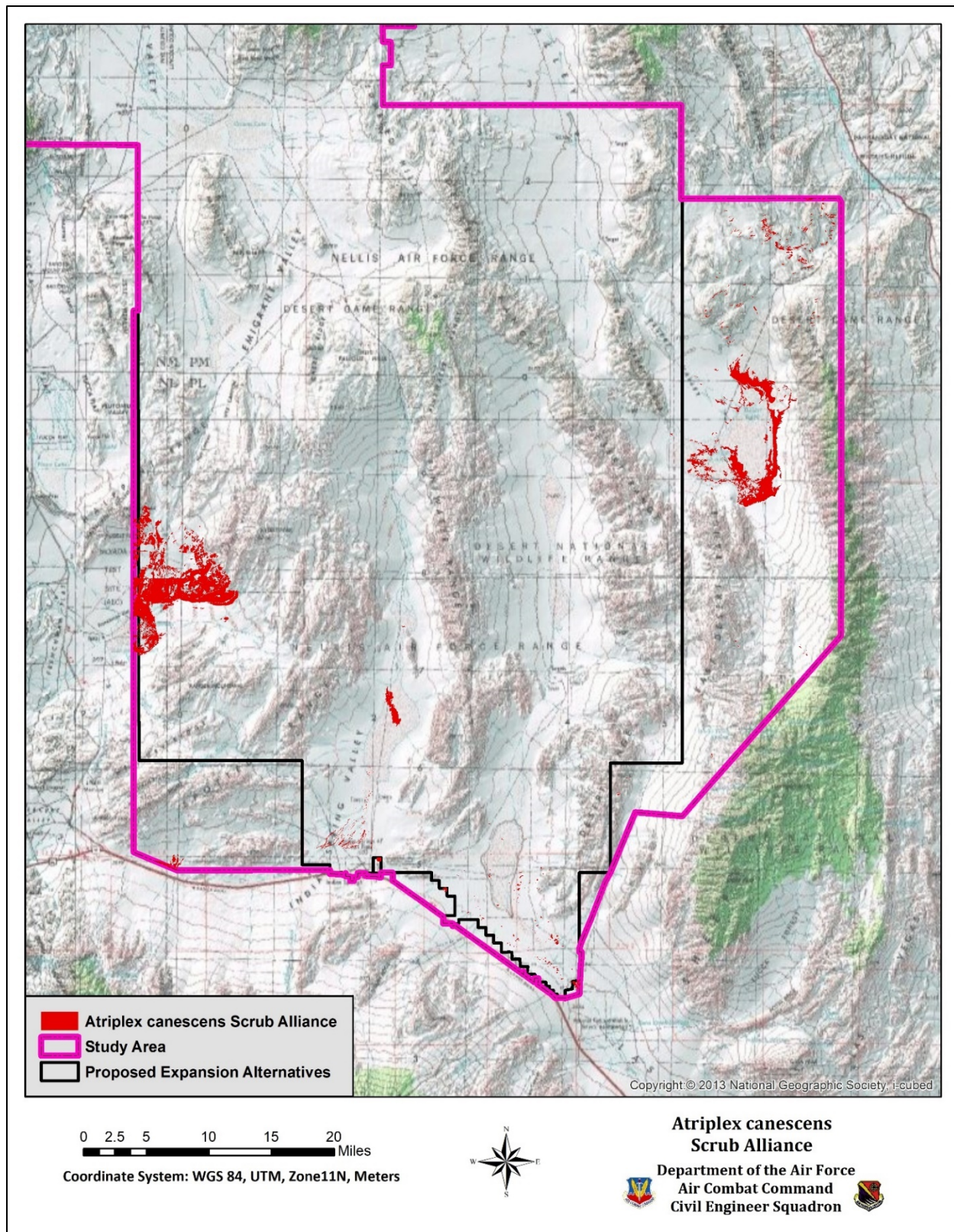


Figure 54. Location of *Atriplex canescens* Scrub Alliance on the South Range Study Area.

A0870 *Atriplex confertifolia* Scrub Alliance

The *Atriplex confertifolia* Scrub Alliance is a member of the G300 Intermountain Shadscale – Saltbrush Scrub group and is found across the western U.S. including the eastern Mojave Desert and Great Basin (USNVC, 2016). It is usually found on valley bottoms or bajadas on alkaline loamy or silty light-colored soils sometimes covered with caliche nodules (Figures 55 and 56). This alliance is characterized by a sparse to moderately dense shrub layer dominated by *Atriplex confertifolia* (Table 29). On the North Range Study Area, the alliance may include *Picrothamnus desertorum* as a codominant. Subdominants that have been observed on the entire study area in this alliance include *Ephedra nevadensis* and *Krascheninnikovia lanata*.



***Atriplex confertifolia* Scrub Alliance**

The soil textures associated with this alliance on the study area are highly variable and range from gravelly, sandy loams to gravelly, fine sandy loams. At the upper reaches of the bajadas, the soils become covered with rocks, cobble, and even boulders. Soils that accumulate on ledges, cracks, and crevices on mountain slopes may support scattered populations of this alliance. Other plants commonly found within this alliance include *Eriogonum deflexum*, *Ambrosia dumosa*, *Artemisia arbuscula*, *Gutierrezia microcephala*, *Sphaeralcea ambigua*, and *Stanleya pinnata*. Common grasses include *Achnatherum hymenoides* and *Pleuraphis jamesii*. The shrub layer generally averages 1.5 feet tall with an average foliar cover of 8%.

Table 29. List of plant species and characteristics of the *Atriplex confertifolia* Scrub Alliance

Attribute	Detail	
Dominants	<i>Atriplex confertifolia</i>	
Subdominants	<i>Ephedra nevadensis</i> <i>Picrothamnus desertorum</i>	<i>Krascheninnikovia lanata</i>
Common	<i>Acamptopappus shockleyi</i> <i>Achnatherum hymenoides</i> <i>Achnatherum speciosum</i> <i>Agave utahensis</i> var. <i>eborispina</i> <i>Allionia incarnata</i> <i>Allium nevadense</i> <i>Ambrosia acanthicarpa</i> <i>Ambrosia dumosa</i> <i>Amsinckia tessellata</i> <i>Amsonia tomentosa</i> <i>Arctomecon merriamii</i> <i>Aristida purpurea</i> <i>Artemisia arbuscula</i> <i>Astragalus amphioxys</i> var. <i>musimonum</i> <i>Astragalus lentiginosus</i> <i>Atrichoseris platyphylla</i> <i>Atriplex canescens</i> <i>Atriplex hymenelytra</i> <i>Baileya multiradiata</i> <i>Baileya pleniradiata</i> <i>Bassia americana</i> <i>Bromus madritensis</i> ssp. <i>madritensis</i>	<i>Gutierrezia microcephala</i> <i>Halogeton glomeratus</i> <i>Hymenoclea salsola</i> <i>Krameria erecta</i> <i>Krameria grayi</i> <i>Langloisia setosissima</i> <i>Larrea tridentata</i> <i>Lepidium densiflorum</i> <i>Lepidium flavum</i> <i>Lepidium fremontii</i> <i>Lepidium lasiocarpum</i> <i>Lepidium nitidum</i> <i>Lepidium virginicum</i> <i>Linanthus parryae</i> <i>Lycium andersonii</i> <i>Lycium cooperi</i> <i>Lycium shockleyi</i> <i>Malacothrix glabrata</i> <i>Mammillaria tetrancistra</i> <i>Menodora spinescens</i> <i>Mentzelia albicaulis</i> <i>Mentzelia oreophila</i>

Attribute	Detail	
	<i>Bromus madritensis ssp. rubens</i> <i>Camissonia boothii</i> <i>Camissonia brevipes</i> <i>Camissonia claviformis</i> <i>Camissonia walkeri</i> <i>Chaenactis macrantha</i> <i>Chaenactis stevioides</i> <i>Chamaesyce albomarginata</i> <i>Chorizanthe brevicornu</i> <i>Chorizanthe rigida</i> <i>Croton californicus</i> <i>Cryptantha angustifolia</i> <i>Cryptantha circumscissa</i> <i>Cryptantha nevadensis</i> <i>Cryptantha pterocarya</i> <i>Cryptantha tumulosa</i> <i>Cuscuta salina</i> <i>Cylindropuntia echinocarpa</i> <i>Cymopterus gilmanii</i> <i>Dasyochloa pulchella</i> <i>Descurainia pinnata</i> <i>Echinocactus polycephalus</i> <i>Echinocereus engelmannii</i> <i>Encelia virginensis</i> <i>Enceliopsis covillei</i> <i>Enceliopsis nudicaulis</i> <i>Ephedra torreyana</i> <i>Erigeron concinnus</i> <i>Eriogonum concinnum</i> <i>Eriogonum deflexum</i> <i>Eriogonum inflatum</i> <i>Eriogonum nidularium</i> <i>Eriogonum nummulari</i> <i>Eriogonum reniforme</i> <i>Eriogonum trichopes</i> <i>Eriophyllum pringlei</i> <i>Eschscholzia californica</i> <i>Eschscholzia minutiflora</i> <i>Escobaria vivipara var. rosea</i> <i>Fallugia paradoxa</i> <i>Gilia cana</i> <i>Glyptopleura setulosa</i> <i>Grayia spinosa</i>	<i>Mimulus bigelovii</i> <i>Mirabilis laevis</i> <i>Mirabilis pudica</i> <i>Monoptilon bellidiforme</i> <i>Muhlenbergia porteri</i> <i>Nama demissum</i> <i>Nicotiana obtusifolia</i> <i>Oenothera caespitosa</i> <i>Oenothera deltoides</i> <i>Opuntia basilaris</i> <i>Opuntia polyacantha</i> <i>Opuntia polyacantha var. erinacea</i> <i>Oxytheca perfoliata</i> <i>Peucephyllum schottii</i> <i>Phacelia crenulata</i> <i>Phacelia fremontii</i> <i>Picrothamnus desertorum</i> <i>Plantago ovata</i> <i>Pleuraphis jamesii</i> <i>Pleuraphis rigida</i> <i>Pleurocoronis pluriseta</i> <i>Prenanthes exigu</i> <i>Psathyrotes ramosissima</i> <i>Psilostrophe cooperi</i> <i>Psoralea fremontii</i> <i>Salazaria mexicana</i> <i>Salsola tragus</i> <i>Schismus arabicus</i> <i>Sphaeralcea ambigua</i> <i>Sporobolus cryptandrus</i> <i>Stanleya pinnata</i> <i>Stephanomeria exigu</i> <i>Stephanomeria pauciflora</i> <i>Stipa speciosa</i> <i>Thamnosma montana</i> <i>Thymophylla pentachaeta</i> <i>Tiquilia plicata</i> <i>Tridens muticus</i> <i>Vulpia octoflora</i> <i>Xylorhiza tortifolia</i> <i>Yucca brevifolia</i> <i>Yucca schidigera</i>
Occasional	<i>Arabis pulchra</i> <i>Argyrochosma jonesii</i> <i>Astragalus mohavensis</i> <i>Encelia farinosa</i> <i>Erodium cicutarium</i>	<i>Ipomopsis polycladon</i> <i>Lepidium nitidum</i> <i>Rafinesquia neomexicana</i> <i>Stanleya elata</i>
Average Height	1.5 ft.	
Area	North Range Study Area: 123,205 acres	South Range Study Area: 113,906 acres
Elevation	2,900-6,200 ft. MSL	
Average Foliar Cover	8%	

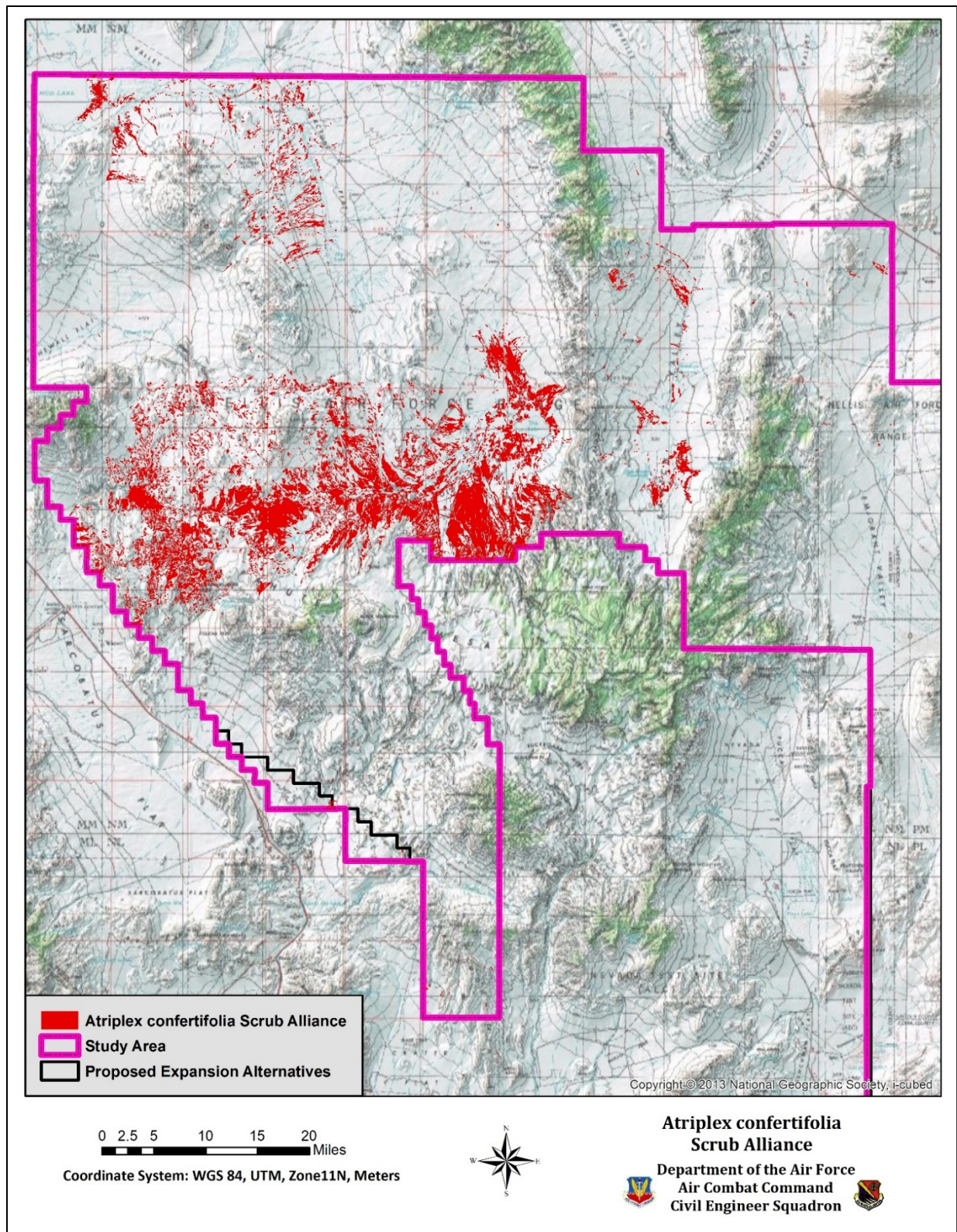


Figure 55. Location of *Atriplex confertifolia* Scrub Alliance on the North Range Study Area.

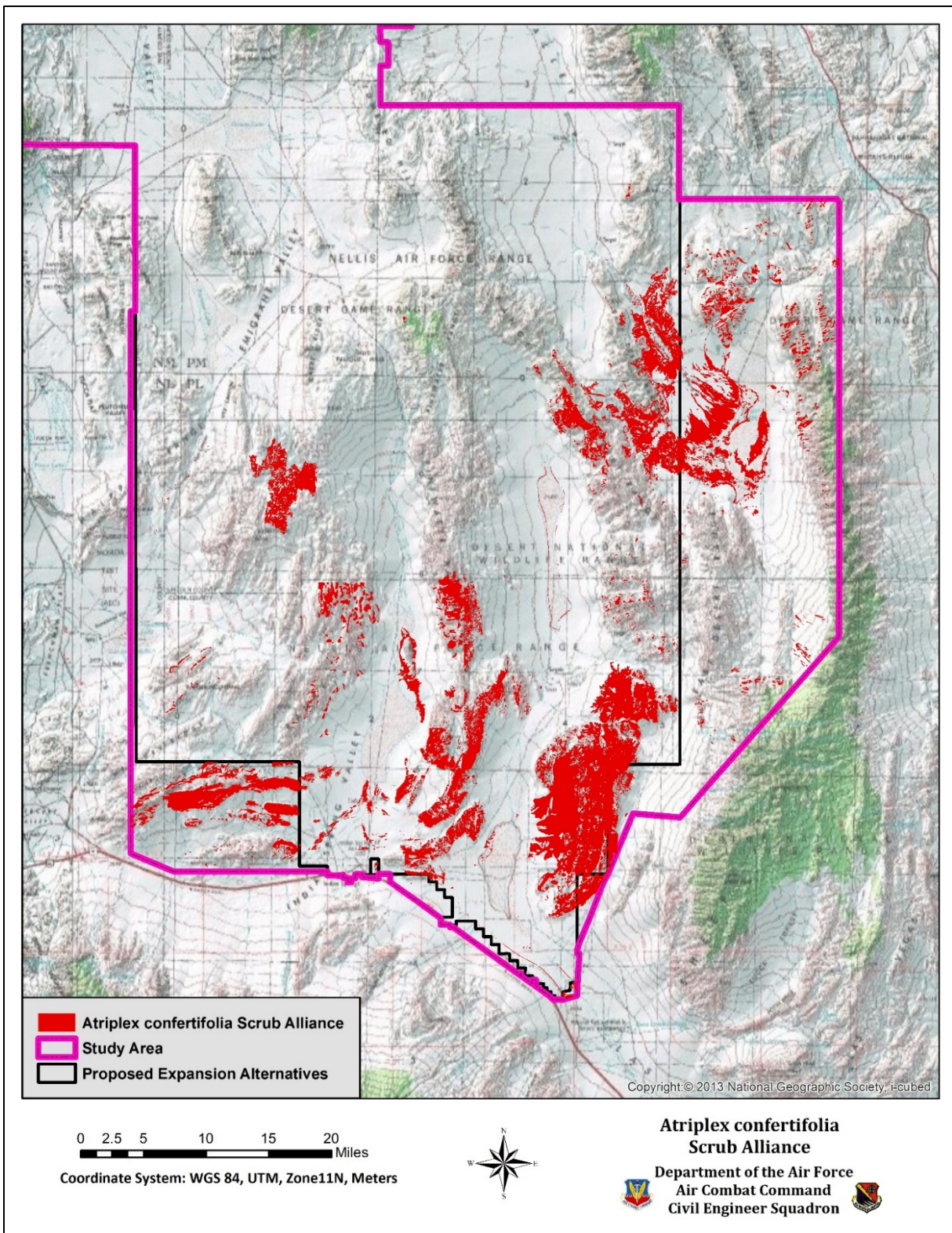


Figure 56. Location of *Atriplex confertifolia* Scrub Alliance on the South Range Study Area.

CEGL001315 *Atriplex confertifolia* / *Tetradymia glabrata* Shrubland

The *Atriplex confertifolia* / *Tetradymia glabrata* Shrubland is in the A0870 Shadscale Saltbush Scrub Alliance, a member of G300 Intermountain Shadscale - Saltbush Scrub group (USNVC, 2016). This plant community is best described as this combination, although *Tetradymia glabrata* is usually the distinctive dominant on the study area with *Atriplex confertifolia* as a subdominant or codominant. On the North Range Study Area, this association is almost always found on sandy soils of stabilized dunes, especially on Cactus Flats on the North Range Study Area (Figure 57). The association has not been found on the South Range Study Area. On the study area, the shrubland is dominated by *Tetradymia glabrata*, but may also include *Tetradymia axillaris*. Subdominants may also include *Ephedra nevadensis* (Table 30). Grasses common in this alliance include *Acnatherum hymenoides*, *Dasyochloa pulchella*, and *Pleuraphis jamesii*. Most of the communities found on the North Range Study Area were found at 5,400 - 5,700 ft. MSL. The shrub layer is usually 2.5 ft. tall with an average foliar cover of 14%.



Atriplex confertifolia / *Tetradymia glabrata* Shrubland

Table 30. List of plant species and characteristics of the *Atriplex confertifolia* / *Tetradymia glabrata* Shrubland

Attribute	Detail	
Dominants	<i>Tetradymia glabrata</i>	
Subdominants	<i>Atriplex confertifolia</i>	<i>Ephedra nevadensis</i>
Common	<i>Halogeton glomeratus</i>	<i>Krascheninnikovia lanata</i>
Occasional	<i>Achnatherum hymenoides</i> <i>Cylindropuntia echinocarpa</i> <i>Dasyochloa pulchella</i> <i>Ericameria nauseosa</i> <i>Lepidium fremontii</i>	<i>Menodora spinescens</i> <i>Picrothamnus desertorum</i> <i>Pleuraphis jamesii</i> <i>Sarcobatus baileyi</i> <i>Sphaeralcea ambigua</i>
Average Height	2.5 ft.	
Area	North Range Study Area: 3,637 acres	South Range Study Area: 0 acres
Elevation	5,400-5,700 ft. MSL	
Average Foliar Cover	14%	

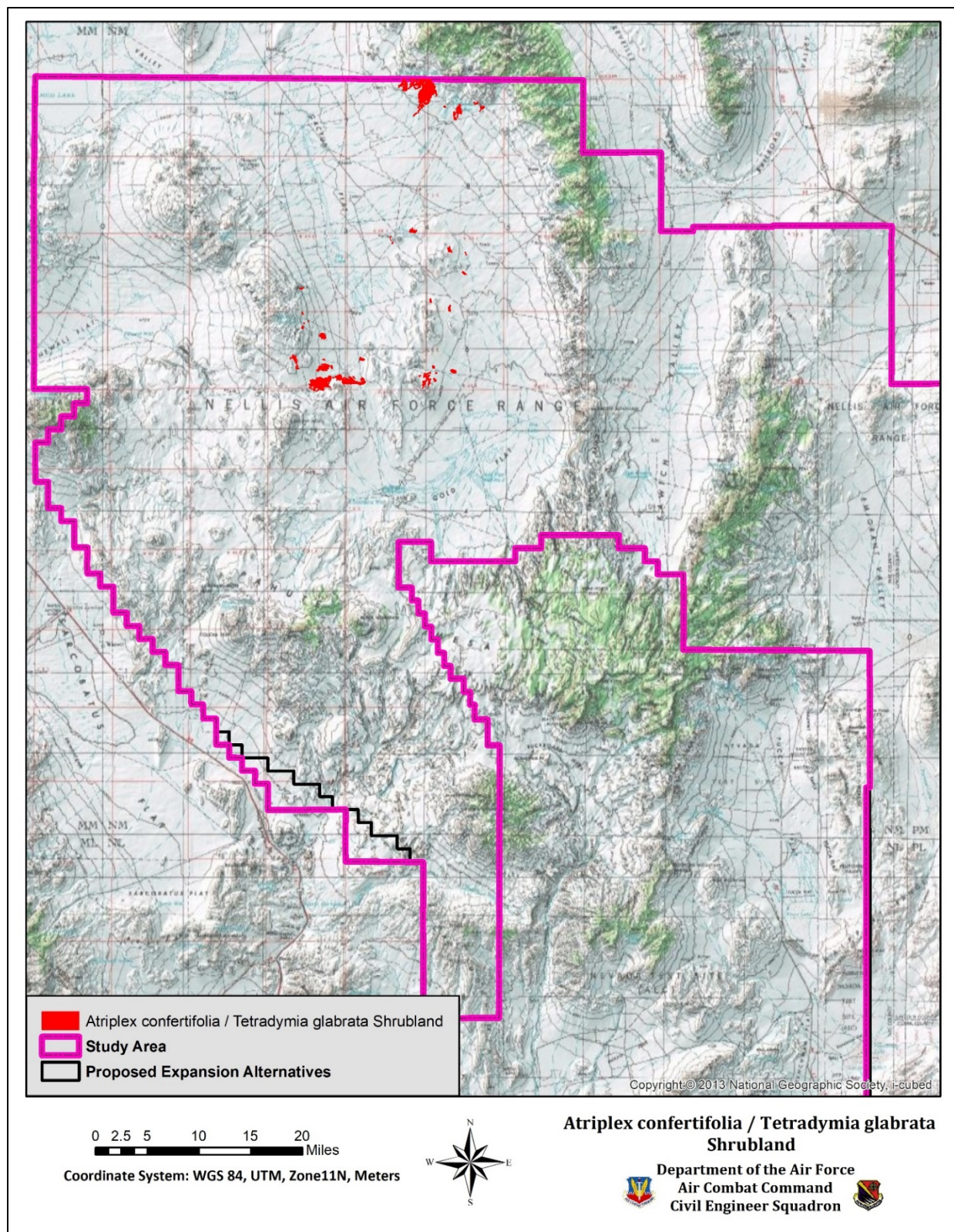


Figure 57. Location of the *Atriplex confertifolia* / *Tetradymia glabrata* Shrubland on the North Range Study Area.

CEGL001452 *Picrothamnus desertorum* Shrubland

The NNHP has documented minimal information for the *Picrothamnus desertorum* Shrubland Alliance (Peterson, 2008). According to the NNHP, it is one of the least common salt desert shrub communities and occurs on alkaline soil, along the margins of the large playas, and on alluvial gravel deposits of lake basins. The USNVC includes *Picrothamnus desertorum* as a dominant in three different associations in A0870 Shadscale Saltbush Scrub Alliance, which is in the G300 Intermountain Shadscale – Saltbush Scrub group. For the purposes of this report, this plant community will be placed in the CEG001452 *Picrothamnus desertorum* Shrubland, but because no



Picrothamnus desertorum Shrubland Alliance

description is provided for this association, it is possible that the plant community may also fit in the CEG001297 *Atriplex confertifolia* - *Picrothamnus desertorum* / *Achnatherum hymenoides* Shrubland or the CEG001296 *Atriplex confertifolia* - *Picrothamnus desertorum* / *Krascheninnikovia lanata* Shrubland (both of which also lack detailed descriptions). Interestingly, this plant community plays a major role on the North Range Study Area comprising of 242,108 acres of the surface area (Figure 58). The association is not found on the South Range Study Area. On the project area, *Picrothamnus desertorum* is the dominant woody species, with *Achnatherum hymenoides* and *Pleuraphis jamesii* as the dominant grass species (Table 31). Common subdominants or codominants observed on the study area include *Krascheninnikovia lanata* and *Atriplex confertifolia*. Other shrubs that occur within this alliance are *Ephedra nevadensis*, *Grayia spinosa*, and *Atriplex canescens*. The shrub layer in this alliance generally remains between 0.5 - 2.0 ft. tall (average 1 ft.) with an average of 10% foliar cover, which can be as high as 22%. Elevations range from 4,600 to 6,200 ft. MSL on the study area.

Table 31. List of plant species and characteristics of the *Picrothamnus desertorum* Shrubland Alliance

Attribute	Detail	
Dominants	<i>Picrothamnus desertorum</i>	
Subdominants	<i>Atriplex confertifolia</i>	<i>Krascheninnikovia lanata</i>
Common	<i>Achnatherum hymenoides</i> <i>Aristida purpurea</i> <i>Artemisia nova</i> <i>Atriplex canescens</i> <i>Atriplex spinifera</i> <i>Bromus madritensis ssp. rubens</i> <i>Cardaria chalapensis</i> <i>Chrysothamnus Greenei</i> <i>Chrysothamnus viscidiflorus</i>	<i>Dasyochloa pulchella</i> <i>Ephedra nevadensis</i> <i>Ephedra viridis</i> <i>Ericameria cooperi</i> <i>Grayia spinosa</i> <i>Halogeton glomeratus</i> <i>Pleuraphis jamesii</i> <i>Sphaeralcea ambigua</i> <i>Sporobolus contractus</i>
Occasional	<i>Artemisia arbuscula</i> <i>Artemisia tridentata</i> <i>Astragalus lentiginosus</i> <i>Bassia americana</i> <i>Bouteloua barbata</i> <i>Bouteloua gracilis</i>	<i>Gutierrezia microcephala</i> <i>Hymenoclea salsola</i> <i>Lycium cooperi</i> <i>Oenothera caespitosa</i> <i>Opuntia polyacantha var. erinacea</i> <i>Salsola tragus</i>

Attribute	Detail	
	<i>Bromus tectorum</i> <i>Cylindropuntia echinocarpa</i> <i>Cylindropuntia ramosissima</i> <i>Elymus elymoides</i> <i>Ericameria nauseosa</i> <i>Eriogonum inflatum</i> <i>Eriogonum microthecum</i> <i>Glossopetalon spinescens</i> <i>Grusonia pulchella</i>	<i>Sarcobatus baileyi</i> <i>Sarcobatus vermiculatus</i> <i>Sclerocactus polyancistrus</i> <i>Stanleya elata</i> <i>Stanleya pinnata</i> <i>Stephanomeria pauciflora</i> <i>Symphoricarpos longiflorus</i> <i>Tetradymia glabrata</i> <i>Yucca brevifolia</i>
Average Height	1 ft.	
Area	North Range Study Area: 242,108 acres	South Range Study Area: 0 acres
Elevation	4,600-6,200 ft. MSL	
Average Foliar Cover	10%	

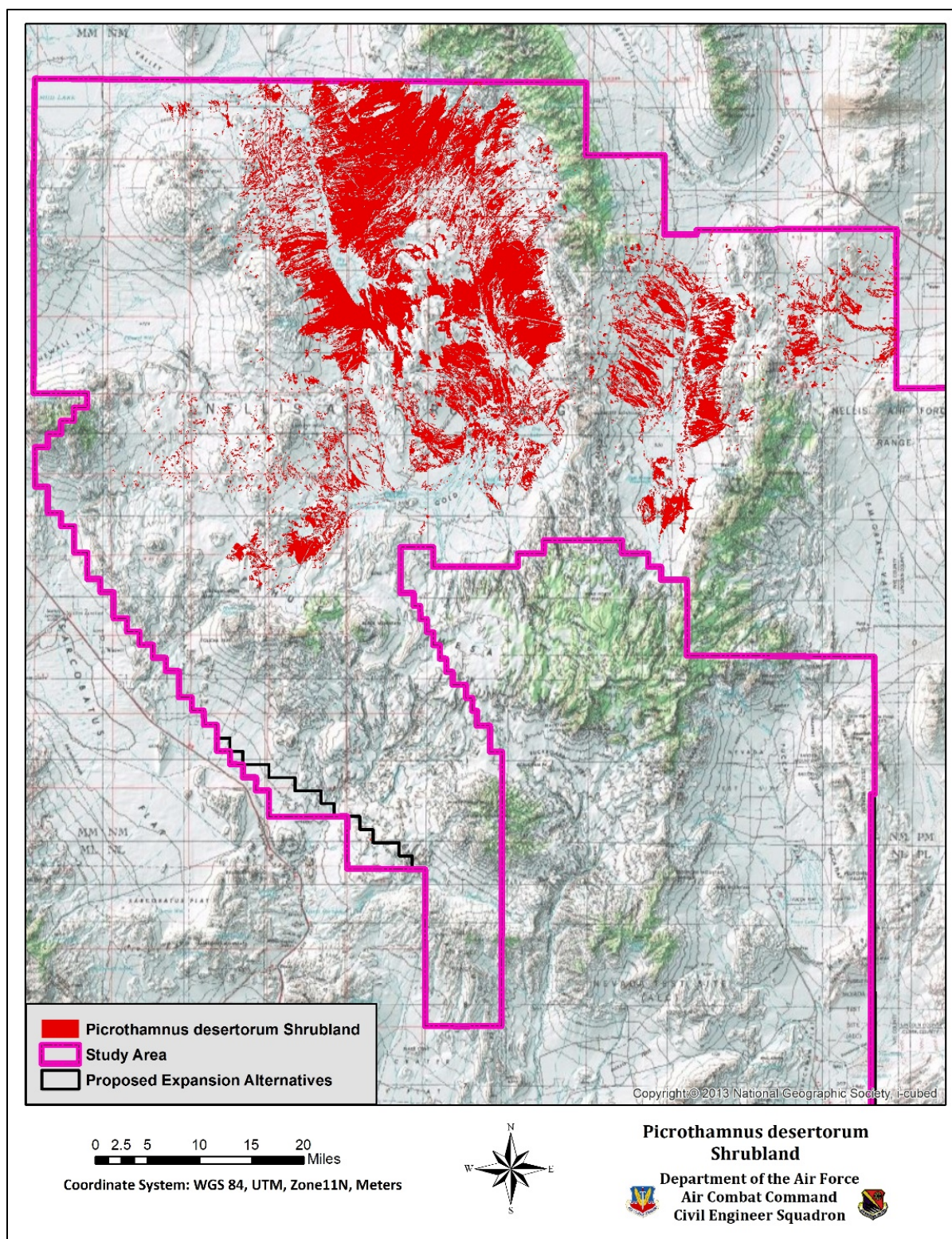


Figure 58. Location of *Picrothamnus desertorum* Shrubland on the North Range Study Area.

A3171 *Grayia spinosa* Scrub Alliance

The *Grayia spinosa* Scrub Alliance Vegetation is a member of the G300 Intermountain Shadscale – Saltbush Scrub group (USNVC, 2016). The alliance occurs throughout low to mid-elevations of the Great Basin and the eastern Mojave Desert, usually on mountain slopes or alluvial fans bordering intermountain basins. This plant alliance is more drought tolerant than big sagebrush alliances found in higher elevations. Soils are highly variable, but are generally coarse-textured and well-drained, and often alkaline (Peterson, 2008). On the North Range Study Area, the alliance is found on the east side of Mud Lake, the east side of the Kawich Range in



Grayia spinosa Scrub Alliance

Kawich Valley, and the plateaus of Thirsty Canyon (Figure 59). The alliance is also found in the east part of Desert Lake in Desert Valley in Expansion Alternative 3C (Figure 60). This alliance is characterized by a sparse to moderately dense shrub layer of *Grayia spinosa* averaging about 11% foliar cover. On the study area, subdominants include *Ephedra nevadensis* and *Opuntia basilaris* (Table 32). Common brush species include *Picrothamnus desertorum*, *Krascheninnikovia lanata*, *Lycium andersonii*, and *Atriplex canescens*. Common grasses in this alliance tend to be *Pleuraphis jamesii* and *Achnatherum hymenoides*. The height of the shrub layer averages 2 ft. with elevations ranging from 3,200 to 6,100 ft. MSL.

Table 32. List of plant species and characteristics of the *Grayia spinosa* Scrub Alliance

Attribute	Detail	
Dominants	<i>Grayia spinosa</i>	
Subdominants	<i>Ephedra nevadensis</i>	<i>Opuntia basilaris</i>
Common	<i>Acamptopappus shockleyi</i> <i>Achnatherum hymenoides</i> <i>Allionia incarnata</i> <i>Amsinckia tessellata</i> <i>Atriplex canescens</i> <i>Atriplex confertifolia</i> <i>Baileya multiradiata</i> <i>Bassia americana</i> <i>Bromus madritensis ssp. rubens</i> <i>Bromus tectorum</i> <i>Camissonia brevipes</i> <i>Chaenactis fremontii</i> <i>Chamaesyce albomarginata</i> <i>Chorizanthe rigida</i> <i>Chrysothamnus viscidiflorus</i> <i>Dasyochloa pulchella</i> <i>Echinocactus polycephalus</i> <i>Elymus elymoides</i> <i>Enceliopsis nudicaulis</i> <i>Ephedra nevadensis</i> <i>Ephedra viridis</i> <i>Ericameria cooperi</i> <i>Ericameria nauseosa</i>	<i>Halogeton glomeratus</i> <i>Hymenoclea salsola</i> <i>Krascheninnikovia lanata</i> <i>Lepidium fremontii</i> <i>Lepidium nitidum</i> <i>Leymus triticoides</i> <i>Lycium andersonii</i> <i>Lycium cooperi</i> <i>Malacothrix glabrata</i> <i>Menodora spinescens</i> <i>Oenothera deltoides</i> <i>Oenothera primiveris</i> <i>Opuntia basilaris</i> <i>Opuntia engelmannii</i> <i>Picrothamnus desertorum</i> <i>Pleuraphis jamesii</i> <i>Psoralea polydenius</i> <i>Salsola tragus</i> <i>Sphaeralcea ambigua</i> <i>Stanleya elata</i> <i>Stanleya pinnata</i> <i>Tetradymia axillaris</i> <i>Tetradymia glabrata</i>

Attribute	Detail	
	<i>Ericameria teretifolia</i> <i>Eriogonum deflexum</i> <i>Eriogonum fasciculatum</i> <i>Eriogonum inflatum</i> <i>Eriogonum palmerianum</i> <i>Eriogonum trichopes</i> <i>Eriophyllum pringlei</i> <i>Gutierrezia sarothrae</i>	<i>Thymophylla pentachaeta</i> <i>Yucca brevifolia</i>
Occasional	<i>Escobaria vivipara</i> <i>Gilia cana</i> <i>Krameria erecta</i>	<i>Langloisia setosissima</i> <i>Larrea tridentata</i> <i>Yucca brevifolia</i>
Average Height	2 ft.	
Area	North Range Study Area: 5,084 acres	South Range Study Area: 2,074
Elevation	3,200-6,100 ft. MSL	
Average Foliar Cover	11%	

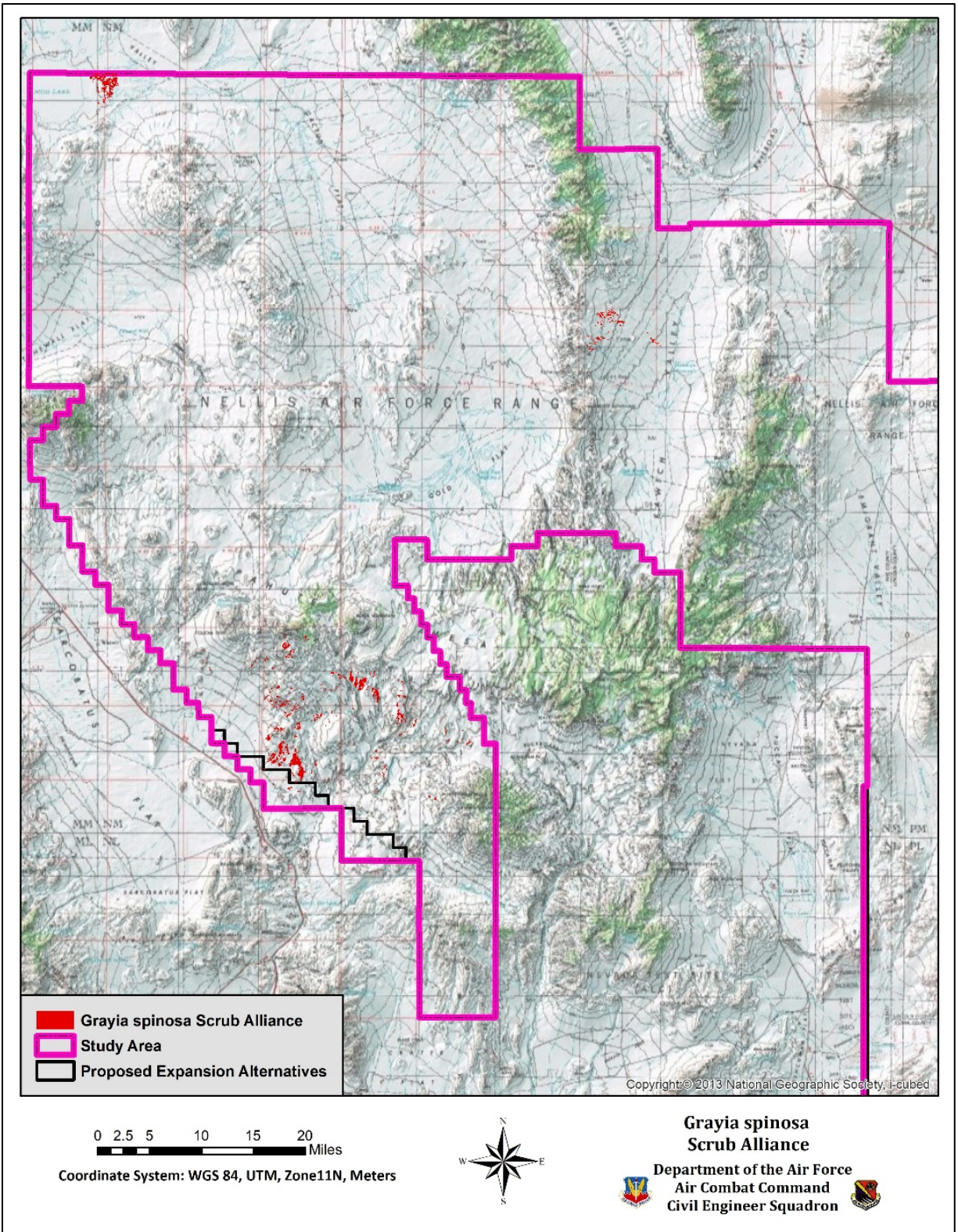


Figure 59. Location of *Grayia spinosa* Shrubland Alliance on the North Range Study Area.

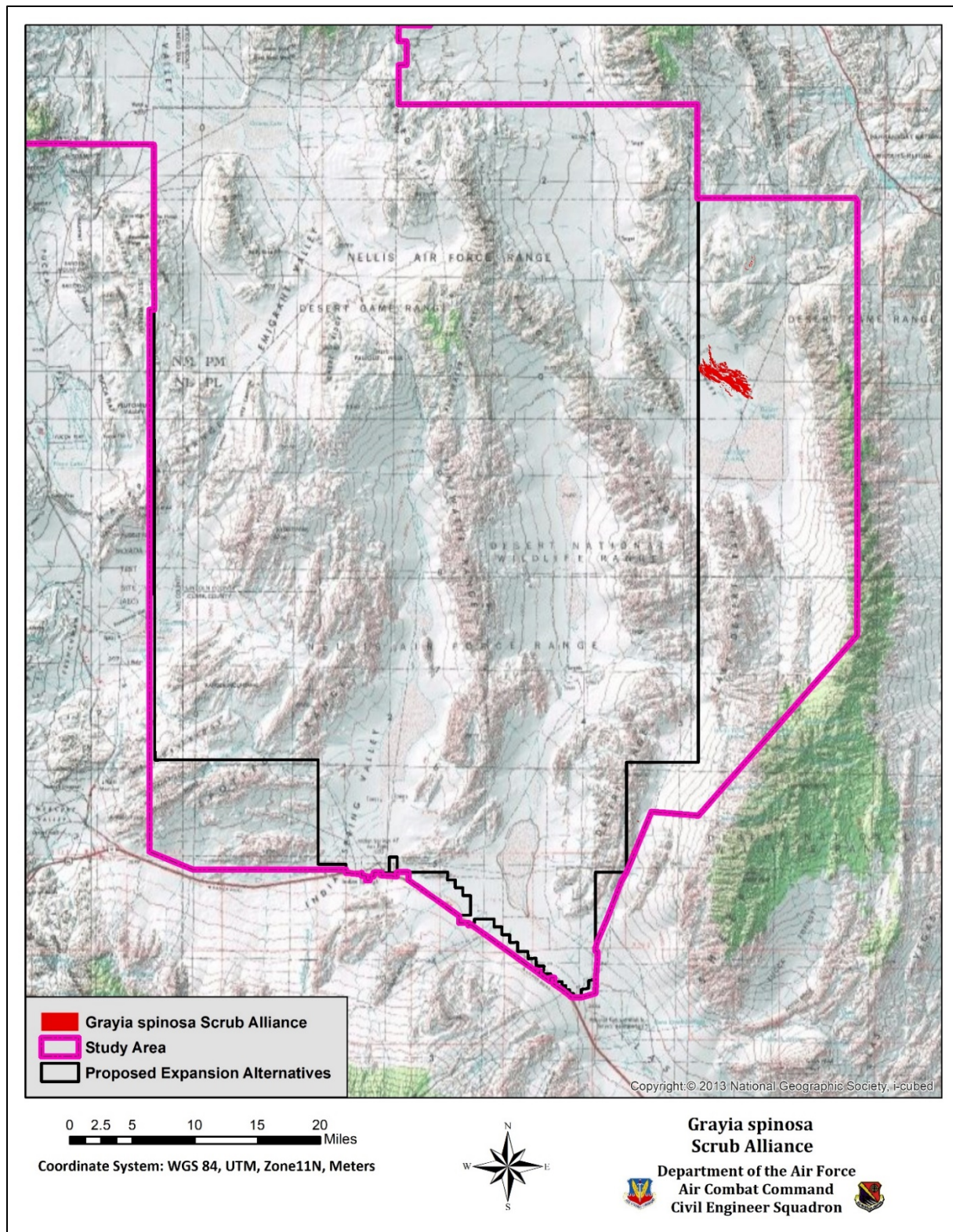


Figure 60. Location of *Grayia spinosa* Shrubland Alliance on the South Range Study Area.

G303 INTERMOUNTAIN TALL SAGEBRUSH STEPPE & SHRUBLAND

A3198 *Artemisia tridentata* - Mixed Shrub Dry Steppe & Shrubland Alliance

Artemisia tridentata - Mixed Shrub Dry Steppe & Shrubland Alliance is a broadly distributed alliance found in the western U.S. in the Great Basin. On the study areas, Pritchett and Smith called this alliance the *Artemisia tridentata* Alliance (Pritchett, D. and F.J. Smith, 2000B). The USNVC placed this alliance in the G303 Intermountain Tall Sagebrush Steppe & Shrubland group. Populations of *Artemisia tridentata* are typically observed in the higher elevations of the North Range Study Area. This alliance has not been observed on the South Range Study Area in surveys conducted thus far. On the study area, the alliance is usually found upgradient of the *Artemisia arbuscula* ssp. *arbuscula* Steppe & Shrubland Alliance and the *Artemisia nova* Steppe & Shrubland Alliance. It has been observed in the foothills of the Kawich and Belted Ranges, Tolicha Peak, Black Mountain, Quartz Peak, Stonewall Mountain, Pahute Mesa, Timber Mountain, and Thirsty Canyon (Figure 61). It has been identified in nearly monoculture stands that eventually intermingle with *Juniperus osteosperma* and *Pinus monophylla*. Species found within this alliance serving as codominants or subdominants include *Ephedra nevadensis*, *Purshia stansburiana*, *Ephedra viridis*, *Menodora spinescens*, *Pinus monophylla*, *Juniperus osteosperma*, and *Chrysothamnus viscidiflorus* (Table 33). Herbaceous species found in this alliance include *Bromus tectorum*, *Achnatherum hymenoides*, and *Pleuraphis jamesii*. Average foliar cover was 16% but was observed to be as high as 60% in valleys like Breen Creek. Brush height averaged 2 ft. but was recorded as high as 3 ft. Grasses tend to dominate the herbaceous strata. The alliance is found at elevations ranging from 3,000 to 7,000 ft. MSL on the study area. This plant community was not identified on the South Range Study Area.



Artemisia tridentata - Mixed Shrub Dry Steppe & Shrubland Alliance

Table 33. List of plant species and characteristics of the *Artemisia tridentata* - Mixed Shrub Dry Steppe & Shrubland Alliance as documented by field surveys on the study area.

Attribute	Detail	
Dominants	<i>Artemisia tridentata</i>	
Subdominants	<i>Ephedra nevadensis</i> <i>Purshia stansburiana</i> <i>Ephedra viridis</i> <i>Menodora spinescens</i>	<i>Gutierrezia sarothrae</i> <i>Pinus monophylla</i> <i>Juniperus osteosperma</i> <i>Chrysothamnus viscidiflorus</i>
Common	<i>Acamptopappus shockleyi</i> <i>Achnatherum hymenoides</i> <i>Achnatherum speciosum</i> <i>Amsinckia tessellata</i> <i>Aristida purpurea</i> <i>Atriplex canescens</i> <i>Atriplex confertifolia</i> <i>Bromus tectorum</i> <i>Chrysothamnus greenei</i> <i>Cylindropuntia echinocarpa</i> <i>Descurainia pinnata</i>	<i>Eriogonum ovalifolium</i> <i>Eriogonum wrightii</i> <i>Grayia spinosa</i> <i>Gutierrezia microcephala</i> <i>Halogeton glomeratus</i> <i>Hymenoclea salsola</i> <i>Krascheninnikovia lanata</i> <i>Lycium andersonii</i> <i>Phacelia crenulata</i> <i>Phacelia fremontii</i> <i>Picrothamnus desertorum</i>

Attribute	Detail	
	<i>Encelia virginensis</i> <i>Ericameria cooperi</i> <i>Ericameria nana</i> <i>Ericameria nauseosa</i> <i>Ericameria teretifolia</i> <i>Eriogonum caespitosum</i> <i>Eriogonum fasciculatum</i> <i>Eriogonum inflatum</i> <i>Eriogonum microthecum</i>	<i>Pleuraphis jamesii</i> <i>Poa secunda</i> <i>Purshia tridentata</i> <i>Salsola tragus</i> <i>Sphaeralcea ambigua</i> <i>Sporobolus cryptandrus</i> <i>Stanleya pinnata</i> <i>Tetradymia glabrata</i> <i>Yucca brevifolia</i>
Occasional	<i>Amaranthus fimbriatus</i> <i>Arenaria kingii</i> <i>Artemisia arbuscula</i> <i>Astragalus lentiginosus</i> <i>Atriplex parryi</i> <i>Bassia americana</i> <i>Bouteloua gracilis</i> <i>Bromus madritensis ssp. rubens</i> <i>Chamaesyce albomarginata</i> <i>Coleogyne ramosissima</i> <i>Cylindropuntia acanthocarpa</i> <i>Dasyochloa pulchella</i> <i>Echinocereus coccineus</i> <i>Echinocereus engelmannii</i> <i>Elymus elymoides</i> <i>Ericameria cooperi</i> <i>Ericameria nauseosa</i> <i>Erigeron aphanactis</i> <i>Eriogonum anemophilum</i> <i>Eriogonum heermannii</i>	<i>Eriogonum nidularium</i> <i>Escobaria vivipara</i> <i>Festuca idahoensis</i> <i>Hesperostipa comata</i> <i>Krameria erecta</i> <i>Linanthus pungens</i> <i>Linum lewisii</i> <i>Lycium cooperi</i> <i>Mentzelia albicaulis</i> <i>Opuntia basilaris</i> <i>Opuntia polyacantha var. erinacea</i> <i>Philadelphus microphyllus</i> <i>Poa fendleriana</i> <i>Prunus fasciculata</i> <i>Rhus aromatica</i> <i>Sarcobatus baileyi</i> <i>Sclerocactus polyancistrus</i> <i>Sphaeralcea ambigua</i> <i>Tetradymia glabrata</i> <i>Yucca elata</i>
Average Height	2 ft.	
Area	North Range Study Area: 234,192acres	South Range Study Area: 0 acres
Elevation	3,000-7,000 ft. MSL	
Average Foliar Cover	16%	

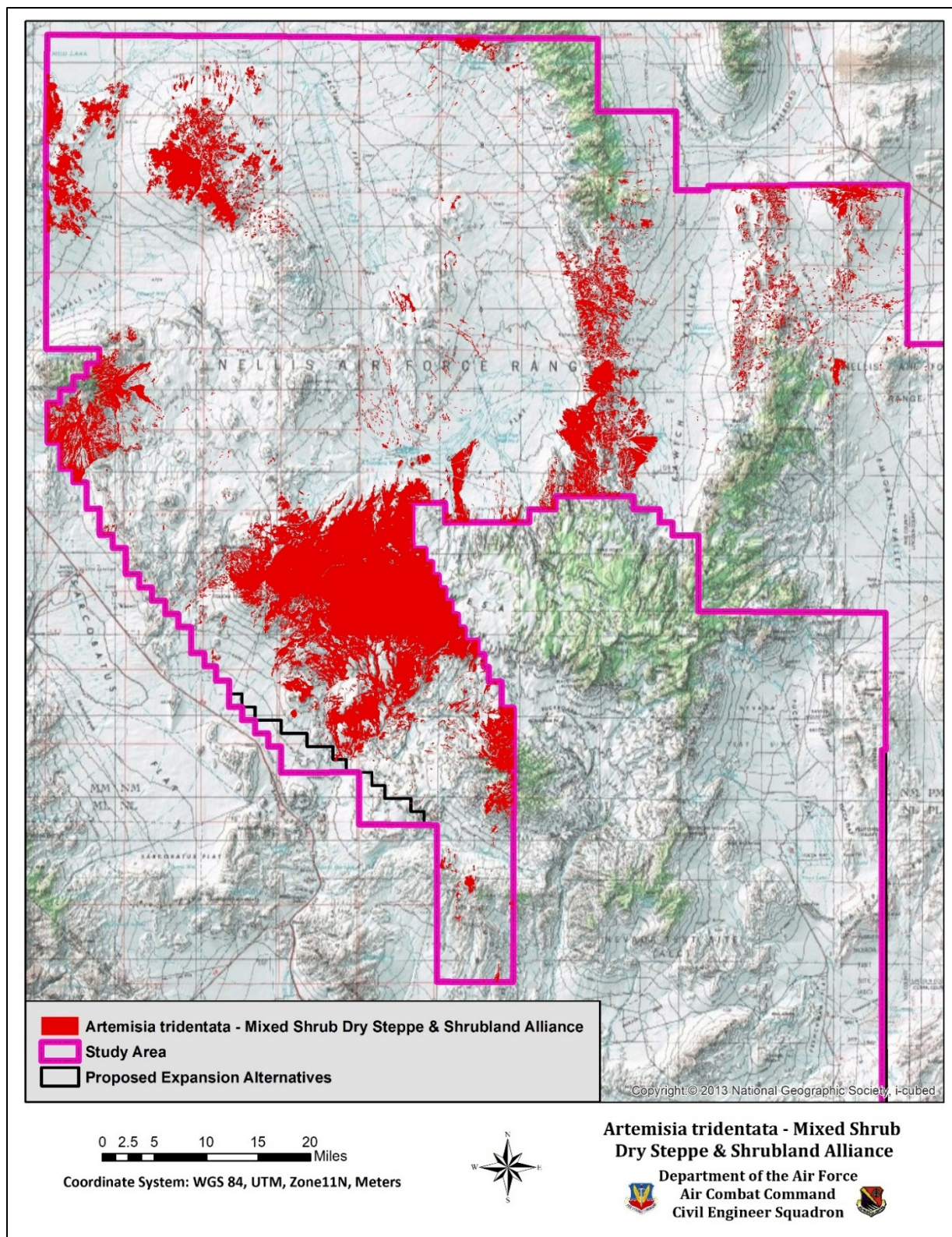


Figure 61. Location of *Artemisia tridentata* - Mixed Shrub Dry Steppe & Shrubland Alliance on the North Range Study Area.

A3219 *Artemisia arbuscula* ssp. *arbuscula* Steppe & Shrubland Alliance

Artemisia arbuscula ssp. *arbuscula* Steppe & Shrubland Alliance is common on the North Range Study Area and scattered on the South Range Study Area at elevations of 3,500 to 7,100 ft. MSL (Figures 62 and 63). The alliance is a member of the G308 Intermountain Low and Black Sagebrush Steppe and Shrubland. *Artemisia arbuscula* dominates the shrub layer with perennial grasses dominating the herbaceous layer. Stands typically occur in soils that are shallow, rocky clays and have poor drainage (USNVC, 2016). The Alliance is prevalent on the North Range Study Area, especially on the foothills



Artemisia arbuscula ssp. *arbuscula* Steppe & Shrubland Alliance

and basins in and around the Kawich and Belted Ranges and in Pahute Mesa, south of Stonewall Mountain. It is also found in higher elevations of mountains and foothills of the South Range Study Area, especially the Desert Range, Sheep Range, and Spotted Range. Grass species dominating the herbaceous strata in this alliance include *Pleuraphis jamesii* and *Achnatherum hymenoides*. Subdominants in this alliance include *Ephedra nevadensis* and *Ephedra viridis* (Table 34). Common associated shrubs include *Gutierrezia microcephala*, *Juniperus osteosperma*, and *Grayia spinosa*. The alliance may also have stands of *Artemisia tridentata* or *Artemisia nova*. On average, foliar cover is 16%, with the actual cover being dependent on the soil, slope, and rock cover. Brush height of the plant community averaged about 1.5 ft. with grasses ranging in height from 0.5-1 ft. *Artemisia arbuscula* rarely exceeded 1.5 ft. in height. This alliance usually is bounded upgradient by plant communities dominated by *Artemisia tridentata*, *Pinus monophylla*, and *Juniperus osteosperma* and down gradient by mixed scrub plant communities dominated by *Picrothamnus desertorum*.

Table 34. List of plant species and characteristics of the *Artemisia arbuscula* ssp. *arbuscula* Steppe & Shrubland Alliance as documented by field surveys on the study area.

Attribute	Detail	
Dominants	<i>Artemisia arbuscula</i>	
Subdominants	<i>Ephedra nevadensis</i>	<i>Ephedra viridis</i>
Common	<i>Acamptopappus shockleyi</i> <i>Achnatherum hymenoides</i> <i>Agave utahensis</i> var. <i>eborispina</i> <i>Arenaria kingii</i> <i>Aristida purpurea</i> <i>Artemisia ludoviciana</i> <i>Astragalus lentiginosus</i> <i>Atriplex canescens</i> <i>Atriplex confertifolia</i> <i>Atriplex spinifera</i> <i>Bassia americana</i> <i>Bouteloua gracilis</i> <i>Brickellia atractyloides</i>	<i>Eucnide urens</i> <i>Fallugia paradoxa</i> <i>Grayia spinosa</i> <i>Gutierrezia microcephala</i> <i>Halogeton glomeratus</i> <i>Hecastocleis shockleyi</i> <i>Hesperostipa comata</i> <i>Juniperus osteosperma</i> <i>Krascheninnikovia lanata</i> <i>Lappula occidentalis</i> <i>Lepidium fremontii</i> <i>Menodora spinescens</i> <i>Nicotiana obtusifolia</i>

Attribute	Detail	
	<i>Bromus madritensis</i> ssp. <i>rubens</i> <i>Bromus tectorum</i> <i>Buddleja utahensis</i> <i>Chrysothamnus greenei</i> <i>Chrysothamnus viscidiflorus</i> <i>Dasyochloa pulchella</i> <i>Echinocactus polycephalus</i> <i>Echinocereus engelmannii</i> <i>Ericameria nana</i> <i>Eriogonum anemophilum</i> <i>Eriogonum caespitosum</i> <i>Eriogonum heermannii</i> <i>Eriogonum ovalifolium</i>	<i>Opuntia polyacantha</i> <i>Peucephyllum schottii</i> <i>Picrothamnus desertorum</i> <i>Pinus monophylla</i> <i>Pleuraphis jamesii</i> <i>Psorothamnus fremontii</i> <i>Psorothamnus polydenius</i> <i>Sarcobatus vermiculatus</i> <i>Sphaeralcea ambigua</i> <i>Stipa speciosa</i> <i>Suaeda moquinii</i> <i>Tetradymia glabrata</i> <i>Xylorhiza tortifolia</i> <i>Yucca brevifolia</i>
Occasional	<i>Achnatherum speciosum</i> <i>Arenaria kingii</i> <i>Astragalus purshii</i> <i>Atriplex parryi</i> <i>Bassia californica</i> <i>Castilleja angustifolia</i> <i>Caulanthus crassicaulis</i> <i>Chaetopappa ericoides</i> <i>Cylindropuntia echinocarpa</i> <i>Descurainia pinnata</i> <i>Echinocereus coccineus</i> <i>Elymus elymoides</i> <i>Ericameria nauseosa</i> <i>Eriogonum microthecum</i> <i>Eriogonum nidularium</i> <i>Eriogonum umbellatum</i> <i>Erodium cicutarium</i> <i>Escobaria vivipara</i> <i>Grusonia pulchella</i> <i>Hymenoclea salsola</i>	<i>Larrea tridentata</i> <i>Linanthus pungens</i> <i>Linum lewisii</i> <i>Lycium andersonii</i> <i>Machaeranthera canescens</i> <i>Oenothera caespitosa</i> <i>Opuntia polyacantha</i> var. <i>erinacea</i> <i>Pediocactus simpsonii</i> <i>Phacelia viscida</i> <i>Poa fendleriana</i> <i>Poa secunda</i> <i>Purshia stansburiana</i> <i>Salsola tragus</i> <i>Sarcobatus baileyi</i> <i>Sporobolus cryptandrus</i> <i>Stanleya pinnata</i> <i>Stipa shoshoneana</i> <i>Yucca elata</i> <i>Yucca baccata</i>
Average Height	1.5 ft.	
Area	North Range Study Area: 192,656 acres	South Range Study Area: 13,455 acres
Elevation	3,500-7,100 ft. MSL	
Average Foliar Cover	16%	

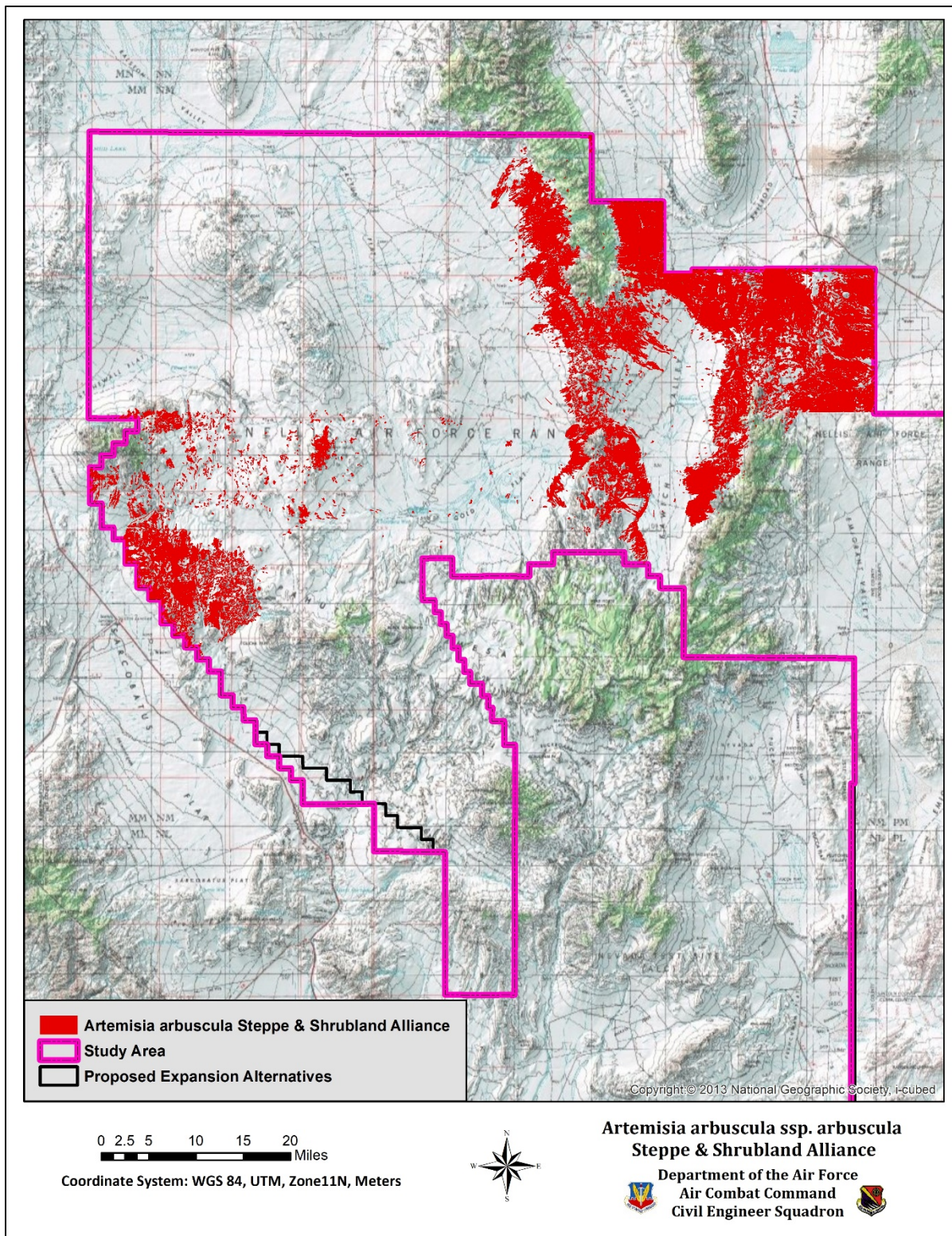


Figure 62. Location of *Artemisia arbuscula* ssp. *arbuscula* Steppe & Shrubland Alliance on the North Range Study Area.

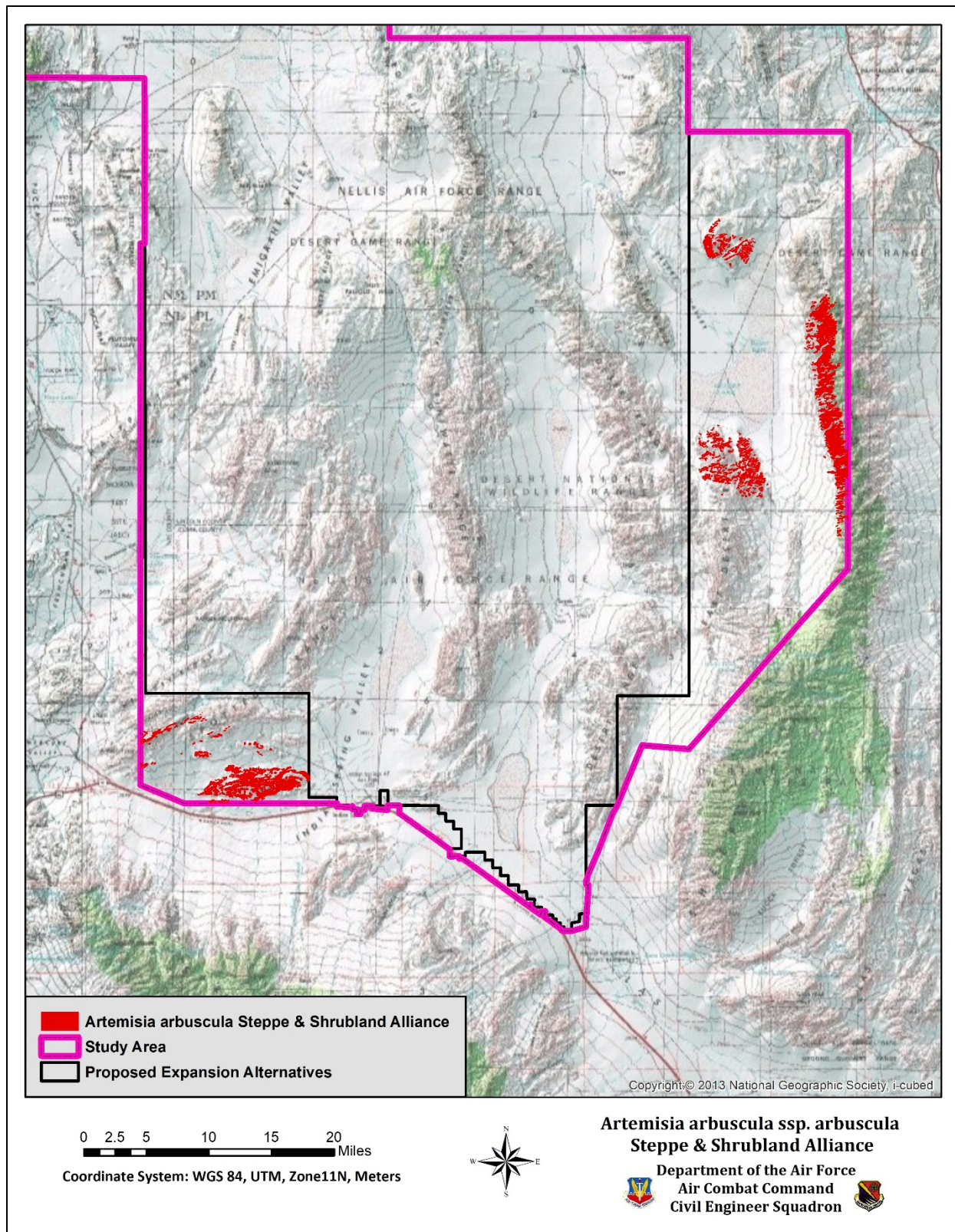


Figure 63. Location of *Artemisia arbuscula ssp. arbuscula* Steppe & Shrubland Alliance on the South Range Study Area.

A3222 *Artemisia nova* Steppe & Shrubland Alliance

The *Artemisia nova* Steppe & Shrubland Alliance occurs at elevations ranging from 3,200 to 7,400 ft. MSL on the foothills of the Cactus Range, Yucca Mountain, and Kawich Range in the North Range Study Area and the Spotted Range and Desert Range in the South Range Study Area (Figures 64 and 65). This plant alliance was classified as the *Artemisia nova* alliance by Pritchett and Smith (Pritchett, D. and F.J. Smith, 2000B). According to the USNVC, the alliance is a member of the G308 Intermountain Low & Black Sagebrush Steppe & Shrubland. The alliance is usually associated



Artemisia nova Steppe & Shrubland Alliance

with typically young, shallow, coarse-textured soils derived from calcareous parent materials, but also occurs on deeper soils on well-drained slopes and ridges (USNVC, 2016), especially on the North Range Study Area. This alliance, especially on the study area, is characterized by the dominance of the dwarf-shrub *Artemisia nova* with no codominants or subdominants. Common shrub species that occur in stands of this alliance include *Chrysothamnus viscidiflorus*, *Atriplex confertifolia*, *Artemisia tridentata*, *Artemisia arbuscula*, *Menodora spinescens*, and *Gutierrezia sarothrae* (Table 35). The herbaceous stratum is usually dominated by *Pleuraphis jamesii* and *Achnatherum hymenoides*. On average, foliar cover averaged 18% with a highest level of 50%, apparently dependent on the soil, slope, and rock cover. Brush height averaged 1.5 ft. with grasses reaching a height of 1 ft. in this alliance.

Table 35. List of plant species and characteristics of the *Artemisia nova* Steppe & Shrubland Alliance as documented by field surveys on the study area.

Attribute	Detail	
Dominants	<i>Artemisia nova</i>	
Subdominants	None	
Common	<i>Acamptopappus shockleyi</i> <i>Achnatherum hymenoides</i> <i>Achnatherum speciosum</i> <i>Agave utahensis</i> var. <i>eborispina</i> <i>Arenaria kingii</i> <i>Artemisia arbuscula</i> <i>Artemisia tridentata</i> <i>Atriplex canescens</i> <i>Atriplex confertifolia</i> <i>Bassia americana</i> <i>Bouteloua gracilis</i> <i>Bromus madritensis</i> ssp. <i>rubens</i> <i>Bromus tectorum</i> <i>Chaetopappa ericoides</i> <i>Chrysothamnus Greenei</i> <i>Chrysothamnus viscidiflorus</i> <i>Coleogyne ramosissima</i> <i>Cylindropuntia echinocarpa</i> <i>Ephedra nevadensis</i> <i>Ephedra torreyana</i> <i>Ephedra viridis</i> <i>Ericameria nana</i>	<i>Ericameria nauseosa</i> <i>Eriogonum heermannii</i> <i>Eriogonum microthecum</i> <i>Eriogonum ovalifolium</i> <i>Fallugia paradoxa</i> <i>Gutierrezia microcephala</i> <i>Gutierrezia sarothrae</i> <i>Halogeton glomeratus</i> <i>Hecastocleis shockleyi</i> <i>Juniperus osteosperma</i> <i>Krameria erecta</i> <i>Krascheninnikovia lanata</i> <i>Menodora spinescens</i> <i>Picrothamnus desertorum</i> <i>Pleuraphis jamesii</i> <i>Stanleya pinnata</i> <i>Tetradymia glabrata</i> <i>Thamnosma montana</i> <i>Xylorhiza tortifolia</i> <i>Yucca brevifolia</i> <i>Yucca schidigera</i>
Occasional	<i>Aristida purpurea</i>	<i>Machaeranthera canescens</i>

Attribute	Detail	
	<i>Astragalus lentiginosus</i> <i>Caulanthus crassicaulis</i> <i>Dasyochloa pulchella</i> <i>Echinocereus engelmannii</i> <i>Elymus elymoides</i> <i>Ephedra nevadensis</i> <i>Ericameria teretifolia</i> <i>Eriogonum anemophilum</i> <i>Eriogonum fasciculatum</i> <i>Eriogonum inflatum</i> <i>Glossopetalon spinescens</i> <i>Grayia spinosa</i> <i>Linanthus pungens</i>	<i>Opuntia polyacantha</i> var. <i>erinacea</i> <i>Phlox condensata</i> <i>Pinus monophylla</i> <i>Poa fendleriana</i> <i>Poa secunda</i> <i>Purshia stansburiana</i> <i>Purshia tridentata</i> <i>Sarcobatus baileyi</i> <i>Sphaeralcea ambigua</i> <i>Stanleya elata</i> <i>Stephanomeria exigua</i> <i>Tetradymia spinosa</i>
Average Height	1.5 ft.	
Area	North Range Study Area: 68,753 acres	South Range Study Area: 7,207 acres
Elevation	3,200-7,400 ft. MSL	
Average Foliar Cover	18%	

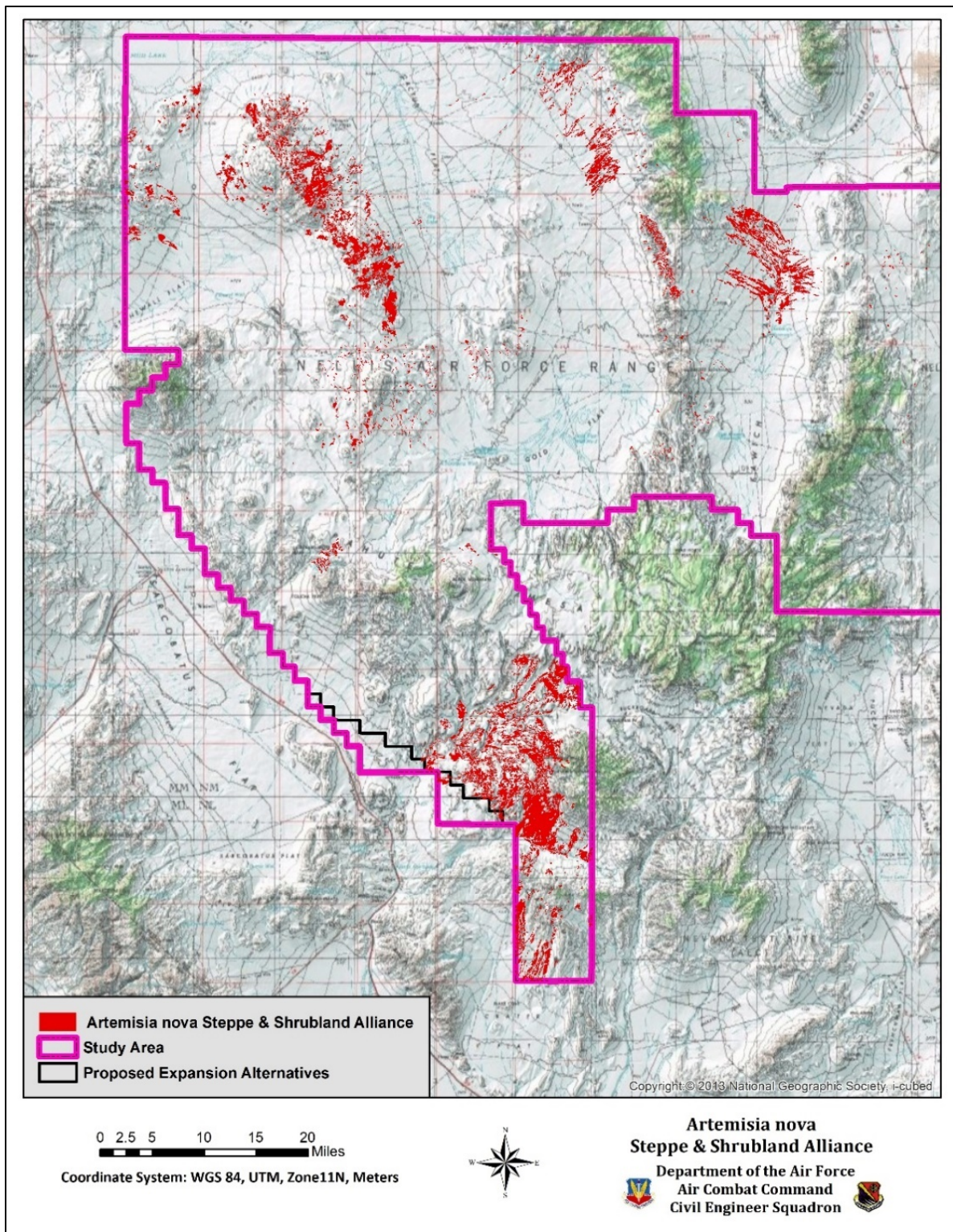


Figure 64. Location of *Artemisia nova* Steppe & Shrubland Alliance on the North Range Study Area.

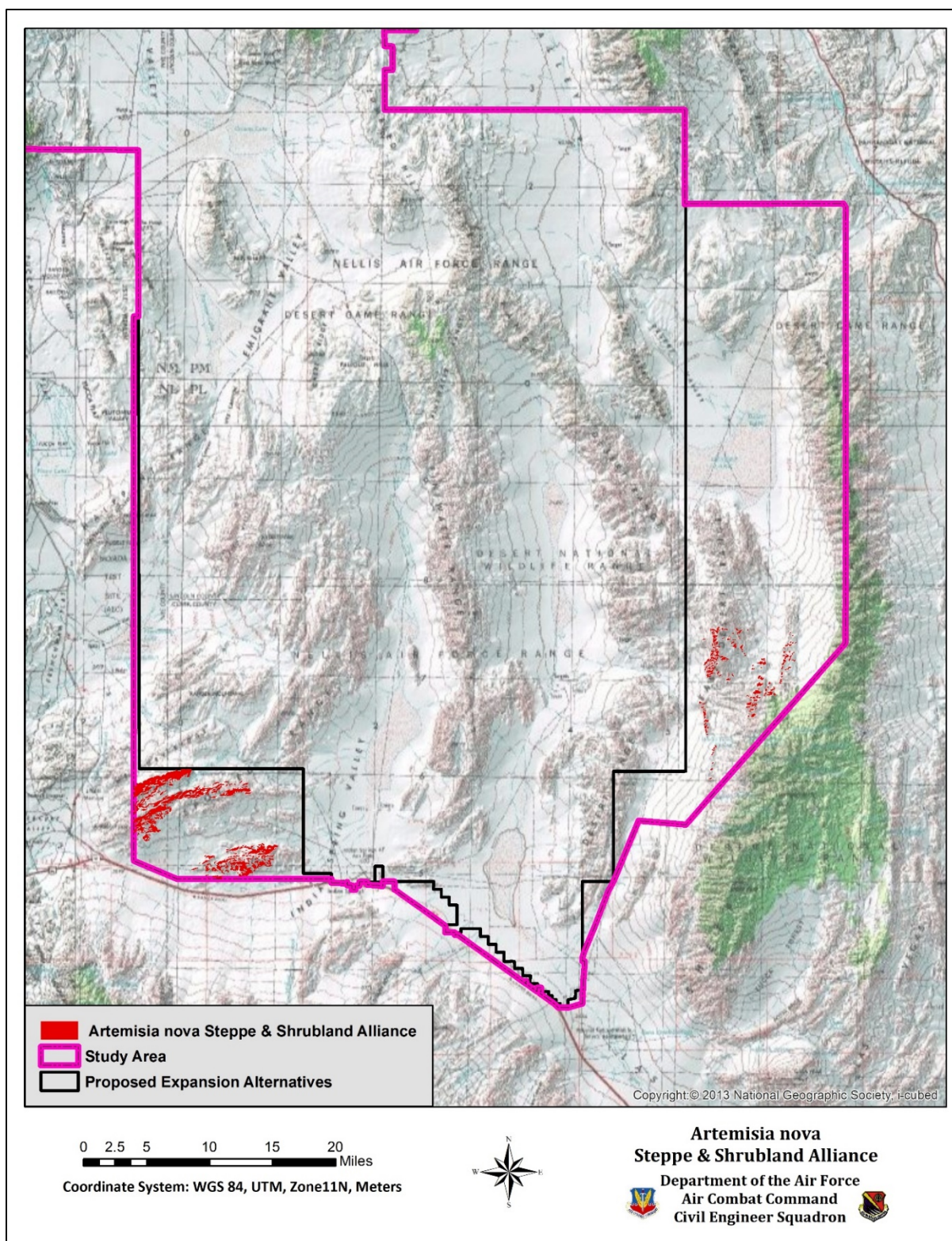


Figure 65. Location of *Artemisia nova* Steppe & Shrubland Alliance on the South Range Study Area.

A2572 *Ephedra torreyana* Shrubland Alliance

The *Ephedra torreyana* Shrubland Alliance is a member of the G312 Colorado Plateau Blackbrush – Mormon Tea Shrubland Group. The alliance has not been officially identified in Nevada, but is considered a potential location for the alliance to occur (USNVC, 2016). Stands tend to be open and can range from steppe to shrublands with <10% to 75% foliar cover. This alliance was not found on the North Range Study Area. It was mostly observed on mountain slopes and bajadas of the Desert and Pintwater Ranges on the South Range Study Area (Figure 66). Additionally, it was identified in the upper bajadas of Three Lake Valley and Indian Spring Valley. At lower elevations near playas, significant populations of *Ephedra trifurca* were identified, which is known from California and Arizona, but not Nevada. The species had the diagnostic thorn-like terminal bud of *Ephedra trifurca*. The species could be a hybrid between *Ephedra torreyana* and *Ephedra trifurca* (*Ephedra torreyana* x *intermixta*), which has been documented to occur and has the thorn-like terminal bud (Flora of North America, 2016). Until further surveys can document the presence of *Ephedra trifurca* it will be placed in this alliance for this report. On the study area, this plant alliance is dominated by *Ephedra torreyana* or *Ephedra torreyana* x *intermixta*, with the most common subdominant being *Atriplex confertifolia* (Table 36). Other subdominant species include *Atriplex confertifolia*, *Larrea tridentata*, *Ambrosia dumosa*, *Lepidium fremontii*, *Lycium andersonii*, *Menodora spinescens*, *Krameria erecta*, and *Sphaeralcea ambigua*. The alliance typically supports about 8% foliar cover with the plants being an average of 2 ft. tall.



Ephedra torreyana Shrubland Alliance

Table 36. List of plant species and characteristics of the *Ephedra torreyana* Shrubland Alliance

Attribute	Detail	
Dominants	<i>Ephedra torreyana</i>	
Subdominants	<i>Atriplex confertifolia</i> <i>Larrea tridentata</i> <i>Ambrosia dumosa</i> <i>Lepidium fremontii</i>	<i>Lycium andersonii</i> <i>Menodora spinescens</i> <i>Krameria erecta</i>
Common	<i>Acamptopappus shockleyi</i> <i>Achnatherum hymenoides</i> <i>Allionia incarnata</i> <i>Amsonia tomentosa</i> <i>Artemisia nova</i> <i>Astragalus amphioxys</i> var. <i>musimonum</i> <i>Atchoseris platyphylla</i> <i>Baileya multiradiata</i> <i>Bromus madritensis</i> ssp. <i>rubens</i> <i>Camissonia brevipes</i> <i>Chaenactis stevioides</i> <i>Cryptantha confertiflora</i> <i>Cymopterus gilmanii</i> <i>Dasyochloa pulchella</i> <i>Echinocactus polycephalus</i> <i>Echinocereus engelmannii</i> <i>Encelia farinosa</i>	<i>Hymenoclea salsola</i> <i>Krameria erecta</i> <i>Krameria grayi</i> <i>Krascheninnikovia lanata</i> <i>Langloisia setosissima</i> <i>Larrea tridentata</i> <i>Lepidium fremontii</i> <i>Linanthus parryae</i> <i>Menodora spinescens</i> <i>Mirabilis laevis</i> <i>Monoptilon bellidiforme</i> <i>Nama demissum</i> <i>Nama hispidum</i> <i>Oenothera</i> <i>Opuntia basilaris</i> <i>Phacelia fremontii</i> <i>Pleiacanthus spinosus</i>

Attribute	Detail	
	<i>Encelia virginensis</i> <i>Eriogonum concinnum</i> <i>Eriogonum darrovii</i> <i>Eriogonum inflatum</i> <i>Escobaria vivipara</i> var. <i>rosea</i> <i>Escobaria vivipara</i> <i>Gutierrezia sarothrae</i>	<i>Psoralea argemone</i> <i>Salvia dorrii</i> <i>Sphaeralcea ambigua</i> <i>Stipa speciosa</i> <i>Thamnosma montana</i> <i>Xylorhiza tortifolia</i> <i>Yucca schidigera</i>
Height	2 ft.	
Area	North Range Study Area: 0 acres	South Range Study Area: 2,784 acres
Elevation	3,000-5,100 ft. MSL	
Foliar Cover	8%	

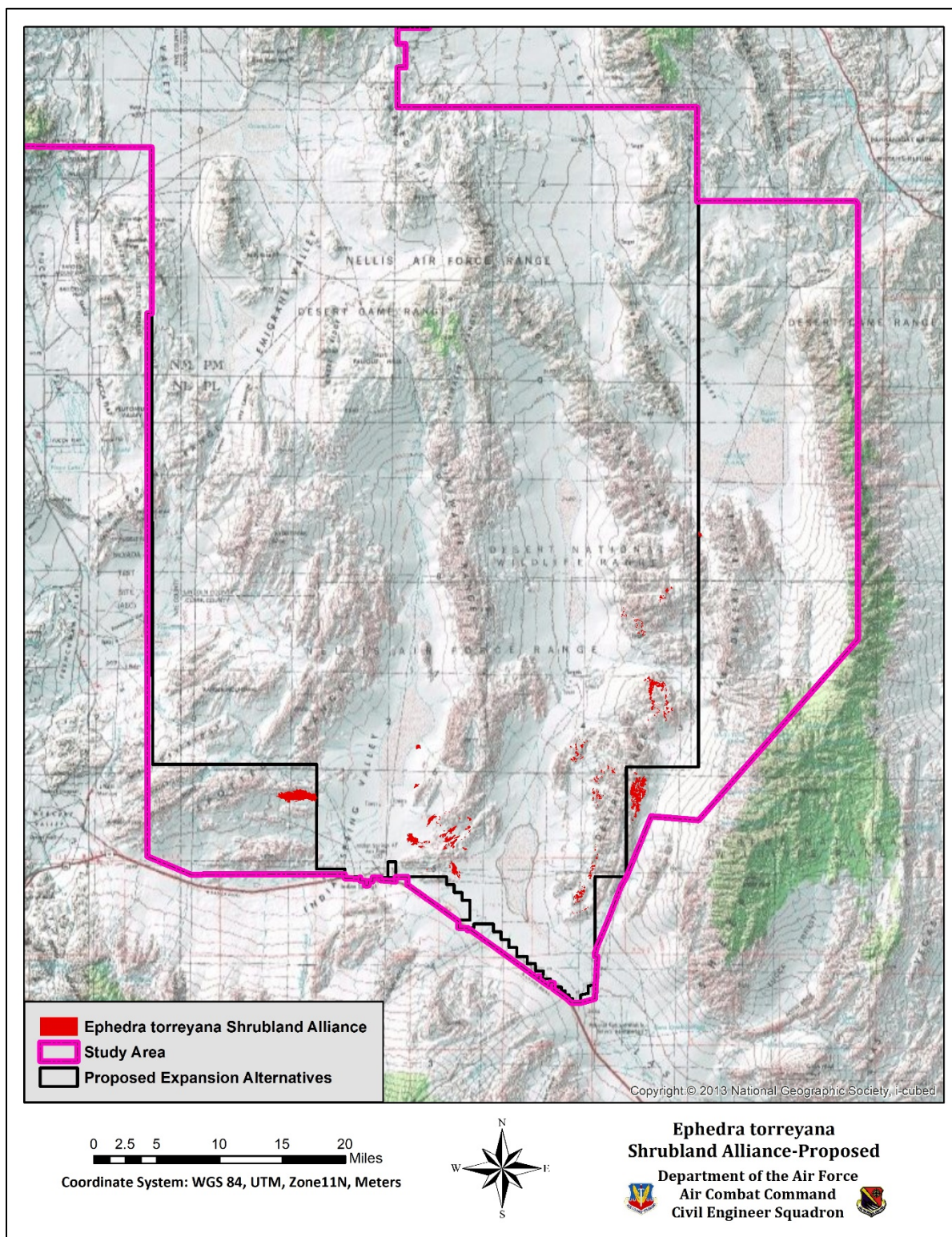


Figure 66. Location of *Ephedra torreyana* Shrubland Alliance on the South Range Study Area.

A1046 *Sarcobatus vermiculatus* Intermountain Wet Shrubland Alliance

“This widespread shrubland alliance occurs on lowland sites in plains, mountain valleys, and intermountain basins throughout the arid and semi-arid western United States. Sites are generally flat, poorly drained and intermittently flooded with a shallow water table, such as alkali flats around playas and floodplains along stream channels” (Peterson, 2008; USNVC, 2016). This alliance is a member of the G537 North American Desert Alkaline-Saline Wet Scrub group. Across Nevada, this alliance is dominated by *Sarcobatus vermiculatus*. While the *Sarcobatus baileyi* Shrubland Alliance occurs on upland areas, this alliance is found in



Sarcobatus vermiculatus Intermountain Wet Shrubland Alliance

washes and low areas with moisture from water tables within reach of the plant roots. Other shrub co-dominants included in the USNVC description are *Picrothamnus desertorum*, *Atriplex confertifolia*, *Atriplex canescens*, *Chrysothamnus* spp., or *Grayia spinosa* (Peterson, 2008). On the North Range Study Area, the species typically is the only dominant with *Krascheninnikovia lanata* or *Tetradymia glabrata* as subdominants (Table 37). It is found in Stonewall Flats and the western slopes of the Cactus Range on the North Range Study Area (Figure 67). This alliance is not found on the South Range Study Area. Brush height can be as low as 1 ft. but averages 2 ft. with an average foliar cover of 9.5%. The alliance is found at elevations ranging from 3,900 to 5,800 ft. MSL.

Table 37. List of plant species and characteristics of the *Sarcobatus vermiculatus* Intermountain Wet Shrubland Alliance

Attribute	Detail	
Dominants	<i>Sarcobatus vermiculatus</i>	
Subdominants	<i>Krascheninnikovia lanata</i>	<i>Tetradymia glabrata</i>
Common	<i>Achnatherum speciosum</i> <i>Artemisia nova</i> <i>Atriplex canescens</i> <i>Atriplex confertifolia</i> <i>Baileya pleniradiata</i> <i>Bassia americana</i> <i>Chaenactis stevioides</i> <i>Descurainia pinnata</i> <i>Ephedra nevadensis</i> <i>Ericameria nauseosa</i> <i>Eriogonum inflatum</i> <i>Halogeton glomeratus</i>	<i>Hymenoclea salsola</i> <i>Lepidium fremontii</i> <i>Picrothamnus desertorum</i> <i>Pleuraphis jamesii</i> <i>Salsola tragus</i> <i>Sphaeralcea ambigua</i> <i>Sporobolus cryptandrus</i> <i>Stanleya pinnata</i> <i>Suaeda moquinii</i> <i>Tetradymia glabrata</i> <i>Yucca brevifolia</i>
Occasional	<i>Achnatherum hymenoides</i> <i>Amsinckia tessellata</i> <i>Bromus madritensis ssp. rubens</i> <i>Camissonia boothii</i> <i>Ericameria cooperi</i> <i>Eriophyllum pringlei</i> <i>Gilia cana</i> <i>Grayia spinosa</i> <i>Gutierrezia microcephala</i>	<i>Langloisia setosissima</i> <i>Lepidium nitidum</i> <i>Lycium andersonii</i> <i>Menodora spinescens</i> <i>Monoptilon bellidiforme</i> <i>Opuntia polyacantha var. erinacea</i> <i>Phacelia fremontii</i> <i>Stanleya elata</i> <i>Tetradymia axillaris</i>

Attribute	Detail	
Average Height	2 ft.	
Area	North Range Study Area: 20,665 acres	South Range Study Area: 0 acres
Elevation	3,900-5,800 ft. MSL	
Average Foliar Cover	9.5%	

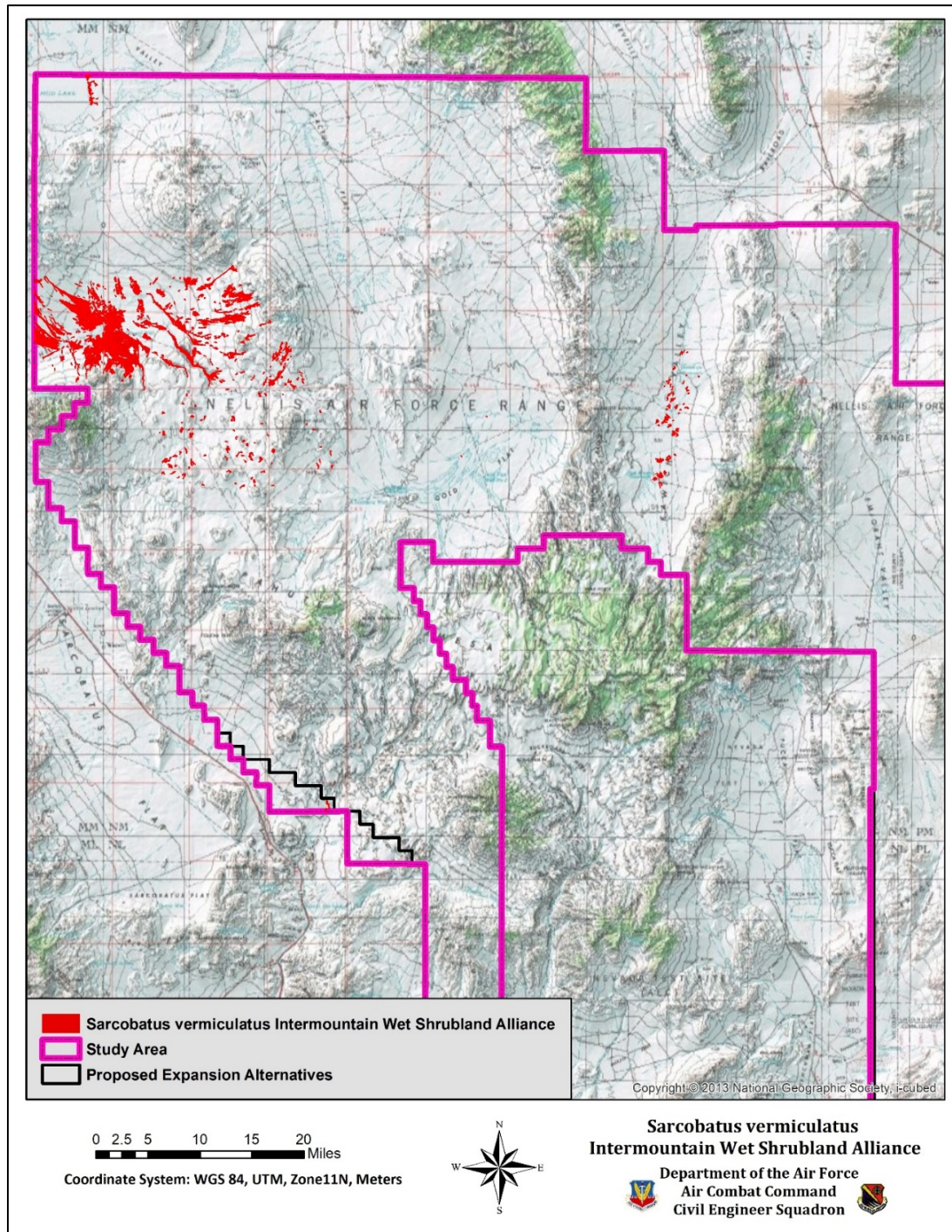


Figure 67. Location of the *Sarcobatus vermiculatus* Intermountain Wet Shrubland Alliance on the North Range Study Area.

A3880 Mojave Seablite - Red Swampfire Alkaline Wet Scrub Alliance

CEGL001991 *Suaeda moquinii* Wet Shrubland

The *Suaeda moquinii* Wet Shrubland association occurs in desert basins or playas in Nevada, Arizona, and southern and eastern California (Peterson, 2008; USNVC, 2016). This association is in A3880 Mojave Seablite - Red Swampfire Alkaline Wet Scrub Alliance which is a member of G537 North American Desert Alkaline-Saline Wet Scrub group. The association has only been identified on the South Range Study Area and usually along the periphery of playas or in low areas and channels found throughout the dry lake, but may be found on the North



Suaeda moquinii Wet Shrubland

Range Study Area in association with *Sarcobatus vermiculatus* (Figure 68). The shrubland is often a monoculture of *Suaeda moquinii* or a mixture of *Suaeda moquinii* with *Atriplex canescens* as a co-dominant (Table 38). Typically, this plant community occurs in isolated pockets throughout playas and dry lakes. The shrub height averages 1.6 ft. with foliar cover averaging 9%, but can be as high as 35% or low as 1%. The shrubland may be found at elevations of 2,500 to 3,500 ft. MSL on the study area.

Table 38. List of plant species and characteristics of the *Suaeda moquinii* Wet Shrubland

Attribute	Detail	
Dominants	<i>Suaeda moquinii</i>	<i>Atriplex canescens</i>
Common	<i>Amaranthus fimbriatus</i> <i>Amsinckia tessellata</i>	<i>Atriplex argentea</i> <i>Phacelia parishii</i>
Height	1.6 ft.	
Area	North Range Study Area: 0 acres	South Range Study Area: 2,133 acres
Elevation	2,500 – 3,500 ft. MSL	
Foliar Cover	9%	

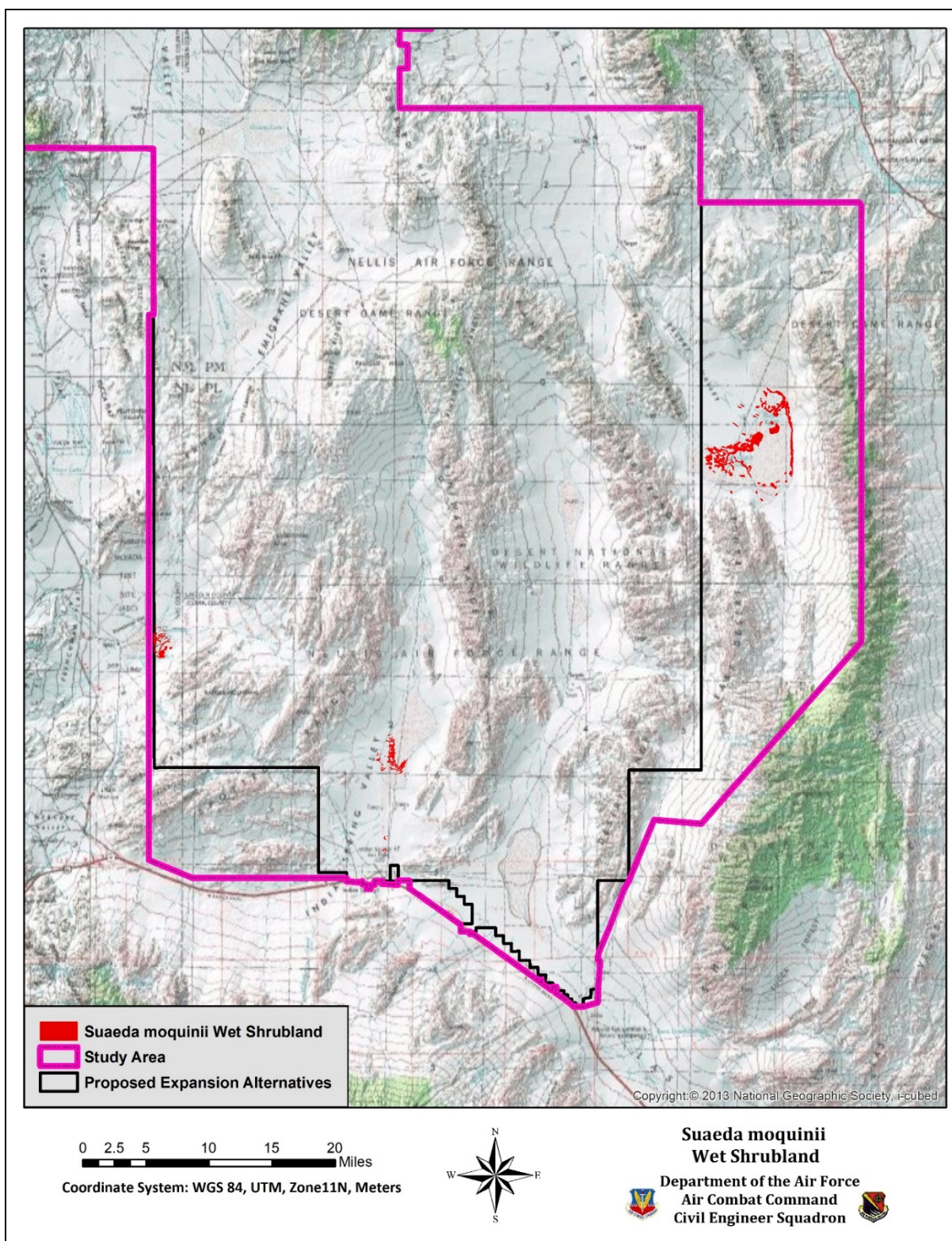


Figure 68. Location of the *Suaeda moquinii* Wet Shrubland on the South Range Study Area.

G569 NORTH AMERICAN WARM SEMI-DESERT CLIFF, SCREE & PAVEMENT SPARSE VEGETATION

G570 INTERMOUNTAIN BASINS CLIFF, SCREE & BADLAND SPARSE VEGETATION

This community includes lands that are considered barren in their natural state. These barren landscapes include bedrock, desert pavement, sand dunes, gravel pits, and badlands (Wildlife Action Plan Team, 2006). According to the Nevada Wildlife Action Plan, vegetation accounts for less than 15% of the total ground cover. On the study area, these mapped areas are usually devoid of vegetation.



Badlands typically found on the South Range Study Area

On the South Range Study Area, this plant community group includes desert pavement, badlands, gypsiferous soils, sand dunes, volcanic talus, and bedrock surfaces on mountain cliffs and slopes (Figure 69). Because of the variability in the composition of this feature, it was classed as G569 North American Warm Semi-Desert Cliff, Scree & Pavement Sparse Vegetation (USNVC, 2016), which is found across the Mojave Desert. Geology for this group is highly variable and includes sedimentary, igneous, and metamorphic rocks. Desert pavement on the study area is usually devoid of vegetation except in the washes that often dissect the pavement and support healthy, diverse populations of plants often including *Ambrosia dumosa*, *Lycium andersonii*, *Atriplex confertifolia*, *Atriplex canescens*, and *Gutierrezia microcephala*. Badlands rarely support plant communities, but may have scattered populations of some brush species including *Larrea tridentata* and *Atriplex canescens*.

On the North Range Study Area, this plant community is a member of G570 Intermountain Basins Cliff, Scree & Badland Sparse Vegetation group (Figure 70). The group is mostly comprised of vegetated cliffs, sand dunes, volcanic talus, and bedrock surfaces. According to the USNVC, common plants in this group include *Artemisia tridentata*, *Atriplex canescens*, *Atriplex confertifolia*, *Eriogonum corymbosum*, *Eriogonum heermannii*, *Eriogonum ovalifolium*, *Fallugia paradoxa*, *Grayia spinosa*, *Purshia tridentata*, *Salvia dorrii*, and *Sarcobatus vermiculatus* (USNVC, 2016). However, field observations on the North and South Range study areas indicated that both groups supported sparse populations of *Ambrosia dumosa*, *Larrea tridentata*, *Atriplex confertifolia*, *Opuntia basilaris*, *Yucca schidigera*, and *Atriplex canescens* (Table 39). On both groups, foliar cover averaged 0-1% with plant heights usually under 1 ft.

Table 39. List of plant species and characteristics of North American Warm Semi-Desert Cliff, Scree & Pavement Sparse Vegetation and Intermountain Basins Cliff, Scree & Badland Sparse Vegetation as observed during field surveys of the study area

Attribute	Detail	
Occasional	<i>Ambrosia dumosa</i> <i>Larrea tridentata</i> <i>Atriplex confertifolia</i>	<i>Opuntia basilaris</i> <i>Yucca schidigera</i> <i>Atriplex canescens</i>
Height	0-1 ft.	
Area: G569	North Range Study Area: 0 acres	South Range Study Area: 11,263 acres
Area: G570	North Range Study Area: 227 acres	South Range Study Area: 0 acres
Elevation	3,500-5,400 ft. MSL	
Foliar Cover	0-1%	



Desert pavement on the South Range Study Area



Exposed bedrock commonly found on mountain slopes of the study area

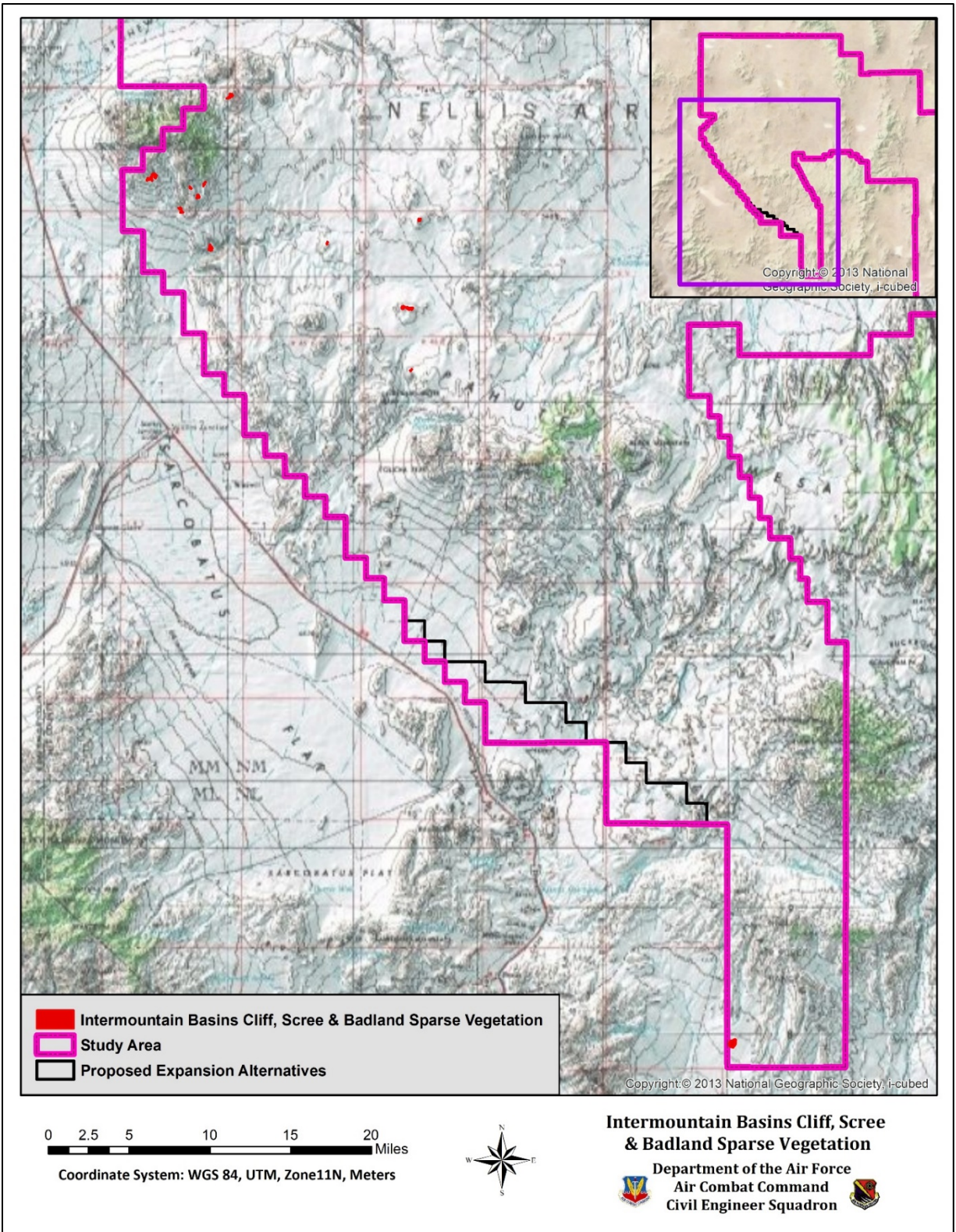


Figure 69. Location of Intermountain Basins Cliff, Scree & Badland Sparse Vegetation on the North Range Study Area.

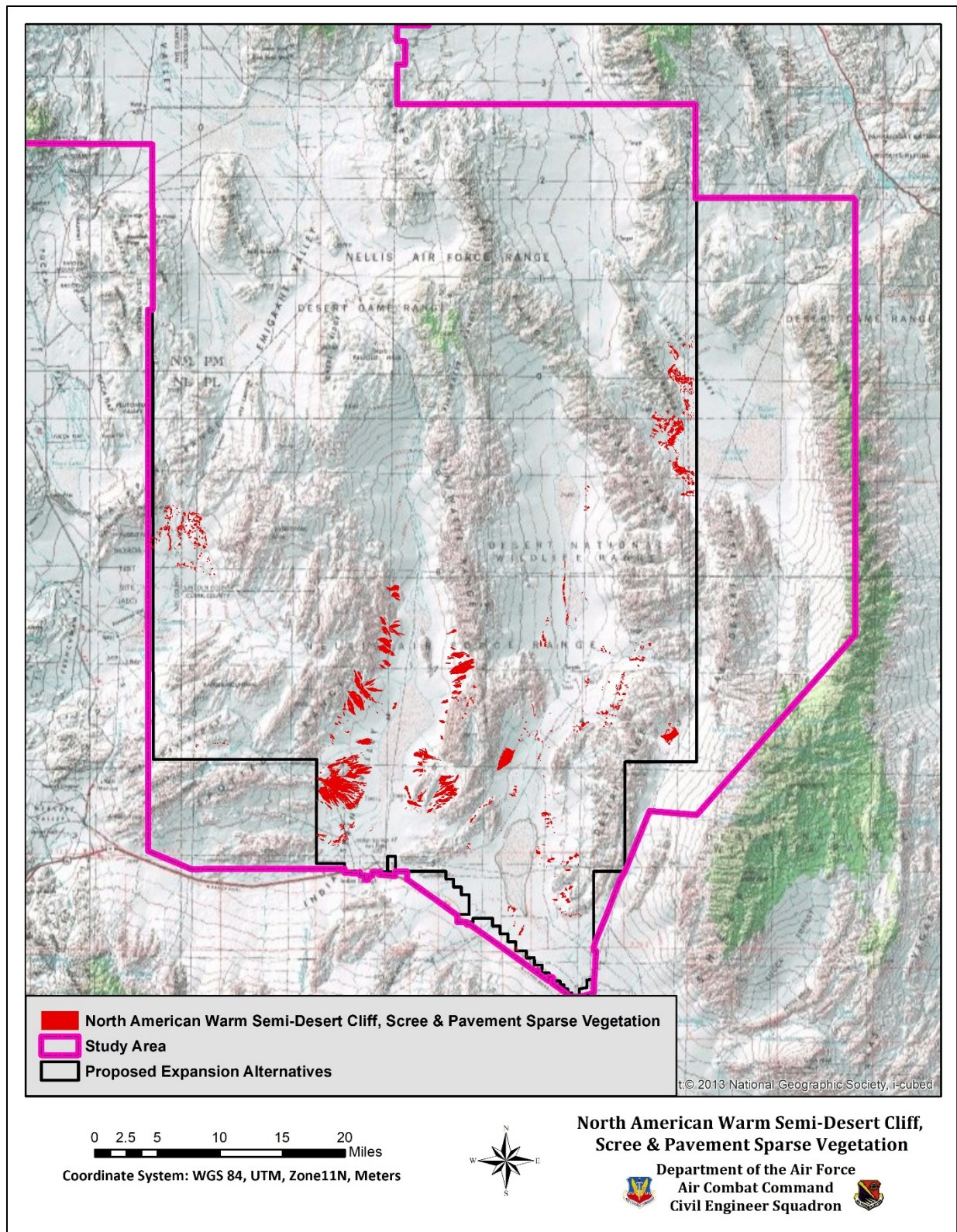


Figure 70. Location of North American Warm Semi-Desert Cliff, Scree & Pavement Sparse Vegetation on the South Range Study Area.

A3170 *Pleuraphis rigida* Desert Grassland Alliance

The *Pleuraphis rigida* Desert Grassland Alliance is a member of the G675 North American Warm Semi-Desert Dune and Sand Flats group (USNVC, 2016). This alliance is comprised of small areas of sand dunes and sandy soils dominated by *Pleuraphis rigida* and scattered populations of *Ambrosia dumosa*, *Atriplex confertifolia*, *Atriplex canescens* and *Lycium andersonii* (Table 40). Throughout this association, *Pleuraphis rigida* contributes a significant percentage of foliar cover for the herbaceous layer. This is especially evident in wet seasons when the grass is growing large and robust. This plant alliance appears to become established in the transition zones between dry lakes or playas and the *Atriplex canescens* Scrub Alliance. In other locations, *Pleuraphis rigida* lies in sandy soils and is a dominant on many of the sand dunes found on the west side of the Pintwater Range (Figure 71). The alliance has not been found on the North Range Study Area. The alliance is important in this habitat because it is often the only species present and provides structural support for rodent burrows, forage for wildlife, and stability for the dunes. The grass and shrub layer in this alliance generally remains under 2 feet tall with 0 - 14% foliar cover. Overall, the alliance has about 10% foliar cover of herbaceous plants and shrubs.



Pleuraphis rigida Desert Grassland Alliance

Table 40. List of plant species and characteristics of the *Pleuraphis rigida* Desert Grassland Alliance

Attribute	Detail	
Dominants	<i>Pleuraphis rigida</i>	
Subdominants	<i>Ambrosia dumosa</i> <i>Atriplex canescens</i>	<i>Atriplex confertifolia</i> <i>Lycium andersonii</i>
Common	<i>Sarcobatus vermiculatus</i> <i>Salsola tragus</i>	<i>Lepidium fremontii</i>
Occasional	<i>Baileya pleniradiata</i> <i>Ephedra torreyana</i> <i>Eriogonum inflatum</i> <i>Gutierrezia sarothrae</i>	<i>Machaeranthera canescens</i> <i>Sphaeralcea ambigua</i> <i>Stanleya elata</i> <i>Oenothera californica</i>
Height	2 ft.	
Area	North Range Study Area: 0 acres	South Range Study Area: 1,245 acres
Elevation	3,000 - 4000 ft. MSL	
Foliar Cover	10%	

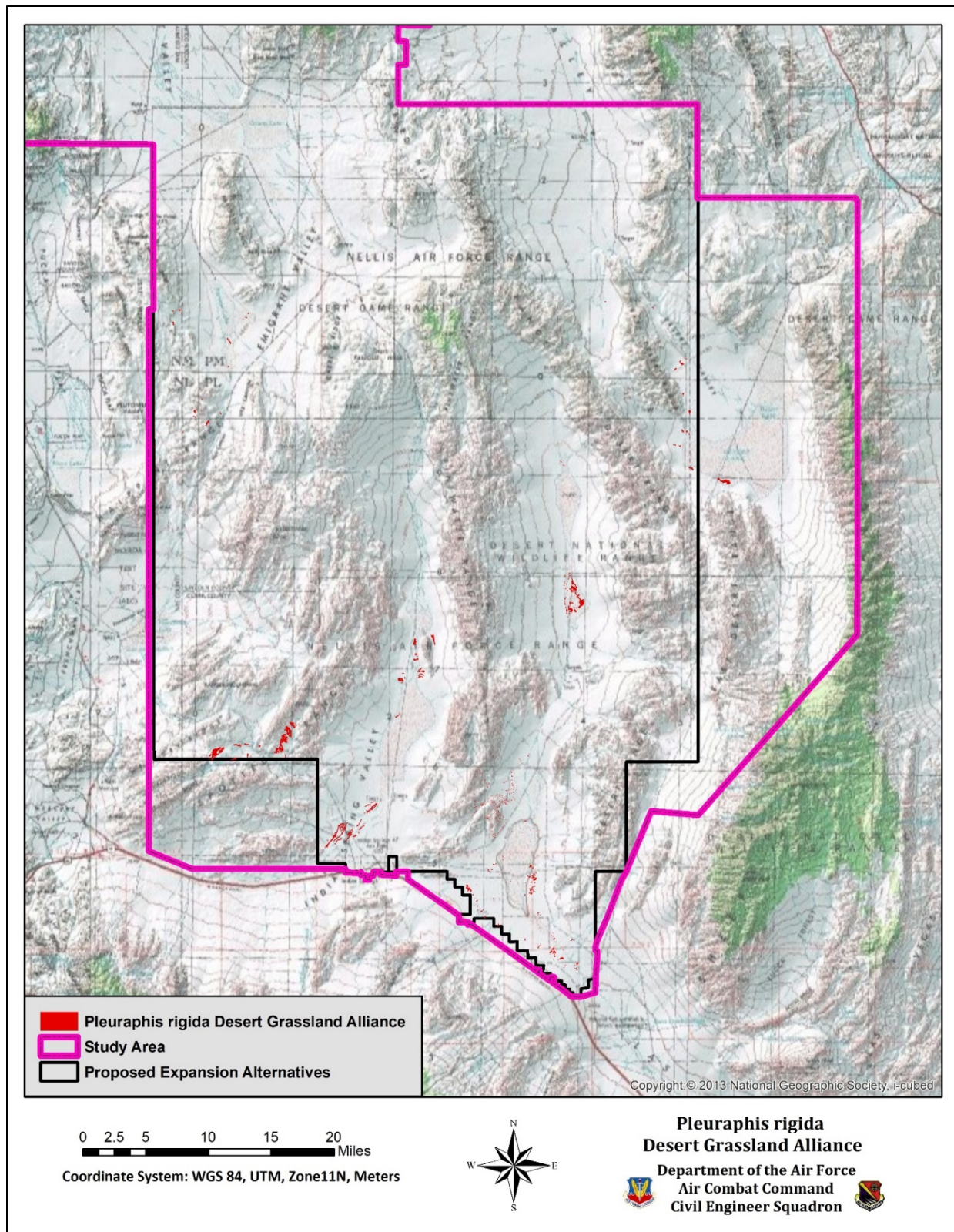


Figure 71. Location of the *Pleuraphis rigida* Desert Grassland Alliance on the South Range Study Area.

G775 INTERMOUNTAIN SPARSELY VEGETATED DUNE SCRUB & GRASSLAND GROUP

Achnatherum hymenoides Vegetation Alliance (Place Holder)

According to the USNVC, this plant community belongs in G775 Intermountain Sparsely Vegetated Dune Scrub & Grassland Group. In that classification system, none of the alliances or associations currently defined are characterized by *Achnatherum hymenoides* as the only dominant plant. For the purposes of this report and the fact that this is a somewhat unique plant community, it will be listed as a proposed alliance for the study area and the purposes of wildlife and natural resources management.



Achnatherum hymenoides Vegetation Alliance

On the study area, this alliance is usually located in small, isolated areas on sand dunes or sandy soils sometimes covered with gravel. The dominant species, *Achnatherum hymenoides*, may be the only species present, but is often associated with other herbaceous species endemic to dunes, such as *Oenothera californica*, *Sphaeralcea ambigua*, *Baileya pleniradiata*, and *Tiquilia nuttallii*, as well as shrubs such as *Psoralea fremontii*. The plant community has been observed in small areas on the North Range Study Area and the sand dunes found on the DNWR near Desert Lake (Figures 72-73). The plant community is important because *Achnatherum hymenoides* has a high palatability rating, and is utilized by larger herbivores like desert bighorn sheep, especially during drought years. Seeds are staples to a variety of granivorous animals. The total area supporting this plant community is 183 acres on the North Range Study Area and 564 acres on the South Range Study Area (Table 41).

Table 41. List of plant species and characteristics of the *Achnatherum hymenoides* Vegetation Alliance as documented by field surveys on the study area.

Attribute	Detail	
Dominants	<i>Achnatherum hymenoides</i>	
Subdominants	<i>Psoralea fremontii</i> <i>Tiquilia nuttallii</i> <i>Baileya pleniradiata</i>	<i>Oenothera californica</i> <i>Sphaeralcea ambigua</i>
Common	<i>Cryptantha micrantha</i> <i>Salsola paulsenii</i>	<i>Sporobolus flexuosus</i>
Occasional	<i>Abronia turbinata</i> <i>Ambrosia acanthicarpa</i> <i>Amsonia tomentosa</i> <i>Asclepias erosa</i> <i>Atriplex canescens</i> <i>Bromus madritensis ssp. rubens</i> <i>Chaetadelpa wheeleri</i> <i>Cryptantha maritima</i> <i>Linanthus campanulatus</i> <i>Mentzelia albicaulis</i> <i>Pleuraphis rigida</i> <i>Schismus arabicus</i> <i>Vulpia octoflora</i>	<i>Aliciella leptomeria</i> <i>Baileya multiradiata</i> <i>Ambrosia dumosa</i> <i>Argemone corymbosa</i> <i>Astragalus sabulonum</i> <i>Bromus tectorum</i> <i>Eriastrum eremicum</i> <i>Krameria erecta</i> <i>Malacothrix sonchoides</i> <i>Phacelia ivesiana</i> <i>Salsola tragus</i> <i>Sporobolus cryptandrus</i>
Height	0.5-2.0 ft.	
Area	North Range Study Area: 183 acres	South Range Study Area: 565 acres
Elevation	3,200-6,400 ft. MSL	
Foliar Cover	10%	

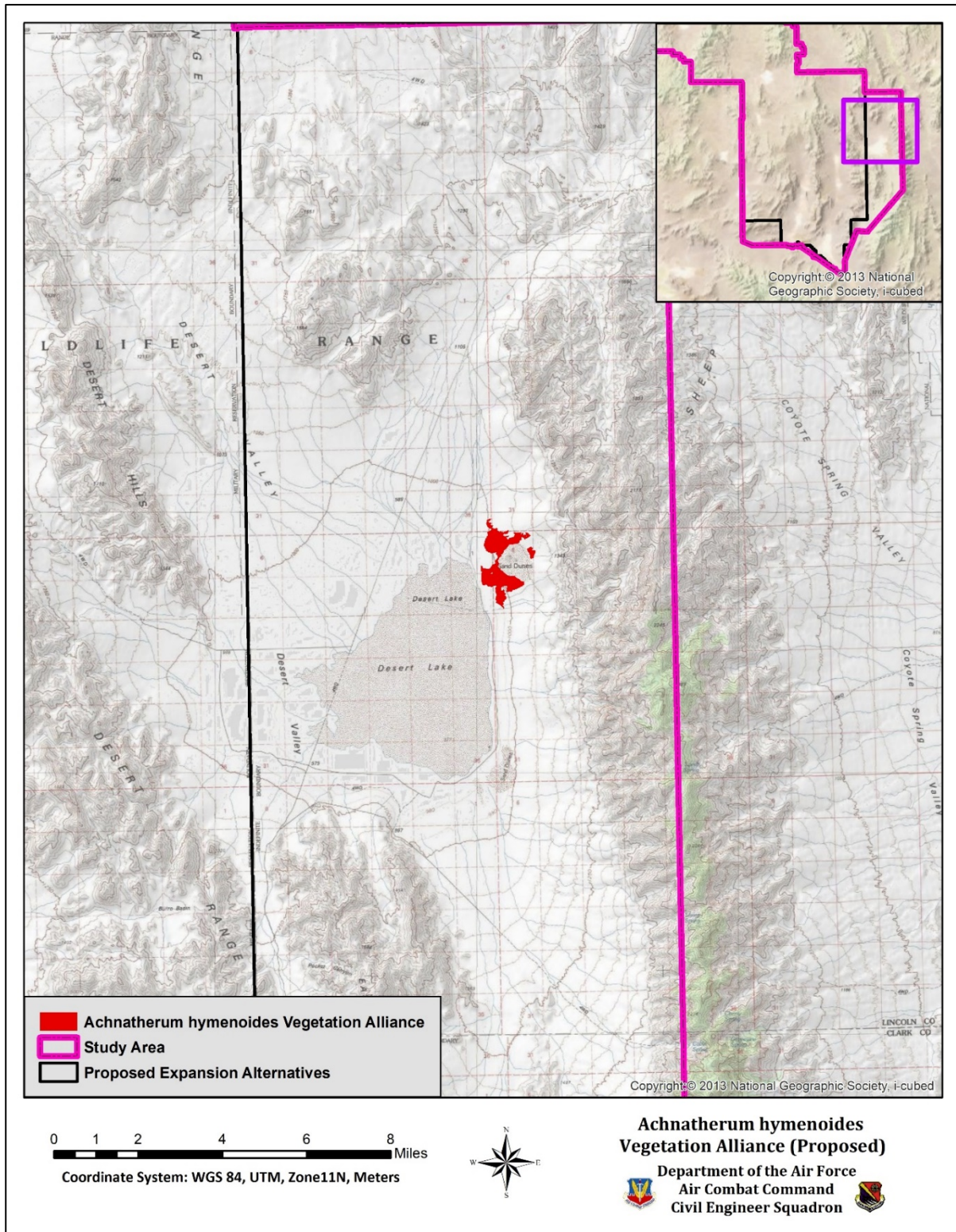


Figure 72. Location of *Achnatherum hymenoides* Vegetation Alliance on the South Range Study Area.

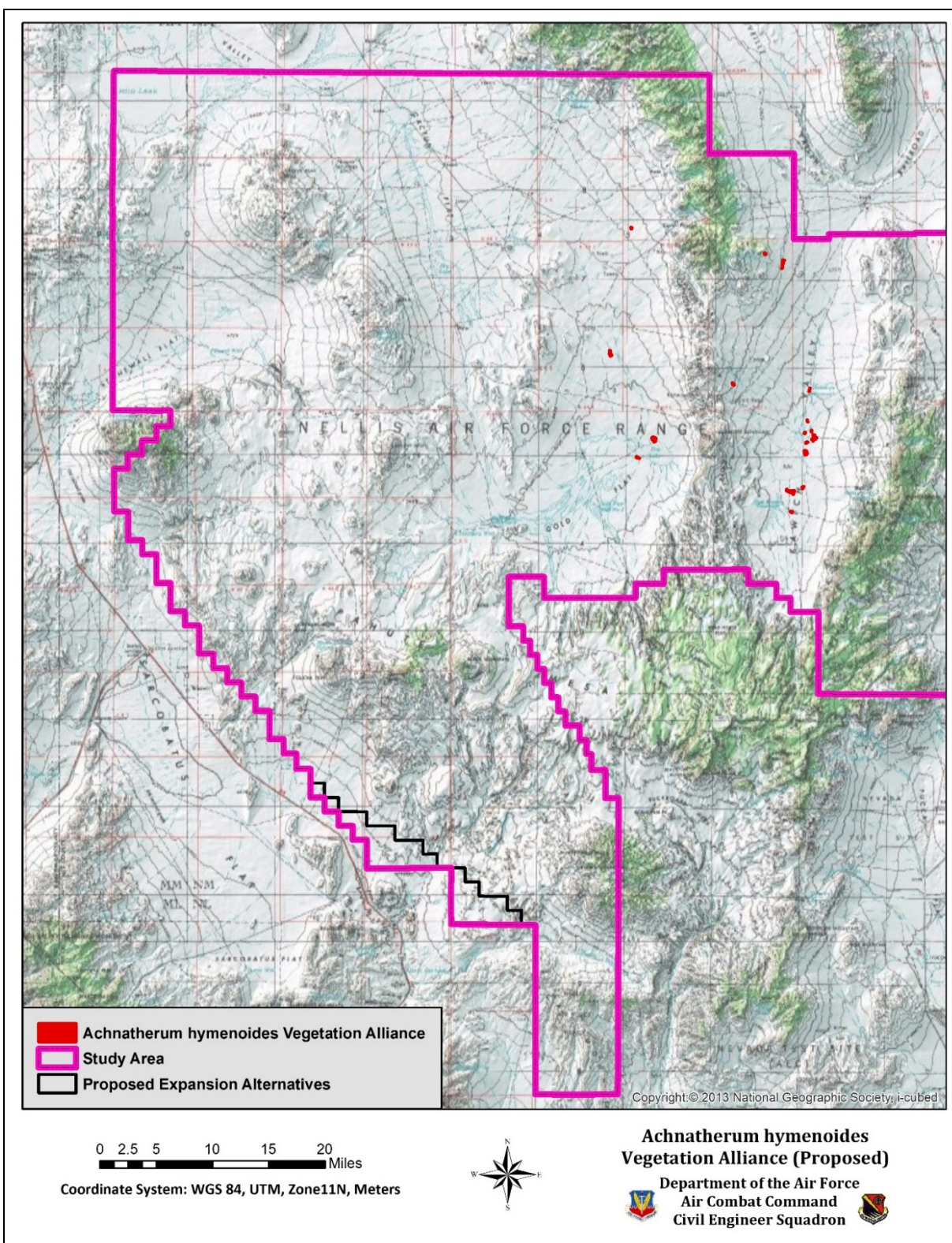


Figure 73. Location of *Achnatherum hymenoides* Herbaceous Vegetation Alliance on the North Range Study Area.

A.858 *Ephedra viridis* Shrubland Alliance

The *Ephedra viridis* Shrubland Alliance is not recognized as an alliance by the USNVC, but was listed by the NNHP in their 2008 plant classification list. The alliance occurs on canyon slopes in the Colorado Plateau, Mojave, and Sonoran Deserts of Arizona and California (Peterson, 2008). The soils are derived from limestone, sandstone, and igneous rocks and tend to be shallow, coarse-textured, and rocky. Stands are dominated by a sparse to moderately dense cover of shrubs averaging 2 ft. in height with perennial grasses usually less than 0.5 ft. tall. Total vegetation cover averages 14% mostly dependent



Typical *Ephedra viridis* Shrubland Alliance on the study area

on soil, slope, and rock cover. Subdominants include *Ephedra nevadensis*, *Gutierrezia microcephla*, and *Atriplex canescens* (Table 42). Some of the common species include *Coleogyne ramosissima*, *Atriplex confertifolia*, *Artemisia nova*, *Purshia stansburiana*, and *Gutierrezia sarothrae*. A variety of grasses dominate the herbaceous strata. This alliance is found at elevations ranging from 4,600 to 6,800 ft. MSL and has only been observed on the North Range Study Area on the Kawich and Cactus ranges (Figure 74).

Table 42. List of plant species and characteristics of the *Ephedra viridis* Shrubland Alliance

Attribute	Detail	
Dominants	<i>Ephedra viridis</i>	
Subdominants	<i>Atriplex canescens</i> <i>Ephedra nevadensis</i>	<i>Gutierrezia microcephla</i>
Common	<i>Achnatherum hymenoides</i> <i>Achnatherum speciosum</i> <i>Aristida purpurea</i> <i>Artemisia nova</i> <i>Artemisia tridentata</i> <i>Atriplex confertifolia</i> <i>Bromus tectorum</i> <i>Coleogyne ramosissima</i> <i>Chrysothamnus Greenei</i> <i>Chrysothamnus viscidiflorus</i> <i>Ericameria nauseosa</i>	<i>Glossopetalon spinescens</i> <i>Gutierrezia sarothrae</i> <i>Halogeton glomeratus</i> <i>Hesperostipa comata</i> <i>Krascheninnikovia lanata</i> <i>Picrothamnus desertorum</i> <i>Pleuraphis jamesii</i> <i>Purshia stansburiana</i> <i>Sarcobatus baileyi</i> <i>Stanleya pinnata</i> <i>Tetradymia glabrata</i>
Occasional	<i>Astragalus lentiginos</i> <i>Brickellia microphylla</i> <i>Bromus madritensis ssp. rubens</i> <i>Cylindropuntia echinocarpa</i> <i>Dasyochloa pulchella</i> <i>Echinocereus engelmannii</i> <i>Elymus elymoides</i> <i>Elymus trachycaulus</i> <i>Ericameria teretifolia</i> <i>Eriogonum fasciculatum</i> <i>Eriogonum inflatum</i>	<i>Grusonia pulchella</i> <i>Juniperus osteosperma</i> <i>Lepidium fremontii</i> <i>Menodora spinescens</i> <i>Mirabilis alipes</i> <i>Opuntia polyacantha var. erinacea</i> <i>Pinus monophylla</i> <i>Sphaeralcea ambigua</i> <i>Stanleya elata</i> <i>Tetradymia axillaris</i> <i>Yucca brevifolia</i>

Attribute	Detail	
	<i>Eriogonum microthecum</i> <i>Grayia spinosa</i>	<i>Yucca elata</i>
Average Height	2 ft.	
Area	North Range Study Area: 4,460 acres	South Range Study Area: 0 acres
Elevation	4,600-6,800 ft. MSL	
Average Foliar Cover	14%	

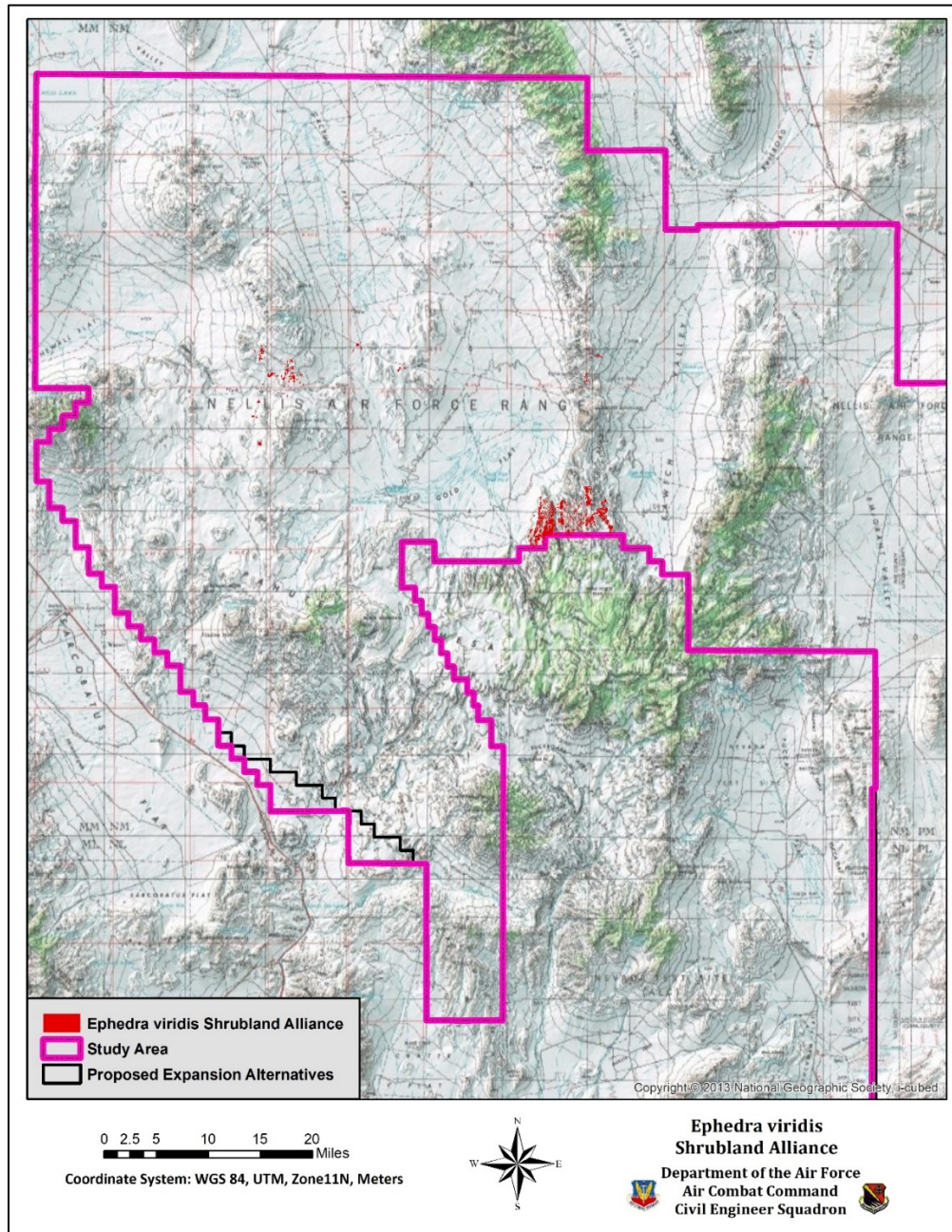


Figure 74. Location of the *Ephedra viridis* Shrubland Alliance on the North Range Study Area.

***B.001 Sarcobatus baileyi* Shrubland Alliance (Peterson, 2008)**

The *Sarcobatus baileyi* Shrubland Alliance is currently not recognized by the USNVC, but was classified by the NNHP as endemic to Nevada. Peterson (2008) indicated that the species taxonomy was uncertain in the past, but now is recognized in the National Plants Database and has ecology and morphology that makes it distinct from other greasewoods. Based on this information and the fact that the species is widespread on the North Range Study Area, it is placed in a separate alliance for this report. *Sarcobatus baileyi* is most commonly found in the basin areas and lower slopes and foothills of the North Range Study Area. This alliance is dominated by *Sarcobatus baileyi* which



***Sarcobatus baileyi* Shrubland Alliance**

intermixes with a variety of shrubs, especially those commonly found in salt desert scrub plant communities. On the North Range Study Area, the alliance is prevalent in Stonewall Flats, Cactus Flats, and the southern end of Kawich Valley (Figure 75). This alliance is not found on the South Range Study Area. This species of *Sarcobatus* differs from *Sarcobatus vermiculatus* because of water requirements. *Sarcobatus vermiculatus* generally requires access to groundwater via taproot and is often found in washes, while *Sarcobatus baileyi* inhabits upland areas with no requirement for access to groundwater. Subdominants in this alliance include *Ephedra nevadensis*, *Atriplex confertifolia*, *Picrothamnus desertorum*, and *Menodora spinescens* (Table 43). Common shrub species that occur in this alliance include *Bassia americana*, *Atriplex canescens*, and *Krascheninnikovia lanta*. Perennial grasses are often found in this alliance but are usually sparse. Some of the grasses that have been found in this alliance include *Pleuraphis jamesii*, *Achnatherum hymenoides*, *Elymus elymoides*, or *Dasyochloa pulchella*. On average, foliar cover averages 12% with an average shrub height of 1.7 ft. with grasses reaching a height of 1 ft. in this alliance.

Table 43. List of plant species and characteristics of the *Sarcobatus baileyi* Shrubland Alliance

Attribute	Detail	
Dominants	<i>Sarcobatus baileyi</i>	
Subdominants	<i>Atriplex confertifolia</i> <i>Ephedra nevadensis</i>	<i>Menodora spinescens</i> <i>Picrothamnus desertorum</i>
Common	<i>Achnatherum hymenoides</i> <i>Aristida purpurea</i> <i>Astragalus lentiginosus</i> <i>Atriplex canescens</i> <i>Baileya multiradiata</i> <i>Bassia americana</i> <i>Bassia californica</i>	<i>Gutierrezia microcephala</i> <i>Halogeton glomeratus</i> <i>Hymenoclea salsola</i> <i>Krascheninnikovia lanata</i> <i>Mammillaria tetrancistra</i> <i>Philadelphus microphyllus</i> <i>Pleuraphis jamesii</i>

Attribute	Detail	
	<i>Chamaesyce albomarginata</i> <i>Chrysothamnus Greenei</i> <i>Dasyochloa pulchella</i> <i>Descurainia pinnata</i> <i>Ericameria nana</i> <i>Ericameria nauseosa</i>	<i>Salsola tragus</i> <i>Sphaeralcea ambigua</i> <i>Sporobolus cryptandrus</i> <i>Sporobolus flexuosus</i> <i>Tetradymia glabrata</i> <i>Yucca brevifolia</i>
Occasional	<i>Achnatherum speciosum</i> <i>Ambrosia dumosa</i> <i>Artemisia tridentata</i> <i>Atriplex canescens</i> <i>Boraginaceae</i> <i>Bouteloua barbata</i> <i>Bromus tectorum</i> <i>Chaetopappa ericoides</i> <i>Cylindropuntia echinocarpa</i> <i>Descurainia sophia</i> <i>Echinocereus engelmannii</i> <i>Elymus elymoides</i> <i>Eriogonum inflatum</i> <i>Eriogonum microthecum</i> <i>Eriogonum ovalifolium</i> <i>Grayia spinosa</i> <i>Grusonia pulchella</i>	<i>Hesperostipa comata</i> <i>Juniperus osteosperma</i> <i>Larrea tridentata</i> <i>Lepidium fremontii</i> <i>Linanthus pungens</i> <i>Lycium cooperi</i> <i>Opuntia polyacantha var. erinacea</i> <i>Oxytheca perfoliata</i> <i>Pediocactus simpsonii</i> <i>Psoralea polydenia</i> <i>Sarcobatus vermiculatus</i> <i>Sclerocactus polyancistrus</i> <i>Stanleya elata</i> <i>Stanleya pinnata</i> <i>Suaeda moquinii</i> <i>Tetradymia axillaris</i> <i>Xylorhiza tortifolia</i>
Height	1.7 ft.	
Area	North Range Study Area: 237,178 acres	South Range Study Area: 0 acres
Elevation	4,500-6,200 ft. MSL	
Foliar Cover	12%	

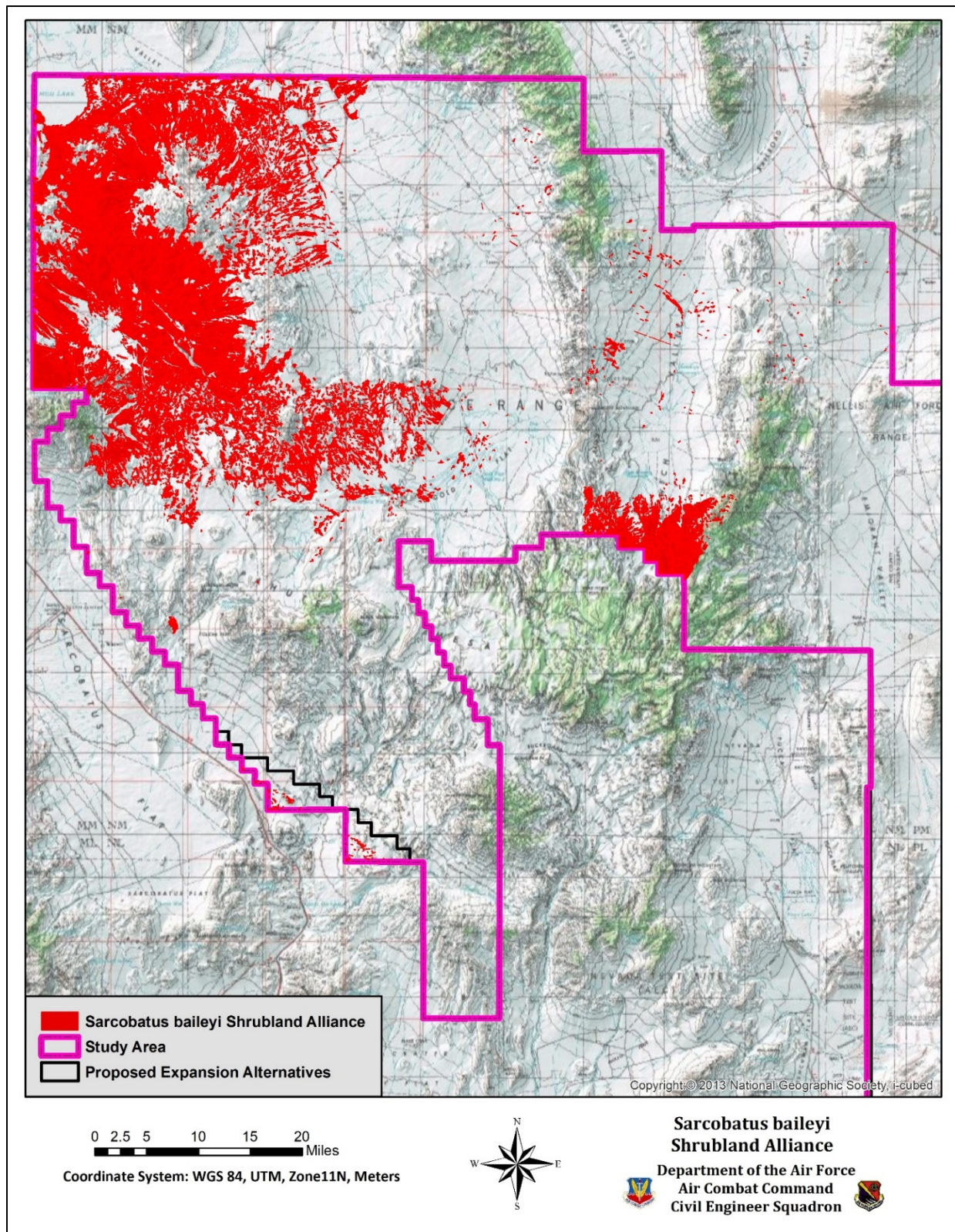


Figure 75. Location of the *Sarcobatus baileyi* Shrubland Alliance on the North Range Study Area.

NO CURRENT CLASSIFICATION

Developed or Disturbed Land

This landscape is mostly a habitat type that is typified by areas that have been disturbed by human activities such as development and road construction. Using satellite imagery and remote sensing software, only a small portion of the disturbed areas were mapped as “disturbed or developed” because the software classification process only shows areas that were basically bare ground and obviously disturbed, not developed or disturbed areas that support some type of vegetation. Detailed information on disturbed areas is provided in the Roadless Areas on the Nevada Test and Training Range and Proposed Expansion Alternatives (Nellis Air Force Base, 2016). These areas often support populations of invasive species such as *Salsola tragus* and *Halogeton glomeratus*. Remote sensing maps showed 1,607 acres of disturbed land on the North Range Study Area and 1,649 acres of disturbed land on the South Range Study Area (Figures 76 and 77). Using manual delineation of roads and disturbed areas based on development and soils disturbance and not vegetation provides a more realistic estimate of land impacted by development or other military activities that are otherwise masked by restoration of plant communities or encroachment of invasive species. Thus, additional maps were created to provide the total disturbed or developed land, which includes 17,803 acres on the North Range Study Area and 21,306 acres on the South Range Study Area (Figures 78 and 79).

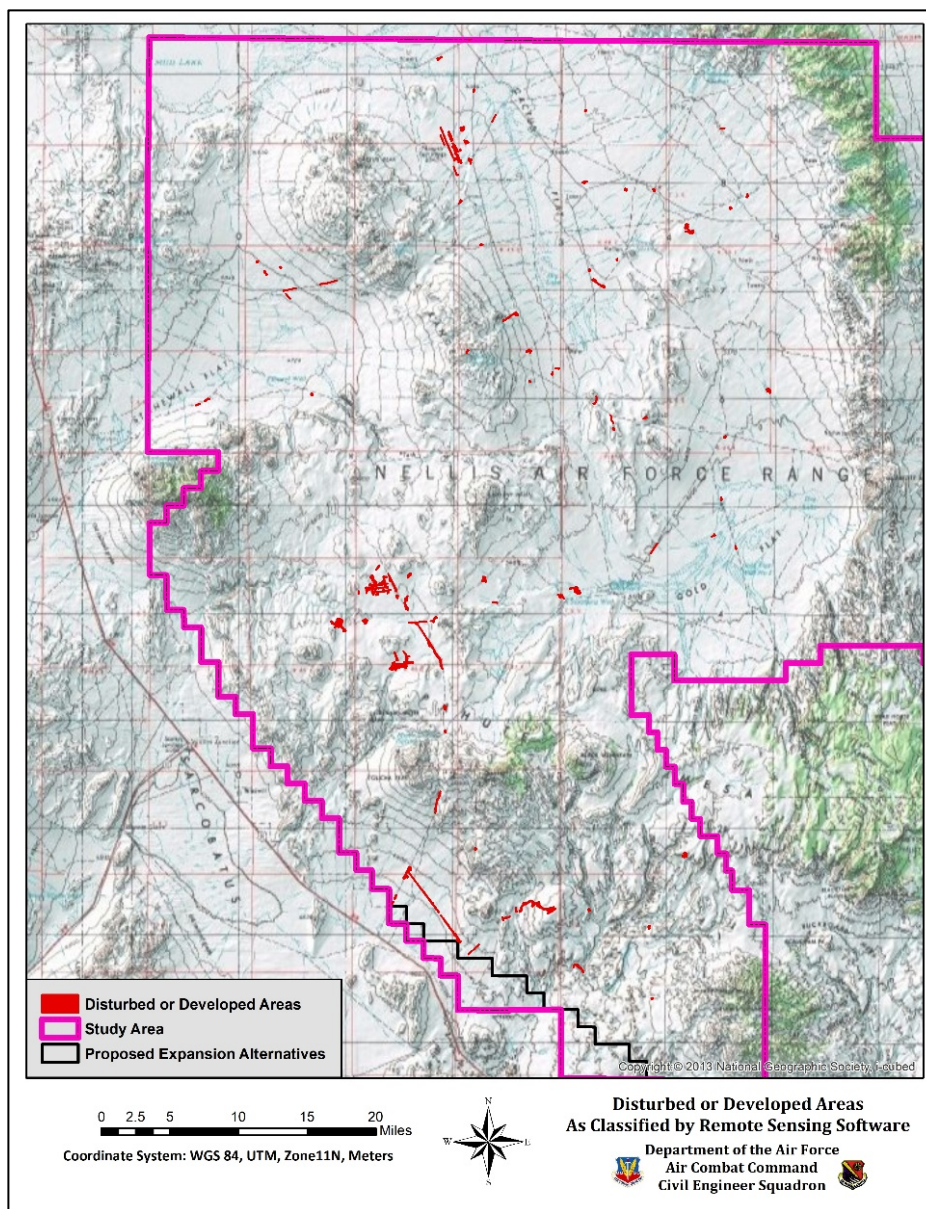


Figure 76. Location of Developed or Disturbed Land as mapped by satellite imagery/remote sensing programs on the North Range Study Area.

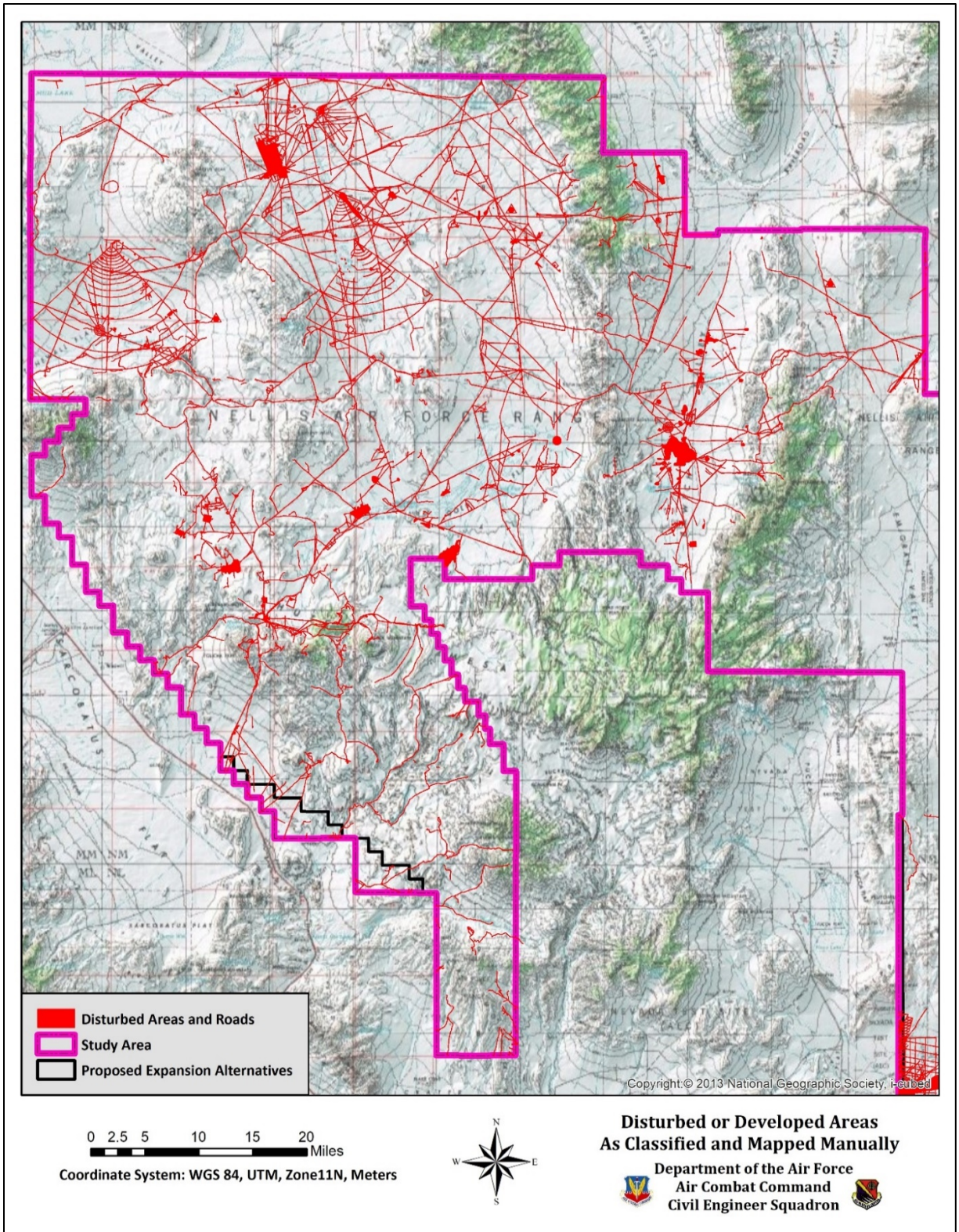


Figure 78. Roads and disturbed areas of the North Range Study Area as classified and mapped manually.

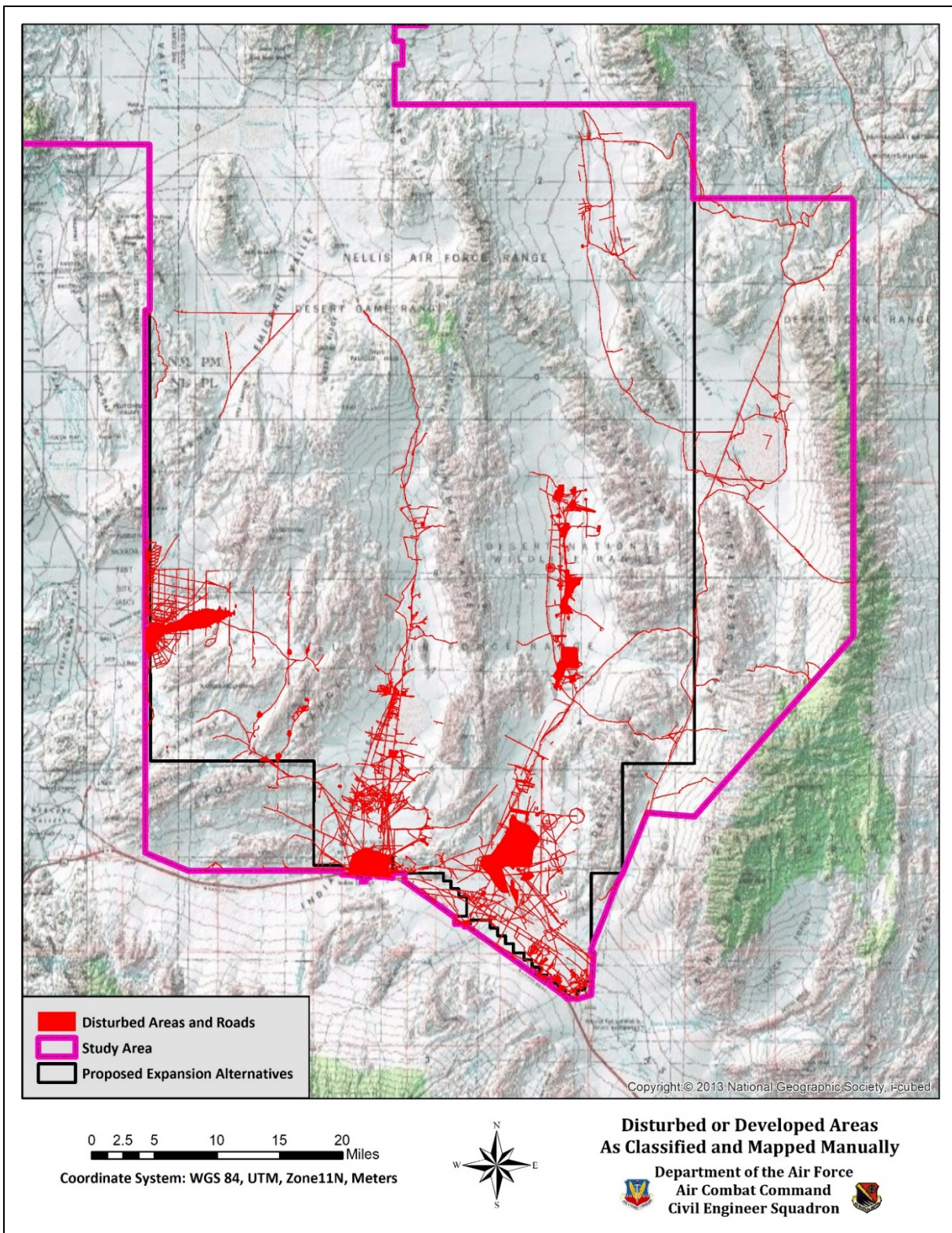


Figure 79. Roads and disturbed areas of the South Range Study Area as classified mapped manually.

B.007 Microphytic Playa Alliance (Peterson, 2008)

The Microphytic Playa Alliance is an alliance of plant communities named by the NNHP that encompasses natural situations where dry lakebeds form at the base of valleys (Peterson, 2008). The USNVC does not have an alliance dedicated to unvegetated playas, but does address vegetated playas in the M082 Warm & Cool Desert Alkali-Saline Marsh, Playa & Shrubland Macrogroup and in G538 North American Desert Alkaline-Saline Marsh & Playa (USNVC, 2016). However, these playas are described as vegetated to some degree. The plant community described here fits the description presented by Peterson (2008) and will be used for the purposes of this report.



Microphytic Playa Alliance

This proposed alliance is found on both the South Range Study Area and North Range Study Area (Figures 80 and 81). Water often accumulates in playas for short periods of time and may temporarily support invertebrates and waterfowl or wading birds while water is present. The water in these lakes also supports photosynthetic organisms including algae, cyanobacteria, or diatoms. These areas tend to be saline and often void of vegetation. However, the vegetation within this alliance is comprised of salt tolerant plants (Peterson, 2008). The most common species found in this alliance include sparse populations of *Atriplex canescens*, *Halogeton glomeratus*, and *Suaeda moquinii* (Table 44). In wet years, annuals such as *Sphaeralcea ambigua*, *Lepidium flavum*, and *Phacelia fremontii* may form substantial stands for a short period of time. A rare plant, *Phacelia parishii*, has become well established on the west side of the dry lake in Indian Springs Valley. In a wet year, this rare plant establishes dense populations, while in a dry year, none will be found. This alliance is characterized by having less than 1% average foliar cover. The shrub layer in this alliance rarely exceeds 0.5 ft. in height, but may be as high as 3 ft. in wet years or in isolated areas that accumulate storm water. Elevations range from 3,000 to 5,100 ft. MSL.



Microphytic Playa Alliance with no vegetation

Table 44. List of plant species and characteristics of the Microphytic Playa Alliance

Attribute	Detail	
Dominants	<i>Halogeton glomeratus</i> <i>Suaeda moquinii</i> <i>Atriplex canescens</i> <i>Ephedra nevadensis</i> <i>Sarcobatus vermiculatus</i>	<i>Achnatherum hymenoides</i> <i>Atriplex confertifolia</i> <i>Sarcobatus baileyi</i> <i>Grayia spinosa</i>
Subdominants	<i>Lepidium flavum</i> <i>Psoralea fremontii</i>	<i>Phacelia parishii</i>
Common	<i>Amaranthus spinosus</i> <i>Atriplex canescens</i> <i>Atriplex hymenelytra</i>	<i>Ambrosia dumosa</i> <i>Atriplex confertifolia</i> <i>Ephedra nevadensis</i>

Attribute	Detail	
	<i>Ephedra trifurca</i> <i>Gutierrezia microcephala</i> <i>Hymenoclea salsola</i> <i>Lycium andersonii</i> <i>Opuntia basilaris</i> <i>Psoralea arborescens</i> <i>Salsola tragus</i> <i>Sphaeralcea ambigua</i> <i>Stephanomeria parryi</i>	<i>Eriogonum inflatum</i> <i>Lepidium fremontii</i> <i>Lycium cooperi</i> <i>Pleuraphis rigida</i> <i>Schismus barbatus</i> <i>Stanleya pinnata</i> <i>Descurainia sp.</i> <i>Phacelia fremontii</i> <i>Oenothera californica</i>
Height	0.5-3.0 ft.	
Area	North Range Study Area: 19,684 acres	South Range Study Area: 38,006 acres
Elevation	3,000 to 5,300 ft. MSL	
Average Foliar Cover	Less than 1%	

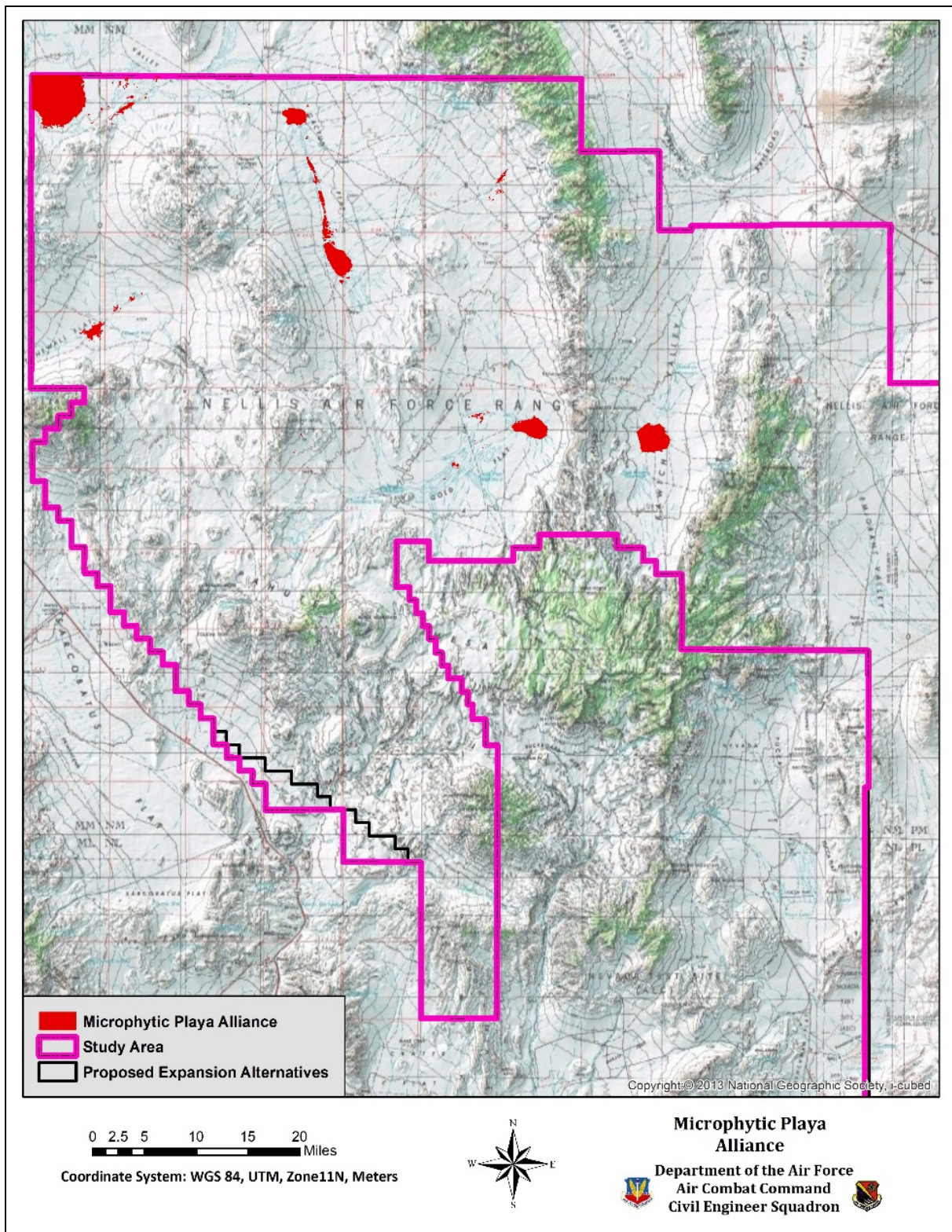


Figure 80. Location of Microphytic Playa Alliance on the North Range Study Area.

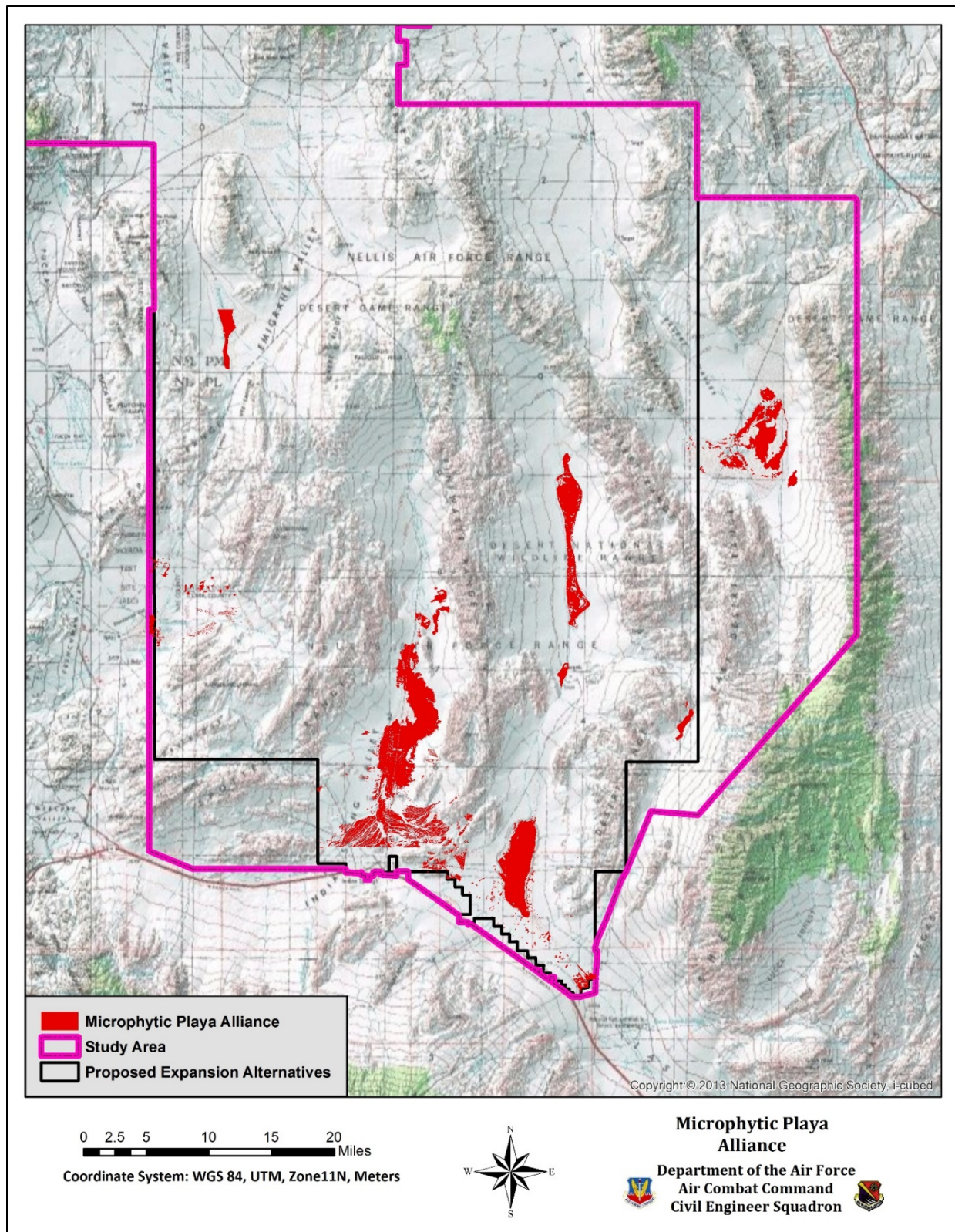


Figure 81. Location of Microphytic Playa Alliance on the South Range Study Area.

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Appendix A:
List of Scientific and Common Names
of All Plants Mentioned in the Report

Appendix A - List of Scientific and Common Names of Plants Mentioned in the Text of the Report

Scientific Name	Common Name
<i>Abronia nana</i> var. <i>covillei</i>	Coville's Dwarf Sand Verbena
<i>Abronia villosa</i>	Desert Sand-verbena
<i>Acacia greggii</i>	Catclaw Acacia
<i>Acamptopappus shockleyi</i>	Shockley's Goldenhead
<i>Acamptopappus sphaerocephalus</i>	Rayless Goldenhead
<i>Achnatherum hymenoides</i>	Indian Rice Grass
<i>Achnatherum parishii</i>	Parish's Needlegrass
<i>Achnatherum speciosum</i>	Desert Needlegrass
<i>Adenophyllum cooperi</i>	Cooper's Dogweed
<i>Agave utahensis</i>	Utah Agave
<i>Agave utahensis</i> var. <i>eborispina</i>	Utah Agave
<i>Agoseris glauca</i>	Pale Agoseris
<i>Agrostis exarata</i>	Spike Bentgrass
<i>Agrostis pallens</i>	Seashore bentgrass
<i>Aliciella heterostyla</i>	Cactus Flat Gilia
<i>Aliciella nyensis</i>	Nye Gilia
<i>Aliciella ripleyi</i>	Ripley's Gilia
<i>Allionia incarnata</i>	Trailing Windmills
<i>Amaranthus fimbriatus</i>	Fringed Amaranth
<i>Amaranthus spinosus</i>	Spiny amaranth
<i>Ambrosia acanthicarpa</i>	Flatspine Bur Ragweed
<i>Ambrosia canescens</i>	Hairy Ragweed
<i>Ambrosia dumosa</i>	Burrobush
<i>Ambrosia eriocentra</i>	Woolly Fruit Bur Ragweed
<i>Amelanchier utahensis</i>	Utah serviceberry
<i>Amphipappus fremontii</i>	Fremont's Chaffbush
<i>Amsinckia tessellata</i>	Bristly Fiddleneck
<i>Amsonia tomentosa</i>	Woolly Bluestar
<i>Antheropeas lanosum</i>	White Easterbonnets
<i>Antheropeas wallacei</i>	Woolly Easterbonnets
<i>Arabis shockleyi</i>	Shockley's Rockcress
<i>Arceuthobium cyanocarpum</i>	Dwarf Mistletoe
<i>Arctomecon californica</i>	Las Vegas Bearpoppy
<i>Arctomecon merriamii</i>	Desert Bearpoppy
<i>Arenaria kingii</i>	Kings Sandwort
<i>Arenaria lanuginosa</i>	Spreading sandwort
<i>Arenaria macradenia</i>	Mojave Sandwort
<i>Argemone munita</i>	Flatbud Pricklypoppy
<i>Aristida purpurea</i>	Purple Threeawn
<i>Artemisia arbuscula</i>	Little Sagebrush

Scientific Name	Common Name
<i>Artemisia bigelovii</i>	Bigelow Sage
<i>Artemisia ludoviciana</i>	White Sagebrush
<i>Artemisia nova</i>	Black Sagebrush
<i>Artemisia tridentata</i>	Big Sagebrush
<i>Asclepias eastwoodiana</i>	Eastwood Milk
<i>Asclepias subulata</i>	Rush Milkweed
<i>Asclepias uncialis</i>	Eastwood Milkweed
<i>Astragalus ackermanii</i>	Ackerman Milkvetch
<i>Astragalus aequalis</i>	Clokey's Milkvetch
<i>Astragalus amphioxys</i> var. <i>musimonum</i>	Sheep Mountain Milkvetch
<i>Astragalus beatleyae</i>	Beatley's Milkvetch
<i>Astragalus funereus</i>	Funeral Mountain Milkvetch
<i>Astragalus gilmanii</i>	Gilman's Milkvetch
<i>Astragalus inyoensis</i>	Inyo Milkvetch
<i>Astragalus lentiginosus</i>	Freckled Milkvetch
<i>Astragalus lentiginosus</i> var. <i>fremontii</i>	Fremont's Milkvetch
<i>Astragalus mohavensis</i>	Mojave Milkvetch
<i>Astragalus mohavensis</i> var. <i>hemigyris</i>	Mojave Milkvetch
<i>Astragalus nyensis</i>	Nye Milkvetch
<i>Astragalus oophorus</i>	Egg Milkvetch
<i>Astragalus oophorus</i> var. <i>clokeyanus</i>	Egg Milkvetch/Clokey Milkvetch
<i>Astragalus pseudodanthus</i>	Tonopah Milkvetch
<i>Astragalus purshii</i>	Woollypod Milkvetch
<i>Astragalus uncialis</i>	Currant Milkvetch
<i>Atrichoseris platyphylla</i>	Parachute Plant
<i>Atriplex canescens</i>	Fourwing Saltbush
<i>Atriplex confertifolia</i>	Shadscale Saltbush
<i>Atriplex hymenelytra</i>	Desert Holly
<i>Atriplex parryi</i>	Parry's Saltbush
<i>Atriplex polycarpa</i>	Cattle Saltbush
<i>Atriplex spinifera</i>	Spinescale Saltbrush
<i>Baccharis salicifolia</i>	Mule-Fat
<i>Baccharis sarothroides</i>	Desertbroom
<i>Baileya multiradiata</i>	Desert Marigold
<i>Baileya pleniradiata</i>	Woolly Desert Marigold
<i>Bassia americana</i>	Green Molly
<i>Bassia californica</i>	Rusty Molly
<i>Bebbia juncea</i>	Sweetbush
<i>Blepharidachne kingii</i>	King's Eyelash Grass
<i>Boraginaceae</i>	Forget-me-not family
<i>Bouteloua barbata</i>	Sixweeks grama
<i>Bouteloua gracilis</i>	Blue Grama
<i>Brassica tournefortii</i>	Asian Mustard

Scientific Name	Common Name
<i>Brickellia arguta</i>	Pungent Brickellbush
<i>Brickellia atractyloides</i>	Spearleaf Brickellbush
<i>Brickellia californica</i>	California Brickellbush
<i>Brickellia microphylla</i>	Littleleaf Brickellbush
<i>Bromus carinatus</i>	California Brome
<i>Bromus hordeaceus</i>	Soft Brome
<i>Bromus inermis</i>	Smooth Brome
<i>Bromus madritensis ssp. madritensis</i>	Compact Brome
<i>Bromus madritensis ssp. rubens</i>	Red Brome
<i>Bromus tectorum</i>	Cheatgrass
<i>Buddleja utahensis</i>	Utah Butterfly Bush
<i>Calochortus flexuosus</i>	Winding Mariposa Lily
<i>Calycoseris wrightii</i>	White Tackstem
<i>Camissonia boothii</i>	Booth's Evening Primrose
<i>Camissonia brevipes</i>	Yellow Cups
<i>Camissonia chamaenerioides</i>	Longcapsule Suncup
<i>Camissonia claviformis</i>	Brown Eyes
<i>Camissonia megalantha</i>	Large Flower Suncup
<i>Camissonia walkeri</i>	Walker's Sun Cup
<i>Cardaria chalapensis</i>	Lenspod Whitetop
<i>Carex deweyana</i>	Dewey Sedge
<i>Carex douglasii</i>	Douglas' sedge
<i>Castilleja angustifolia</i>	Northwestern Indian Paintbrush
<i>Castilleja angustifolia var. dubia</i>	Desert Paintbrush
<i>Castilleja applegatei ssp. martinii</i>	Wavy Leaf Indian Paintbrush
<i>Castilleja linariifolia</i>	Wyoming Indian paintbrush
<i>Castilleja martini var. clokeyi</i>	Clokey's Paintbrush
<i>Caulanthus cooperi</i>	Cooper's Wild Cabbage
<i>Caulanthus crassicaulis</i>	Thick Stem Wild Cabbage
<i>Caulanthus inflatus</i>	Desert Candle
<i>Caulanthus pilosus</i>	Hairy Wild Cabbage
<i>Centrostegia thurberi</i>	Red Triangles
<i>Cercocarpus intricatus</i>	Littleleaf Mountain Mahogany
<i>Cercocarpus ledifolius</i>	Curl-Leaf Mountain Mahogany
<i>Chaenactis carphoclinia</i>	Pebble Pincushion
<i>Chaenactis douglasii</i>	Douglas' dustymaiden
<i>Chaenactis fremontii</i>	Pincushion Flower
<i>Chaenactis stevioides</i>	Esteve's Pincushion
<i>Chaetopappa ericoides</i>	Rose Heath
<i>Chamaesyce albomarginata</i>	White Margin Sandmat
<i>Chorizanthe brevicornu</i>	Brittle Spineflower
<i>Chorizanthe rigida</i>	Devil's Spineflower
<i>Chrysothamnus eremobius</i>	Pintwater Rabbitbrush

Scientific Name	Common Name
<i>Chrysothamnus greenii</i>	Greene's Rabbitbrush
<i>Chrysothamnus viscidiflorus</i>	Yellow Rabbitbush
<i>Cirsium mohavense</i>	Mojave Thistle
<i>Cirsium neomexicanum</i>	New Mexico Thistle
<i>Cirsium vulgare</i>	Bull Thistle
<i>Coleogyne ramosissima</i>	Blackbrush
<i>Crossosoma bigelovii</i>	Ragged Rockflower
<i>Croton californicus</i>	California Croton
<i>Cryptantha angustifolia</i>	Panamint Cryptantha
<i>Cryptantha barbiger</i>	Bearded Cryptantha
<i>Cryptantha circumscissa</i>	Cushion Cryptantha
<i>Cryptantha confertiflora</i>	Basin Yellow Cryptantha
<i>Cryptantha fulvocanescens</i>	Tawny Cryptantha
<i>Cryptantha gracilis</i>	Narrowstem Cryptantha
<i>Cryptantha maritima</i>	Guadalupe Cryptantha
<i>Cryptantha micrantha</i>	Redroot Cryptantha
<i>Cryptantha nevadensis</i>	Nevada Cryptantha
<i>Cryptantha pterocarya</i>	Wingnut Cryptantha
<i>Cryptantha racemosa</i>	Bushy Cryptantha
<i>Cryptantha recurvata</i>	Curvenut Cryptantha
<i>Cryptantha sobolifera</i>	Waterton Lakes Cryptantha
<i>Cryptantha utahensis</i>	Scented Cryptanta
<i>Cryptantha virginensis</i>	Virgin River Cryptantha
<i>Cucurbita palmata</i>	Coyote Gourd
<i>Cylindropuntia acanthocarpa</i>	Buckhorn Cholla
<i>Cylindropuntia echinocarpa</i>	Wiggins' Cholla
<i>Cylindropuntia ramosissima</i>	Branched Pencil Cholla
<i>Cymopterus gilmanii</i>	Gilman's Spring Parsley
<i>Cymopterus multinervatus</i>	Purple Nerve Spring Parsley
<i>Cymopterus ripleyi</i>	Ripley's Biscuitroot
<i>Cymopterus ripleyi</i> var. <i>saniculoides</i>	Sanicle Biscuitroot
<i>Dasyochloa pulchella</i>	Low Woollygrass
<i>Datura wrightii</i>	Sacred Thorn-Apple
<i>Delphinium parishii</i>	Desert Larkspur
<i>Descurainia pinnata</i>	Western Tansymustard
<i>Descurainia sophia</i>	Herb Sophia
<i>Dichelostemma capitatum</i>	Bluedicks
<i>Dicoria canescens</i>	Desert Twinbugs
<i>Distichlis spicata</i>	Saltgrass
<i>Echinocactus polycephalus</i>	Cottontop Cactus
<i>Echinocereus coccineus</i>	Scarlet Hedgehog Cactus
<i>Echinocereus engelmannii</i>	Engelmann's Hedgehog Cactus
<i>Echinocereus mojavensis</i>	Mojave Kingcup Cactus

Scientific Name	Common Name
<i>Echinomastus johnsonii</i>	Johnson's Fishhook Cactus
<i>Elymus elymoides</i>	Squirreltail
<i>Elymus multisetus</i>	Big Squirreltail
<i>Elymus trachycaulus</i>	Slender Wheatgrass
<i>Encelia actonii</i>	Acton's Brittlebush
<i>Encelia farinosa</i>	Brittlebush
<i>Encelia frutescens</i>	Button Brittlebush
<i>Encelia virginensis</i>	Virgin River Brittlebush
<i>Enceliopsis covillei</i>	Panamint daisy
<i>Enceliopsis nudicaulis</i>	Nakedstem Sunray
<i>Ephedra californica</i>	California jointfir
<i>Ephedra funerea</i>	Death Valley Jointfir
<i>Ephedra nevadensis</i>	Nevada Jointfir
<i>Ephedra torreyana</i>	Torrey's Jointfir
<i>Ephedra trifurca</i>	Longleaf Jointfir
<i>Ephedra viridis</i>	Mormon Tea
<i>Epilobium ciliatum</i>	Fringed Willowherb
<i>Eriastrum diffusum</i>	Miniature Woollystar
<i>Ericameria cervina</i>	Deer Goldenbush
<i>Ericameria cooperi</i>	Cooper's Goldenbush
<i>Ericameria discoidea</i>	Whitestem Goldenbush
<i>Ericameria nana</i>	Dwarf Goldenbush
<i>Ericameria nauseosa</i>	Rubber Rabbitbrush
<i>Ericameria paniculata</i>	Mojave Rabbitbrush
<i>Ericameria teretifolia</i>	Green Rabbitbrush
<i>Ericameria watsonii</i>	Watson's Goldenbush
<i>Erigeron aphanactis</i>	Rayless Shaggy Fleabane
<i>Erigeron ovinus</i>	Sheep Fleabane
<i>Erigeron pumilus</i>	Shaggy Fleabane
<i>Eriogonum anemophilum</i>	Greene West Humboldt Buckwheat
<i>Eriogonum beatleyae</i>	Beatley Buckwheat
<i>Eriogonum caespitosum</i>	Matted Buckwheat
<i>Eriogonum concinnum</i>	Mourning Buckwheat
<i>Eriogonum corymbosum var. nilesii</i>	Las Vegas Buckwheat
<i>Eriogonum darrovii</i>	Darrow's Buckwheat
<i>Eriogonum deflexum</i>	Flatcrown Buckwheat
<i>Eriogonum fasciculatum</i>	Eastern Mojave buckwheat
<i>Eriogonum heermannii</i>	Heermann's Buckwheat
<i>Eriogonum heermannii var. clokeyi</i>	Clokey's Buckwheat
<i>Eriogonum inflatum</i>	Desert Trumpet
<i>Eriogonum microthecum</i>	Slender Buckwheat
<i>Eriogonum nidularium</i>	Birdnest Buckwheat
<i>Eriogonum ovalifolium</i>	Cushion Buckwheat

Scientific Name	Common Name
<i>Eriogonum palmerianum</i>	Palmer's buckwheat
<i>Eriogonum rupinum</i>	Wyman Creek Buckwheat
<i>Eriogonum trichopes</i>	Little Desert Trumpet
<i>Eriogonum umbellatum</i>	Sulphur-flower Buckwheat
<i>Eriogonum wrightii</i>	Bastardsage
<i>Eriophyllum pringlei</i>	Pringle's Woolly Sunflower
<i>Erodium cicutarium</i>	Redstem Stork's Bill
<i>Eschscholzia californica</i>	California Poppy
<i>Eschscholzia glyptosperma</i>	Desert Poppy
<i>Escobaria vivipara</i>	Spinystar
<i>Escobaria vivipara</i> var. <i>rosea</i>	Spinystar
<i>Eucnide urens</i>	Desert Stingbush
<i>Fallugia paradoxa</i>	Apache Plume
<i>Ferocactus cylindraceus</i>	California Barrel Cactus
<i>Festuca idahoensis</i>	Idaho Fescue
<i>Frasera albicaulis</i>	White Stem Frasera
<i>Frasera pahutensis</i>	Pahute Green Gentian
<i>Fraxinus anomala</i>	Singleleaf Ash
<i>Funastrum hirtellum</i>	Hairy Milkweed
<i>Galium hilendiae</i> ssp. <i>kingstonense</i>	Kingston Mountains Bedstraw
<i>Gaura coccinea</i>	Scarlet Beeblossom
<i>Gilia cana</i>	Showy Gilia
<i>Gilia latiflora</i>	Hollyleaf Gilia
<i>Gilia nyensis</i>	Nye Gilia
<i>Gilia ripleyi</i>	Ripley Gilia
<i>Gilia scopulorum</i>	Rock Gilia
<i>Glossopetalon spinescens</i>	Nevada Greasebush/Spiny Greasebush
<i>Glyptopleura marginata</i>	Carveseed
<i>Grayia spinosa</i>	Spiny Hopsage
<i>Grusonia pulchella</i>	Sand Cholla/Sagebrush Cholla
<i>Gutierrezia californica</i>	San Joaquin Snakeweed
<i>Gutierrezia microcephala</i>	Threadleaf Snakeweed
<i>Gutierrezia sarothrae</i>	Broom Snakeweed
<i>Halogeton glomeratus</i>	Saltlover
<i>Hazardia brickellioides</i>	Brickelbush Goldenweed
<i>Hecastocleis shockleyi</i>	Prickleleaf
<i>Hedeoma nana</i>	Dwarf False Pennyroyal
<i>Heliotropium curassavicum</i>	Salt heliotrop
<i>Hesperostipa comata</i>	Needle and Thread
<i>Holodiscus dumosus</i>	Heller rockspirea
<i>Hordeum brachyantherum</i>	Meadow Barley
<i>Hordeum murinum</i>	Hare Barley
<i>Hulsea vestita</i> ssp. <i>inyensis</i>	Pumice Alpinegold

Scientific Name	Common Name
<i>Hymenoclea salsola</i>	Cheese Bush
<i>Ipomopsis polycladon</i>	Many Branched Ipomopsis
<i>Isocoma acradenia</i>	Greene Alkali Goldenbush
<i>Ivesia arizonica</i> var. <i>saxosa</i>	Rock Whitefeather
<i>Juncus arcticus</i>	Mountain Rush
<i>Juncus mexicanus</i>	Mexican Rush
<i>Juniperus osteosperma</i>	Utah Juniper
<i>Koeleria macrantha</i>	Prairie Junegrass
<i>Krameria erecta</i>	Littleleaf Ratany
<i>Krameria grayi</i>	White Ratany
<i>Krameria parvifolia</i>	Range Ratany
<i>Krascheninnikovia lanata</i>	Winterfat
<i>Langloisia setosissima</i>	Great Basin Langloisia
<i>Lappula occidentalis</i>	Flatspine Stickseed
<i>Larrea tridentata</i>	Creosote Bush
<i>Lathyrus hitchcockianus</i>	Bullfrog Mountain Pea
<i>Lepidium flavum</i>	Yellow Pepperweed
<i>Lepidium fremontii</i>	Desert Pepperweed
<i>Lepidium lasiocarpum</i>	Shaggyfruit Pepperweed
<i>Lepidium perfoliatum</i>	Clasping Pepperweed
<i>Lepidium virginicum</i>	Virginia Pepperweed
<i>Leptosiphon nuttallii</i>	Nuttall's linanthus
<i>Lesquerella tenella</i>	Moapa Bladderpod
<i>Leymus cinereus</i>	Basin Wild Rye
<i>Leymus triticoides</i>	Beardless Wildrye
<i>Linanthus bigelovii</i>	Bigelow's linanthus
<i>Linanthus demissus</i>	Desert Snow
<i>Linanthus dichotomus</i>	Evening Snow
<i>Linanthus pungens</i>	Granite Prickly Phlox
<i>Linum lewisii</i>	Lewis Flax
<i>Loeseliastrum schottii</i>	Schott's Calico
<i>Logfia depressa</i>	Dwarf Cottonrose
<i>Lomatium grayi</i>	Gray's Biscuitroot
<i>Lomatium mohavense</i>	Mojave Desert Parsley
<i>Lupinus argenteus</i>	Silvery Lupine
<i>Lupinus concinnus</i>	Bajada Lupine
<i>Lupinus flavoculatus</i>	Yelloweyes
<i>Lycium andersonii</i>	Water Jacket
<i>Lycium cooperi</i>	Peach Thorn
<i>Lycium fremontii</i>	Fremont's Desert-Thorn
<i>Lycium pallidum</i>	Pale Desert-Thorn
<i>Lycium shockleyi</i>	Shockley's Desert-Thorn
<i>Machaeranthera canescens</i>	Hoary Tansyaster

Scientific Name	Common Name
<i>Machaeranthera grindelioides</i> var. <i>depressa</i>	Rayless Tansy Aster
<i>Malacothrix glabrata</i>	Smooth Desert Dandelion
<i>Malacothrix sonchoides</i>	Sowthistle Desert Dandelion
<i>Malacothrix torreyi</i>	Torrey's Desert Dandelion
<i>Mammillaria tetrancistra</i>	Common Fishhook Cactus
<i>Medicago sativa</i>	Alfalfa
<i>Menodora spinescens</i>	Spiny Menodora
<i>Mentha arvensis</i>	Wild Mint
<i>Mentzelia albicaulis</i>	Whitestem Blazingstar
<i>Mentzelia laevicaulis</i>	Smoothstem Blazingstar
<i>Mentzelia oreophila</i>	Argus Blazingstar
<i>Mentzelia tridentata</i>	Threetooth Blazingstar
<i>Mimosa microphylla</i>	Littleleaf Sensitive-Briar
<i>Mimulus bigelovii</i>	Bigelow's Monkey Flower
<i>Mimulus guttatus</i>	Seep Monkeyflower
<i>Mimulus nanus mephiticus</i>	Foul Odor Monkeyflower
<i>Mirabilis alipes</i>	Winged Four O'Clock
<i>Mirabilis comata</i>	Hairy-tuft Four O'Clock
<i>Mirabilis laevis</i>	Desert Wishbone-Bush
<i>Mirabilis laevis</i> var. <i>villosa</i>	Wishbone-Bush
<i>Mirabilis pudica</i>	Bashful Four O'Clock
<i>Monoptilon bellidiforme</i>	Daisy Desertstar
<i>Mortonia utahensis</i>	Utah Mortonia
<i>Muhlenbergia filiformis</i>	Pullup Muhly
<i>Muhlenbergia porteri</i>	Bush Muhly
<i>Nama demissum</i>	Purplemat
<i>Nicotiana obtusifolia</i>	Desert Tobacco
<i>Nicotiana obtusifolia</i> var. <i>obtusifolia</i>	Desert Tobacco
<i>Oenothera caespitosa</i>	Tufted Evening Primrose
<i>Oenothera californica</i>	California Evening Primrose
<i>Oenothera deltoides</i>	Birdcage Evening Primrose
<i>Oenothera primiveris</i>	Desert Evening Primrose
<i>Opuntia basilaris</i>	Beavertail Pricklypear
<i>Opuntia engelmannii</i>	Cactus apple
<i>Opuntia polyacantha</i> var. <i>erinacea</i>	Grizzlybear Pricklypear
<i>Oxytheca perfoliata</i>	Roundleaf Oxytheca
<i>Palafoxia arida</i>	Desert Palafox
<i>Pectocarya platycarpa</i>	Broadfruit Combseed
<i>Pectocarya recurvata</i>	Curvenut Combseed
<i>Pectocarya setosa</i>	Moth Combseed
<i>Pedicularis semibarbata</i> var. <i>charlestonensis</i>	Charleston Pinewood Lousewort
<i>Pediocactus simpsonii</i>	Mountain Ball Cactus
<i>Penstemon arenarius</i>	Nevada Sanddune Beardtongue

Scientific Name	Common Name
<i>Penstemon eatonii</i>	Firecracker Penstemon
<i>Penstemon floridus</i>	Panamint Beardtongue
<i>Penstemon newberryi</i>	Mountain Pride
<i>Penstemon pahutensis</i>	Pahute Mesa Beardtongue
<i>Penstemon palmeri</i>	Palmer's Penstemon
<i>Penstemon petiolatus</i>	Petiolate Beardtongue
<i>Penstemon pudicus</i>	Bashful Beardtongue
<i>Penstemon rostriflorus</i>	Bridge Penstemon
<i>Penstemon thompsoniae ssp. jaegeri</i>	Jaeger Beardtongue
<i>Perityle intricata</i>	Narrowleaf Laphamia
<i>Peucephyllum schottii</i>	Schott's Pygmycedar
<i>Phacelia beatleyae</i>	Beatley's Phacelia
<i>Phacelia crenulata</i>	Cleftleaf Wildheliotrope
<i>Phacelia filiae</i>	Clarke Phacelia
<i>Phacelia fremontii</i>	Fremont's Phacelia
<i>Phacelia mustelina</i>	Weasel Phacelia
<i>Phacelia parishii</i>	Parish's Phacelia
<i>Phacelia viscida</i>	Tacky phacelia
<i>Philadelphus microphyllus</i>	Littleleaf Mock Orange
<i>Phlox condensata</i>	Dwarf Phlox
<i>Phlox longifolia</i>	Longleaf Phlox
<i>Phlox stansburyi</i>	Cold-Desert Phlox
<i>Physalis crassifolia</i>	Yellow Nightshade Groundcherry
<i>Picrothamnus desertorum</i>	Bud Sagebrush
<i>Pinus monophylla</i>	Singleleaf Pinyon
<i>Piptatherum shoshoneanum</i>	Shoshone Ricegrass
<i>Plantago ovata</i>	Desert Indianwheat
<i>Pleiocanthus spinosus</i>	Thorn Skeletonweed
<i>Pleuraphis jamesii</i>	James' Galleta
<i>Pleuraphis rigida</i>	Big Galleta
<i>Pleurocoronis pluriseta</i>	Bush Arrowleaf
<i>Poa abbreviata</i>	Short Bluegrass
<i>Poa compressa</i>	Canada Bluegrass
<i>Poa fendleriana</i>	Muttongrass
<i>Poa secunda</i>	Sandberg Bluegrass
<i>Polygala heterorhyncha</i>	Beaked Spiny Polygala
<i>Polypogon monspeliensis</i>	Annual Rabbitsfoot Grass
<i>Polypogon viridis</i>	Beardless Rabbitsfoot Grass
<i>Porophyllum gracile</i>	Slender Poreleaf
<i>Porophyllum pygmaeum</i>	Dwarf Poreleaf
<i>Prosopis glandulosa var. torreyana</i>	Western Honey Mesquite
<i>Prunus fasciculata</i>	Desert Almond
<i>Psilostrophe cooperi</i>	Whitestem Paperflower

Scientific Name	Common Name
<i>Psorothamnus arborescens</i>	Mojave indigobush
<i>Psorothamnus emoryi</i>	Dyebush
<i>Psorothamnus fremontii</i>	Fremont's Dalea
<i>Psorothamnus polydenius</i>	Nevada Dalea
<i>Pteryxia petraea</i>	Rockloving Wavewing
<i>Purshia mexicana</i>	Mexican Cliffrose
<i>Purshia stansburiana</i>	Stansbury Cliffrose
<i>Purshia tridentata</i>	Antelope Bitterbrush
<i>Rafinesquia neomexicana</i>	New Mexico Plumeseed
<i>Ranunculus eschscholtzii</i>	Eschscholtz's Buttercup
<i>Rhus aromatica</i>	Fragrant Sumac
<i>Rhus trilobata</i>	Skunkbush Sumac
<i>Ribes cereum</i>	Wax Currant
<i>Ribes velutinum</i>	Desert Gooseberry
<i>Rosa woodsii</i>	Woods Rose
<i>Sairocarpus kingii</i>	Least Snapdragon
<i>Salazaria mexicana</i>	Mexican Bladdersage
<i>Salix exigua</i>	Narrowleaf Willow
<i>Salix geyeriana</i>	Geyer Willow
<i>Salsola tragus</i>	Prickly Russian Thistle
<i>Salvia columbariae</i>	Chia
<i>Salvia dorrii</i>	Purple Sage
<i>Sarcobatus baileyi</i>	Bailey's Greasewood
<i>Sarcobatus vermiculatus</i>	Greasewood
<i>Schismus arabicus</i>	Arabian Schismus
<i>Schismus barbatus</i>	Common Mediterranean Grass
<i>Sclerocactus polyancistrus</i>	Redspined Fishhook Cactus
<i>Scleropogon brevifolius</i>	Burrograss
<i>Senecio flaccidus</i> var. <i>douglasii</i>	Douglas' Ragwort
<i>Sinapis arvensis</i> L. ssp. <i>arvensis</i>	Wild Mustard
<i>Sisymbrium irio</i>	London Rocket
<i>Sisymbrium orientale</i>	Indian Hedgemustard
<i>Sonchus oleraceus</i>	Sowthistle
<i>Sphaeralcea ambigua</i>	Desert Globemallow
<i>Sphaeralcea grossulariifolia</i>	Gooseberryleaf Globemallow
<i>Sphaeralcea rusbyi</i>	Rusby's Globemallow
<i>Sporobolus airoides</i>	Alkali Sacaton
<i>Sporobolus contractus</i>	Spike Dropseed
<i>Sporobolus cryptandrus</i>	Sand Dropseed
<i>Sporobolus flexuosus</i>	Mesa Dropseed
<i>Stanleya elata</i>	Panamint Princesplume
<i>Stanleya pinnata</i>	Desert Princesplume
<i>Stephanomeria exigua</i>	Small Wirelettuce

Scientific Name	Common Name
<i>Stephanomeria parryi</i>	Parry's Wirelettuce
<i>Stephanomeria pauciflora</i>	Brownplume Wirelettuce
<i>Stipa shoshoneana</i>	Shoshone Ricegrass
<i>Streptanthella longirostris</i>	Longbeak Streptanthella
<i>Suaeda moquinii</i>	Mojave Seablite
<i>Symphoricarpos longiflorus</i>	Desert Snowberry
<i>Tetradymia axillaris</i>	Longspine Horsebrush
<i>Tetradymia canescens</i>	Spineless Horsebrush
<i>Tetradymia glabrata</i>	Littleleaf Horsebrush
<i>Tetradymia spinosa</i>	Shortspine Horsebrush
<i>Thamnosma montana</i>	Turpentinebroom
<i>Thymophylla pentachaeta</i>	Fiveneedle Pricklyleaf
<i>Tiquilia canescens</i>	Woody Crinklemat
<i>Tiquilia nuttalli</i>	Nuttall's Crinklemat
<i>Tiquilia plicata</i>	Fanleaf Crinklemat
<i>Townsendia jonesii</i> var. <i>tumulosa</i>	Charleston Ground Daisy
<i>Tridens muticus</i>	Slim Tridens
<i>Typha angustifolia</i>	Narrowleaf Cattail
<i>Viguiera parishii</i>	Parish's Goldeneye
<i>Vulpia octoflora</i>	Sixweeks Fescue
<i>Xanthocephalum gymnospermoides</i>	San Pedro Matchweed
<i>Xylorhiza tortifolia</i>	Mojave Woodyaster
<i>Yucca baccata</i>	Banana Yucca
<i>Yucca brevifolia</i>	Joshua Tree
<i>Yucca elata</i>	Soaptree Yucca
<i>Yucca schidigera</i>	Mojave Yucca