Appendix B: Botanical Report

Botanical Resources Report

Libra Solar Project
N-99846

Mineral and Lyon Counties, Nevada

Prepared for:
Libra Solar, LLC

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August 2022

Table of Contents

List of Figures

List of Tables

Introduction

This report describes the botanical resources survey conducted in June of 2022 for the proposed Libra Solar Project (Project). The botanical resources survey followed protocol as described in the Bureau of Land Management (BLM) Carson City District Office's *Rare Plant Survey Protocols*.

PROJECT DESCRIPTION

The Project is located on federal land administered by the BLM in the northeastern portion of the Great Basin, approximately 12 miles southeast of Yerington, Nevada and 55 miles southeast of the Reno metropolitan area. The Project is primarily located in an unincorporated area of Mineral County, although some linear features are also located in Lyon County (Figure 2). The Project site is east of Mason Valley and 12 miles east of State Highway 239 within the Hussman Spring and Buckbrush Spring United States Geographical Survey (USGS) 7.5-minute topographic quadrangles. The Project legal land description is as follows:

Mount Diablo Meridian, Nevada
T. 12 N., R. 27 E.,
sec. 15, SW1/4;
sec. 16, E1/2, SW1/4;
sec. 17, S1/2;
secs. 20 thru 22; All;
sec. 23, SW1/4SW1/4;
sec. 25, SW1/4SW1/4;
sec. 26, S1/2, NW1/4;
sec. 27, N1/4, N1/2SW1/4, SW1/4SW/14, N1/2SE1/4;
sec. 28; All;
sec. 29, E1/2, E1/2NW1/4, NW1/4SW1/4;
sec. 32, NE1/4, NE1/4SE1/4;
sec. 33, NW1/4, N1/2SW1/4, NW1/4SE1/4;
sec. 35, E1/2, E1/2NW1/4, NW1/4NW1/4, NW1/4SW1/4; and
sec. 36, W1/2.

The Project includes the construction, operation and maintenance, and decommissioning of a 700 megawatt (MW) alternating current (MWac) photovoltaic (PV) solar project and ancillary facilities, including a battery energy storage system (BESS). The Project footprint includes the development of approximately 5,413 acres and is located entirely on federal lands administered by the BLM under the 2001 Carson City Consolidated Resource Management Plan. The Project is located within a variance area for solar power generation under the 2012 Approved Resource Management Plan Amendments/Record of Decisions for Solar Energy Development in Six Southwestern States.

The Project will directly or indirectly disturb approximately 5,413 acres. Permanently disturbed areas will include the project area (5,413 acres), access roads (5 miles), and the gen-tie lines (18-20 miles).

Botanical surveys were conducted by Phoenix Biological Consulting (PBC) over the entire Project Area in June 2022. The Study Area includes a buffer area of 100 feet surrounding the Project boundary and associated gen-tie lines and access roads (Figure 3).

Figure 1. *Sarcobatus baileyi* Shrubland Alliance Characteristic of the Site.

Figure 2. Libra Solar Project Location

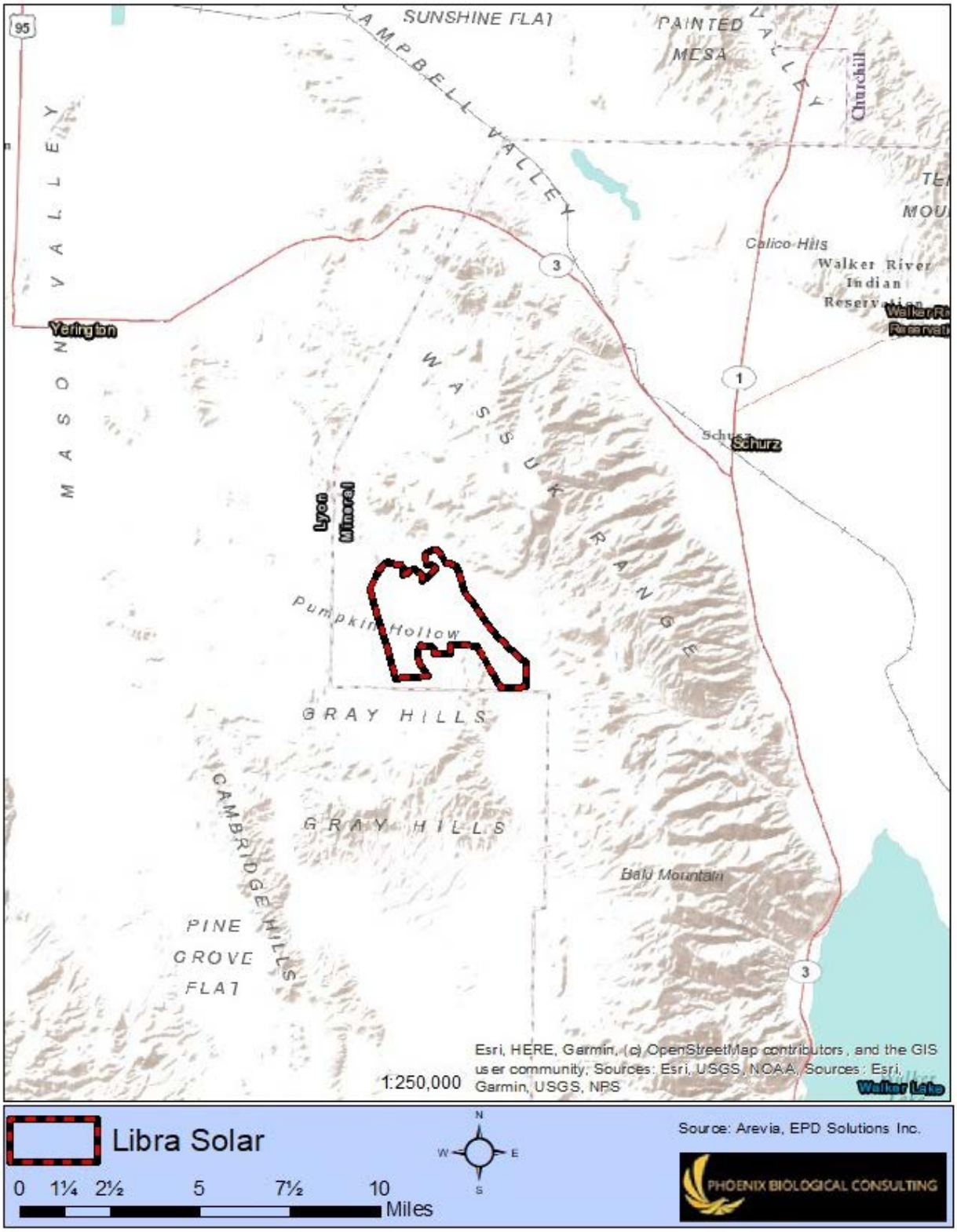


Figure 3. Libra Solar Study Area with Potential Access and Gen-tie Routes

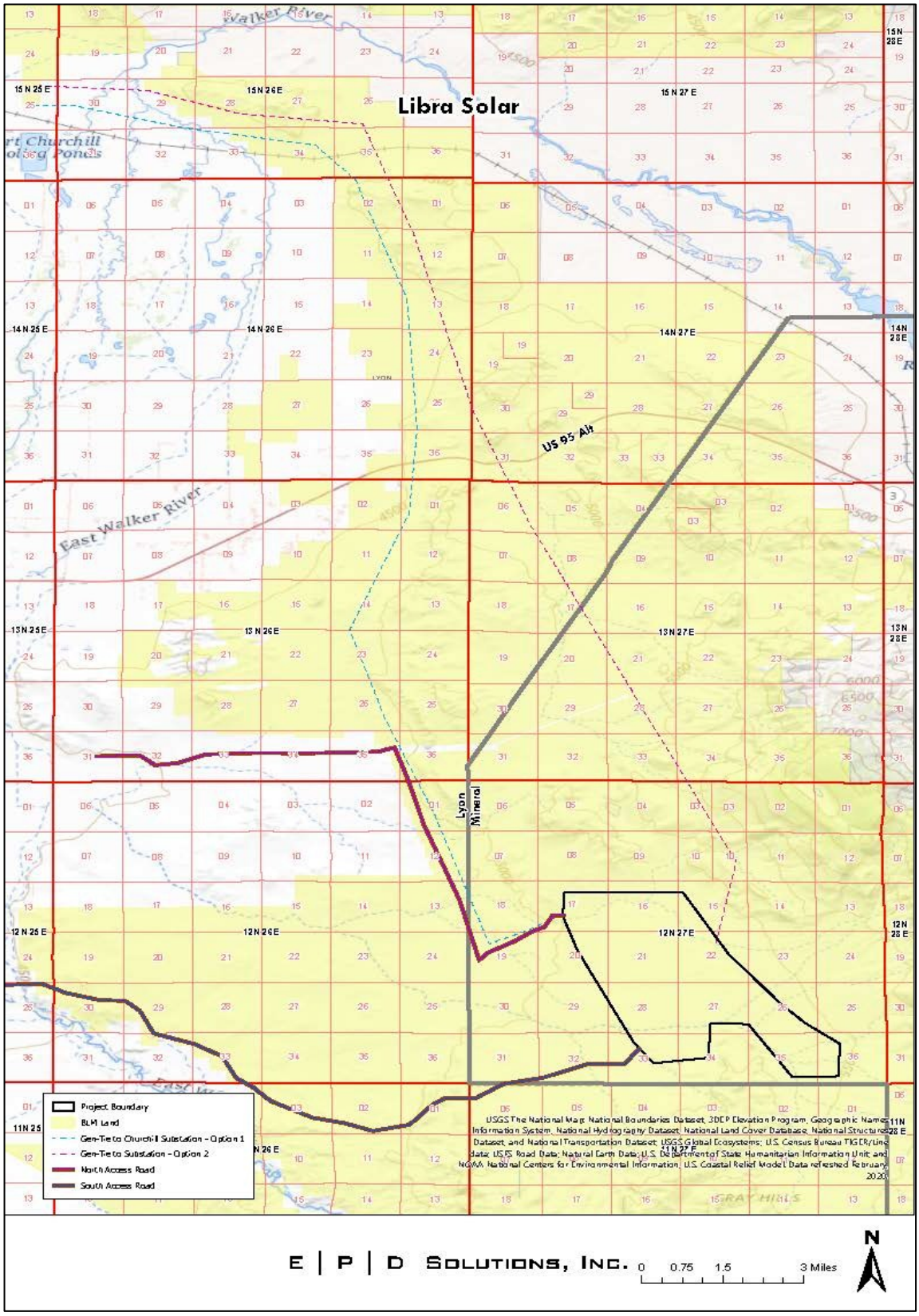
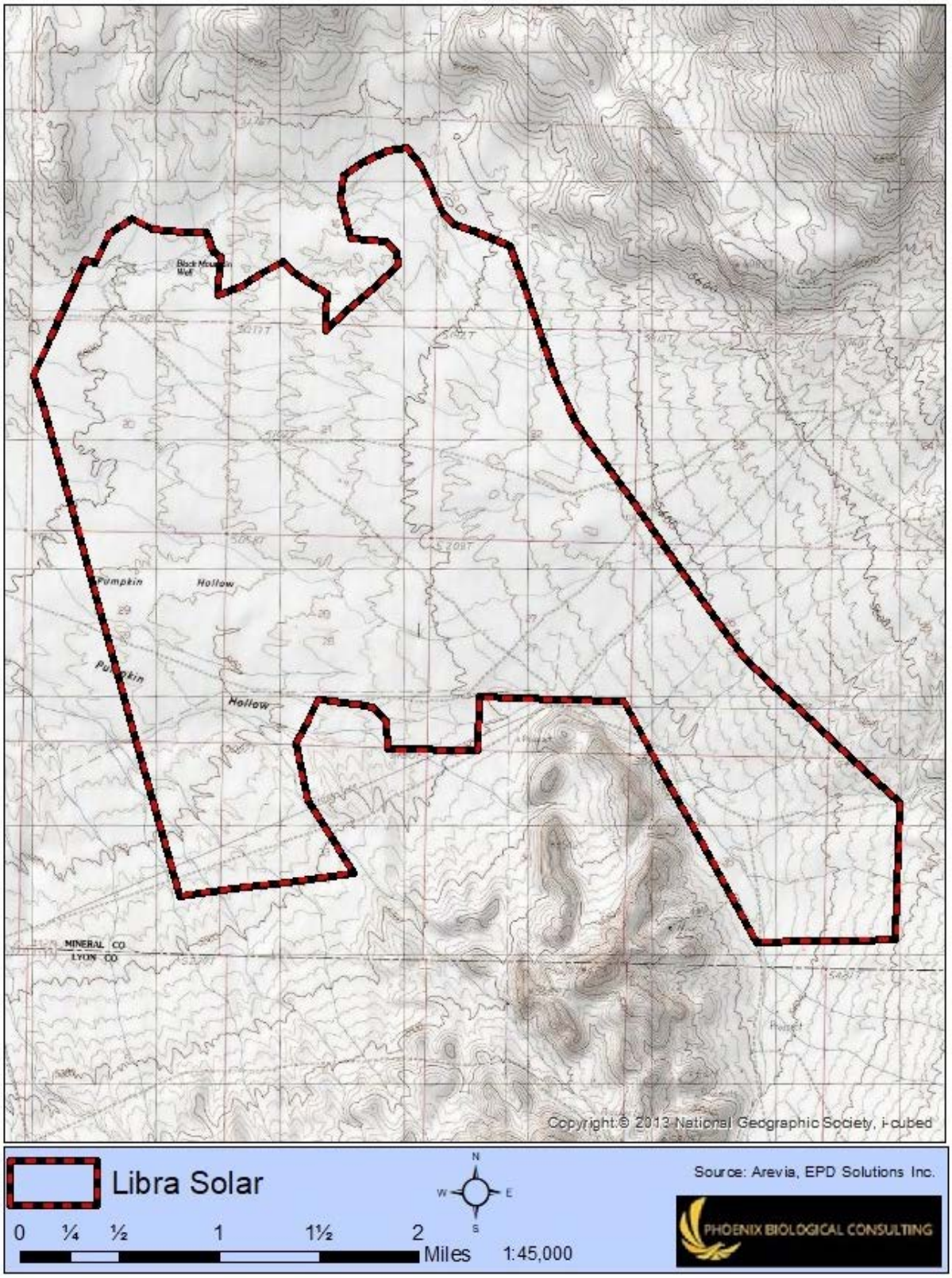


Figure 4. Aerial Imagery of the Libra Solar Project Area

Figure 5: Topographic View of Libra Solar



ENVIRONMENTAL SETTING

The Project is located east of Mason Valley in the northwestern portion of the Great Basin. The topography within the Study Area is composed of gently sloping plains, alluvial floodplains and small hills with an occasional bedrock outcropping. Slopes are gentle, ranging from approximately two to six percent. Elevations range from approximately 4,985 to 5,495 feet with the highest elevations on the eastern portion of the Project Area and the lowest elevations in the western portion. The area where the Project is situated is typical of this region and is characterized by broad basins and numerous parallel mountain ranges aligned in a north-south configuration referred to as the Basin and Range Province that encompasses much of the Great basin and interior western United States. The Project is situated along the lower part of a gently sloping bajada that extends up into the Wassuck Range located approximately six miles to the east. Multiple braided, ephemeral washes flow westward through the Project Area and connect to the Walker River. The western Project Area lies within a lowlands known as Pumpkin Hollow (Figure 5).

The climate is typical of the northwestern Basin and Range Province, characterized by arid conditions and dramatic daily and seasonal temperature fluctuations (Table 1). The solar plant footprint is situated at an elevation of 4,974 ft. to 5,186 ft. on a xeric, bajada geomorphic feature derived from calcareous, sedimentary source strata to the east. Two local National Weather Service (NWS) stations, Yerington (NWS Station# YRGN2) and Smith 6 N (NWS station# SMIN2), provide climatic records for the temporal range 1-1-1974 to 6-30-2022 (U.S. Climate Resilience Toolkit, 2022). The Yerington station is approximately 11 miles to the northwest of the study area and is situated at 4,380 ft. elevation. The Smith 6 N station is approximately 19 miles west of the Project Area and is located at 5,000 ft. elevation.

The Yerington station recorded the average annual high and low temperatures as 82 degrees Fahrenheit (°F) and 28°F, respectively, with average highs between 97 and 101°F during the summer months (June, July, and August) and average lows between 7 and 11°F during the winter months (December, January, and February) (Table 1). The Smith 6 N station recorded the average annual high and low temperatures as 81 degrees Fahrenheit (°F) and 19°F, respectively, with average highs between 96 and 100°F during the summer months (June, July, and August) and average lows between 1 and 6°F during the winter months (December, January, and February) (Table 1). Average annual precipitation recorded at the Yerington station was 4.50 inches and at Smith 6 N was 5.88 inches.

Table 1. Average Monthly Precipitation and Temperature

Average High (°F) [1]	61	67	74	80	90	97	101	100	95	85	71	62	**82°F**
Average High (°F) [2]	62	65	73	80	88	96	100	98	94	84	71	63	**81°F**
Average Low (°F) [1]	8	11	18	24	31	39	48	46	36	24	13	7	**25°F**
Average Low (°F) [2]	1	6	13	17	25	32	42	40	30	17	7	1	**19°F**
Precipitation (in.)[1]	0.54	0.40	0.46	0.33	0.60	0.39	0.32	0.26	0.19	0.38	0.40	0.43	**4.50 inches**
Precipitation (in.)[2]	0.83	0.76	0.72	0.35	0.64	0.42	0.40	0.27	0.26	0.43	0.51	0.65	**5.88 inches**

[1] From the Yerington Station
[2] From the Smith 6 N Station

The soils on site are derived from both aeolian deposits and alluvial deposition of limestone and dolomite parent material. The majority of the site consists of either sandy-gravelly loams or fine sand with gravelly substratum.

Natural vegetation types are found throughout the region except in developed areas. The vegetation types found in the Project Area are characteristic of local vegetation types and include shrublands associated with arid valley floors and alluvial slopes. These arid shrublands are commonly characterized by dominant species such as *Sarcobatus baileyi, Ephedra nevadensis*, and *Kraschennikovia lanata*.

Methods

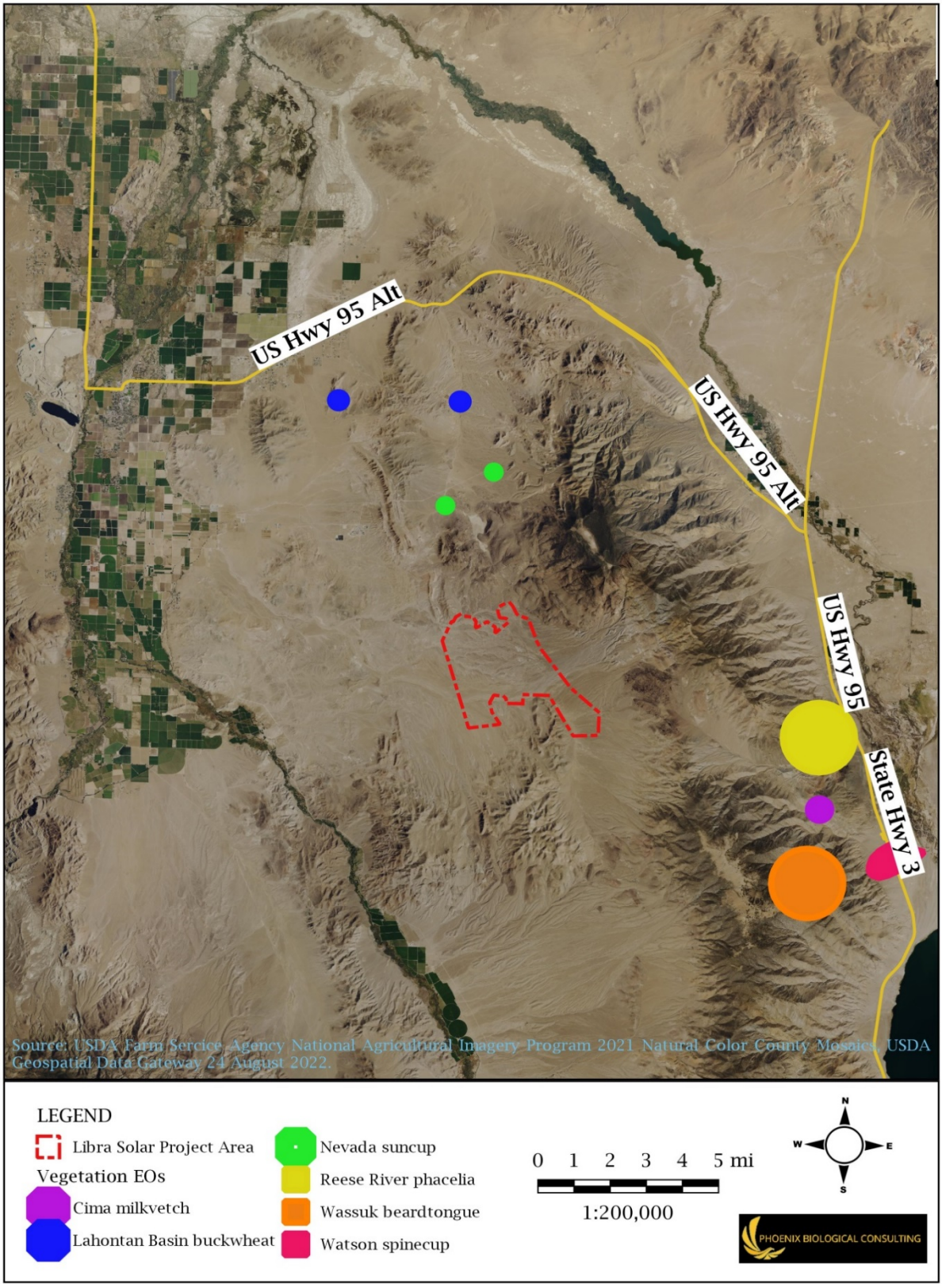
This section describes the methods for the botanical resources surveys conducted in June 2022 within the Study Area.

PRE-FIELD REVIEW

Development of Target Species List

A pre-field review was conducted to determine special-status plant species with the potential to occur within the Project Area. Brian Elliott, Vice-President and Senior Botanist at Elliott Environmental Consulting, developed the list of potential special-status species for the Project Area as a consultant to PBC. BLM Botanist Dean Tonenna was also consulted during development of the potential target species list. In addition, plant databases were reviewed, including a data request from the Nevada Natural Heritage Program (NNHP, 2021) the Nevada Division of Natural Heritage (NDNH) online species information site (NDNH, 2022). and the U.S. Fish and Wildlife Service's (USFWS) Information for Planning and Consultation (IPaC) site (USFWS 2022). The list of special-status species determined to have at least some likelihood to occur within the Study Area is included in Appendix A.

Figure 6. Nevada Natural Heritage Program Results in the Libra Solar Study Area



RECONNAISSANCE VISITS

PBC Biologist Sarah Schmid performed field reconnaissance on December 14, 2021, and January 19, 2022. The purpose of these site visits was to provide initial habitat mapping and site characterization for the study area in order to identify further studies or to exclude others based on habitat type. The entire site was evaluated for potential impacts from the Project, including sensitive plant and animal species as well as to assess if potential jurisdictional drainages are present that may be affected by the project. Based on the reconnaissance visits, field botanical surveys were deemed appropriate and Phoenix initiated further discussion with BLM. The results of the reconnaissance visits are present in the biological habitat assessment prepared by PBC (Phoenix, 2022)

IDENTIFICATION OF VEGETATION COMMUNITIES AND SOILS

Vegetation communities within the Study Area were identified and mapped during reconnaissance surveys in late 2021 and early 2022 by PBC Biologist Sarah Schmid and were further refined in the field during the botanical survey, as needed. Vegetation types within the Study Area were classified to the alliance level using the NNHP's *International Vegetation Classification Alliances and Associations Occurring in Nevada with Proposed Additions* (Peterson, 2008).

A soil resource report for the Study Area was created using the Natural Resources Conservation Service (NRCS) Web Soil Survey (NRCS, 2022).

SPECIAL-STATUS PLANT INVENTORY METHODOLOGY

A floristic survey of the Study Area was conducted using an intuitive controlled botanical survey methodology. Using this method, the surveyor traverses through the Study Area enough to see a representative cross section of all the major habitats and topographic features, looking for the target species while en route between different areas. As a result most of the project area will have been surveyed. When the surveyor arrives at an area of high potential habitat (that was defined in the pre-field review or encountered during the field visit), a complete survey for the target species is made (Whiteaker et al, 1998). These methods complied with the BLM Carson City District Office's *Rare Plant Survey Protocols* and were reviewed by BLM Botanist Dean Tonenna prior to implementation (BLM, 2022). The following key aspects of the survey protocols were implemented during the survey of the Study Area:

- PBC botanists reviewed the potential sensitive plant list prior to field work to familiarize themselves with sensitive species that may occur on site.
- PBC botanists conducted an intuitive controlled pedestrian survey of the Study Area.
- The floristic inventory included documenting all plant taxa within the Study Area (solar development area, buffer and gen-ties).
- All rare taxa encountered were recorded using a mapping-grade global positioning system (GPS) unit (Trimble Geo7).
- Data for all rare taxa were recorded in a data dictionary loaded into the GPS units that was developed to record all requisite fields of the NNHP's Nevada Native Species Site Survey Report (NNHP, 2018b).
- Survey tracks were documented using recreational-grade Garmin Etrex20 GPS units.
- A working master plant list was maintained and updated daily.

- Observations of vegetation types were used to update the map of vegetation communities.

The botanical survey teams split up and worked independently. Each botanical surveyor carried a mapping grade Trimble Geo7 GPS unit, a recreational grade Garmin eTrex20x, paper maps with an aerial background, and a rare plant field guide developed specifically for the project. All data was recorded on the Trimble units, which were collected each day and all data was downloaded.

Special-status plant locations were mapped as points, lines, or polygons as appropriate using the Trimble Geo7 units. Data was recorded for each feature using a project-specific data dictionary that included the data requested on the NNHP's Nevada Native Species Site Survey Report form. Recorded data included the observer's name, scientific name, phenology (percent dormant, vegetative, budding, flowering, fruiting, and/or seeding), age structure (percent senescent, mature, seedling), interactions (disease, predation, competition, parasitism, symbiosis, pollination, hybridization, none, or other), current site use (camping, grazing, mining, OHV trails, transmission line, undisturbed, or other), associated species, population estimate, size estimate, and notes. Representative photos were taken of special-status plant taxa and their habitats.

Data gathered during the special-status plant survey was used to populate a Nevada Native Species Site Survey Report, commonly referred to as an element occurrence form. These forms are included as Appendix E. Spatial data collected using the Trimble GPS units was converted to shapefiles and provided to the client.

All project botanists had experience surveying for rare plants in the Great Basin and met the requirements of the BLM Carson City District Office. See the contractor qualifications section included below.

References used for plant identification during the survey included *The Jepson Manual, Vascular Flora of California* (Baldwin et al., 2012), *Jepson Desert Manual, Vascular Flora of Southeastern California* (Baldwin et al. 2002), *The Cacti of the United States and Canada* (Benson, 1988), *Intermountain Flora* (Cronquist et al., 2013), *Flora of North America* electronic flora (FNA, 2018), *A Flora of Nevada* (Kartesz, 1988), and *North American Species of Astragalus* (Welsh, 2007).

Inventory Timing

The special-status plant inventory of the Study Area was conducted from June 15, 2022, to June 22, 2022. The timing was determined based on target species phenology as well as seasonal rainfall events, regional temperatures, site reconnaissance, and input from BLM Botanist Dean Tonenna. Based on these factors, June was determined to be the optimal survey time when most target species could be most reliably identified. No weather extremes had occurred in the previous year to delay or accelerate growing seasons and plant phenology in the first half of 2022.

CACTI AND INVASIVE WEEDS SAMPLING SURVEY METHODOLOGY

In addition to the intuitive-controlled botanical survey, cacti and invasive weeds were sampled by surveying belt transects. Belt transects were placed in the Project Area polygon using a stratified random methodology. The buffer area and gen-ties were not included as these areas were subject to more intensive survey as a result of access roads within their boundaries. Belt transects were 33 feet (15 meters) wide and their lengths were variable, ranging from 1,677 to 16,896 ft. (511-5150 m.) in length

and from 1.9 to 19.1 acres in size. In total, belt transects comprised 293 acres of the total 5,143 acres located within the Project Area solar site. Thus, approximately 5.7% of the total area was surveyed using belt transects. Figure 15 below shows the stratified random transects within the Project. Appendix B includes data sheets from belt transect sampling. Pre-established transect lines were uploaded to hand-held GPS units to be used by each surveyor as the center line of the survey transect. Surveyors worked individually and walked along the center line of each transect.

Cacti Sampling

Botanical surveyors counted each individual cactus and tallied them on a data sheet; tallies for each species were made in the appropriate height class (0-3 feet; 3-6 feet; >6 feet) as either numeric values or tally marks. At the end of each transect surveyors totaled up the numbers of individuals of each species and recorded the totals on the data sheet at the end of the row.

Invasive Weed Sampling

Invasive weed species were also tallied during implementation of the belt transects. The surveyor estimated the number of each weed and tallied them on the data sheet as either numeric values or tallies. At the end of each transect surveyors totaled the number of invasive weeds and recorded the totals on the data sheet at the end of the row for each species.

Additional Invasive Species Mapping

Invasive weed species targeted during the inventory included all species listed on the Nevada Department of Agriculture (NDA) Nevada Noxious Weed List (NDA, 2021). Only Category "A" noxious weeds were to be mapped, and none of these species were located anywhere within the Project Area. One Category "C" noxious weed species, *Lepidium latifolium*, was documented. Additionally, several invasive, non-native species not listed on the noxious weed list were documented during the survey. These include *Bromus tectorum*, *Bromus rubens*, *Halogeton glomeratus*, *Salsola tragus*, and *Salsola paulsenii*. In addition to invasive species sampling conducted during the belt transects surveys, they were also documented during the course of intuitive controlled surveys.

Results

VEGETATION COMMUNITIES

The Study Area is vegetated primarily by a Great Basin Salt Desert Scrub community, best described as a *Sarcobatus baileyi* Shrubland Alliance (Alliance Code B.001). Within this alliance, at least two associations were observed: *Sarcobatus baileyi-Picrothamnus desertorum - Atriplex confertifolia / Pleuraphis jamesii* Shrubland (Association Code NNHP070) and *Sarcobatus baileyi - Ephedra nevadensis* Shrublands (Association Code NNHP071). Numerous drainage features are present, and these contain desert wash communities vegetated by *Ericameria nauseosa* Shrubland Alliance (Alliance Code A.835), *Atriplex canescens* Shrubland Alliance (Alliance Code A.869), and North American Warm-Desert Xeric-Riparian Scrub Macrogroup (NatureServe Element Code M092). Alliances, associations and codes are in accordance with vegetation type definitions from Natureserve (2022) and the NDNH publication, *International Vegetation Classification Alliances and Associations Occurring in Nevada with Proposed Additions* (Peterson, 2008). Vegetation communities are summarized in Table 2 and described in narratives following the table. Representative photographs from vegetation communities are shown in Appendix D.

Table 2. Area and Proportion of Vegetation Communities in the Study Area.

Vegetation Community	Acreage within the Study Area	Percentage of the Study Area	Acreage Sampled	Linear Distance of Belt Transects Sampled	Percentage of Community Area Sampled
Ericameria nauseosa Alliance	16	0.3%	0.88	0.24 kilometers of 15 meter wide transects	5.5%
Atriplex canescens Alliance	94	1.8%	5.66	1.53 kilometers of 15 meter wide transects	6.0%
North American Warm Desert Xeric Riparian Scrub	216	4.2%	13.83	3.73 kilometers of 15 meter wide transects	6.4%
Sarcobatus baileyi – Picrothamnum desertorum – Atriplex confertifolia/ Pleuraphis jamesii Alliance	1,991	38.7%	113.11	30.51 kilometers of 15 meter wide transects	5.7%
Sarcobatus baileyi – Ephedra nevadensis Alliance	2,832	55.0%	181.60	48.99 kilometers of 15 meter wide transects	6.4%
Total	**5,149**		**315 acres**	**85.0 kilometers**	

Sarcobatus baileyi - Picrothamnus desertorum - Atriplex confertifolia / Pleuraphis jamesii Shrubland Alliance

The *Sarcobatus baileyi - Picrothamnus desertorum - Atriplex confertifolia / Pleuraphis jamesii* Shrubland (Association Code NNHP070) occurs over much of the southern Study Area (Figure 7). This alliance is common in lowlands of the western Great Basin, where it occupies upper elevations of salt desert scrublands. It is "co-dominated by *S. baileyi* and *P. desertorum*, and typically has some amount of *A. confertifolia*, though generally not in amounts equal to the first two. The graminoid layer is quite sparse, sometimes even absent; when present, *P. jamesii* is most abundant, indicating Mojavean influences, perhaps in greater warm-season rainfall than is typical for the Great Basin" (Peterson, 2008).

Sarcobatus baileyi - Ephedra nevadensis Shrubland Alliance

Sarcobatus baileyi - Ephedra nevadensis Shrublands (Association Code NNHP071) occupy most of the northern project area (Figure 7). This alliance typically occurs in dry, sandy sites in central-western Nevada. *S. baileyi* is "generally dominant, though occasionally one of the other primary shrub associates may have higher cover. *E. nevadensis* is a reliable associate, though cover may vary or have minimal presence. *Grayia spinosa* and *Krascheninnikovia lanata* may also be present and can even co-dominate the type. Perennial grasses are sparse to absent; *Achnatherum hymenoides* appears to be the primary species present" (Peterson, 2008).

Ericameria nauseosa Shrubland Alliance

A small stand of *Ericameria nauseosa* Shrubland Alliance (Alliance Code A.835) occurs in northwest project area (Figure 7) in a deep westerly drainage, with a steep bank on the north side and a gently sloped floodplain to the south. The substrate is deep sand, and sand-loving associates are present. This alliance includes both natural and semi-natural stands across the northern Great Plains and throughout the western U.S. Naturally occurring stands have been described "from areas of partially stabilized sands, in regions of actively moving dune deposits, and in other areas of high natural disturbance such as on steep colluvial slopes, along drainages or in floodplains. Semi-natural stands are seral shrubland communities resulting from overgrazing by livestock, road building, or other cultural disturbance of typically grass-dominated communities. Soils are variable, but generally well-drained and coarse-textured. The vegetation is characterized by an open to moderately dense, short-shrub layer (15-60% cover) that is dominated by *E. nauseosa*" (Peterson, 2008).

Atriplex canescens Shrubland Alliance

A modest stand of *Atriplex canescens* Shrubland Alliance (Alliance Code A.869) occurs in the southeast project area, within the gravelly eastern floodplains of the Gray Hills. This widespread alliance occurs in variety of environmental settings in arid and semi-arid areas of the southwestern U.S., central Mexico, and the western Great Plains. Overall, shrublands in this alliance occur on lowland sites including alluvial flats, drainage terraces, playas, washes and interdune basins, as well as upland sites including bluffs and gentle to moderately steep, sandy or rocky slopes. Soils are variable with depths ranging from shallow to moderately deep, and texture ranging from sand to loam to clay; lowland sites may be moderately saline or alkaline (Peterson, 2008).

North American Warm-Desert Xeric-Riparian Scrub Alliance

North American Warm-Desert Xeric-Riparian Scrub (NatureServe Element Code M092) occurs in the wide, gravelly, sometimes braided washes in the southeastern project area. This macrogroup occupies intermittently flooded washes or arroyos that dissect bajadas, mesas, plains and basin floors throughout the warm deserts of the western U.S. and northwestern Mexico. The vegetation consists of variable shrublands and grasslands of desert washes, and typically occurs along the edges or in the channel bottoms. This macrogroup is "associated with flash flooding and rapid sheet and gully flows that scour channel bottoms. The vegetation is sparse both from the high impact of flooding and the lack of moisture for the rest of the year" (Natureserve, 2022). At Libra Solar, this macrogroup is dominated by *Hymenoclea salsola*, annual and perennial *Eriogonum* species, mixed herbs and grasses.

Soil Types

Substrates in the study area range from sandy to gravelly or stony. Drainage channels are generally gravelly with cobbles and small boulders; some are predominately sand and silt. Soils in the study area are derived from mixed alluvium and they consist of: Deefan-Rawe-Bluewing association (65.4%), Smedley-Annaw-Izo association (18.8%), Deefan-Cleaver-Bluewing association (7.8%), Rawe-Bluewing-Trocken association (5%), Smedley very gravelly sandy loam, 4-30% slopes (3%), and other minor components (<1%). Smedley, Smedley very gravelly sandy loam 4-30% slopes, and Cleaver type soils include a cemented horizon, or duripan. Figure 8 depicts the USDA Soil Survey Map Units within the project area (USDA, 2022). Table 3 summarizes characteristics of the USDA Soil Survey Map Units.

Deefan type soils occur on fan remnants; they consist of very gravelly fine sandy loam (0-3"), gravelly clay (3-10"), a cemented horizon (10-26"), and stratified extremely gravelly coarse sand/sandy loam (26-60"). Rawe type soils occur on inset fans; they consist of gravelly sandy loam (0-1"), clay (1-10"), and stratified extremely to very gravelly coarse sandy loam (10-60"). Bluewing type soils occur on channels; they consist of very gravelly loamy sand (0-7") and stratified very gravelly sand to extremely gravelly loamy coarse sand (7-60"). Smedley type soils occur on fan remnants; they consist of very gravelly sandy loam (0-2"), gravelly clay loam (2-15"), a cemented horizon (15-33"), and stratified extremely gravelly sand to extremely gravelly sandy loam (33-60"). Annaw type soils occur on inset fans; they consist of very gravelly loamy sand (0-2"), gravelly sandy loam (2-11"), and stratified extremely gravelly loamy coarse sand to very gravelly loamy sand (11-60"). Izo type soils occur on channels; they consist of very gravelly sand (0-8") and stratified extremely gravelly coarse sand to gravelly loamy sand (8-60"). Cleaver type soils occur on fan remnants; they consist of very gravelly sandy loam (0-3"), gravelly loam (3-11"), cemented horizon (11-20"), and stratified extremely gravelly coarse sand to gravelly sandy loam (20-60"). Trocken type soils occur on inset fans; they consist of very gravelly sandy loam (0-3") and stratified very cobbly loam to extremely gravelly coarse sandy loam (3-60"). Smedley very gravelly sandy loam, 4-30% slopes, occurs on fan remnants and is derived from mixed alluvium; it consists of very gravelly sandy loam (0-2"), gravelly clay loam (2-18"), a cemented horizon (18-43"), and stratified extremely gravelly sand to extremely gravelly sandy loam (43-60").

Table 3: Soil Types Mapped Within the Project Area

Map Unit Symbol	Map Unit Name	Landform	Frequency of Flooding/Ponding	Drainage Class	Project Area Location	Percentage of Project Area	Hydric Rating*
1090	Singatse-Theon-Rock outcrop association	Hills and ridges	None/none	Somewhat excessively drained – well drained	Northwest corner	<1	0
3020	Rawe-Bluewing-Trocken association	Fan remnants and inset fans	None-rare/none	Excessively drained - well drained	Southwest corner	~5	0
3040	Deefan-Rawe-Bluewing association	Fan remnants, inset fans, channels	None, frequent/none	Excessively drained - well drained	Central portion	~65	0
3043	Deefan-Cleaver-Bluewing association	Fan remnants and channels	None-occasional/none	Excessively drained - well drained	Southwest corner	~8	0
3061	Smedley-Annaw-Izo association	Fan remnants, inset fans, channels	Rare, occasional, none/none	Excessively drained - well drained	Southeast corner	~19	0
3063	Smedley very gravelly sandy loam, 4 to 30 percent slopes	Fan remnants	None/none	Well drained	Southeast corner	~3	0
4177	Downeyville-Mirkwood-Nemico assoociation	Plateaus	None/none	Well drained	Southeast corner	<1	0

Figure 7. Vegetation Communities in the Study Area

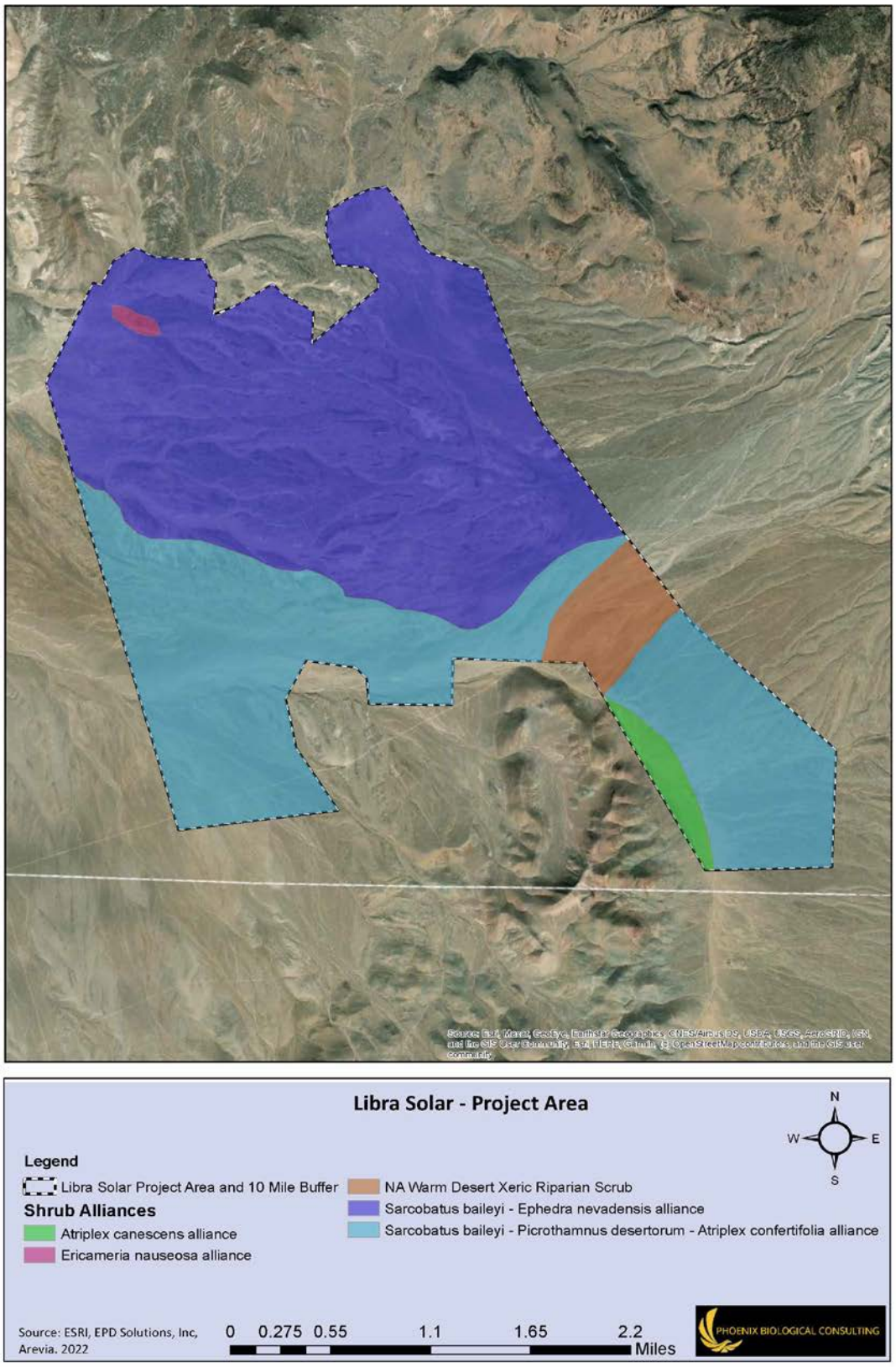
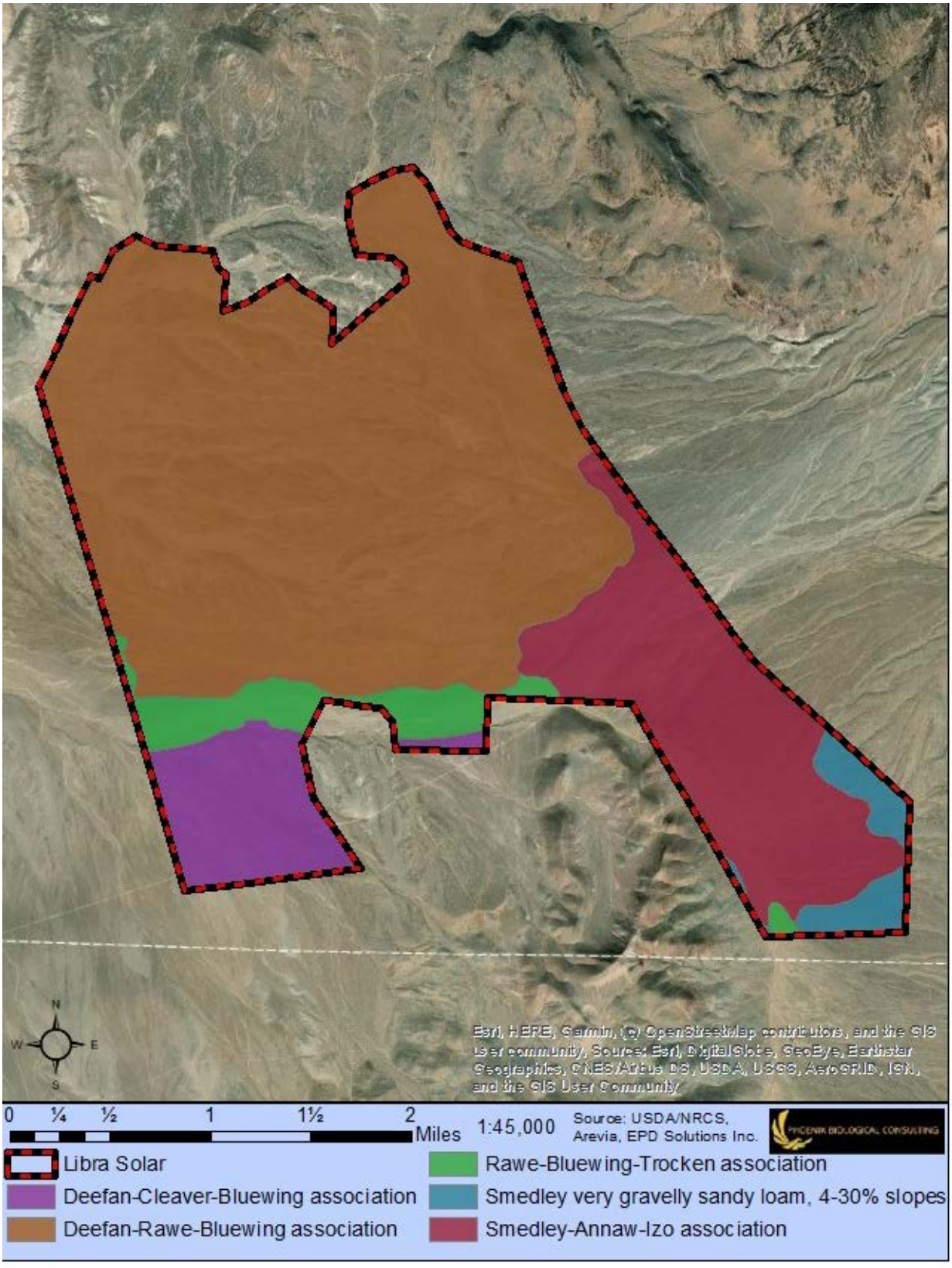


Figure 8. Soil Types in the Study Area



SPECIAL-STATUS PLANT INVENTORY

The June 2022 special-status plant inventory was floristic in nature and a complete list of all plant species identified during the survey, totaling 123 taxa, is included in Appendix C. Four taxa of special-status plants were identified within the Study Area during the June 2022 surveys, including *Penstemon palmeri* var. *macranthus*, *Oryctes nevadensis*, *Grusonia pulchella*, and *Astragalus pseudiodanthus*. *Penstemon palmeri* var. *macranthus* is listed as Imperiled by both the State of Nevada and the Nevada Heritage Program. *O. nevadensis* is listed as Vulnerable by both the State of Nevada and the Nevada Heritage Program. *G. pulchella* is listed as Imperiled to Vulnerable by the Nevada Heritage Program and Apparently Secure by the State of Nevada. *A. pseudiodanthus* is listed as Imperiled by the Nevada Heritage Program and Vulnerable by the State of Nevada.

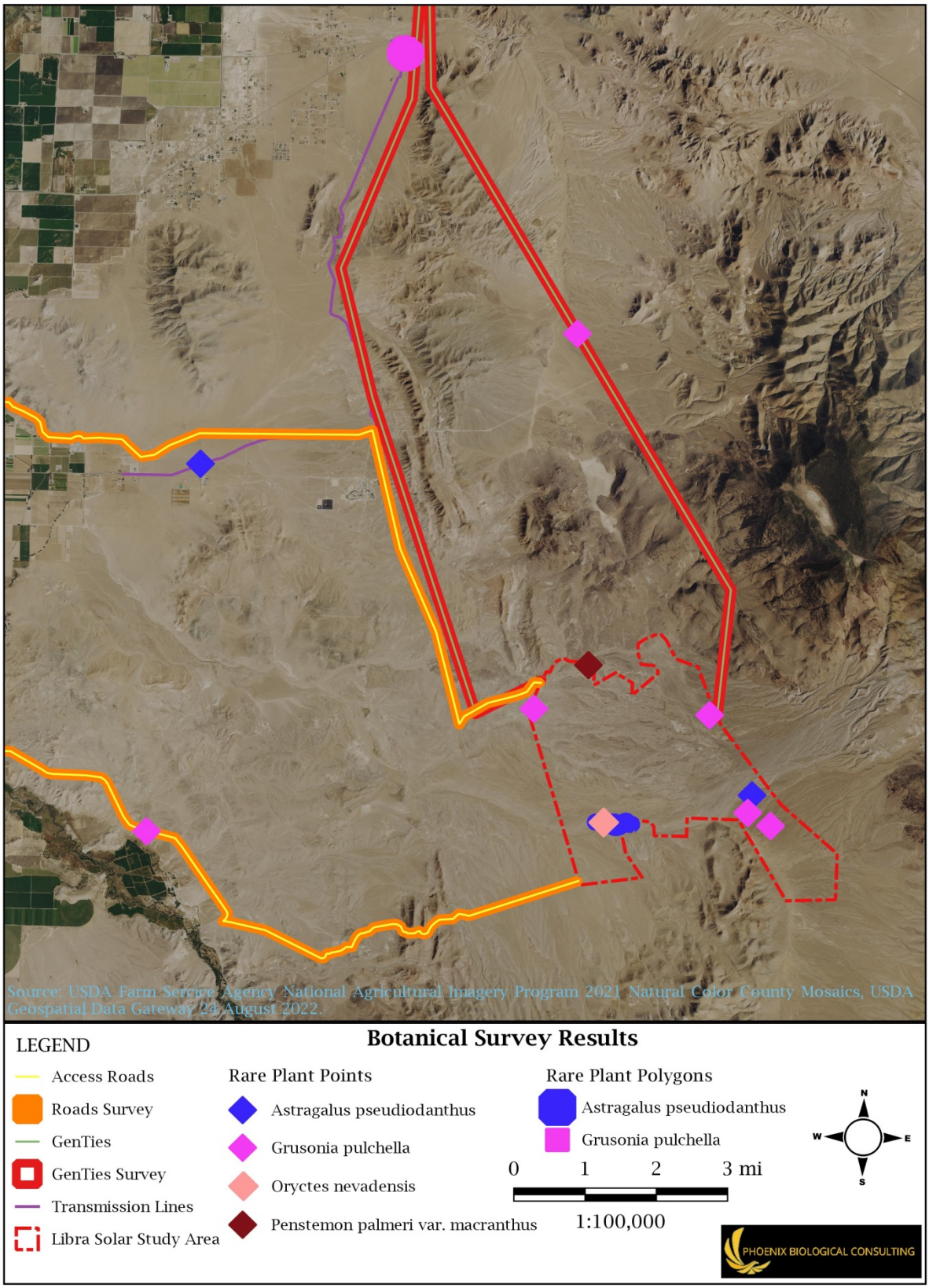
All populations of special-status plant taxa identified during the special-status plant inventory are mapped in Figure 9 and discussed in detail below. A summary of each documented rare plant site is provided in Table 4.

Table 4: Documented Rare Plant Summary

Scientific Name	Feature Type	Elev. (ft.)	Population Number	Occupied Area	Phenology	Plant Community	Associated Species	Slope	Aspect
Astragalus pseudiodanthus	Polygon	5120	30	10,000 sq. ft.	100% vegetative	*Sarcobatus baileyi-Picrothamnus desertorum*	*Krascheninnikovia lanata, Hilaria jamesii*	3°	60°
Astragalus pseudiodanthus	Polygon	5100	200	10 acres	100% vegetative	*Sarcobatus baileyi-Picrothamnus desertorum*	*Krascheninnikovia lanata, Achnatherum hymenoides*	2°	60°
Astragalus pseudiodanthus	Polygon	5090	40	1 acre	100% vegetative	*Sarcobatus baileyi-Picrothamnus desertorum*	*Krascheninnikovia lanata, Achnatherum hymenoides*	6°	60°
Astragalus pseudiodanthus	Polygon	5110	75	2 acres	100% vegetative	*Sarcobatus baileyi-Picrothamnus desertorum*	*Krascheninnikovia lanata, Achnatherum hymenoides*	2°	60°
Astragalus pseudiodanthus	Point	5350	2	3 sq. ft.	100% vegetative	*Sarcobatus baileyi-Picrothamnus desertorum*	*Hilaria jamesii, Chaenactis stevioides, Greeneocharis circumscissa, Bromus tectorum*	5°	280°
Astragalus pseudiodanthus	Polygon	4530	8	200 sq. ft.	100% vegetative	*Sarcobatus baileyi-Picrothamnus desertorum*	*Achnatherum hymenoides, Bromus tectorum*	0°	0°
Astragalus pseudiodanthus	Point	4540	4	10 sq. ft.	100% vegetative	*Sarcobatus baileyi-Picrothamnus desertorum*	*Hilaria jamesii, Chaenactis stevioides, Greeneocharis circumscissa, Bromus tectorum*	5°	280°
Grusonia pulchella	Polygon	4750	6	10 sq. ft.	33% flowering; 67% vegetative	*Sarcobatus baileyi-Picrothamnus desertorum*	*Chrysothamnus greenei, Achnatherum hymenoides, Krascheninnikovia lanata, Bromus tectorum*	2°	60°

Grusonia pulchella	Point	5260	1	1 sq. ft.	100% in fruit	*Sarcobatus baileyi-Picrothamnus desertorum-Ephedra nevadensis*	*Chrysothamnus sp., Hilaria jamesii, Chaenactis stevioides*	3°	240°
Grusonia pulchella	Point	5310	1	2 sq. ft.	100% in flower	*Sarcobatus baileyi-Picrothamnus desertorum*	*Hilaria jamesii, Chaenactis stevioides, Achnatherum hymenoides*	2°	180°
Grusonia pulchella	Point	5290	1	1 sq. ft.	100% in flower	*Sarcobatus baileyi-Picrothamnus desertorum*	*Hilaria jamesii, Chaenactis stevioides, Greeneocharis circumscissa*	2°	220°
Grusonia pulchella	Point	4950	1	1 sq. ft.	100% in flower	*Sarcobatus baileyi-Picrothamnus desertorum*	*Atriplex confertifolia, Hilaria jamesii, Chaenactis stevioides*	3°	270°
Grusonia pulchella	Point	4550	1	1 sq. ft.	100% vegetative	*Sarcobatus baileyi-Picrothamnus desertorum*	*Chaenactis stevioides, Halogeton glomeratus, Bromus tectorum*	4°	220°
Grusonia pulchella	Point	5060	1	1 sq. ft.	100% vegetative	*Sarcobatus baileyi-Picrothamnus desertorum*	*Chaenactis stevioides, Bromus tectorum*	0°	0°
Oryctes nevadensis	Point	5100	5	50 sq. ft.	80% fruiting, 20% flowering	Dune area with *Sarcobatus baileyi-Picrothamnus desertorum*	*Krascheninnikovia lanata, Achnatherum hymenoides*	2°	60°
Penstemon palmeri var. macranthus	Point	5010	1	1 sq. ft.	100% in flower	*Ericameria nauseosa-Psorothamnus polydenius* rocky wash	*Sarcobatus baileyi, Achnatherum hymenoides, Chrysothamnus* sp.	2°	60°

Figure 9. Special-Status Plant Populations Identified in the Study Area



Astragalus pseudiodanthus

A. pseudiodanthus is a rare perennial forb of the Pea Family (*Fabaceae*). Plants are from a low caudex bearing clustered, generally decumbent to mat-forming stems. Stems are lightly strigulose while leaves are glabrate. Leaflets are numerous ([11]13-19) per leaf, small (5-15 mm) and obovate. Flowering stalks are shorter than the leaves and each has approximately ([5]7-15 flowers). Petals are pink-purple to pale lavender. Fruit pods are sessile and sharply incurved from 90-360° forming the characteristic circular or looped fruit (Figure 10).

A. pseudiodanthus occurs in deep and loose sandy soils of stabilized and active dune margins, old beaches, valley floors, or drainages. It is often found with *Sarcobatus vermiculatus* and other salt desert shrub taxa. In Nevada the species appears dependent on sand dunes or deep sand.

According to NatureServe (2022) the species occurs in the Great Basin ecoregion and is known only from Nye, Lyon, Mineral, Churchill, and Esmeralda Counties, Nevada, and Mono County, California. The plant is known from fewer than ten occurrences in California and for 16 extant occurrences in Nevada.

During the special-status plant inventory survey, *A. pseudiodanthus* was documented at seven sites within the Study Area, for a total of 360 individuals. Five element occurrences were located within the Project Area, with one occurrence in the North American Desert Xeric Riparian Scrub Alliance and the remaining four located in the *Sarcobatus baileyi - Picrothamnus desertorum - Atriplex confertifolium* Shrubland Alliance. Another two occurrences were found outside the Project Area along a gen-tie where vegetation types were not formally mapped but were described as being within the *Sarcobatus baileyi - Picrothamnus desertorum - Atriplex confertifolium* Shrubland Alliance. Approximately 75% of plants found were in vegetative condition with 25% bearing fruit.

Figure 10: *Astragalus pseudiodanthus* showing the characteristic curved fruit.

Grusonia pulchella

G. pulchella is a member of the Cactus Family (Cactaceae) that has been previously included in several other genera, including *Opuntia, Cornyopuntia,* and *Micropuntia.* It is a clump-forming low shrub generally less than 20 cm tall. The stem segments are cylindrical with prominent tubercles. Spines are 8-15 per areole and clustered at the distal ends of the stem. The rose-purplish flowers make it distinct from other members of the genus. Sand cholla grows in sandy substrates of dunes, dry-lake borders, river bottoms, washes, valleys, and plains in the desert. The SEINet (2022) reports the species in from 103 occurrences, primarily scattered across Nevada but with a few occurrences in western Utah and eastern California (Figure 11).

During the special-status plant inventory, eleven individuals within six occurrences of sand cholla were identified in the Study Area. Sand cholla occurrences were distributed across vegetation alliances within the solar generating area including one occurrence within the North American Desert Xeric Riparian Scrub Alliance, one within the *Sarcobatus baileyi - Picrothamnus desertorum - Atriplex confertifolium* Shrubland Alliance, and two within the *Sarcobatus baileyi - Ephedra nevadensis* Shrubland Alliance. Two occurrences were found outside the Project Area where vegetation types were not formally mapped, one within a gen-tie and one near an access road. Both were found in areas described as *Sarcobatus baileyi-Picrothamnus desertorum.* One third of the plants were vegetative while the remaining two thirds were in flower. The plants were found in disjunct populations and, with one exception, were solitary.

Figure 11: *Grusonia pulchella* showing the diagnostic rose-colored flowers.

Oryctes nevadensis

O. nevadensis is an annual forb of the Nightshade Family (Solanaceae). Plants range from 5-20 cm in height, are taprooted, and are generally branched at the base and glandular-sticky. Leaves are 1-3 cm long, and linear to ovate with shallow lobes and a narrowly-winged petiole. The calyx is small, 2-3 mm, expanding to under 10 mm in fruit. The corolla is 5-8 mm, urn-shaped, and purple. The fruit is a rounded capsule (Figure 12).

O. nevadensis inhabits deep and loose sand of stabilized dunes, washes, and valley flats. It is found on a variety of slopes and aspects at elevations ranging from 3,900 to 5,900 feet. SEINet (2022) reports the species in a band of occurrences found mostly in western Nevada with a few occurrences in adjacent California. In all, SEINet reports 22 records, some closely adjacent to the Project.

During the special-status plant inventory, five *O. nevadensis* individuals were found within one occurrence in the Project Area. Eighty percent of the plants documented were in fruit while 20 percent were in flower. All plants in the Project were found in the *Sarcobatus baileyi - Picrothamnus desertorum - Atriplex confertifolium* Shrubland Alliance.

Figure 12: *Oryctes nevadensis*, Showing its Glandular Foliage and Minute Flower

Penstemon palmeri var. *macranthus*

P. palmeri var. *macranthus* is a perennial forb previously placed in the Figwort Family (*Scrophulariaceae*) but now included in the Plantain Family (Plantaginaceae). It bears ovate basal leaves with coarsely dentate margins and 5-8 pairs of ovate to triangular cauline leaves also with coarsely dentate margins. Cauline leaves clasp the stem. Flowers are borne in a thyrse, a type of inflorescence with an indeterminate main axis but determinate side branches. Flowers are white to pale pink or pale lavender (Figure 13). The plant grows along washes, roadsides, and canyon floors, particularly on carbonate-containing substrates and usually where subsurface moisture is available throughout most of the summer. SEINet (2022) reports the species from 57 occurrences, mostly in western and south-central Nevada.

During the special-status plant inventory, a single individual was located in flower near the Project Area boundary. The plant was found within the *Sarcobatus baileyi - Ephedra nevadensis* Shrubland Alliance.

Figure 13: Flower of *Penstemon palmeri* var. *macranthus*

INVASIVE SPECIES

Five invasive weed species were documented during the botanical survey. Only one, *Lepidium latifolium*, is listed as a noxious weed by NDA (2021). The other species, although not listed by NDA, are of concern due to their ability to invade and dominate areas of ground disturbance. Of particular concern are the two brome grasses, *B. rubens* and *B. tectorum*. The Project Area was remarkably free of *B. tectorum* compared to adjacent areas where it forms a dense understory.

Bromus rubens: This species is an annual in the Grass Family (Poaceae) native to Europe. It invades disturbed areas including roadsides, agricultural fields, rangelands in a variety of habitats including desert shrublands, pinyon-juniper communities, pine woodlands, and coastal scrub. *B. rubens* invasion contributes to increased fire frequency and converts native plant communities to annual grassland. *B. rubens* is uncommon within the project area and is characterized by small and widely scattered populations.

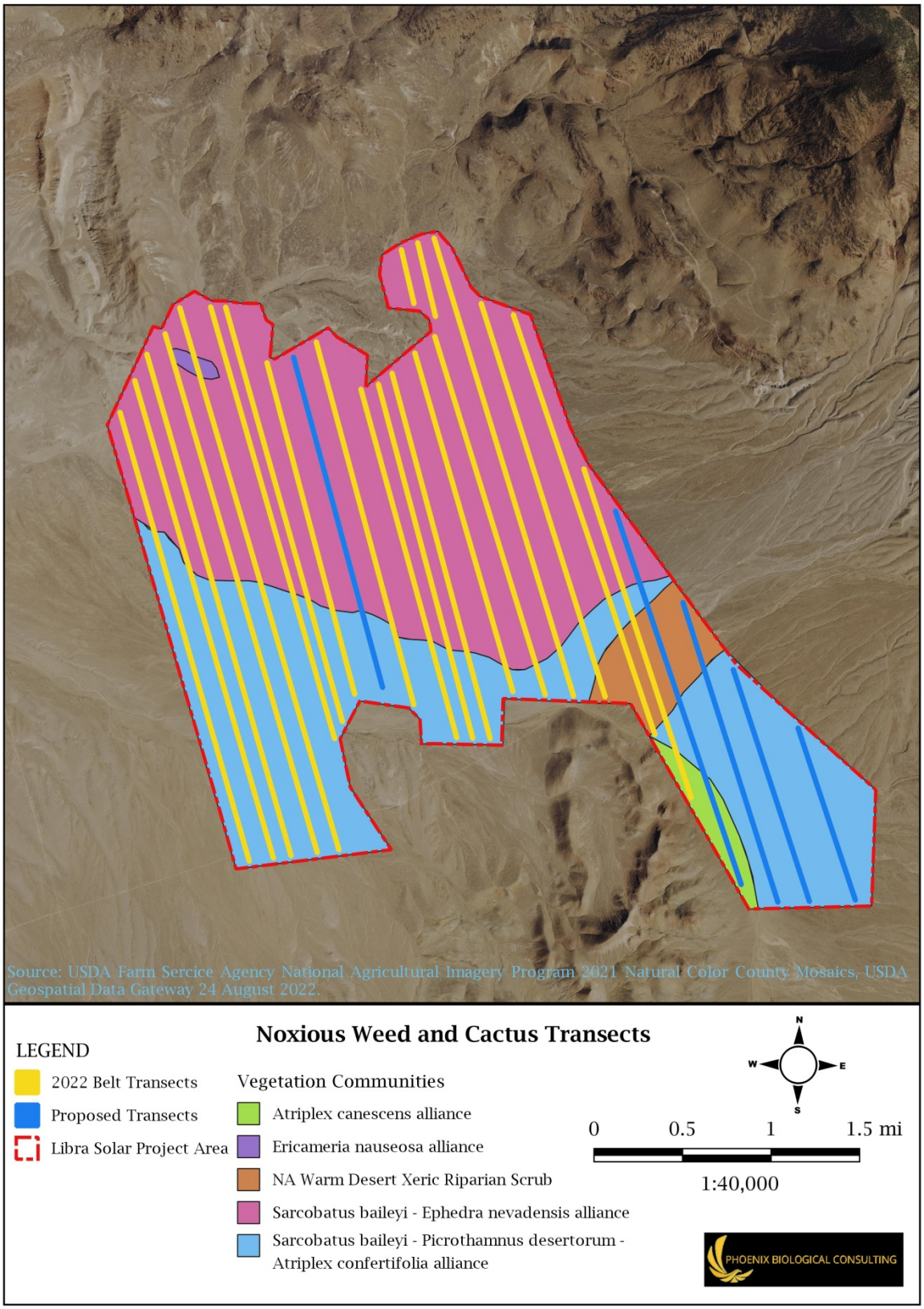
Bromus tectorum: This species is an annual in the Grass Family (*Poaceae*) native to Eurasia. It invades rangelands, grasslands, and shrublands. Like *B. rubens*, *B. tectorum* invasion contributes to increases in fire frequency and converts natural habitat to annual grassland or overcrowds native grasslands and rangelands. *B. tectorum* is found in scattered infestations in the Project Area but populations are generally not dense. However, the species will likely spread and multiply in areas of ground disturbance.

***Halogeton glomeratus*:** This species is an annual forb of the Goosefoot Family (*Chenopodiaceae*) introduced to Nevada in the 1930's and thrives on saline soils. The plant is poisonous to livestock due to calcium oxalate accumulation. *H. glomeratus* was found along access roads near agricultural field in the far southeastern portion of the Project. A few scattered plants were seen in the project area.

***Lepidium latifolium*:** This species is a perennial forb of the Mustard Family (*Brassicaceae*) native to Eurasia. It is common in disturbed wetland areas and may form dense monocultures extremely difficult to control. One population was found where a gen-tie crosses the Walker River.

Salsola tragus* and barbwire *Salsola paulsenii: *S. tragus* and *S. paulsenii* are large annual herbs in the Goosefoot Family (*Chenopodiaceae*) native to Eurasia. They are common in disturbed places and are better known as tumbleweeds for their habit of being blown about in its roughly circular skeletal form. Both species were found in the southern portion of the Project Area.

Figure 14. Invasive Species Populations Identified in the Study Area



CACTI AND INVASIVE SPECIES SAMPLING

A total of 23 belt transects were sampled for cacti and invasive weeds throughout the Project Area, excluding gen-ties and access roads. Table 5 describes the belt transects and their distribution throughout the vegetation communities in the main polygon of the Project, also shown in Figure 15. Five transects were inadvertently omitted from sampling (the omitted transects are shown as Proposed Transects). In the event all transects were sampled a total of 6.12 percent of the approximately 5,149-acre project area would have been sampled. With the omitted transects, 5.15 percent of the project area was sampled, and adequate sampling of each vegetation community was achieved as shown in Table 5 below.

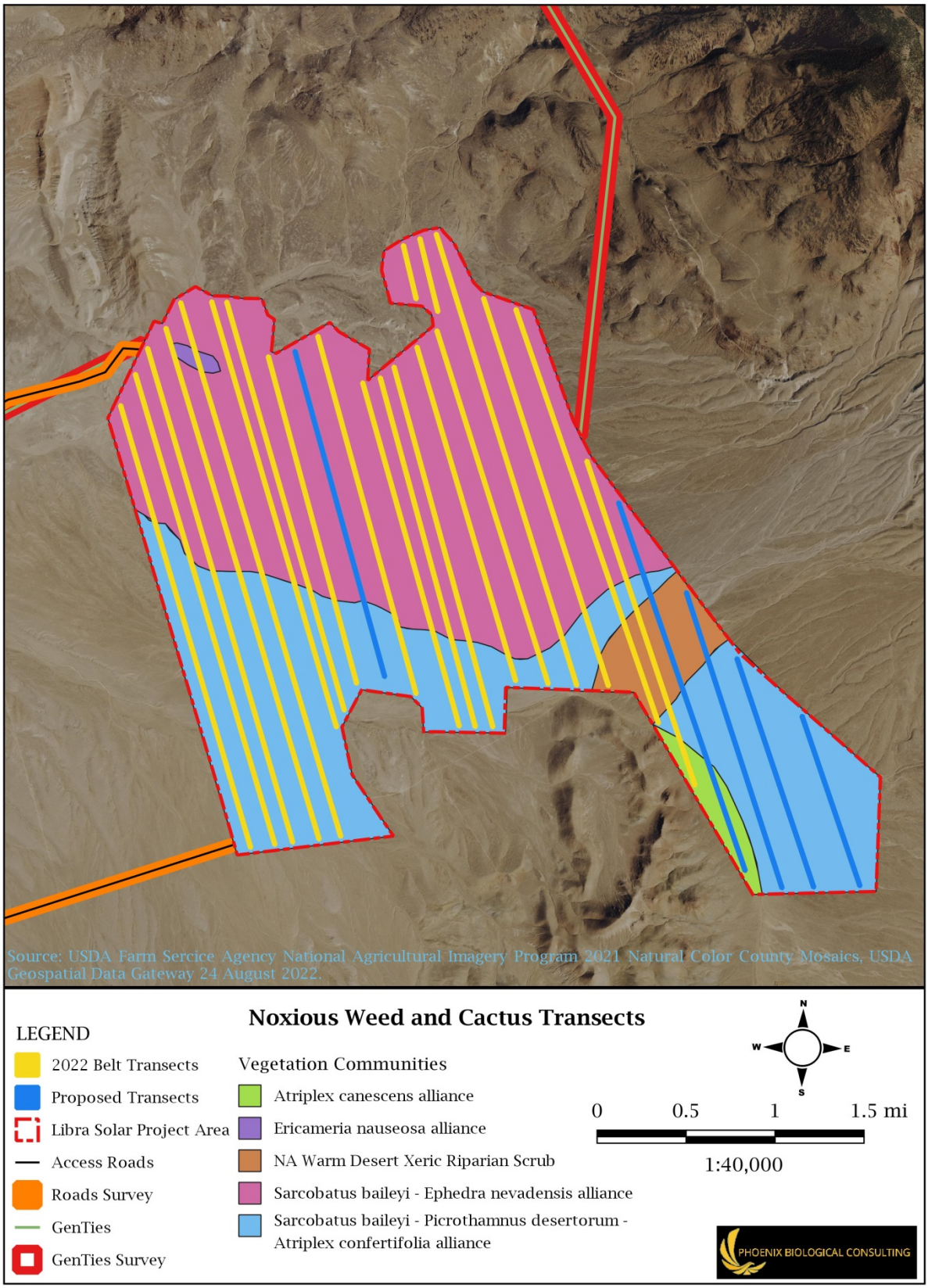
A stratified-random method was used to place belt transects within the Project Area. The resulting distribution of transects within vegetation types was remarkably consistent, as shown in Table 5, below.

Table 5. Belt Transects Summary.

Vegetation Community	Acreage within the Study Area[1]	% of the Study Area	Acreage Sampled: 2022/Proposed/Total	Linear Distance of Belt Transects Sampled2022/Proposed/ Total	Percentage of Community Area Sampled2022/Proposed/ Total
Ericameria nauseosa Alliance	16	0.3%	0.88/0.0/0.88	0.24/0.0/0.24 kilometers of 15 meter wide transects	5.5/0.0/5.5%
Atriplex canescens Alliance	94	1.8%	1.71/3.95/5.66	0.46/1.07/1.53 kilometers of 15 meter wide transects	1.8/4.2/6.0%
North American Warm Desert Xeric Riparian Scrub	216	4.2%	8.08/5.75/13.83	2.18/1.55/4.73 kilometers of 15 meter wide transects	3.7/2.7/6.4%
Sarcobatus baileyi – Picrothamnum desertorum – Atriplex confertifolia Alliance	1,991	38.7%	84.27/28.84/113.11	22.73/7.78/30.51 kilometers of 15 meter wide transects	4.2/1.5/5.7%
Sarcobatus baileyi – Ephedra nevadensis Alliance	2,832	55.0%	170.15/11.45/181.60	45.90/3.09/48.99 kilometers of 15 meter wide transects	6.0/0.4/6.4%
Total	**5,149[1]**		**265.09/49.98/315.08 acres**	**71.51/13.49/85.0 kilometers**	**5.15/0.97/6.12%**

[1] No belt transects were assigned within the gen-tie routes or access roads, so acreages for those areas are not included.

Figure 15. Cactus and Invasive Weeds Sampling Transects in the Study Area



Cacti Belt Sampling Transects

Two species of cacti were documented during the belt transects: *Opuntia polyacantha* var. *erinacea* and *G. pulchella*). Belt transects typically include documentation of *Yucca* sp. but no species of *Yucca* were seen during the belt transects or botanical surveys. The results of the belt transect sampling for cacti are summarized in Table 6. Belt transect sampling results for cacti is depicted in figures 16 and 17, and data sheets from belt transects are included in Appendix B.

All cactus sampled were between zero and three feet tall. *O. polyacantha* var. *erinacea* rarely exceeds three feet in height, and sand cholla is a low shrub never exceeding three feet in height. Table 6 shows the number of cacti counted as well as the total number expected in the Project Area polygon by extrapolating the number cacti counted in the belt transects to the total number of acres. Density is calculated from the expected number of cacti divided by the number of acres within the Project Area.

Table 6. Estimated Cacti within the Project Area.

Scientific Name	Number Counted	Total Expected	Estimated Density cacti/acre
Grusonia pulchella	2	35	0.007/acre
Opuntia polyacantha var. *erinacea*	75	1,318	0.26/acre

Figure 16. Belt Transect Cacti Sampling - *Grusonia pulchella*

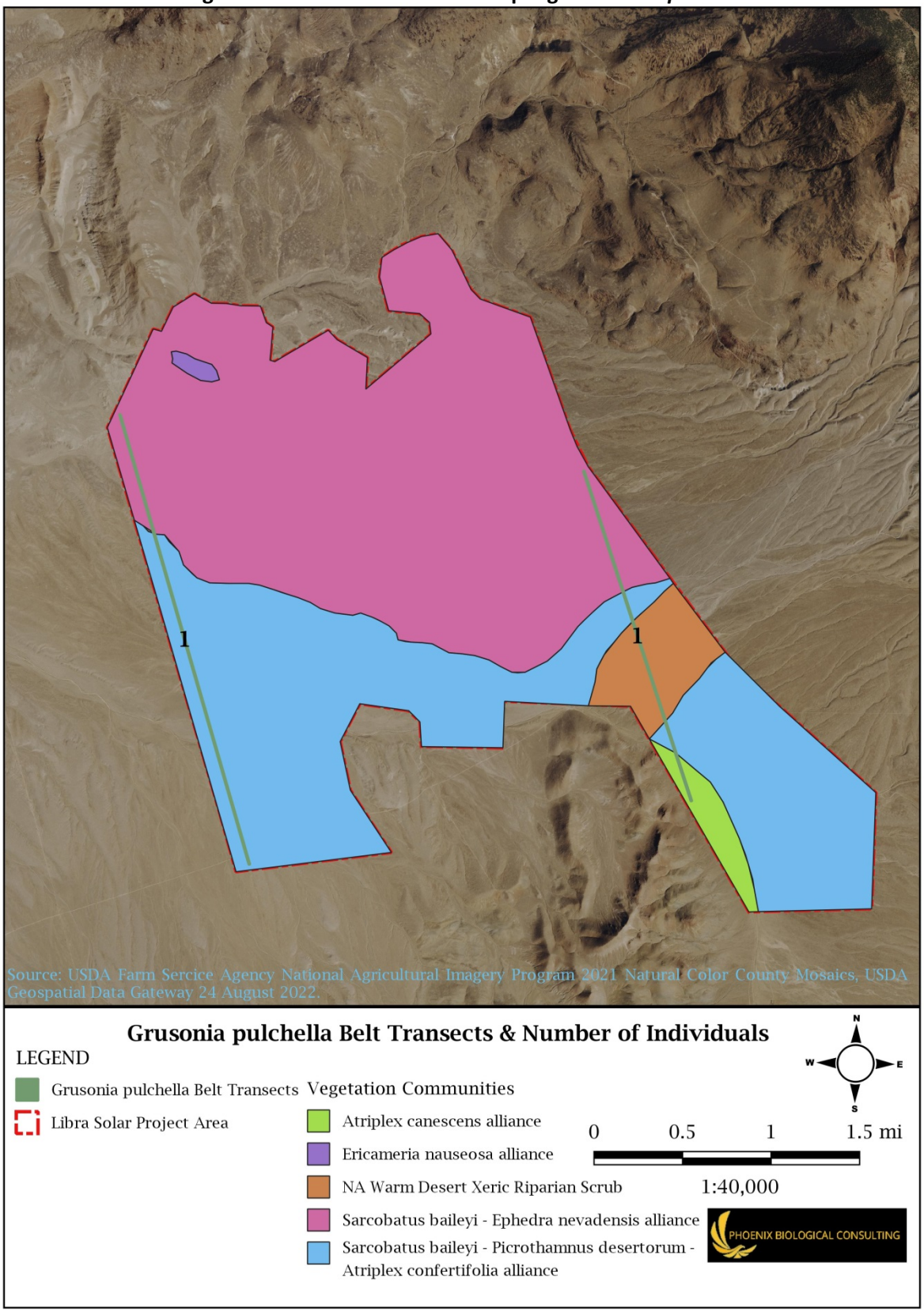
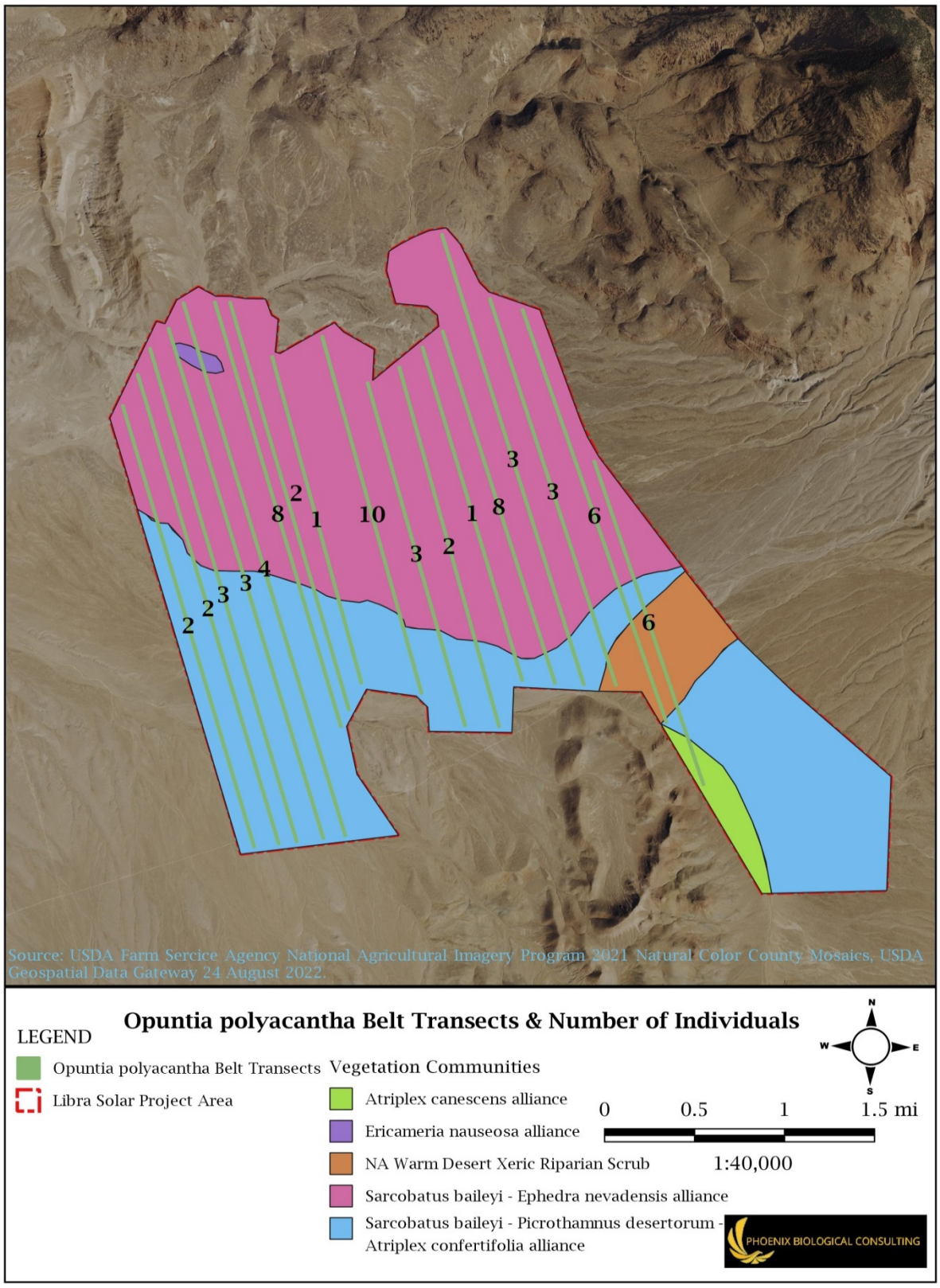


Figure 17. Belt Transect Cacti Sampling - *Opuntia polyacantha* var. *erinacea*



Invasive Weeds Belt Transect Sampling

Four invasive species were recorded during the belt transect sampling in the Project Area: *B. tectorum, B. rubens, H. glomeratus,* and *S. paulsenii*. None of these species is listed by the NDA on the *Nevada Noxious Weed List* (NDA 2021). Weed sampling results for invasive species are depicted in Figures 18-21. In the figures, only transects where the species was detected is displayed and the number of individuals is shown alongside the transect. The estimated populations and densities of these weed species are listed below in Table 7. Species descriptions, including discussion of the weed populations in the Project Area, are included below.

Table 7. Estimated Invasive Species within the Project Area.

Scientific Name	Number Counted	Total Expected	Estimated Density (total weeds/acre)
Bromus tectorum	9,461	166,261	32/acre
Bromus rubens	69	1,213	0.25
Halogeton glomeratus	103	1,811	0.35
Salsola paulsenii	706	12,407	2.41

Figure 18. Weed Sampling Results - *Bromus rubens*

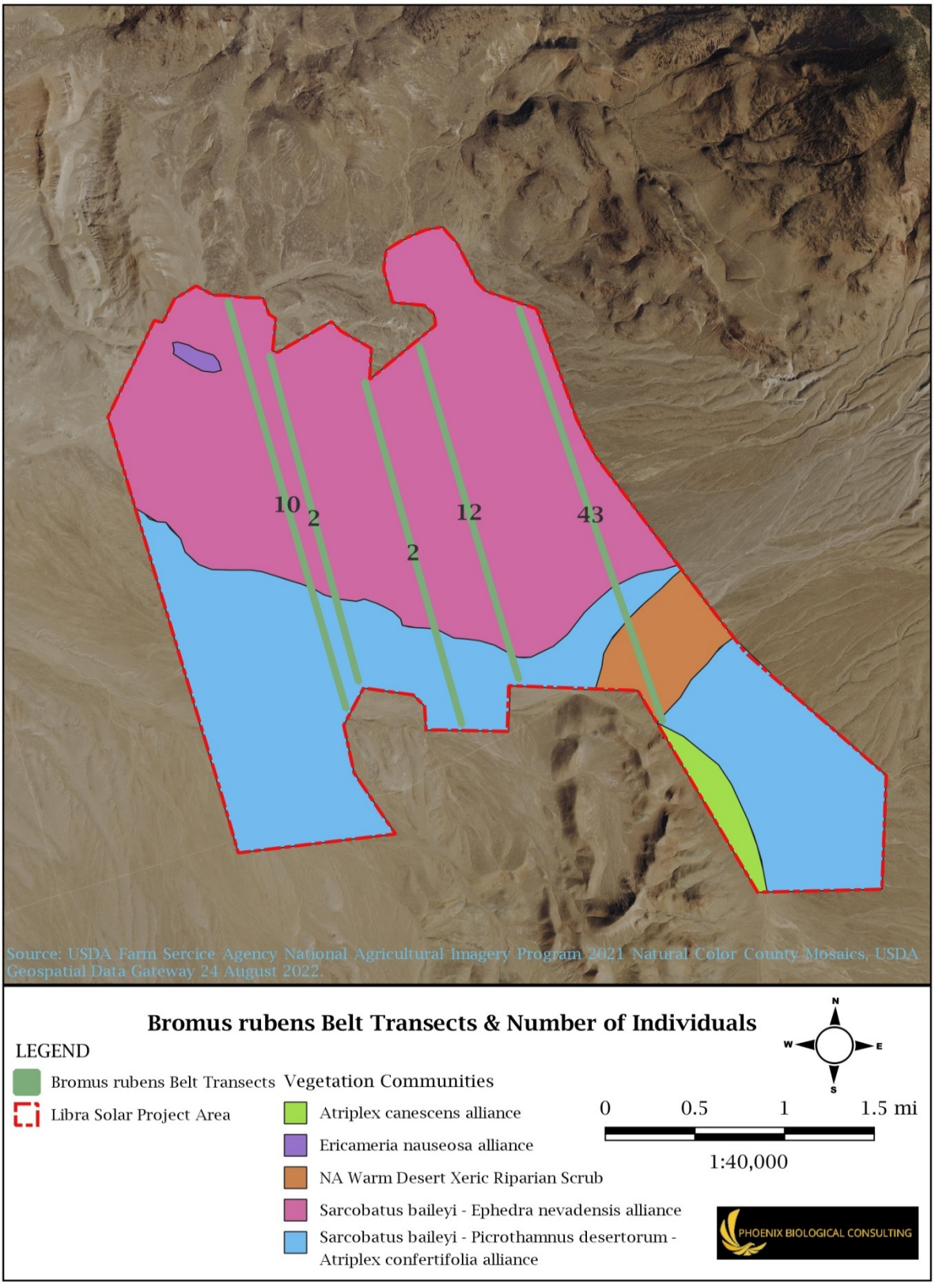


Figure 19. Weed Sampling Results - *Bromus tectorum*

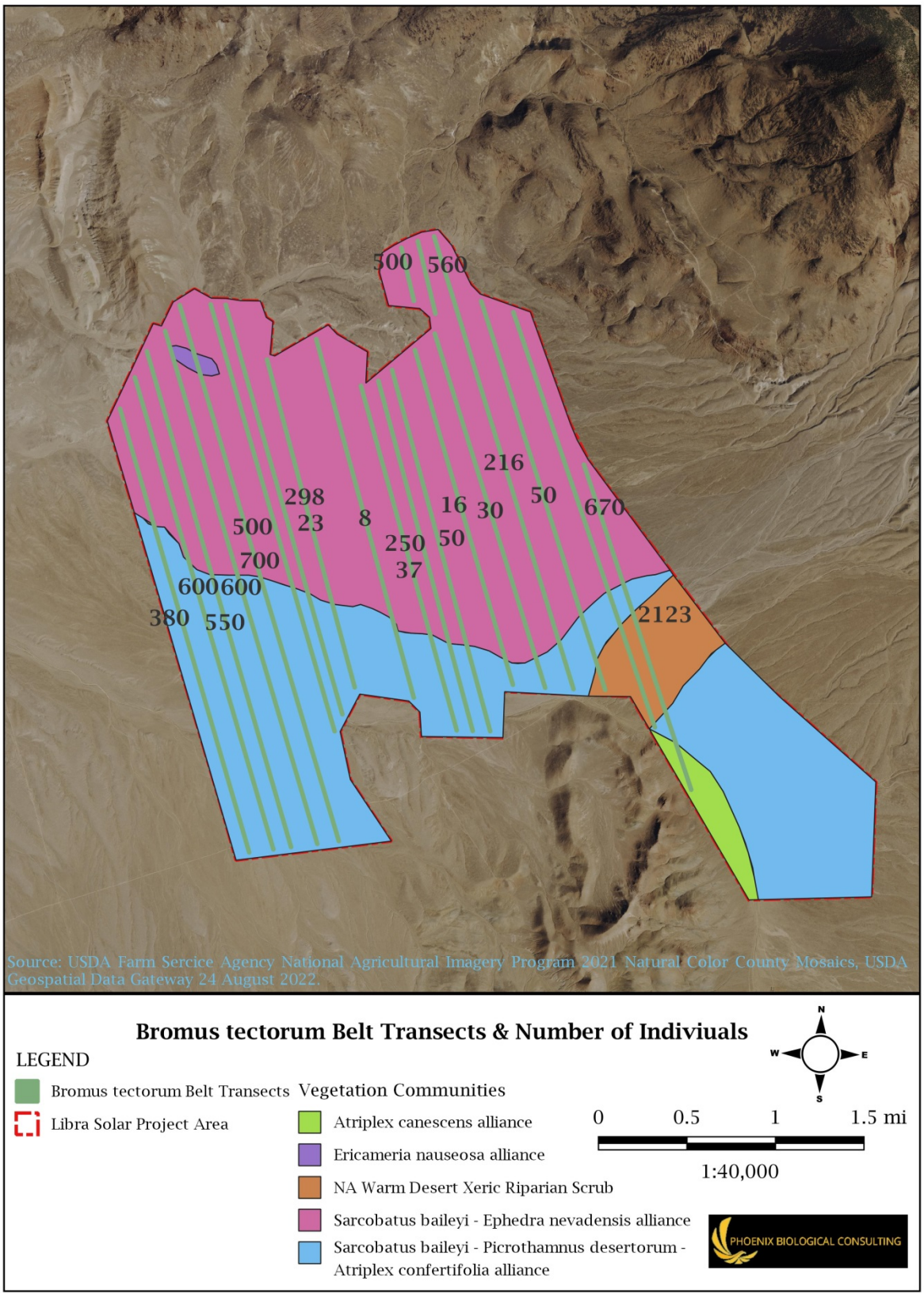


Figure 20. Weed Sampling Results - *Halogeton glomeratus*

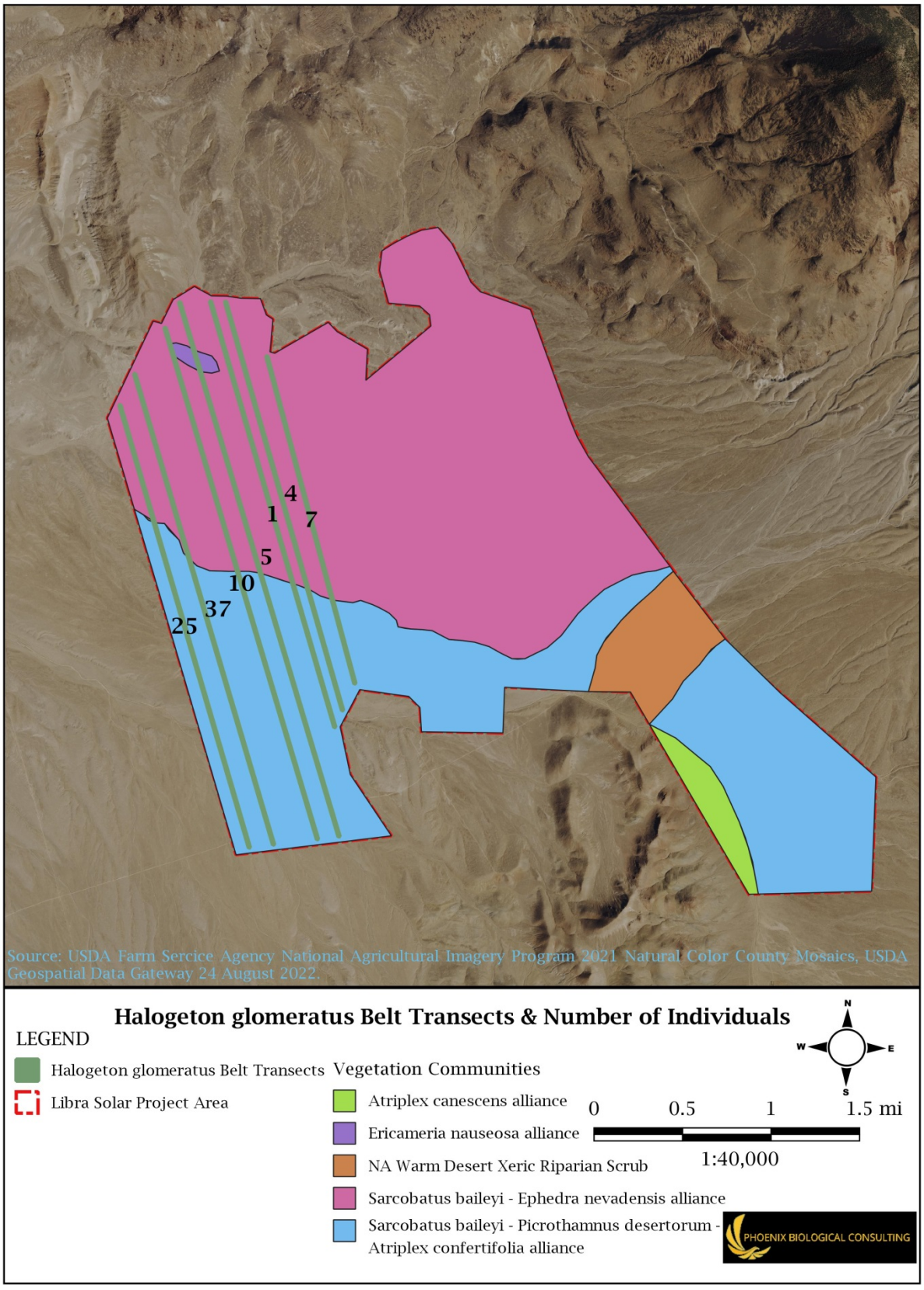


Figure 21. Weed Sampling Results - *Salsola paulsenii*

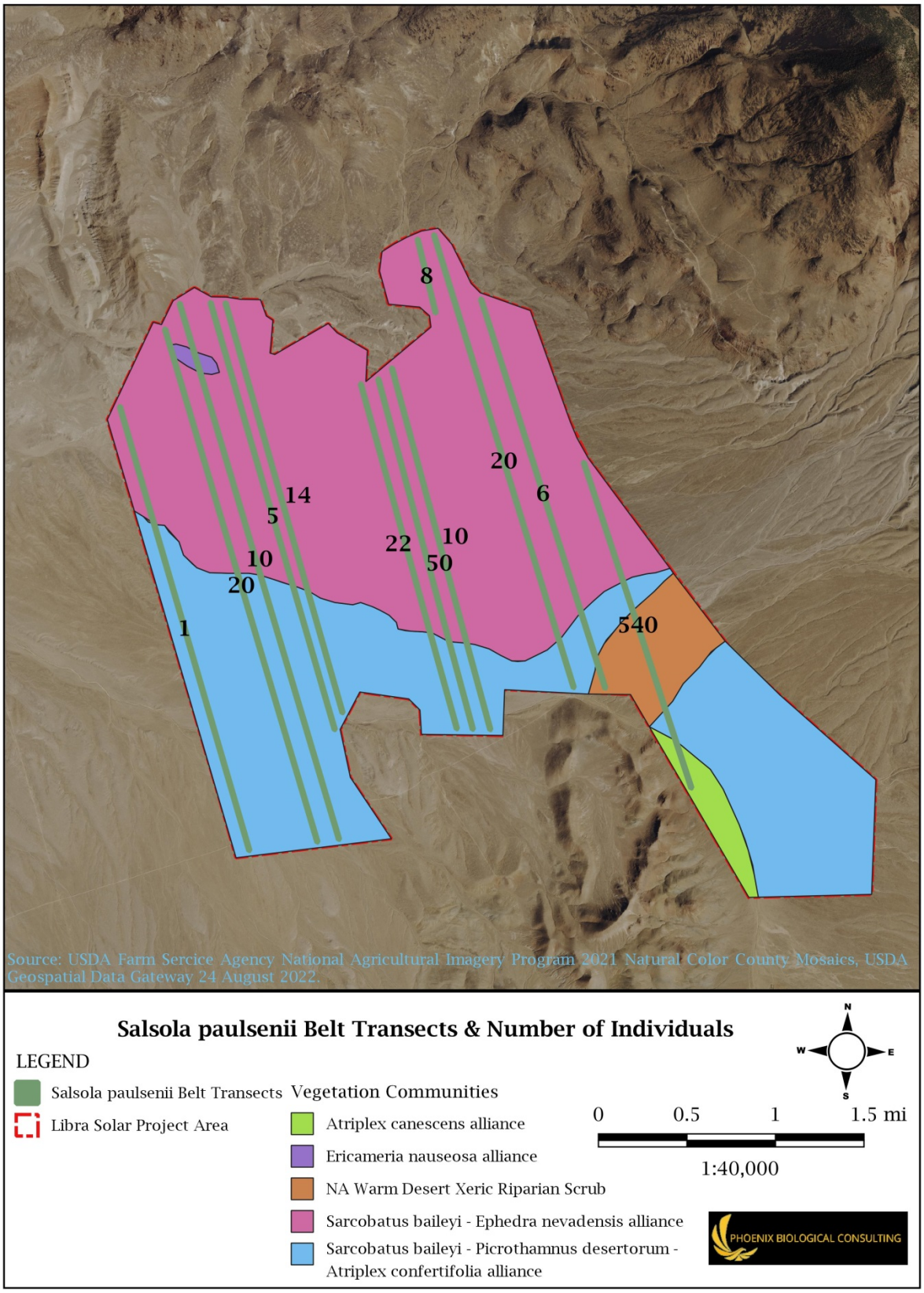
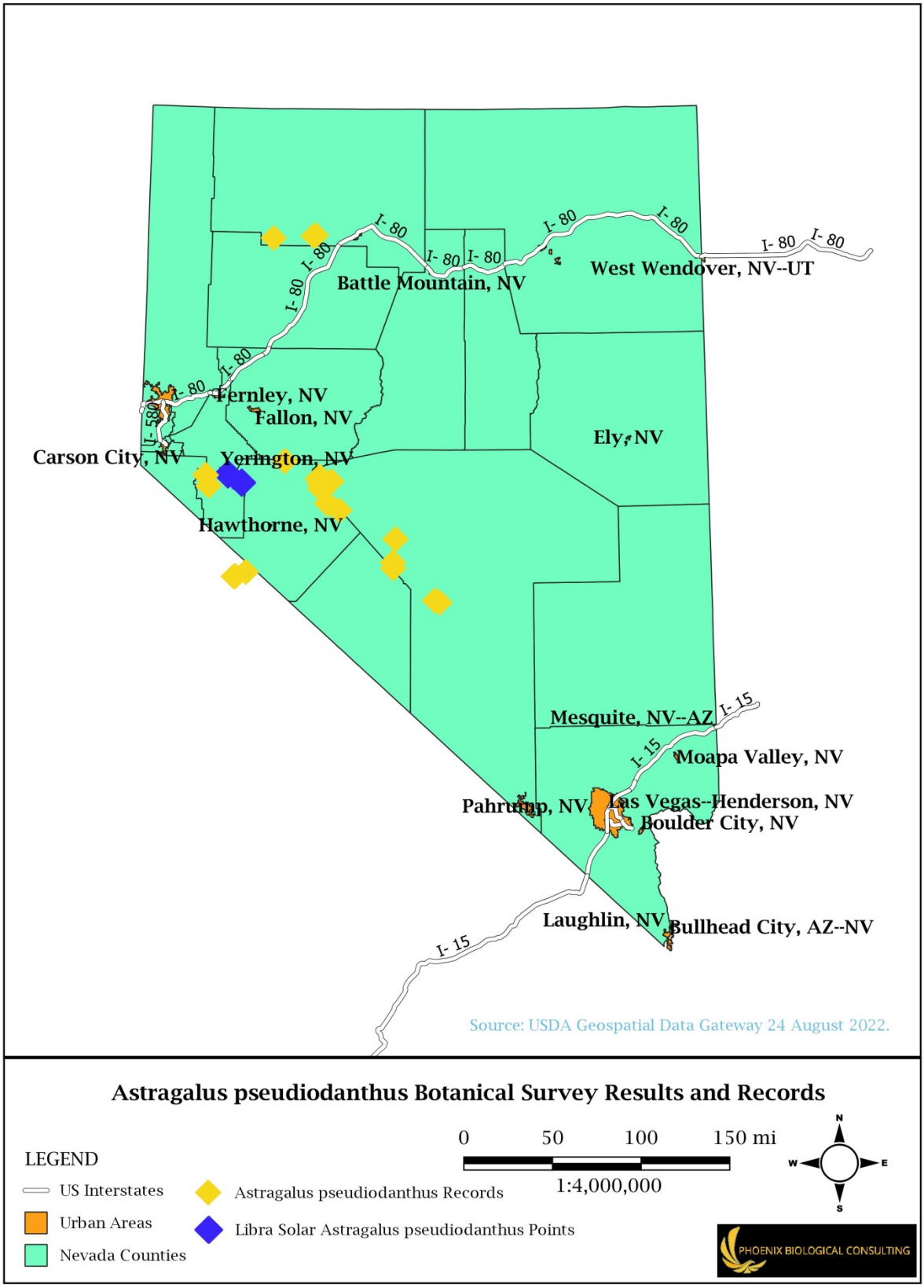


Figure 22. Global Distribution of *Astragalus pseudiodanthus*



Discussion

SPECIAL-STATUS PLANT SPECIES

Four taxa special-status plants, *A. pseudiodanthus*, *O. nevadensis*, *G. pulchella*, and *P. palmeri* var. *macranthus* were documented within the Project Area during the June 2022 special-status plant inventory. The conservation status of these at-risk species is described below.

Astragalus pseudiodanthus

A. pseudiodanthus is a Great Basin species known from western Nevada with a few known sites in adjacent California (Figure 22). NatureServe (2022) indicates it is ranked as G3 (vulnerable) globally and S2 (imperiled) in both California and Nevada. NatureServe lists eight historic occurrences from California and sixteen from Nevada, but their data for the species is over ten years old. A search of herbarium records from SEINet (2022) shows 56 herbarium records for the species within the described range of the species.

The species inhabits deep sandy substrates in the desert. This habitat is common and the species' rarity is therefore not a result of limited habitat or habitat destruction. The primary threat to the plant and its habitat is livestock grazing and invasion of its habitat by non-native plant species, particularly cheatgrass. Off-road vehicles may also impact the species.

New populations located during the botanical survey are within the expected range of the species are between known populations to the east and west. New sites are located on the southern end of the proposed project area in areas of deep alluvial sand.

Figure 23. *Astragalus pseudiodanthus* in its Characteristic Sandy Habitat

Grusonia pulchella

G. pulchella is a Great Basin species known primarily from Nevada but with a few records from adjacent areas in California and Utah. NatureServe (2022) indicates that the plant is vulnerable to apparently secure (G3G4) globally but vulnerable in Nevada (S3) and imperiled in both California and Utah (S2). NatureServe shows nine occurrences in California, eleven in Utah, and 37 in Nevada. SEINet (2022), however, shows 103 collections of the species with most collections from Nevada (Figure 25).

Similar to *A. pseudiodanthus*, *G. pulchella* grows in a common habitat usually described as sandy to rocky flats and slopes. It is therefore not limited by lack of habitat as are some soil substrate specialists. The species is threatened by livestock grazing, off-road vehicle use, collection for nursery and landscaping use, mining, and non-native plant invasion of its habitat, particularly by cheatgrass.

New populations located during the botanical survey are within the expected range of the species on the western edge of its range. New sites are scattered throughout the Project and are not clustered in any one area. NatureServe (2022) notes that occurrences generally consist of few individuals and new occurrences from the Project Area (with one exception) consisted of one individual.

Figure 24. *Grusonia pulchella* in *Sarcobatus baileyi* Habitat.

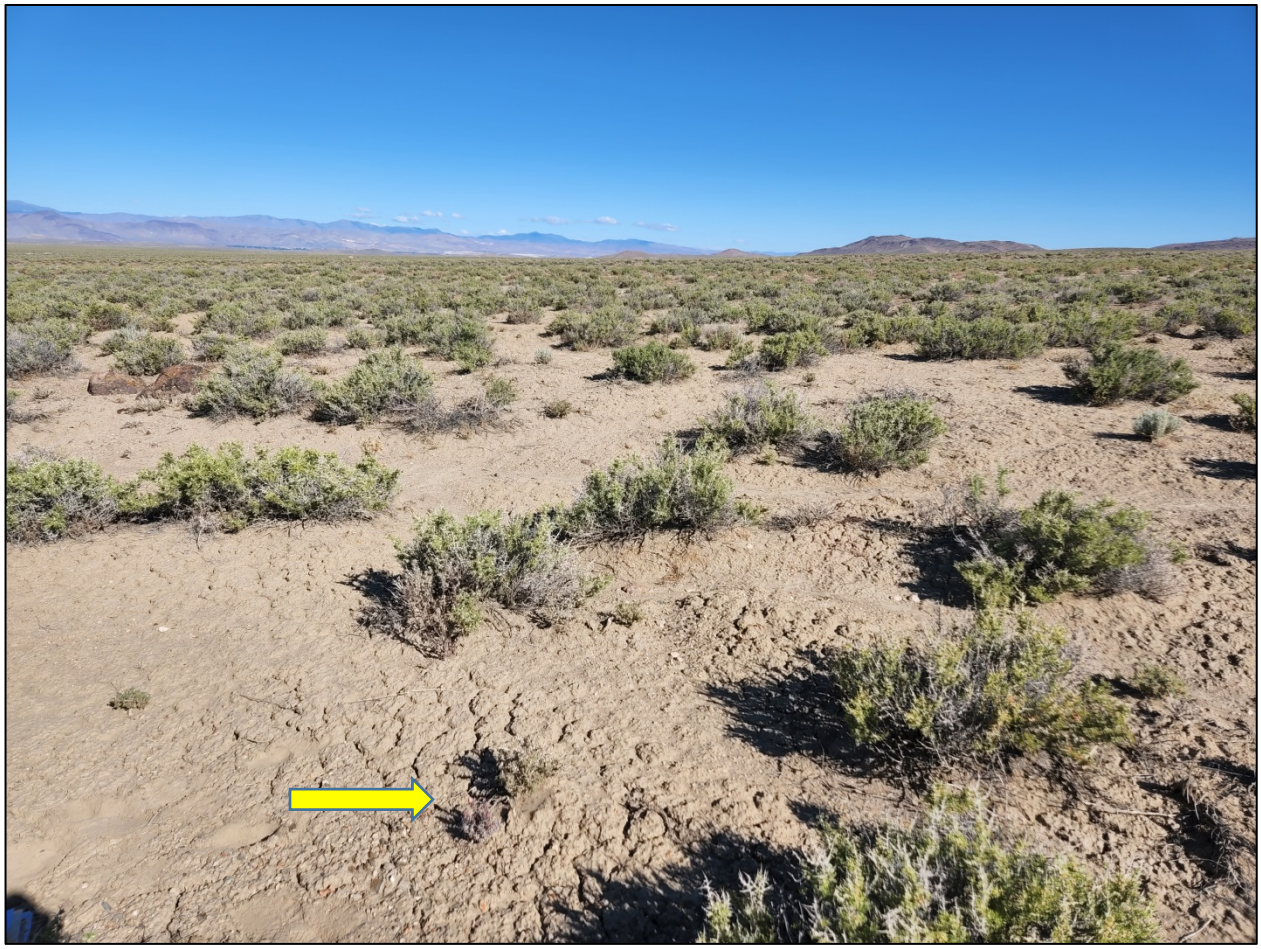
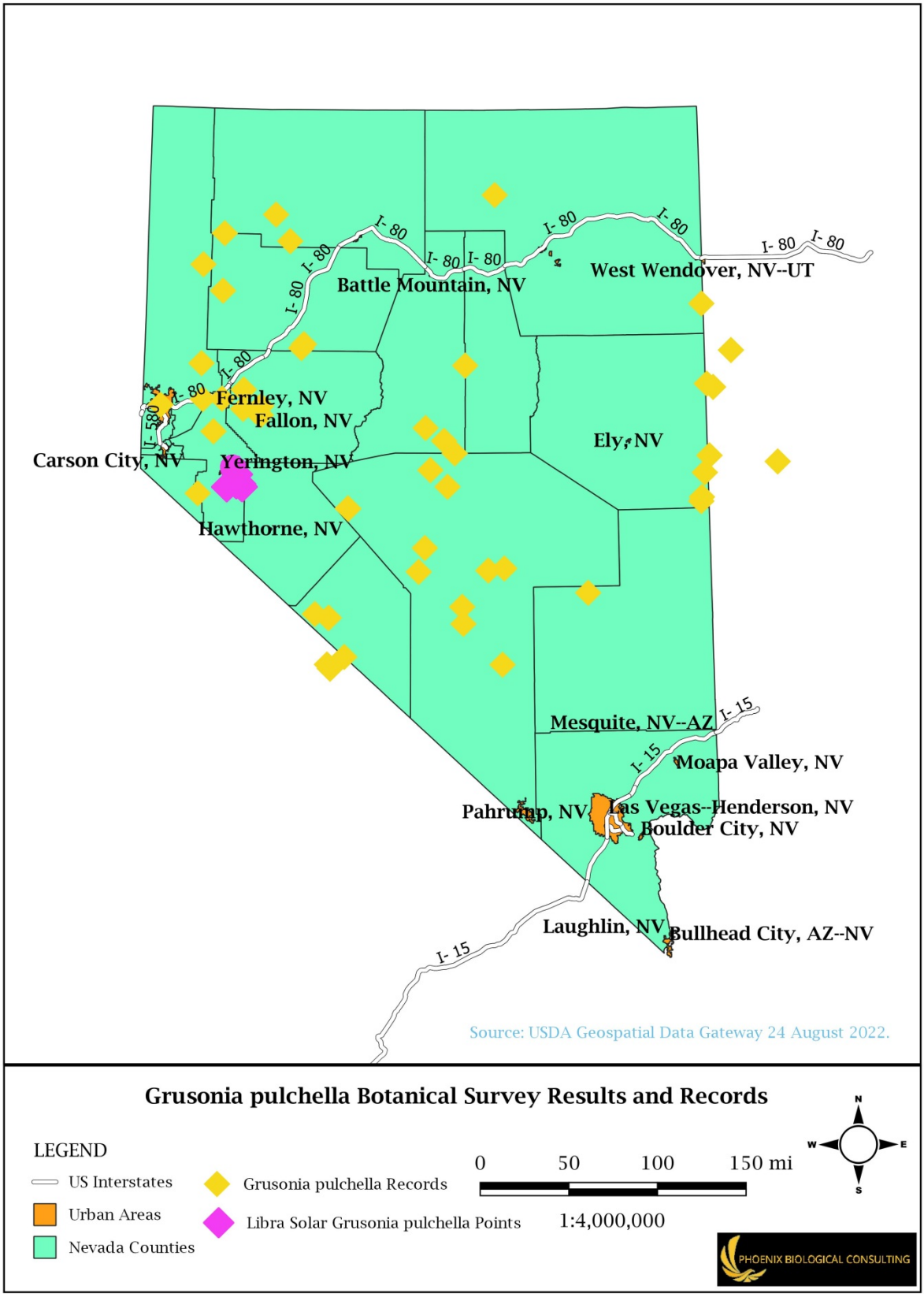


Figure 25. Global Distribution of *Grusonia pulchella*



Oryctes nevadensis

O. nevadensis is a Great Basin species known from Nevada and California. NatureServe (2022) indicates that the plant is vulnerable (G3) globally but imperiled in both California and Nevada (S2). NatureServe lists 33 occurrences in California and 30 in Nevada. Many of these occurrences are historic and have not been visited in over 20 years. SEINet (2022) shows 72 collections of the species with very few in California (Figure 27).

O. nevadensis inhabits deep and loose sandy habitats of stabilized dunes, washes, and valley flats. Primary threats to the species include livestock grazing, road and utilities maintenance, off-road vehicles, and invasion of its habitat by non-native plants.

New populations located during the botanical survey are within the expected range of the species. New sites are located on the southern end of the project area in areas of deep alluvial sand.

Figure 26. *Oryctes nevadensis* Growing in Deep Sand

Figure 27. Global Distribution of *Oryctes nevadensis*

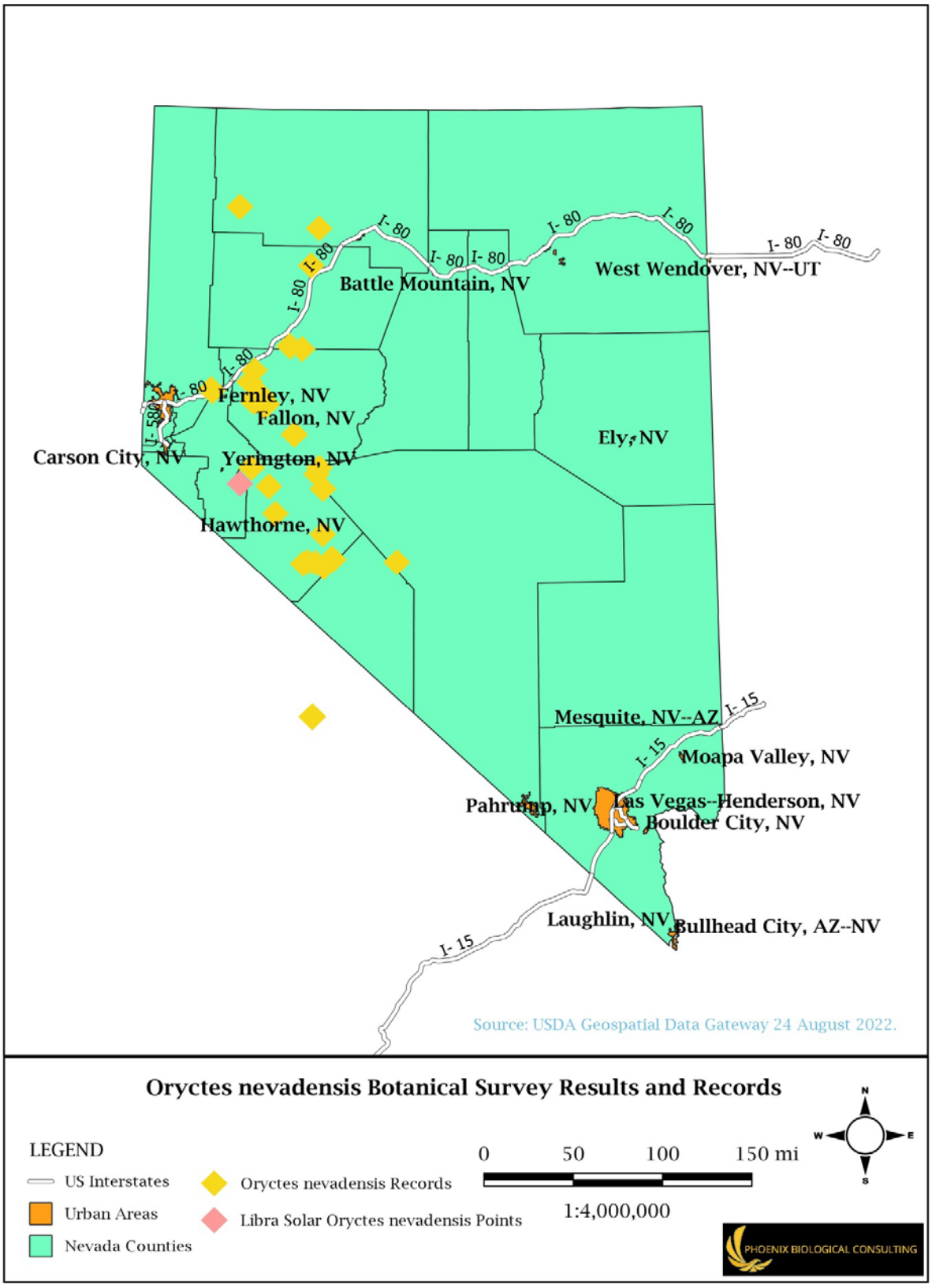
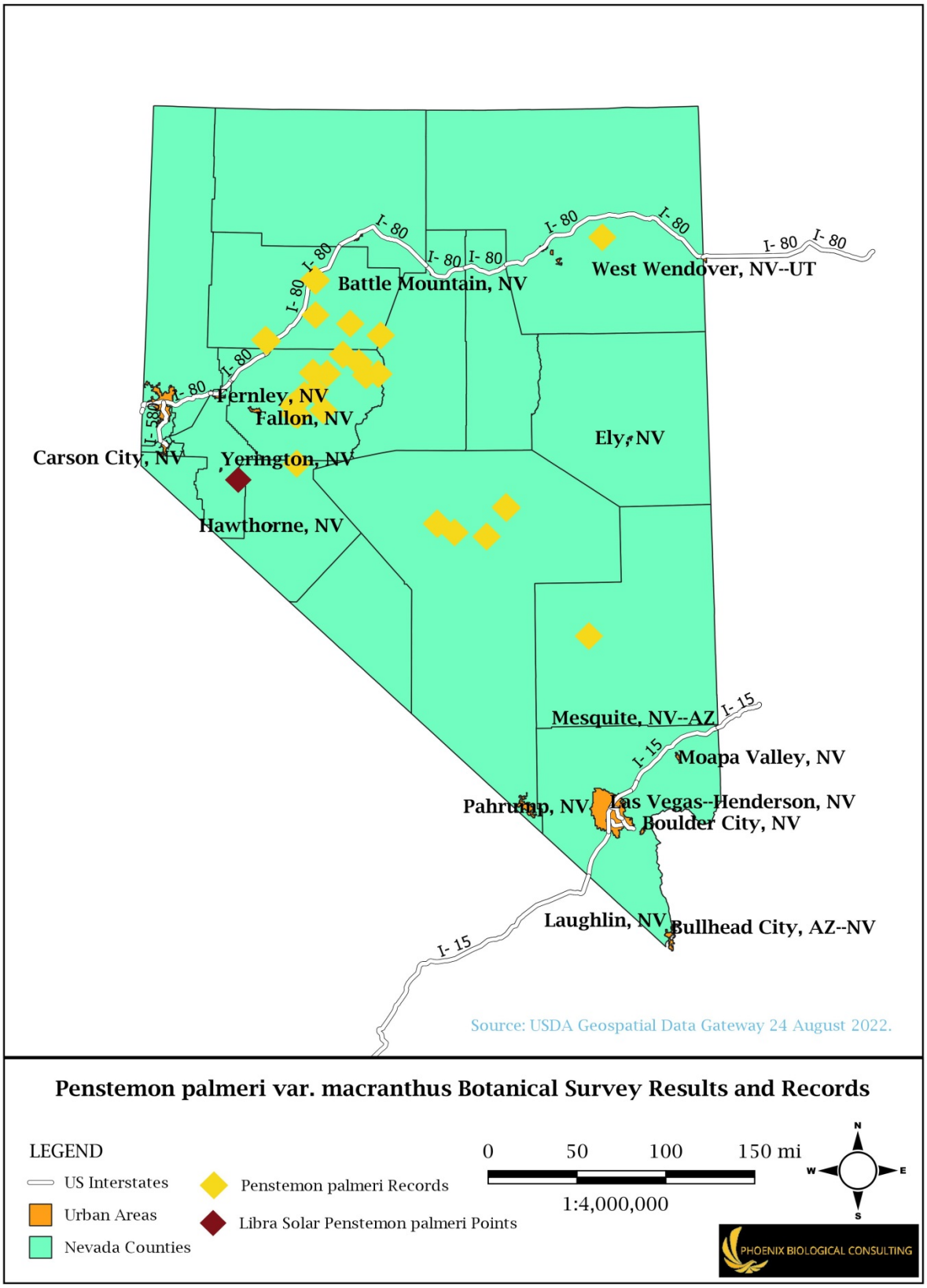


Figure 28. Global Distribution of *Penstemon palmeri*



Penstemon palmeri var. *macranthus*

NatureServe (2022) indicates *P. palmeri* var. *macranthus* is a Nevada endemic ranked as imperiled (T2, a rank indicating the status of the variety) in the state. Globally the species is considered apparently secure to secure (G4G5) but the variety *macranthus* is listed as imperiled (T2). NatureServe notes only four documented sites while SEINet (2022) shows 57 collections of the variety from Nevada (Figure 28).

Variety *macranthus* grows in a variety of habitats including washes, roadsides, and canyon floors, particularly on carbonate-containing substrates. Similar to other rare plants found during the botanical survey, its rarity does not appear to be due to lack of available habitat. The primary threat to the variety appears to be the widespread use of *P. palmeri* var. *palmeri* in re-vegetation and habitat restoration. Variety *macranthus* is known to hybridize with the more common and widespread variety *palmeri,* and thus introgression could overwhelm the rare variety. Other activities such as livestock grazing, off-road vehicle use, and invasion of habitat by non-native plant species may also pose a threat.

The single plant located during the botanical survey is on the western edge of the varieties' range. It was located in a dry stony wash on the northern edge of the Project Area.

Figure 29. *Penstemon palmeri* var. *macranthus* in a Stony Wash.

VEGETATION COMMUNITIES

Five vegetation communities were documented in the project area. Of these, three are common and widely distributed. Two associations within the *Sarcobatus baileyi* Shrubland Alliance (Alliance Code B.001), however, are considered less common due to the limited distribution of Bailey's greasewood. These are *Sarcobatus baileyi-Picrothamnus desertorum - Atriplex confertifolia / Pleuraphis jamesii* Shrubland (Association Code NNHP070) and *Sarcobatus baileyi - Ephedra nevadensis* Shrublands (Association Code NNHP071). Little information regarding the distribution and extent of these vegetation types is available. However, given the limited distribution of Bailey's greasewood any vegetation type based on it will be restricted.

CACTI

The cacti populations in the Project Area are a typical of the cacti found in the vegetation communities and at the elevation of the region.

INVASIVE SPECIES

All of the non-native invasive plant species documented during the survey are widespread and abundant weeds expected to be found at the site.

Impact Analysis

SPECIAL-STATUS PLANT SPECIES

Potential permanent impacts to special-status plants from the proposed Project include mortality, morbidity, reduced growth and reproduction, and disturbance to individual plants or plant populations, including the seed bank. Impacts may occur during vegetation removal, grading, and construction activities. Impacts include the introduction of invasive weeds from new road and transmission line networks and increased use of the area, impacts to vegetation communities from vegetation management activities such as mowing and spraying herbicides, alterations to the hydrology, topography, substrates, and shade regime from construction activities and the resulting infrastructure of the Project.

Possible conservation measures that may be undertaken to reduce impacts to rare plant populations may include avoiding individuals where possible, salvage (i.e. ex-situ conservation) minimizing changes to drainage patterns in the vicinity of rare plant populations, topsoil salvage, seed collection, implementing protection measures for rare plant populations to avoid impacts during construction, and, implementing a weed management program to reduce the abundance of invasive weeds in the Project Area and design/developing a Restoration Plan for the decommissioning stage.

VEGETATION COMMUNITIES

Conservation measures to reduce impacts to vegetation communities may include allowing the plant communities in the solar fields to revegetate following construction, possibly lessening permanent impacts to the native plant communities. A weed management program should also be implemented to control and reduce the spread of invasive weeds in the native plant communities of the Project Area. Additional restoration techniques that may be used to restore the temporary impact areas could include seed collection, perennial shrub salvage, soil/substrate salvage, plant propagation, shrub outplanting, soil surface stabilization, decompacting terrain, replacing soils, and replanting/reseeding.

CACTI

Potential permanent and temporary impacts to cacti from the proposed Project include mortality, morbidity, and disturbance to individuals or populations. These impacts may occur during vegetation removal, grading, and construction activities, during salvage and relocation activities, and/or via alterations to the hydrology, topography, substrates, and shade regime from construction activities and completed infrastructure of the Project. Invasion of the Project Area by non-native invasive plant species, particularly the brome grasses, may result in reduced growth and reproduction by cacti.

Conservation measures to reduce impacts and protect cacti may include avoiding individuals where possible and salvaging and relocating healthy individuals outside of the impact area. A weed control plan that limits invasion and spread by non-native invasive plant species will be vital to conservation of cacti in the Project Area.

Surveyor Qualifications

The following PBC biologists conducted the botanical inventory and the vegetation, cacti, and invasive weed sampling activities.

Ryan Young: B.A. in Geography from San Francisco State University, San Francisco, CA (1995); more than 25 years working in the arid southwest as Senior Biologist and Vice President of Phoenix Biological Consulting. His range of services include ArcGIS, project administration, technical report writing, agency consultation, focused biological surveys and permitting. R. Young's role consists primarily of project management, technical report writing, agency interface, logistics, and GIS services for the Project.

Sarah Schmid: B.S. in Botany from the University of Florida, Gainesville, FL; 13 years of professional experience performing biological surveys in the Mojave and Great Basin deserts, the Sierra Nevada, and the Intermountain West. S. Schmid conducted the plant community mapping for the Project.

Brian Elliott: B.S. in Horticulture and Philosophy from the University of Idaho and a M.S. in Botany from the University of Wyoming; 26 years of professional experience performing botanical surveys in the western and southeastern United States. B. Elliott conducted the special status plant survey and cactus/noxious weed sampling for the plant community mapping for the Project.

Steve Till: B.S. in Botany from Northern Arizona University; 22 years of professional experience performing biological surveys in the Mojave, Sonoran, and Great Basin deserts. S. Till conducted the special status plant survey and cactus/noxious weed sampling for the plant community mapping for the Project.

Carrie Veety: B.S. in Environmental Science from Albright College; 11 years of professional experience performing botanical surveys the Mojave, Sonoran, and Great Basin deserts. C. Veety conducted the special status plant survey and cactus/noxious weed sampling for the plant community mapping for the Project.

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Appendix A: List of Special-status Plants with Potential to Occur in the Study Area

List of Special-status Plants with Potential to Occur in the Libra Study Area

Common Name	Scientific Name	Growth Habit	Habitat	Rank	Rationale
Eastwood milkweed	*Asclepias eastwoodiana*	Perennial	In open areas on a wide variety of basic (pH usually 8 or higher) soils, including calcareous clay knolls, sand, carbonate or basaltic gravels, or shale outcrops, generally barren and lacking competition, frequently in small washes or other moisture-accumulating microsites, in the shadscale, mixed-shrub, sagebrush, and lower pinyon-juniper zones.	USFS (S); NVHP (S2S3); NS (G2Q)	Presence: Possible. Project habitat contains numerous small washes with gravelly soils. Vegetation type in the project area (salt desert scrub) is also apparently suitable for the species.
Cima milkvetch	*Astragalus cimae* var. *cimae*	Perennial	Dry, open, relatively barren calcareous gravel slopes or clay hills	NVHP (S2); NS (G3T2)	Presence: Possible. The preferred vegetation type (sagebrush according to Welsh (2007)) and substrate reported for the species differ slightly from those found in the project area. However, a known site in close proximity (on the west side of 95 between Walker Lake and Schurz) to the project site warrants keeping the species on a list of target plant species.
Callaway milkvetch	*Astragalus callithrix*	Perennial	Deep, sandy soil on the valley floor or on dunes in barren openings with *Atriplex, Grayia, Chrysothamnus*, and *Artemisia*;	NVHP (S3); NS (G3)	Presence: Possible. Deep sandy substrates may be present in dry washes and the project is within the

			1550 - 1710 m		range of the species.
Lahontan milkvetch	*Astragalus porrectus*	Perennial	Open, calcareous or alkaline, sandy to gravelly washes, alluvium, or gullies on clay badlands, knolls, or playa edges in the shadscale zone	NVHP (S3?); NS (G3?)	Presence: Possible. Habitat appears to be is present within the project, although known occurrences are somewhat distant at Reno and northward.
Tonopah milkvetch	*Astragalus pseudiodanthus*	Perennial	Deep loose sandy soils of stabilized and active dune margins, old beaches, valley floors, or drainages, with Sarcobatus vermiculatus and other salt desert shrub taxa. Dependent on sand dunes or deep sand in Nevada	NVHP (S2); NS (G3Q)	Presence: Possible. Deep sandy substrates may be present in dry washes and the project is within the range of the species.
Nevada suncup	*Camissonia nevadensis*	Annual	Open, sandy, gravelly, or clay slopes and flats in the salt-desert, shadscale, and lower sagebrush zones	NVHP (S3); NS (G3)	Presence: Possible. Habitat for the species (gravelly flats in salt-desert scrub) is present in the project area.
Mojave thistle (Virgin River thistle)	*Cirsium mohavense*	Annual/Biennial/ Perennial	Damp soils around desert springs, streams, and ditches; 1,500 to 9,000 feet elevation	NVHP (SNR); NS (G2G3)	Presence: Possible. Desert springs could be present within the project area although this habitat is expected to be extremely uncommon.
Alexander's buckwheat	Eriogonum alexanderae	Perennial	Light colored clay outcrops, hillsides, and badlands in the shadcale, sagebrush, and pinyon-juniper zones.	NVHP (S2S3); NS (G5T2T3)	Presence: Possible. Shadscale habitat is present and known occurrences are in topographic positions similar to those found in the project area.

Lahontan Basin buckwheat	*Eriogonum rubricaule*	Annual	Dry, open, light-colored, strongly alkaline shrink-swell clay soils on bluffs and badlands derived from fluviolacustrine silt, volcanic ash, or diatomite deposits, sometimes perched on dark basaltic slopes, in the shadscale, mixed-shrub, and lower sagebrush zones	NVHP (S3); NS (G3)	Presence: Possible. Appropriate vegetation types (shadscale and mixed shrub) are known from the project area and several occurrences are known from the project area.
Sand cholla	*Grusonia pulchella*	Perennial	Sand of dunes, dry-lake borders, river bottoms, washes, valleys, and plains in the desert. Dependent on sand dunes or deep sand in Nevada	NDOW (CY); NVHP (S2S3); NS (G4)	Presence: Possible. Deep sand substrates may be found in washes within the project area.
Sagebrush pygmyleaf	*Loeflingia squarrosa* ssp. *artemisiarum*	Annual	Sandy soils of desert dunes and flats in Great Basin sagebrush shrub and Mojave desert shrub. It occurs at elevations of 2,300 to 4,000 feet	NVHP (S1S2); NS (G5T2T3)	Presence: Possible. Deep sand may be present in wash bottoms and vegetation type is present within the project area.
Candelaria blazingstar	*Mentzelia candelariae*	Perennial	Barren, often calcareous, low-competition gravelly or clay soils on weathered volcanic ash deposits, scree slopes, hot spring mounds, washes, or road banks or other recovering disturbances, in the shadscale, mixed-shrub, and sagebrush zones	NVHP (S3); NS (G3?Q)	Presence: Possible. Minimal potential habitat is found within the project area.
Oryctes	*Oryctes nevadensis*	Annual	Deep loose sand of stabilized dunes, washes, and valley flats, on various slopes and aspects	NVHP (S3); NS (G3)	Presence: Possible. Wash habitat is common in the project area.
Watson spinecup	*Oxytheca watsonii*	Annual	Dry, open, loose and/or lightly disturbed, often calcareous, sandy soils of washes, roadsides, alluvial fans, and valley bottoms, in salt desert	NVHP (S3?); NS (G3?)	Presence: Possible. Vegetation type and alluvial fan habitat is common within the project area.

			shrub communities		
Nevada dune beardtongue	*Penstemon arenarius*	Perennial	Deep, volcanic, sandy soils at elevations of 3,940 to 4,430 feet above mean sea level; common associates include fourwing saltbush, littleleaf horsebrush, and greasewood	USFS (S); NVHP (S2); NS (G2G3)	Presence: Possible. Associates are common within the project area and known occurrences are relatively close.
Lahontan beardtongue	*Penstemon palmeri* var. *macranthus*	Perennial	Along washes, roadsides, and canyon floors, particularly on carbonate-containing substrates, usually where subsurface moisture is available throughout most of the summer; unknown if restricted to calcareous substrates	NVHP (S2); NS (G4G5T2)	Presence: Possible. Wash habitat is common in the project area, although it is not know if subsurface moisture is present.
Wassuk beardtongue	*Penstemon rubicundus*	Perennial	Open, rocky to gravelly soils on perched tufa shores, steep decomposed granite slopes, rocky drainage bottoms, and roadsides or other recovering disturbances with enhanced runoff, locally abundant on recent burns, in the pinyon-juniper, sagebrush, and upper mixed-shrub and shadscale zones	USFS (S); NVHP (S3); NS (G2G3)	Presence: Possible. Vegetation type and appropriate topographic position is found in the project area.
Reese River phacelia	*Phacelia glaberrima*	Annual	Open, dry to moist, alkaline, nearly barren, sometimes scree-covered, whitish to brownish shrink-swell clay soils derived from fluviolacustrine volcanic ash and tuff deposits, generally on the steeper slopes of low hills, bluffs, and	NVHP (S3?); NS (G3?)	Presence: Possible. Vegetation type is common is project area and a known location is found on the west side of 95 between Walker Lake and Schurz. Soil type makes presences less

			badlands in the shadscale-greasewood, sagebrush, and lower pinyon-juniper zones		likely.
Potential Target Species with a Low Probability of Occurrence					
Tecopa birdbeak	*Cordylanthus tecopensis*	Annual	Open, moist to saturated, alkali-crusted clay soils of seeps, springs, outflow drainages, and meadows	NVHP (S2); NS (G2)	Presence: Low possibility. Desert springs/seeps could be present within the project area although this habitat is expected to be extremely uncommon. Also, known occurrences are somewhat distant from the project area.
Straw milkvetch	*Astragalus lentiginosus* var. *stramineus*	Biennial/Perennial	Sandy and gravelly valley flats, washes, and dunes in the creosote-bursage, blackbrush, and mixed-shrub zones	NVHP (S1S2); NS (G5T2T3)	Presence: Low Possibility. Although appropriate vegetation type (mixed shrub) and substrate (gravelly flats and washes) are found in the project area, known occurrences are significantly distant from project area.
Halfring milkvetch	*Astragalus mohavensis* var. *hemigyrus*	Annual/Perennial	Carbonate gravels and derivative soils on terraced hills and ledges, open slopes, and along washes in the creosote-bursage, blackbrush, and mixed-shrub zones	NVHP (S2S3); NS (G3G4T2T3)	Presence: Low Possibility. Although appropriate vegetation type (mixed shrub) and substrate (washes) are found in the project area, known occurrences are significantly distant from project area.

Mokiak milkvetch	*Astragalus mokiacensis*	Annual/Perennial	Loose, sandy to gravelly soils, mostly in and near dry drainages or other periodic disturbances, sometimes on bluffs, cliff terraces, badlands, or basalt talus, in the creosote-bursage, blackbrush, and mixed-shrub zones	NVHP (S1S2); NS (G3G4Q)	Presence: Low Possibility. Although appropriate vegetation type (mixed shrub) and substrate (washes) are found in the project area, known occurrences are significantly distant from project area.
Long-calyx eggvetch	*Astragalus oophorus* var. *lonchocalyx*	Perennial	Pinyon-juniper, sagebrush, and mixed desert shrub communities at 5,800 to 7,500 ft; dry gravelly hillsides and stony flats, associated with sagebrush, on limestone	NVHP (S2); NS (G4T2)	Presence: Low Possibility. Although appropriate vegetation type (mixed desert shrub) is found in the project area, known occurrences are significantly distant from project area.
Currant milkvetch	*Astragalus uncialis*	Perennial	Dry, open, sparsely-vegetated, calcareous sandy-clay soils on flats and gentle slopes of hillsides and alluvial fans	USFS (S) NVHP (S2); NS (G2)	Presence: Low possibility. Vegetation type and alluvial fans are present in the project area. However, the species is not likely to be found as known occurrences are significantly distant from the project area.
Pahrump silverscale	*Atriplex argentea* var. *longitrichoma*	Annual	Alkaline or gypsiferous, sometimes seasonally moist, often disturbed silty clay soils of valley bottoms in salt desert vegetation surrounded by the creosote-bursage zone, or on roadsides or in abandoned fields	NVHP (S1); NS (G5T2)	Presence: Low possibility. Vegetation type is present in the project area. However, the species is not likely to be found as known occurrences are significantly distant from the project area.

Spring-loving centaury	*Centaurium namophilum*	Annual	Open, moist alkali areas, including seeps and meadows at elevations from 2,100 to 3,500 ft	FWS (T); NDOW (CE); NVHP (S2); NS (G2Q)	Presence: Very low possibility. Although desert springs could be present within the project area, the species is known from much lower elevations than those found in the project area and known occurrences are significantly distant from the project area.
Virgin River thistle	*Cirsium virginense*	Perennial	Open, moist, alkaline clay soils of seep and spring areas or gypsum knolls. Aquatic or wetland dependent in Nevada	NVHP (SNR); NS (G2G3)	Presence: Very low possibility. Although desert springs could be present within the project area, the species is known from much lower elevations than those found in the project area and known occurrences are significantly distant from the project area.
Intermountain wavewing	*Cymopterus basalticus*	Perennial	Bare basaltic rocks, barren clays, gravelly hills and alluvial fans, mostly on dolomite. 4400-7000 ft in the pinyon-juniper, sagebrush, and shadscale zones	NVHP (S1); NS (G2)	Presence: Very low possibility. The project area is an alluvial fan with some shadscale habitat. However, other substrate characteristics are lacking and known occurrences are significantly distant from project area.
Bullfrog Hills sweetpea	*Lathyrus hitchcockianus*	Perennial	Washes and canyon bottoms in rocky volcanic gravelly or sandy soil; desert shrub above creosote bush; 1370-1585 m. Often grows entangled with nearby shrubs; sesert and	NVHP (S2); NS (G2)	Presence: Very low possibility. Apparently appropriate substrate and vegetation type are known from the project area (the described

			shrubland/chaparral		sustrate/vegetation is quite generic); however the species is unlikely to be found due to the significant distance of known occurrences.
Beaver Dam breadroot	*Pediomelum castoreum*	Perennial	Found in sandy washes and roadcuts in the eastern Mojave of NV	NVHP (S3); NS (G3)	Presence: Very low possibility. Although sandy washes and roadcuts are found in the project area, this is a generic habitat type and all known occurrences are significantly distant from the project area.
Yellow twotone beardtongue	*Penstemon bicolor* ssp. *bicolor*	Perennial	Calcareous or carbonate soils in washes, roadsides, rock crevices, outcrops, or similar places receiving enhanced runoff, in the creosote-bursage, blackbrush, mixed-shrub, and lower juniper zones	NVHP (S2); NS (G3T2Q)	Presence: Very low possibility. Although apparently suitable habitat is present within the project area, all known occurrences are is restricted to the Mojave Desert of southern Nevada and adjacent southeastern California and northwestern Arizona (Smith 2005). Thus the species occupies habitat significantly distant from the project area.

Rosy twotone beardtongue	*Penstemon bicolor* ssp. *roseus*	Perennial	Rocky calcareous, granitic, or volcanic soils in washes, roadsides, scree at outcrop bases, rock crevices, or similar places receiving enhanced runoff, in the creosote-bursage, blackbrush, and mixed-shrub zones	NVHP (S3); NS (G3T3Q)	Presence: Very low possibility. Although apparently suitable habitat is present within the project area, all known occurrences are is restricted to the Mojave Desert of southern Nevada and adjacent southeastern California and northwestern Arizona (Smith 2005). Thus the species occupies habitat significantly distant from the project area.
Railroad Valley globemallow	*Sphaeralcea caespitosa var. williamsiae*	Perennial	Dry, open, flat to gently sloped, gravelly carbonate soils on alluvium and valley fill, often more abundant on recovering disturbances such as washes and roadsides, in the greasewood, shadscale, and mixed shrubs zones	USFS (S); NVHP (S2); NS (G2T2)	Presence: Very low possibility. Although appropriate substrate and vegetation type may be present in the project area, known occurrences are significantly distant from the project area.

Appendix B: Weeds/Cacti Data Sheet

LIBRA SOLAR WEEDS/CACTI DATA SHEET

SURVEYOR: Steve Till	TRANSECT #: 1	DATE: 6/18/2022

CACTI

CODE	Name	Numbers of individuals counted Height Class (Tally)			Total Ex: 1/0/1 or 0
		0-3 feet	3-6 feet	> 6 feet	
OPUPOL	*Opuntia polyacantha var. erinacea*	2			2
GRUPOL	*Grusonia pulchella*	1			1

WEEDS

SPECIES	Tally	Total m^2 Estimate or #
Bromus tectorum	380	380
Halogeton glomeratus	25	25
Salsola paulsenii	1	1

LIBRA SOLAR WEEDS/CACTI DATA SHEET

SURVEYOR: Steve Till	TRANSECT #: 2	DATE: 6/18/2022

CACTI

CODE	Name	Numbers of individuals counted Height Class (Tally)			Total Ex: 1/0/1 or 0
		0-3 feet	3-6 feet	> 6 feet	
OPUPOL	*Opuntia polyacantha var. erinacea*	4			4

WEEDS

SPECIES	Tally	Total m^2 Estimate or #
Bromus tectorum	700	700
Halogeton glomeratus	4	4

LIBRA SOLAR WEEDS/CACTI DATA SHEET

SURVEYOR: Steve Till	TRANSECT #: 3	DATE: 6/18/2022

CACTI

CODE	Name	Numbers of individuals counted Height Class (Tally)			Total Ex: 1/0/1 or 0
		0-3 feet	3-6 feet	> 6 feet	
OPUPOL	*Opuntia polyacantha var. erinacea*	2			2

WEEDS

SPECIES	Tally	Total m^2 Estimate or #
Bromus tectorum	550	550
Halogeton glomeratus	37	37

LIBRA SOLAR WEEDS/CACTI DATA SHEET

SURVEYOR: Steve Till	TRANSECT #: 5	DATE: 6/18/2022

CACTI

CODE	Name	Numbers of individuals counted Height Class (Tally)			Total Ex: 1/0/1 or 0
		0-3 feet	3-6 feet	> 6 feet	
OPUPOL	*Opuntia polyacantha var. erinacea*	3			3

WEEDS

SPECIES	Tally	Total m^2 Estimate or #
Bromus tectorum	600	600

LIBRA SOLAR WEEDS/CACTI DATA SHEET

SURVEYOR: Steve Till	TRANSECT #: 6	DATE: 6/19/2022

CACTI

CODE	Name	Numbers of individuals counted Height Class (Tally)			Total Ex: 1/0/1 or 0
		0-3 feet	3-6 feet	> 6 feet	
OPUPOL	*Opuntia polyacantha var. erinacea*	4			4

WEEDS

SPECIES	Tally	Total m^2 Estimate or #
Bromus tectorum	400	400
Halogeton glomeratus	10	10

LIBRA SOLAR WEEDS/CACTI DATA SHEET

SURVEYOR: Steve Till	TRANSECT #: 7	DATE: 6/19/2022

CACTI

CODE	Name	Numbers of individuals counted			Total Ex: 1/0/1 or 0
		Height Class (Tally)			
		0-3 feet	3-6 feet	> 6 feet	
OPUPOL	*Opuntia polyacantha var. erinacea*	3			3

WEEDS

SPECIES	Tally	Total m^2 Estimate or #
Bromus tectorum	600	600
Halogeton glomeratus	10	10
Salsola paulsenii	20	20

LIBRA SOLAR WEEDS/CACTI DATA SHEET

SURVEYOR: Steve Till	TRANSECT #: 8	DATE: 6/19/2022

CACTI

CODE	Name	Numbers of individuals counted Height Class (Tally)			Total Ex: 1/0/1 or 0
		0-3 feet	3-6 feet	> 6 feet	
OPUPOL	*Opuntia polyacantha var. erinacea*	4			4

WEEDS

SPECIES	Tally	Total m^2 Estimate or #
Bromus tectorum	700	700
Halogeton glomeratus	5	5
Salsola paulsenii	10	10

LIBRA SOLAR WEEDS/CACTI DATA SHEET

SURVEYOR: Steve Till	TRANSECT #: 9	DATE: 6/19/2022

CACTI

CODE	Name	Numbers of individuals counted Height Class (Tally)			Total Ex: 1/0/1 or 0
		0-3 feet	3-6 feet	> 6 feet	
OPUPOL	*Opuntia polyacantha var. erinacea*	8			8

WEEDS

SPECIES	Tally	Total m^2 Estimate or #
Bromus tectorum	500	500
Halogeton glomeratus	1	1
Salsola paulsenii	5	5

LIBRA SOLAR WEEDS/CACTI DATA SHEET

SURVEYOR: Carrie Veety	TRANSECT #: 10	DATE: 6/18/2022

CACTI

CODE	Name	Numbers of individuals counted Height Class (Tally)			Total Ex: 1/0/1 or 0
		0-3 feet	3-6 feet	> 6 feet	
OPUPOL	*Opuntia polyacantha var. erinacea*	2			2

WEEDS

SPECIES	Tally	Total m^2 Estimate or #
Bromus tectorum	298	298
Halogeton glomeratus	4	4
Salsola paulsenii	14	14
Bromus rubens	10	10

LIBRA SOLAR WEEDS/CACTI DATA SHEET

SURVEYOR: Carrie Veety	TRANSECT #: 11	DATE: 6/18/2022

CACTI

CODE	Name	Numbers of individuals counted Height Class (Tally)			Total Ex: 1/0/1 or 0
		0-3 feet	3-6 feet	> 6 feet	
OPUPOL	*Opuntia polyacantha var. erinacea*	8			8

WEEDS

SPECIES	Tally	Total m^2 Estimate or #
Bromus tectorum	23	23
Halogeton glomeratus	7	7
Salsola paulsenii	2	2

LIBRA SOLAR WEEDS/CACTI DATA SHEET

SURVEYOR: Carrie Veety	TRANSECT #: 12	DATE: 6/18/2022

CACTI

CODE	Name	Numbers of individuals counted Height Class (Tally)			Total Ex: 1/0/1 or 0
		0-3 feet	3-6 feet	> 6 feet	
OPUPOL	*Opuntia polyacantha var. erinacea*	10			10

WEEDS

SPECIES	Tally	Total m^2 Estimate or #
Bromus tectorum	8	8

LIBRA SOLAR WEEDS/CACTI DATA SHEET

SURVEYOR: Carrie Veety	TRANSECT #: 13	DATE: 6/18/2022

CACTI

CODE	Name	Numbers of individuals counted Height Class (Tally)			Total Ex: 1/0/1 or 0
		0-3 feet	3-6 feet	> 6 feet	
OPUPOL	*Opuntia polyacantha var. erinacea*	3			3

WEEDS

SPECIES	Tally	Total m^2 Estimate or #
Bromus tectorum	37	37
Bromus rubens	2	2
Salsola paulsenii	22	22

LIBRA SOLAR WEEDS/CACTI DATA SHEET

SURVEYOR: Steve Till	TRANSECT #: 14	DATE: 6/19/2022

CACTI

CODE	Name	Numbers of individuals counted Height Class (Tally)			Total Ex: 1/0/1 or 0
		0-3 feet	3-6 feet	> 6 feet	
	No cacti				

WEEDS

SPECIES	Tally	Total m^2 Estimate or #
Bromus tectorum	250	250
Halogeton glomeratus	0	0
Salsola paulsenii	50	50

LIBRA SOLAR WEEDS/CACTI DATA SHEET

SURVEYOR: Steve Till	TRANSECT #: 15	DATE: 6/19/2022

CACTI

CODE	Name	Numbers of individuals counted Height Class (Tally)			Total Ex: 1/0/1 or 0
		0-3 feet	3-6 feet	> 6 feet	
OPUPOL	*Opuntia polyacantha var. erinacea*	2			2

WEEDS

SPECIES	Tally	Total m^2 Estimate or #
Bromus tectorum	250	250
Halogeton glomeratus	0	0
Salsola paulsenii	10	10

LIBRA SOLAR WEEDS/CACTI DATA SHEET

SURVEYOR: Carrie Veety	TRANSECT #: 16	DATE: 6/19/2022

CACTI

CODE	Name	Numbers of individuals counted Height Class (Tally)			Total Ex: 1/0/1 or 0
		0-3 feet	3-6 feet	> 6 feet	
OPUPOL	*Opuntia polyacantha var. erinacea*	1			1

WEEDS

SPECIES	Tally	Total m^2 Estimate or #
Bromus tectorum	16	16
Bromus rubens	12	12

LIBRA SOLAR WEEDS/CACTI DATA SHEET

SURVEYOR: Carrie Veety	TRANSECT #: 17	DATE: 6/19/2022

CACTI

CODE	Name	Numbers of individuals counted Height Class (Tally)			Total Ex: 1/0/1 or 0
		0-3 feet	3-6 feet	> 6 feet	
OPUPOL	*Opuntia polyacantha var. erinacea*	8			8

WEEDS

SPECIES	Tally	Total m^2 Estimate or #
Bromus tectorum	30	30

LIBRA SOLAR WEEDS/CACTI DATA SHEET

SURVEYOR: Carrie Veety	TRANSECT #: 18	DATE: 6/19/2022

CACTI

CODE	Name	Numbers of individuals counted Height Class (Tally)			Total Ex: 1/0/1 or 0
		0-3 feet	3-6 feet	> 6 feet	
OPUPOL	*Opuntia polyacantha var. erinacea*	3			3

WEEDS

SPECIES	Tally	Total m^2 Estimate or #
Bromus tectorum	216	216
Salsola paulsenii	20	20

LIBRA SOLAR WEEDS/CACTI DATA SHEET

SURVEYOR: Carrie Veety	TRANSECT #: 19	DATE: 6/19/2022

CACTI

CODE	Name	Numbers of individuals counted Height Class (Tally)			Total Ex: 1/0/1 or 0
		0-3 feet	3-6 feet	> 6 feet	
OPUPOL	*Opuntia polyacantha var. erinacea*	3			3

WEEDS

SPECIES	Tally	Total m^2 Estimate or #
Bromus tectorum	50	50
Salsola paulsenii	6	6

LIBRA SOLAR WEEDS/CACTI DATA SHEET

SURVEYOR: Carrie Veety	TRANSECT #: 20	DATE: 6/19/2022

CACTI

CODE	Name	Numbers of individuals counted Height Class (Tally)			Total Ex: 1/0/1 or 0
		0-3 feet	3-6 feet	> 6 feet	
OPUPOL	*Opuntia polyacantha var. erinacea*	6			6

WEEDS

SPECIES	Tally	Total m^2 Estimate or #
Bromus tectorum	670	670
Bromus rubens	43	43

LIBRA SOLAR WEEDS/CACTI DATA SHEET

SURVEYOR: Carrie Veety	TRANSECT #: 21	DATE: 6/19/2022

CACTI

CODE	Name	Numbers of individuals counted Height Class (Tally)			Total Ex: 1/0/1 or 0
		0-3 feet	3-6 feet	> 6 feet	
OPUPOL	*Opuntia polyacantha var. erinacea*	6			6
GRUPOL	*Grusonia pulchella*	1			**1**

WEEDS

SPECIES	Tally	Total m^2 Estimate or #
Bromus tectorum	2123	2123
Sisymbrium altissimum	21	21
Salsola paulsenii	540	540

LIBRA SOLAR WEEDS/CACTI DATA SHEET

SURVEYOR: Carrie Veety	TRANSECT #: 22	DATE: 6/19/2022

CACTI

CODE	Name	Numbers of individuals counted Height Class (Tally)			Total Ex: 1/0/1 or 0
		0-3 feet	3-6 feet	> 6 feet	
	No cacti				

WEEDS

SPECIES	Tally	Total m^2 Estimate or #
Bromus tectorum	560	560
Salsola paulsenii	8	8

LIBRA SOLAR WEEDS/CACTI DATA SHEET

SURVEYOR: Carrie Veety	TRANSECT #: 23	DATE: 6/19/2022

CACTI

CODE	Name	Numbers of individuals counted Height Class (Tally)			Total Ex: 1/0/1 or 0
		0-3 feet	3-6 feet	> 6 feet	
	No cacti				

WEEDS

SPECIES	Tally	Total m^2 Estimate or #
Bromus tectorum	500	500

Appendix C: List of Plant Taxa Observed in the Libra Study Area

Scientific Name	Common Name	Main Polygons	Linears[1]
Ephedraceae			
Ephedra nevadensis	Nevada jointfir	X	X
Asteraceae			
Ambrosia acanthicarpa	flatspine bur ragweed		X
Ambrosia salsola	burrobrush		X
Atrichoseris platyphylla	parachute plant	X	
Brickellia microphylla	littleleaf brickelbush		X
Chaenactis macrantha	bighead dustymaiden	X	X
Chaenactis stevioides	Esteve's pincushion	X	X
Chaetadelphia wheeleri	Wheeler's skeltonweed	X	X
Chrysothamnus greenei	Greene's rabbitbrush	X	X
Chrysothamnus nauseosus	rubber rabbitbrush	X	X
Crepis intermedia	limestone hawksbeard		X
Glyptopleura marginata	carveseed	X	
Gutierrezia sarothrae	snakeweed	X	X
Helianthus annuus	common sunflower		X
Hieracium bolanderi	Bolander's hawkweed	X	
Hymenoclea salsola	burrobrush	X	
Lactuca serriola	pricklylettuce	X	X
Malacothrix glabrata	smooth desertdandelion		X
Picrothamnus desertorum	bud sagebrush	X	X
Prenanthella exigua	brightwhite	X	
Psathyrotes ramosissima	velvet turtleback		X
Stephanomeria exigua	small wirelettuce		X
Stephanomeria pauciflora	brownplume wirelettuce	X	X
Tetradymia canescens	spineless horsebrush	X	
Tetradymia glabrata	littleleaf horsebrush	X	X
Tetradymia spinosa	shortspine horsebrush	X	X
Boraginaceae			
Amsinckia tessellata	bristly fiddleneck	X	X
Cryptantha nevadensis	Nevada cryptantha	X	X
Cryptantha pterocarya	wingnut cryptantha	X	
Greeneocharis circumscissa	cushion cryptantha	X	X
Tiquila nuttallii	Nuttall's crinklemat	X	X
Brassicaceae			
Arabis holboellii var. *retrofracta*	second rockcress	X	

Scientific Name	Common Name	Main Polygons	Linears[1]
Descurainia incisa var. *incisa*	mountain tansymustard	X	X
Descurainia pinnata ssp. *halictorum*	western tansymustard	X	X
Erysimum capitatum var. *capitatum*	sanddune wallflower	X	X
Guillenia lasiophylla	California mustard	X	X
Lepidium densiflorum	common pepperweed	X	
Lepidium fremontii var. *fremontii*	desert pepperweed	X	X
Lepidium lasiocarpum	shaggyfruit pepperweed	X	X
**Lepidium latifolium*	perennial pepperweed		X
Sisymbrium altissimum	tumblemustard	X	X
Stanleya elata	Panamint princesplume	X	X
Stanleya pinnata	desert princesplume	X	
Cactaceae			
!Grusonia pulchella	sand cholla	X	X
Opuntia polyacantha var. *erinacea*	grizzlybear pricklypear	X	
Caprifoliaceae			
Symphoricarpos longiflorus	desert snowberry	X	X
Capparaceae			
Cleome lutea	yellow spiderflower	X	X
Chenopodiaceae			
Atriplex canescens	fourwing saltbush	X	
Atriplex confertifolia	shadscale	X	X
Bassia americana	green molly	X	X
Bassia scoparia	burningbush		X
Chenopodium album	lambsquarters	X	X
**Halogeton glomeratus*	halogeton	X	
Grayia spinosa	spiny hopsage	X	X
Kraschenninikovia lanata	winterfat	X	X
Sarcobatus baileyi	Bailey's greasewood	X	X
Sarcobatus vermiculatus	greasewood		X
**Salsola paulsenii*	barbwire Russian thistle	X	X
**Salsola tragus*	Russian thistle	X	X
Suaeda moquinii	Mojave seablite		X
Crossomataceae			
Glossopetalon spinescens	spiny greasebush	X	
Cuscutaceae			
Cuscuta sp.	dodder	X	X

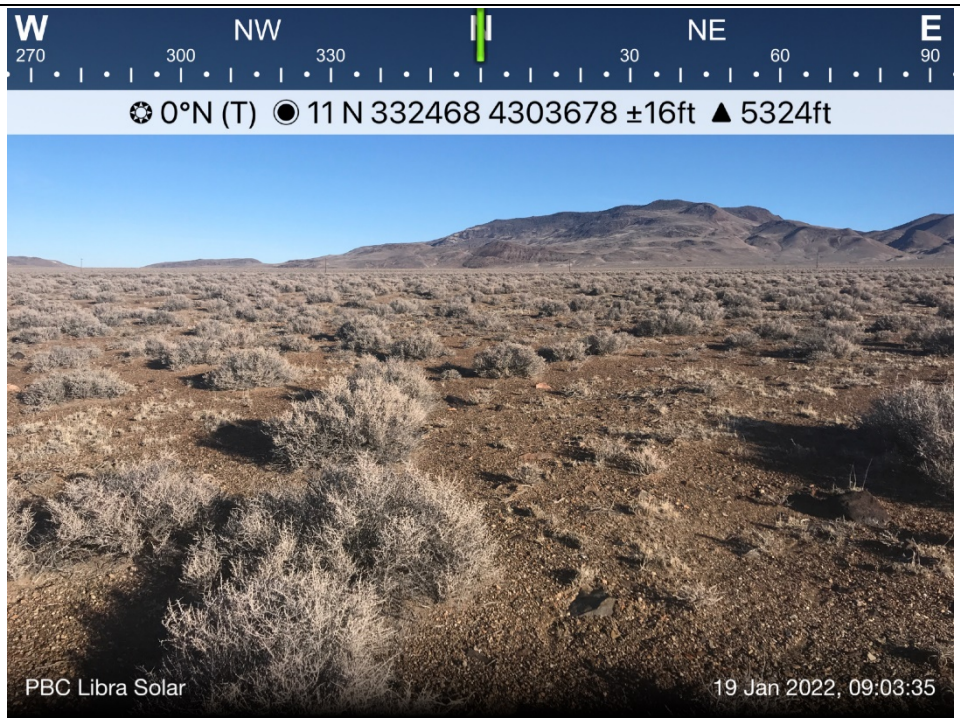
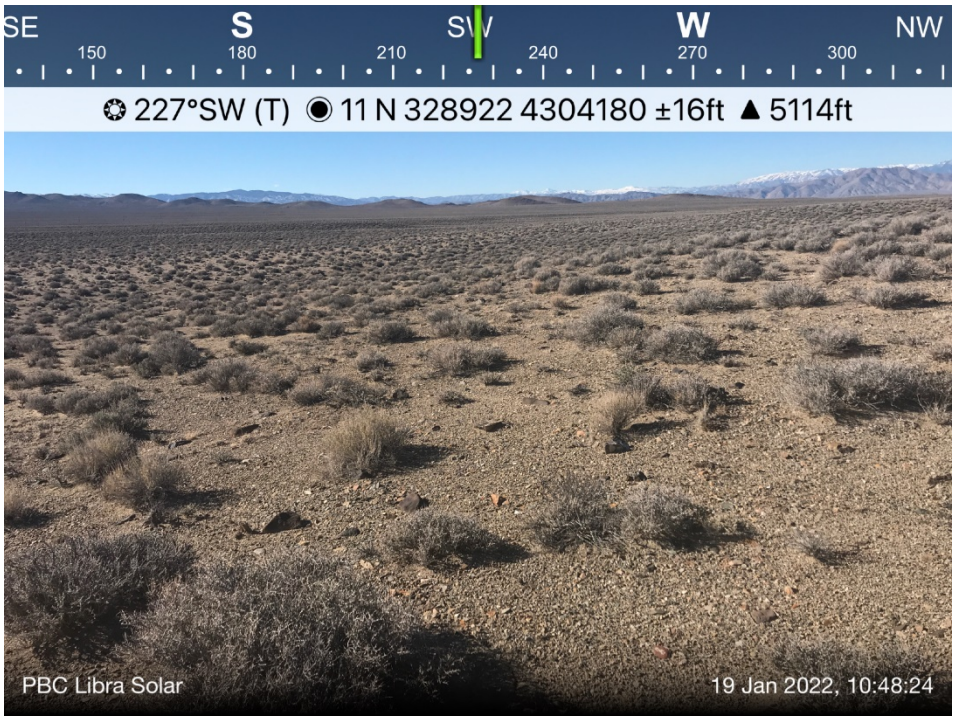
Scientific Name	Common Name	Main Polygons	Linears[1]
Fabaceae			
Astragalus lentiginosus var. *floribundus*	freckled milkvetch	X	X
Astragalus lentiginosus var. *lentiginosus*	freckled milkvetch	X	X
!Astragalus pseudoiodanthus	Tonopah milkvetch	X	
Astragalus purshii	woollypod milkvetch		
Lupinus brevicaulis	shortstem lupine	X	
Lupinus pusillum	rusty lupine	X	X
Psorothamnus polydenius	Nevada dalea	X	X
Geraniaceae			
Erodium cicutarium	storksbill	X	X
Hydrophyllaceae			
Phacelia bicolor	twocolor phacelia	X	
Phacelia crenulata	cleftleaf wild heliotrope		X
Lamiaceae			
Marrubium vulgare	horehound		X
Salvia columbariae	cjia	X	X
Loasaceae			
Mentzelia sp.	blazingstar	X	
Mentzelia albicaulis	whitestem blazingstar	X	X
Mentzelia torreyi	Torrey's blazingstar		X
Malvaceae			
Sphaeralcea ambigua	desert globemallow	X	X
Nyctaginaceae			
Abronia sp.	sand verbena	X	
Abronia turbinata	transmontane sand verbena	X	
Mirabilis sp.	four-o'clock	X	
Mirabilis alipes	winged four-o'clock	X	X
Mirabilis laevis	desert wishbonebush		X
Onagraceae			
Camissonia sp.	suncup	X	
Camissonia boothii var. *alyssiodes*	Pine Creek evening primrose	X	X
Oenothera caespitosa	tufted evening primrose	X	X

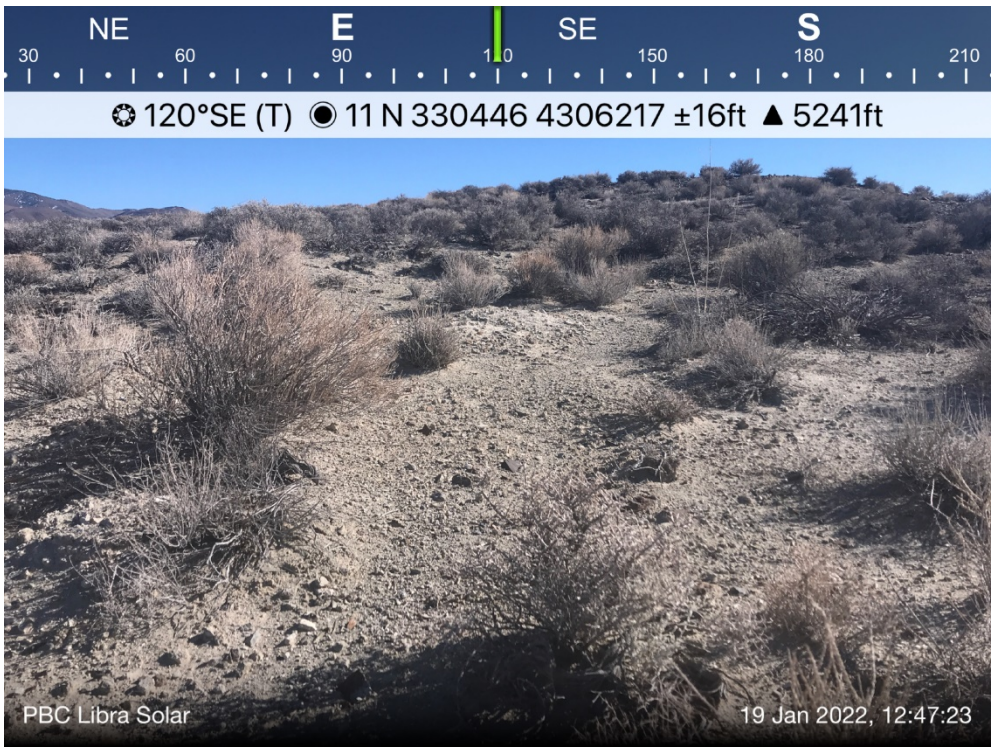
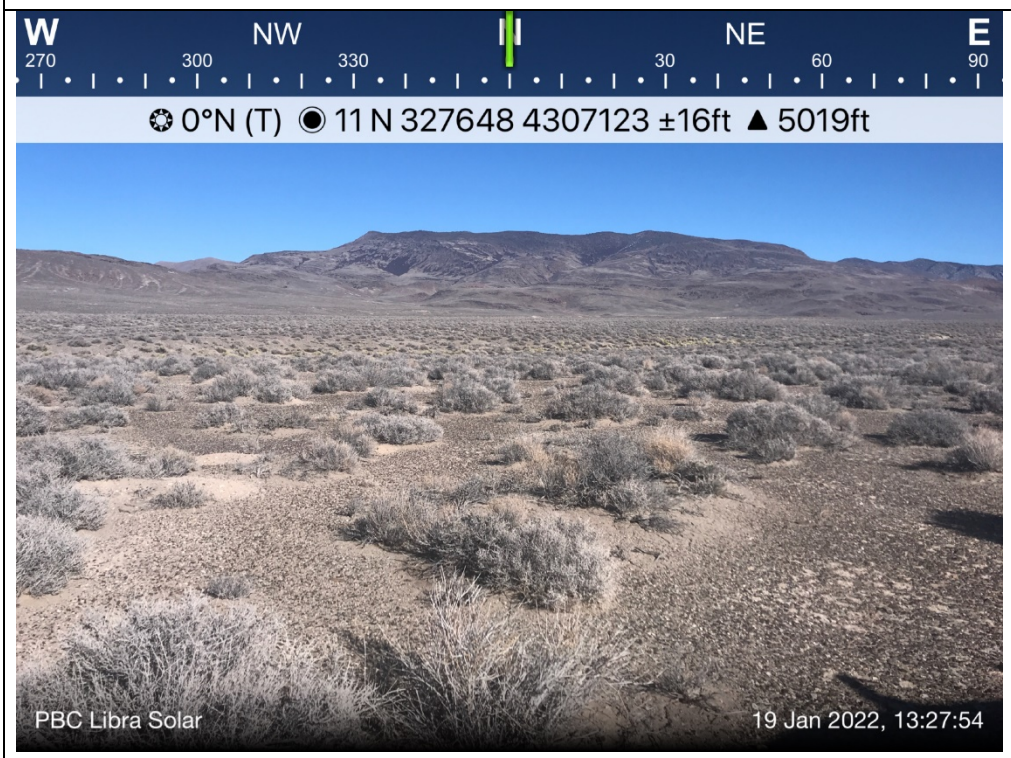
Scientific Name	Common Name	Main Polygons	Linears[1]
Orobanchaceae			
Orobanche corymbosa	flat-top broomrape	X	
Papaveraceae			
Eschscholzia minutiflora	pygmy poppy	X	X
Plantaginaceae			
!Penstemon palmeri var.*macranthus*	Lahontan beardtongue	X	
Penstemon speciosus	royal penstemon	X	X
Poaceae			
Achnatherum hymenoides	Indian ricegrass	X	X
Achnatherum speciosum	desert needlegrass	X	X
**Bromus rubens*	red brome	X	X
**Bromus tectorum*	cheatgrass	X	X
Dasychloa pulchella	low wollygrass	X	X
Distichlis spicata	saltgrass		X
Elymus elymoides	squirreltail	X	X
Elymus repens	quackgrass	X	
Hesperostipa comata	beedle-and-thread grass	X	X
Hilaria jamesii	galeta grass	X	
Hordeum sp.	barley		X
Poa sp.	bluegrass	X	X
Sporobolus cryptandrus	spike dropseed	X	X
Vulpia bromoides	brome fescue	X	
Polemoniaceae			
Aliciella triodon	coyote gilia	X	
Eriastrum sp.	woollystar	X	X
Gilia opthalmoides	eyed gilia	X	X
Ipomopsis polycladon	manybranched ipomopsis	X	X
Loeseliastrum depressa	depressed ipomopsis	X	
Nama aretioides	ground nama	X	X
Polygonaceae			
Eriogonum heermannii	Heermann's buckwheat	X	X
Choizanthe brevicornu	brittle spineflower	X	
Chorizanthe rigida	devil's spineflower		X
Eriogonum brachyanthum	shortflower buckwheat	X	
Eriogonum inflatum	desert trumpet	X	X
Eriogonum maculatum	spotted buckwheat	X	

Scientific Name	Common Name	Main Polygons	Linears[1]
Eriogonum nidularium	birdnest buckwheat	X	X
Eriogonum nutans	Dugway buckwheat	X	X
Eriogonum ovalifolium	cushion buckwheat	X	X
Oxytheca perfoliata	roundleaf oxytheca	X	X
Santalaceae			
Comandra umbellata	bastard toadflax		
Scrophulariaceae			
Castilleja linariifolia	Wyoming Indian paintbrush	X	
Solanaceae			
Lycium sp.	desert-thorn		X
!Oryctes nevadensis	oryctes	X	

[1] Linears include Gen-ties and access roads.
!= rare plant species.
*=non-native invasive species

Appendix D: Vegetation Community Photographs

	**Photo Point 1. Great Basin Salt Desert Scrubland. Southern boundary habitat photo. Facing N.**
	**Photo Point 2. Great Basin Salt Desert Scrubland. Habitat photo in western project area overlooking Pumpkin Hollow. Facing SW.**

	**Photo Point 3. Great Basin Salt Desert Scrubland on rolling hills with whitish substrates in eastern project area. Facing SE.**
	**Photo Point 4. Great Basin Salt Desert Scrubland. Habitat photo along interior NW-SW road in northwest project area with Wassuk Range on horizon. Facing N.**

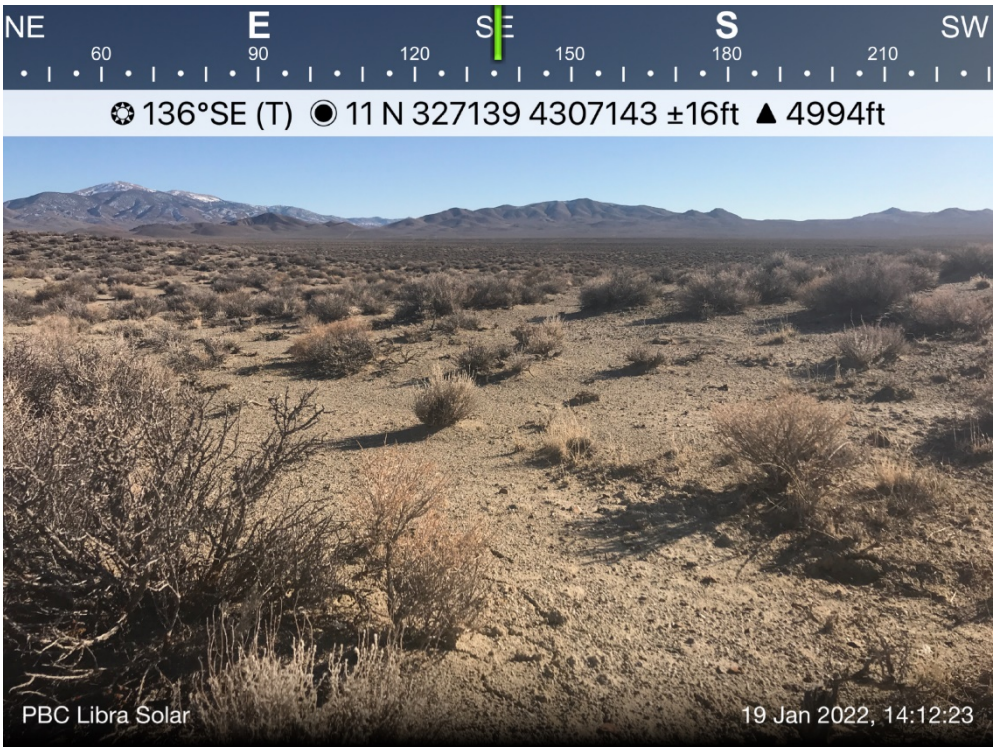
	**Photo Point 5. Great Basin Salt Desert Scrubland. Northwestern boundary habitat photo. Facing SE.**
	**Photo Point 6. Great Basin Salt Desert Scrubland. Southwestern boundary habitat photo. Facing NE along Reese Canyon Road.**

Photo Point 7. Great Basin Salt Desert Scrubland. Habitat photo along interior NW-SW road in eastern project area. Facing W.

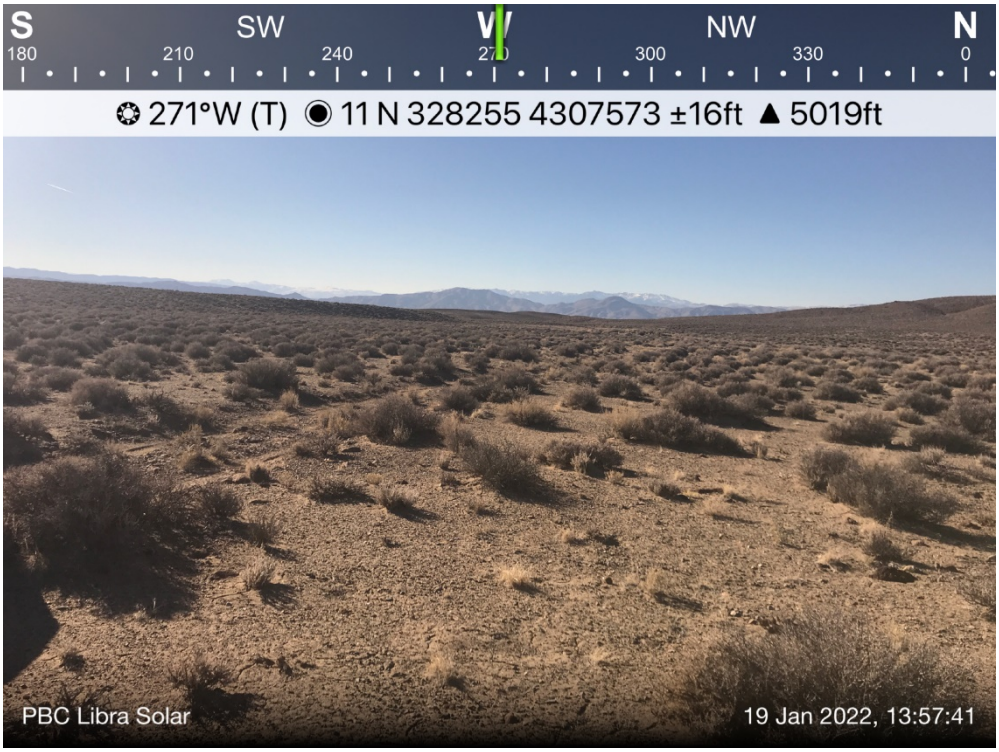
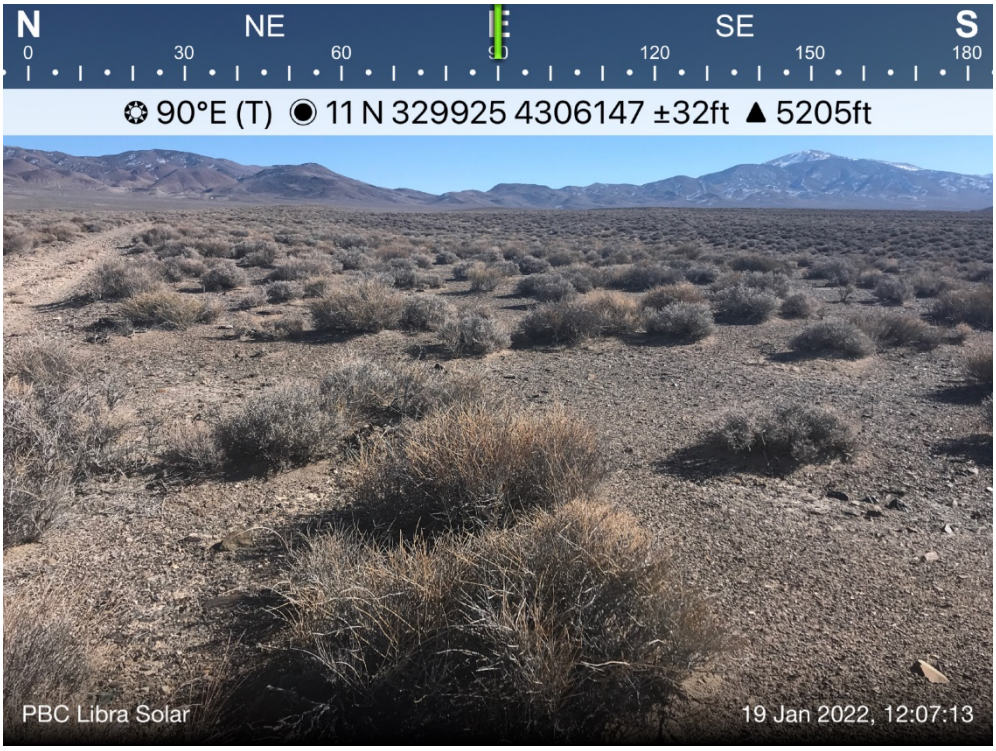
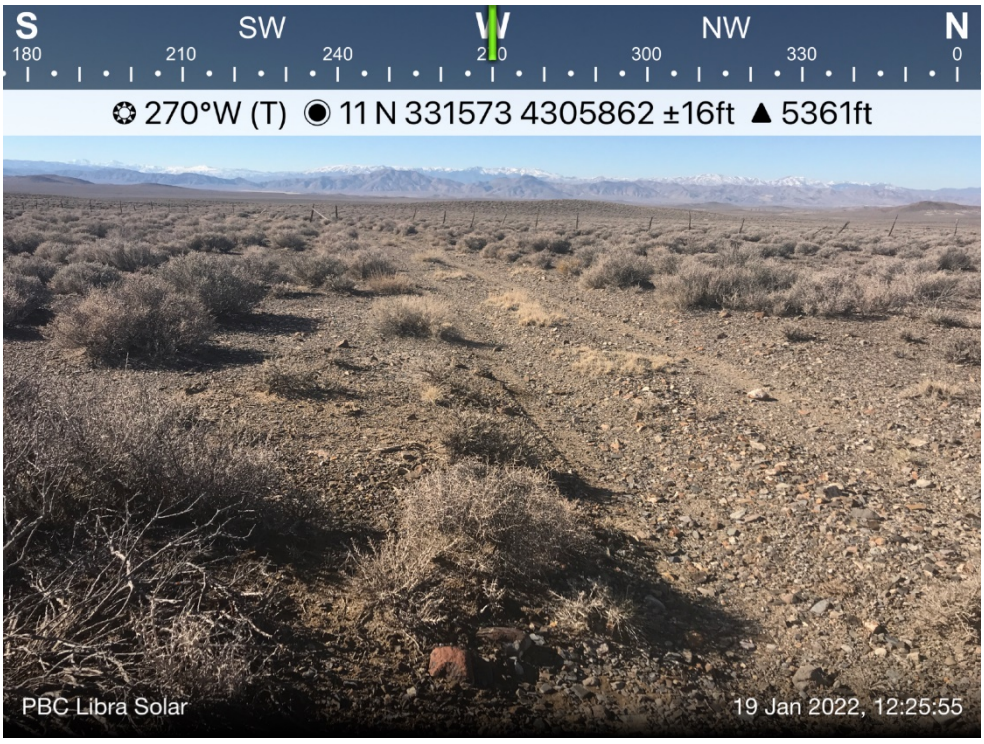


Photo Point 8. Great Basin Salt Desert Scrubland. Habitat photo in northeast project area near Black Mountain Well. Facing W.

	**Photo Point 9. Great Basin Salt Desert Scrubland. Habitat photo in eastern project area with Mount Baldy on horizon to the right. Facing E.**
	**Photo Point 10. Great Basin Salt Desert Scrubland. Habitat photo at eastern boundary. Facing W.**

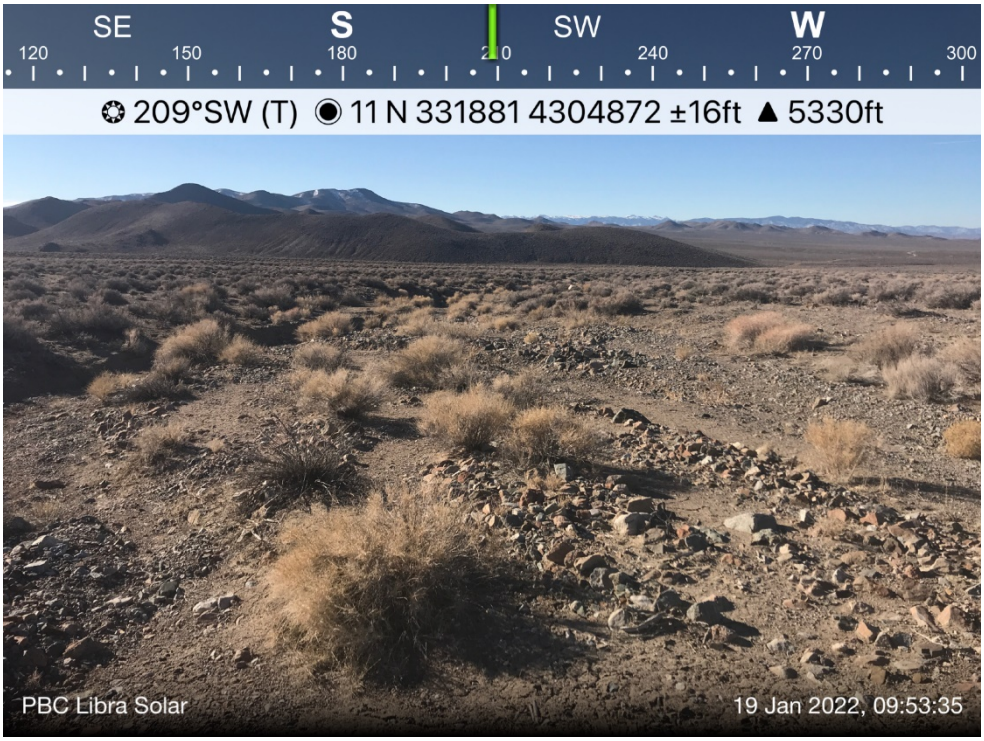


Photo Point 11. Desert wash with cheesebush. Habitat photo in southeast project area with Gray Hills to left on horizon. Facing SSW.

Photo Point 12. Desert wash with deeply incised channels; banks vegetated by cheesebush and buck-wheat. Habitat photo in southeast project area. Facing NNE.

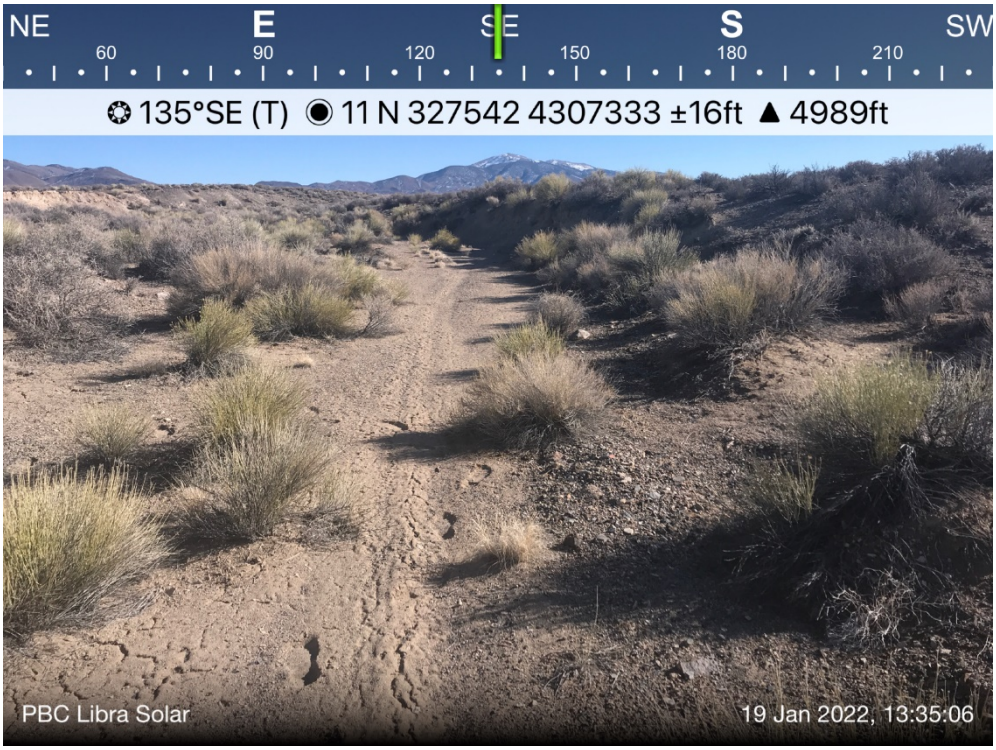


Photo Point 13. Desert wash with rubber rabbitbrush. Habitat photo in northeast project area. Facing SE.

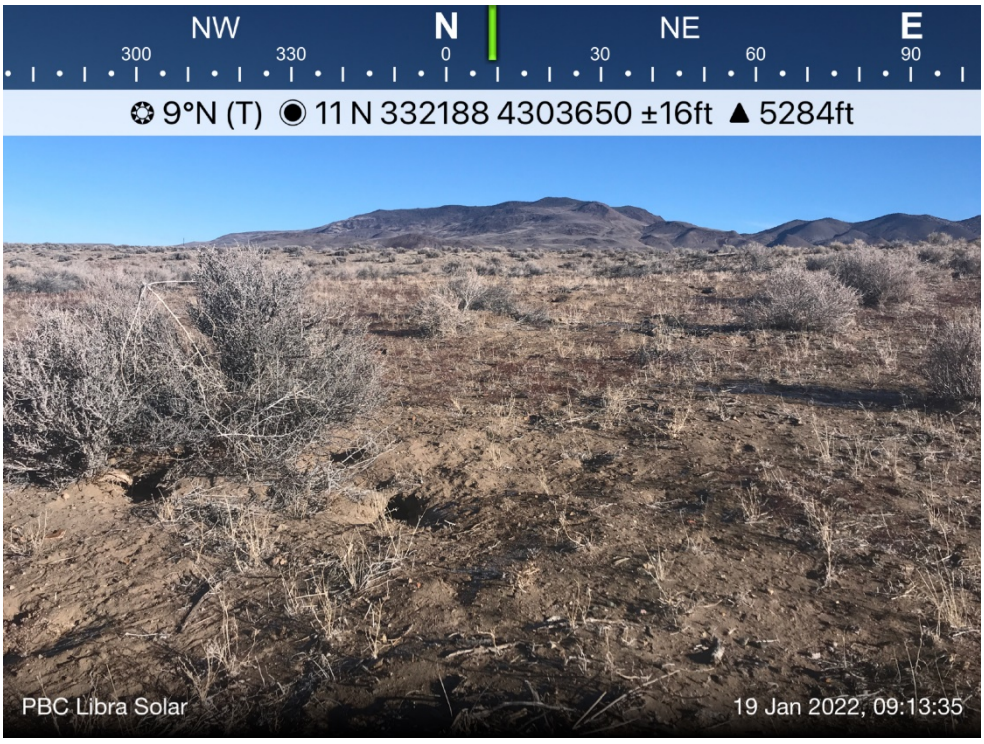


Photo Point 14. Potential pale kangaroo mouse habitat. Complex of rodent burrows in fine-sandy soils in southeast project area. Facing N.

Appendix E: Element Occurrences Forms

An element occurrence form is included for each special status plant occurrence within the Study Area.