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Blue Diamond Cholla Surveys



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2023 Annual Survey Report

Submitted to:

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Table of Contents

Executive Summary	1
1. Introduction	1
1.1 Project Description	1
1.2 Background and Need for the Project	1
1.3 Management Actions Addressed by the Project	2
1.4 Goals and Objectives of the Project	2
2. Methods and Materials	2
2.1 Survey Locations	2
2.2 Field Survey Equipment	5
2.3 Field Data Collection	5
2.4 Data Management and Quality Control	6
2.4.1 Spatial Data.....	6
2.4.2 Survey Coverage Tracks.....	6
2.4.3 Tabular Data	7
2.4.4 Data Accuracy and Quality	7
3. Results	7
3.1 Survey Sites, Habitat, and Acreages	7
4. Discussion	11
4.1 Rare Plant Element Occurrences	11
5. Conclusion	11
6. List of Preparers and Contributors	11
Clark County Desert Conservation Program	11
Ironwood Environmental Consultants	11
7. References	12
Appendix A : Survey Site Representative Photos	A-1

List of Tables

Table 2-1. Survey acreages for general surveyed areas and modeled suitable habitat for Blue Diamond cholla. ... 3

Table 3-1. Acreage of modeled suitable habitat surveyed within and adjacent to survey area polygons..... 8

Table 3-2. Acres surveyed within and adjacent to general survey area polygons..... 8

List of Figures

Figure 2-1. General field survey area locations with target species modeled habitat suitability. 4

Figure 3-1. Blue Diamond cholla surveyed habitat – Northwest. 9

Figure 3-2. Blue Diamond cholla surveyed habitat – South..... 10

Acronyms

ac	acre
DCP	Desert Conservation Program
Ironwood	Ironwood Consulting, Inc.
m	meter
SOW	Scope of Work

Executive Summary

This report provides the results from 2022 field surveys within Clark County, Nevada, completed by Ironwood Consulting, Inc between November 10 and 13, 2022. The project goals were to (1) expand the known occurrence datasets, (2) ground-truth the habitat suitability model for this species, and (3) secure information about Blue Diamond cholla presence in areas at risk for development or disturbance by human activities.

Ironwood used a habitat suitability model provided by the Clark County Desert Conservation to identify potential general survey locations and optimize field efforts. Botany teams targeted these survey locations and used a combination of coarse- and fine-scale ground surveys to search for species of interest. The resulting data includes habitat overview photos and GIS data for survey tracks and survey acreage.

The fall 2022 field surveys recorded did not record any Blue Diamond cholla occurrences although surveys included 12,675 modeled acres and 22,894 total acres This negative data has been provided in the data deliverable and can be used to improve the existing habitat model. Presence/absence data also continue to refine our understanding about the existing range of Blue Diamond cholla.

Recommendations include completing ongoing planned surveys to target Blue Diamond cholla within additional general survey areas identified by the habitat model. These ongoing surveys are scheduled to occur in 2023.

1. Introduction

1.1 Project Description

The Clark County Desert Conservation Program (DCP) contracted Ironwood Consulting, Inc (Ironwood) to complete targeted surveys for the Blue Diamond cholla (*Cylindropuntia multigeniculata* [Clokey] Backb.) where habitat has been modeled but presence has not yet been verified. The project requires focused field surveys that implement a rigorous data collection protocol, using the existing habitat model to determine survey areas.

This annual survey report describes the approach that Ironwood used to meet the project objectives and complete surveys during the fall of 2022 for the target species. Additional surveys are scheduled to be completed during the 2023 field season.

1.2 Background and Need for the Project

Through previous funding, the Desert Conservation Program (DCP) commissioned the development of species distribution models for five targeted rare plant taxa, including Blue Diamond cholla, to support management decisions and conservation of species vulnerable to habitat loss in the County. However, relatively few observations of Blue Diamond cholla exist compared to the area of suitable habitat predicted by the model. This suggests that the majority of modeled habitat within Clark County has remained un-surveyed. These targeted surveys will quickly and efficiently refine the existing distribution for this species and inform the understanding about observed habitat parameters and the actual range of Blue Diamond cholla.

1.3 Management Actions Addressed by the Project

Improved knowledge of the species' distribution may be used to improve the existing habitat model, identify potential areas where conservation could occur, aid in locating new populations, and ultimately help land managers evaluate the status of sensitive species. Species with conservation status are protected under the Multiple Species Habitat Conservation Plan. The state protects species with State of Nevada Critically Endangered and Threatened status; the BLM sensitive species are managed and protected on BLM-administered lands.

1.4 Goals and Objectives of the Project

The goals of the project, as identified by the DCP, are to:

- Expand the known occurrence datasets for Blue Diamond cholla.
- Ground-truth the habitat suitability model for this species.
- Secure information about Blue Diamond cholla presence in areas at risk for development or disturbance by human activities.

2. Methods and Materials

Ironwood completed a project Work Plan (NDNH 2022b) and a Data Management Plan (Ironwood 2022a) that detailed the rare plant survey methods, including pre-field coordination, survey area selection, equipment and materials, data management protocols, injury and illness prevention plans, and contingency plans for unexpected events. Field methods, data management practices, and analysis methods are outlined below.

2.1 Survey Locations

The identification of general sites was completed in close coordination with the DCP. The identified sites are discrete locations with 17 different general survey areas (Figure 2-1). Table 2-1 outlines the potential acreages of modeled habitat for Blue Diamond cholla at each survey area. Survey area locations are named after topographic features identified at or near the area, based on USGS and BLM basemaps.

General survey areas were determined using the habitat suitability model provided by the County (Nussear and Simandle 2019; USGS 2018). Habitat modeled as marginal, suitable, and optimal and occurring within 2.5 miles of mapped roads were identified. These became high-priority survey areas because information was not known about the presence of Blue Diamond cholla in the area.

Table 2-1. Survey acreages for general surveyed areas and modeled suitable habitat for Blue Diamond cholla.

General Survey Area Name	Clark County General Location	Modeled Suitability Rating			Total Area (acres)
		Marginal (0.677 – 0.783)	Suitable (0.784 - 0.871)	Optimal (0.872- 0.100)	
Manse	southwest	953.9	2372.2	200.9	3656.0
Peak 1902/Peak 1859	west-central	474.9	198.7	-	1105.6
Trout Canyon North	southwest	850.9	651.2	124.2	1802.2
Lost Cabin Spring	southwest	1180.6	137.1	-	1952.6
Indian Ridge	west-central	396.6	121.2	-	1199.6
Keystone Wash Prospects	southwest	905.4	2420.9	1252.1	4795.5
Bird Spring Range	south-central	1436.3	2582.2	1140.8	6004.1
Lucy Gray Mountains	south-central	902.2	885.0	1486.8	3655.9
Railroad Spring	south-central	1047.5	1301.3	-	2739.3
McCullough Mtns South	south-central	1518.8	2319.9	254.5	4160.7
Wamp Spring	north-central	1050.9	480.5	-	2215.9
McCullough Mtns North	south-central	994.3	382.7	-	1817.4
Christmas Tree Pass	south	2597.3	1316.9	-	4744.6
Mormon Mountains	north	780.1	377.2	455.2	2555.7
Jumbo	southeast	523.6	762.1	729.7	2327.4
Summit Pass	southeast	238.8	669.3	1342.0	2295.9
Azure Ridge North	southeast	503.9	1323.8	769.0	2905.3
Total Survey Area Acreage for Potential Survey Sites					49,933.6

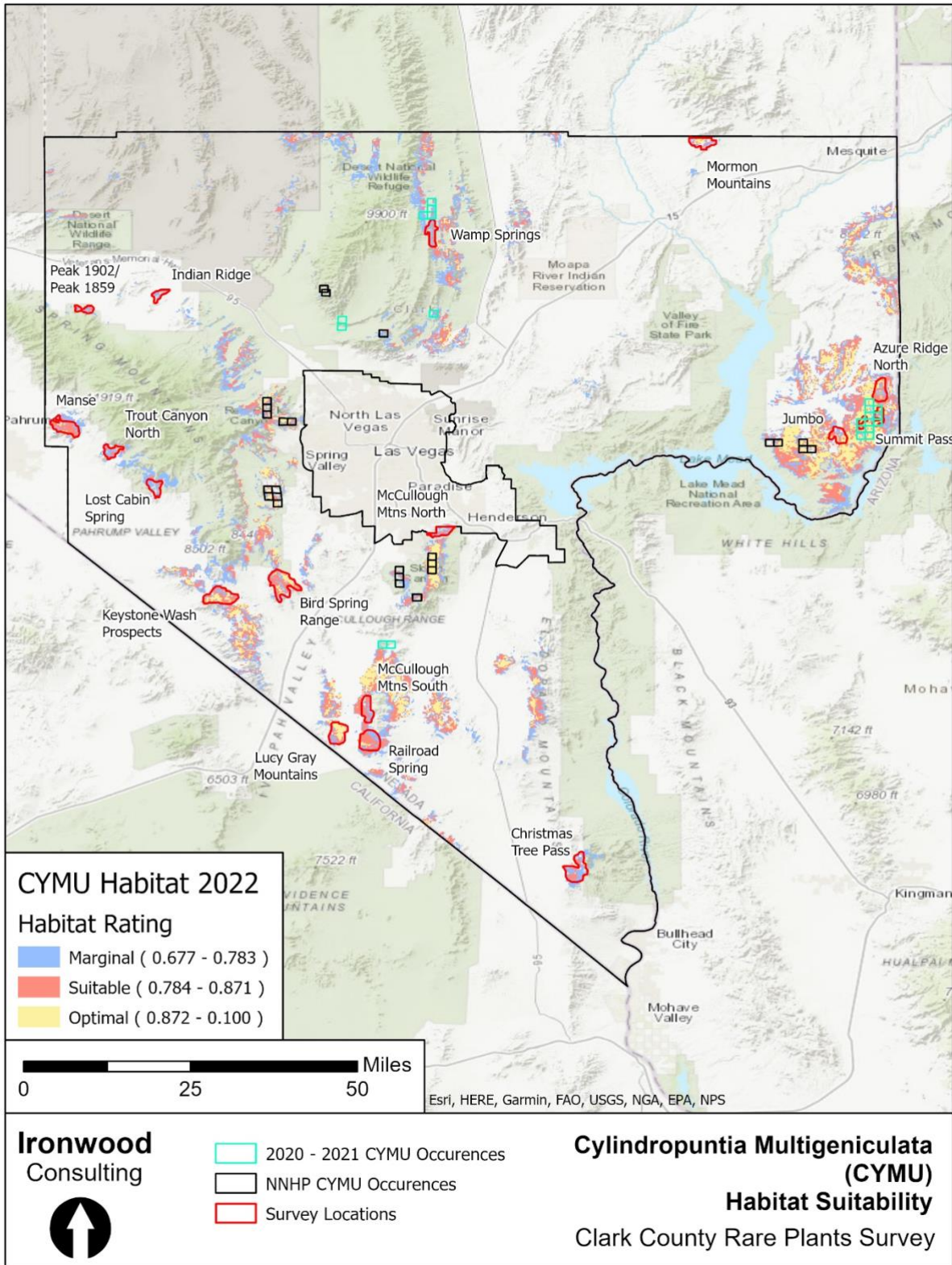


Figure 2-1. General field survey area locations with target species modeled habitat suitability.

2.2 Field Survey Equipment

The following necessary materials, vehicles, and equipment were used to fulfill the contract:

- Recreational GPS units and data collection devices (typically 5-meter [m] accuracy) – Each crew (three to five botanists) used a recreational GPS unit, or an iPad/iPhone integrated GPS with a Bluetooth-enabled data collection device to input field data into a pre-designed data dictionary.
- Data collection interface – ESRI Field Maps and Survey123 were used as data collection interfaces on tablets in the field for spatial all data collection.
- Miscellaneous field equipment, including plant presses and collection equipment (for species that do not have State of Nevada endangered or federal status), hand lenses, data sheets, copies of maps (electronic and paper), compasses, safety gear (e.g., first aid kits), and other field equipment.
- Ironwood created and maintained project binder, containing the project work plan, data management plan, and all other relevant information (maps, figures, protocols, contact information, worker injury and illness prevention plan; the binder was distributed to the field crews for reference and guidance for the project protocol, safety, and methods.
- Drone, including drone-mounted multispectral camera (MicaSense Rededge MX) for appropriate survey areas.

2.3 Field Data Collection

All data was recorded electronically on the application interface designed for the project using ESRI Field Maps and Survey123. Data was uploaded to the cloud server in real time or at the end of the workday if cellular service was not available at a site and backed-up each evening. All photos were saved, labeled, and backed up each evening. If necessary, technical adjustments to the data collection interface were made to ensure data quality and efficiency. Paper datasheets were provided as a backup data collection method and included all fields outlined in the data dictionary.

In general, field data collection included a combination of coarse-scaled surveys that assess the quality of habitat in an area and focused surveys that more thoroughly cover high quality habitat areas for the presence/absence of the target species, per BLM survey guidance provided by the County in the Scope of Work (SOW). A typical survey of a site, including data collection, would include:

- During all surveys, the botanist team collected tracks on a 5-m accuracy GPS (Garmin or similar) unit to document the survey site coverage and acreage.
- The botanist team began each survey by assessing the site for habitat characteristics and quality.
- Assessment of a site at a coarse scale utilized intuitive controlled survey methods outlined in the BLM guidance. The botanist team determined habitat quality using survey intervals of up to 300 m in areas where habitat for Blue Diamond cholla was not present or habitat quality was poor. Blue Diamond cholla is a relatively large plant with a distinct visual signature and detectable at a distance using binoculars.
- In areas where habitat quality for Blue Diamond cholla was moderate or high, the botanist team conducted more focused surveys with smaller survey intervals.
- If a Blue Diamond cholla individual or population was observed, the botanist team would conduct a focused search of the area for individuals, marking individuals with a pin flag. After the population

boundaries are determined, data would be collected for this new Element Occurrence record using a Survey123 form.

- For Blue Diamond cholla individual or population occurrences, the boundaries of the population area would be mapped, and one Field Maps form used to document the sub-population.
- A comprehensive list of observed species at each Blue Diamond cholla occurrence would be collected on a paper Nevada Division of Natural Heritage (NDNH) site inventory form.
- Populations were generally considered to be all individuals separated by less than a half-mile radius.
- All data was saved and uploaded immediately to the ESRI ArcGIS Online server. If cellular signals were not available, data was uploaded once cellular service returned.

The taxonomic authority for species was the *Flora of North America* (Flora of North America Editorial Committee 1993+) Flora of North America Editorial Committee 1993+. Taxonomic sources for identifying species included *A Flora of Nevada* (Kartesz 1987), *The Jepson Desert Manual: Vascular Plants of Southeastern California* (Baldwin et al. 2012; Welsh et al. 2015). The NDNH's Information, Tracking Lists, Survey Report forms, and Other Forms website was referenced for species information and floristic survey protocols (NDNH 2022). The U.S. Department of Agriculture (USDA) PLANTS database was consulted for four-letter species codes (USDA and NRCS2022).

No drones were used during the surveys included in this report. However, for future sites using drone flights, an autopiloted flight plan designed to maintain critical height above ground level will be flown with a drone-mounted multispectral camera (MicaSense Rededge MX). This collects reflectance data from five light/energy bands (red, green, blue, red edge, and near infrared). All drone operations would be compliant with Federal Aviation Administration Part 107 Regulations for remote pilot in command of an unmanned aerial vehicle.

Drone flights intended to traditionally photograph Blue Diamond cholla for mapping datapoints or inventory tally would be flown down to a height of 4-6 m above the plant and a single georeferenced photo would be taken at an oblique angle for later identification by a *Cylindropuntia* specialist. All drone flights would follow agency, local, and federal regulations.

2.4 Data Management and Quality Control

2.4.1 Spatial Data

Data for observed occurrences of the target species would be collected using ESRI Field Maps and Survey123. All spatial data collected on ESRI Field Maps was accessed through ArcGIS Online. All data was saved as shapefiles, and the file data product was packaged as a geodatabase, with all metadata and feature attributes included and labeled according to NNHD data standards (Ironwood 2022a; NDNH 2022).

2.4.2 Survey Coverage Tracks

The field team collected GPS tracks throughout the entire survey to enable acreage calculations totaling at least 16,200, per the SOW. Each botanist collected tracks on a recreational grade GPS unit and/or using Field Maps so that survey coverage could be assessed. Tracks show completed survey areas and survey coverage. Since Blue Diamond cholla is visible from several hundred meters when using binoculars, the survey tracks were buffered

by 300 m because this area was effectively surveyed along the traverse; total sum area within the buffer was reported as surveyed. Binoculars were also used to survey steep hillsides.

2.4.3 Tabular Data

Tabular data may include species lists, photo lists and metadata. All tabular data, unless determined otherwise, was saved in Excel format. This includes all fields necessary so that the data is broadly useful, including dates, UTM coordinates, descriptions, associated files, data type, observer, survey site, species, etc. Tabular data was compiled after the field data collection is completed, from both digital and paper data forms.

2.4.4 Data Accuracy and Quality

To ensure data was collected accurately, all botanists and botany technicians were trained in data collection methodology. For each crew, a botanist or botany technician was assigned the role of data collection lead. This person was tasked with assuring that each data field was populated accurately and completely.

Data was reviewed in the field at the end of each field day by the Project Manager and/or Assistant Project Manager to ensure completeness, accuracy, and quality. Inaccurate or incomplete data was rectified within 24 hours of original data collection. The GIS/Data Lead also reviewed data collected by Field Maps (and/or Survey123) each day to assure that all fields were filled out correctly and there were no errors. If data errors were detected, the GIS/Data Lead contacted the PM and/or Assistant PM and the data was corrected within 24 hours and re-reviewed by the GIS/Data Lead.

The Project Manager and/or Assistant PM were in the field for all data collection to ensure that the workplan was followed and data documentation followed standardized procedures approved by the County.

3. Results

3.1 Survey Sites, Habitat, and Acreages

Surveys took place between November 10 and 13, 2022. Ironwood botanists surveyed in teams of three to five and covered approximately 22,894 total acres (ac) across five of the 17 general survey areas, outlined in Table 3-1 and Table 3-2. Maps of the survey areas with survey sites delineated are seen in Figure 3-1 and Figure 3-2. Representative photographs of each of the survey sites are included in Appendix A. There were no Blue Diamond cholla occurrences detected during these surveys. Drone flights were not completed in 2022 – they will be initiated in 2023.

A total of 12,675.1 ac surveyed were included in the habitat model, with 4,976 ac, 5,982 ac, and 1,716 ac surveyed in marginal, suitable, and optimal habitat (as described by the model), respectively.

A total of 10,219.3 ac were surveyed in areas outside the targeted survey area. These areas were visually identified in the field by Blue Diamond cholla experts (Marc Baker and Michelle Cloud-Hughes) as possible habitat; this acreage was surveyed after the habitat within the survey area polygons had already been surveyed.

Table 3-1. Acreage of modeled suitable habitat surveyed within and adjacent to survey area polygons.

Survey Area	Surveyed Acreage Modeled Habitat						Total Modeled Acres Surveyed in Survey Area	Total Acres Surveyed*
	Marginal (0.677 – 0.783)		Suitable (0.784 – 0.871)		Optimal (0.872 – 1.00)			
	Within Survey Area Polygon	Adjacent to Survey Area Polygon	Within Survey Area Polygon	Adjacent to Survey Area Polygon	Within Survey Area Polygon	Adjacent to Survey Area Polygon		
Bird Spring Range	1,147.5	426.9	2,110.6	89.7	662.5	1.7	4,438.9	10,340.4
Keystone Wash Prospects	172.2	95.6	1,320.0	66.7	778.3	22.0	2,454.8	2,785.6
Lost Cabin Spring	785.0	291.4	87.6	29.9	-	-	1,193.9	2,423.6
Manse	527.1	459.5	1,621.9	106.5	165.3	30.9	2,911.2	4,066.3
Trout Canyon North	617.4	453.6	381.1	168.6	48.3	7.3	1,676.3	3,278.4
Total Survey Acres	3,249.2	1,727.0	5,521.2	461.4	1,654.4	61.9	12,675.1	22,894.4
Modeled Habitat Acres	4,976.2		5,982.6		1,716.3			

* Total Acres Surveyed includes areas inside and outside survey area polygon.

Table 3-2. Acres surveyed within and adjacent to general survey area polygons.

Survey Area	Acres Surveyed Within Polygon	Acres Surveyed Adjacent to Polygon*	Total Acres Surveyed*
Bird Spring Range	4,536.4	5,804.0	10,340.4
Keystone Wash Prospects	2,317.9	467.7	2,785.6
Lost Cabin Spring	1,462.7	960.9	2,423.6
Manse	2,394.8	1,671.5	4,066.3
Trout Canyon North	1,211.1	2,067.3	3,278.4
Total Survey Acres	11,922.9	10,971.4	22,894.4

*Surveyed acres includes areas inside and outside survey area polygon.

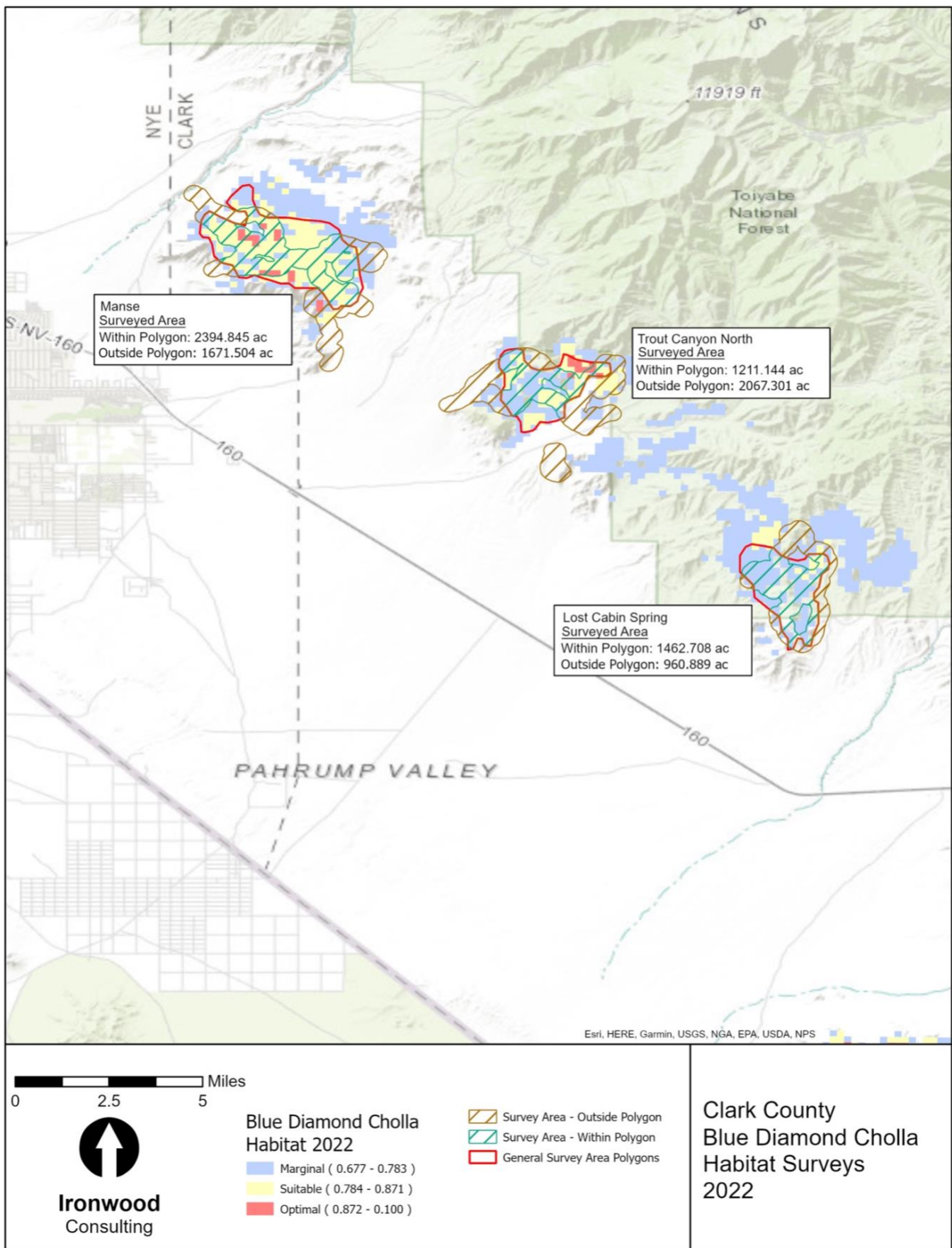


Figure 3-1. Blue Diamond cholla surveyed habitat – Northwest.

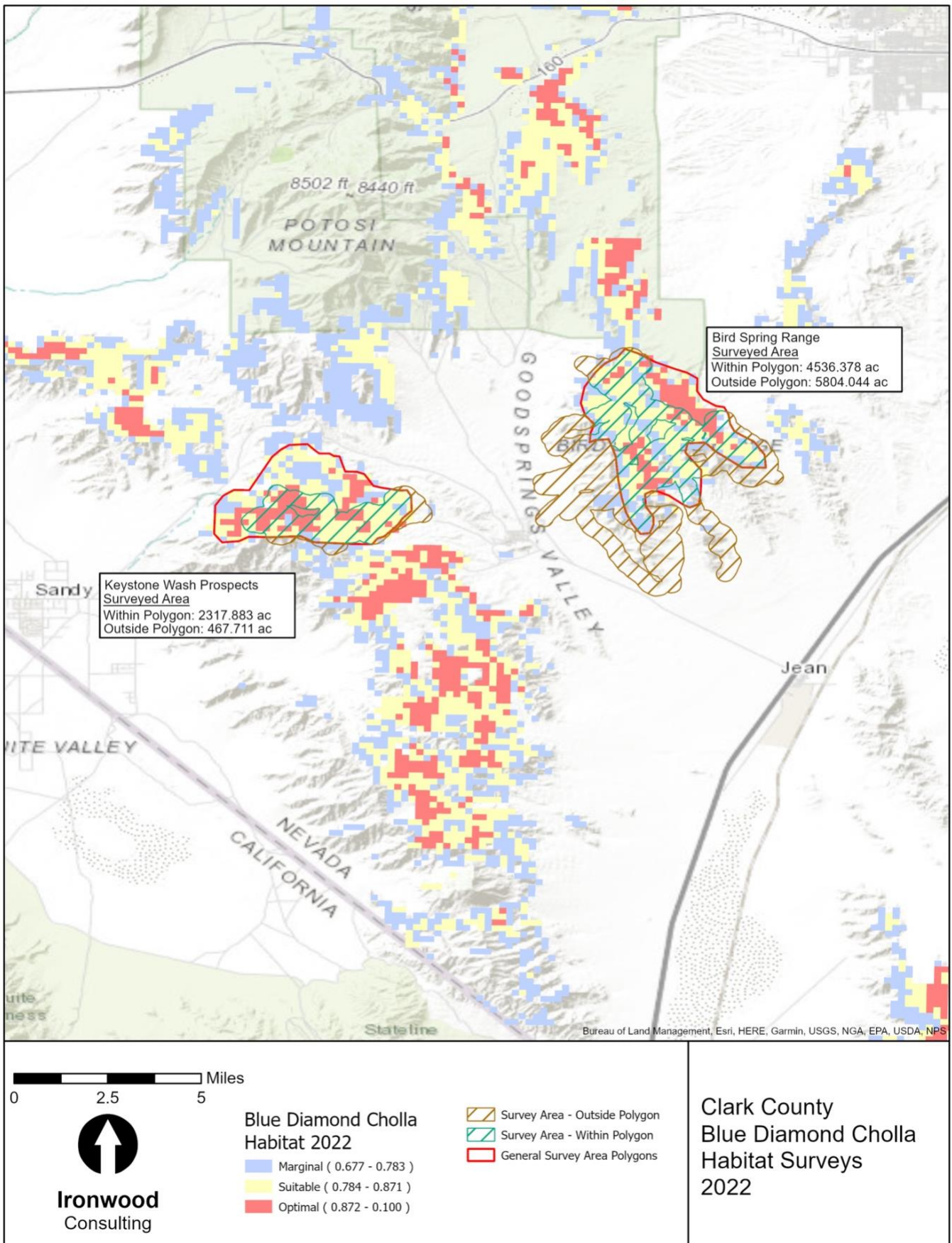


Figure 3-2. Blue Diamond cholla surveyed habitat – South.

4. Discussion

4.1 Rare Plant Element Occurrences

The fall 2022 field surveys recorded did not record any Blue Diamond cholla occurrences although surveys included 12,675 targeted ac and 22,894 total ac. Habitat surveyed that fell outside the Marginal, Suitable, and Optimal modeled classes can inform the habitat model if new occurrences of the target taxon are encountered in habitat *not strongly identified* by the model. Negative data also informs habitat modeling efforts. Presence/absence data also continues to refine our understanding about the existing range of Blue Diamond cholla.

A second round of Blue Diamond surveys will occur in 2023 and these will target general survey areas that were not included in the fall 2022 survey efforts.

5. Conclusion

These field surveys have contributed to the known distribution of the target species in Clark County, Nevada, by providing negative survey data to the DCP. Both positive and negative field results can be used to inform the existing habitat suitability model. In summary, this improved knowledge about the absence of Blue Diamond cholla in areas with predicted habitat may be used to identify potential areas where conservation could take place, aid in locating new populations, and ultimately help land managers evaluate the status of sensitive species populations.

6. List of Preparers and Contributors

Clark County Desert Conservation Program

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Appendix A: Survey Site Representative Photos



Photo A-1. Bird Spring Range habitat overview

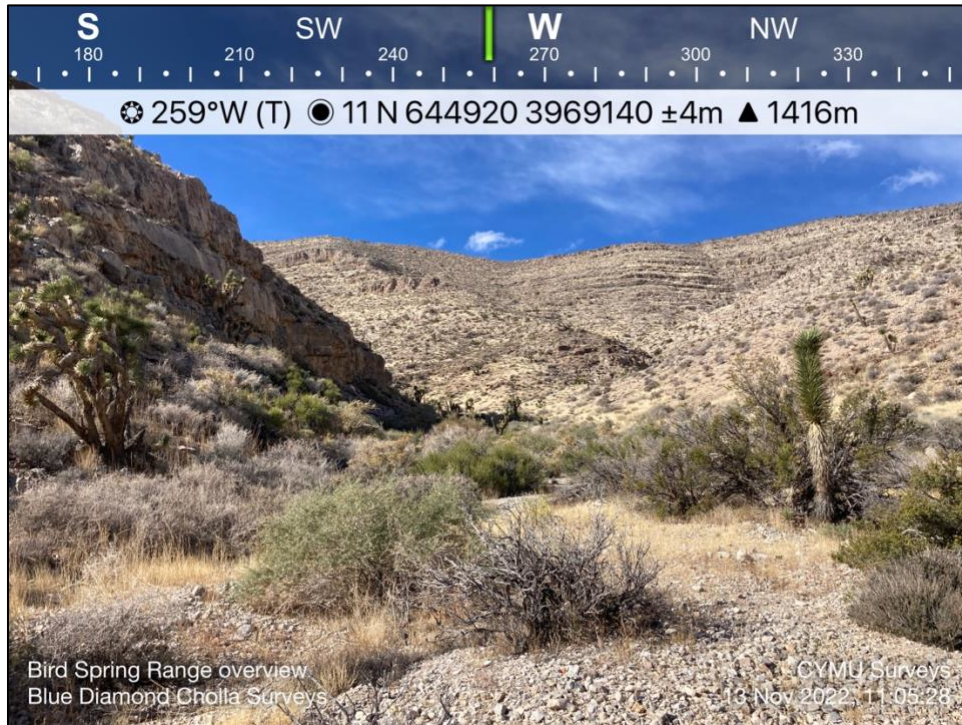


Photo A-2. Bird Spring Range habitat overview

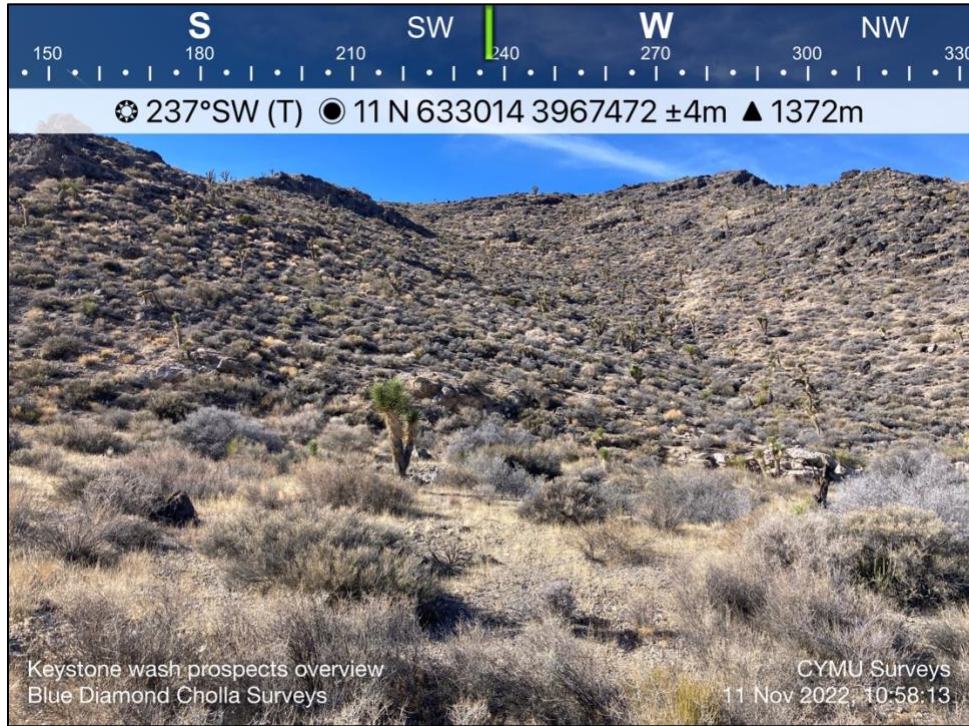


Photo A-3. Keystone Wash habitat overview

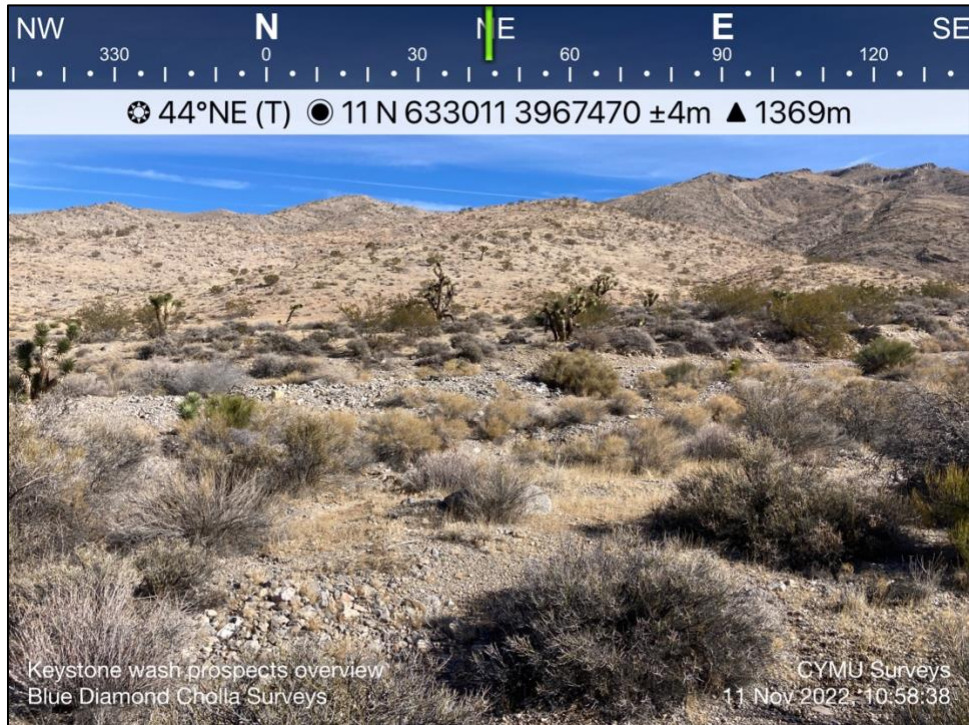


Photo A-4. Keystone Wash habitat overview

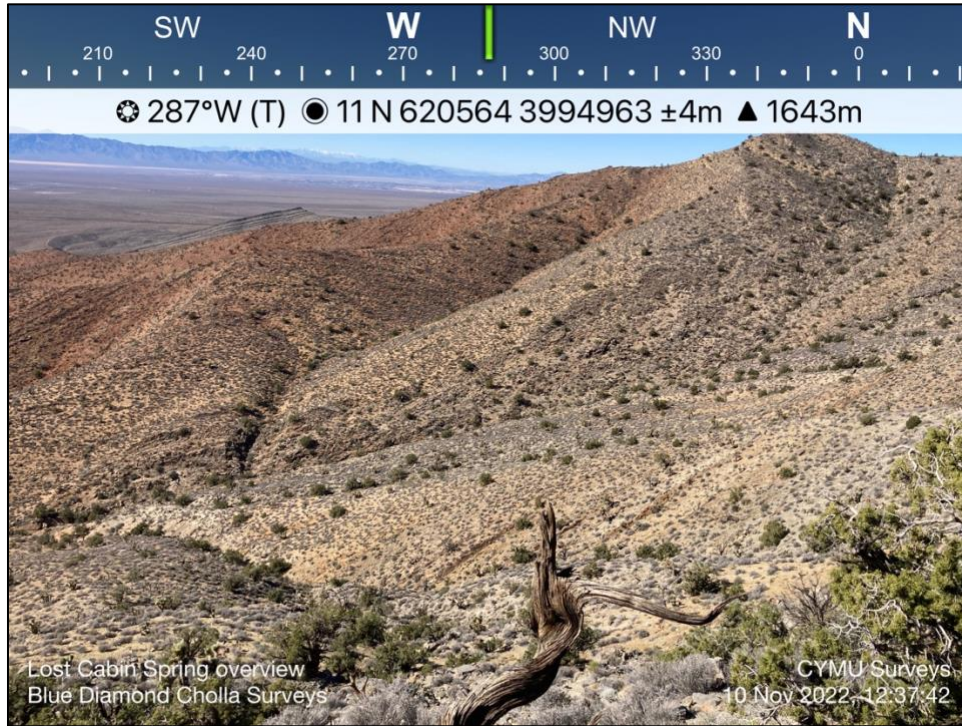


Photo A-5. Lost Cabin Spring habitat overview

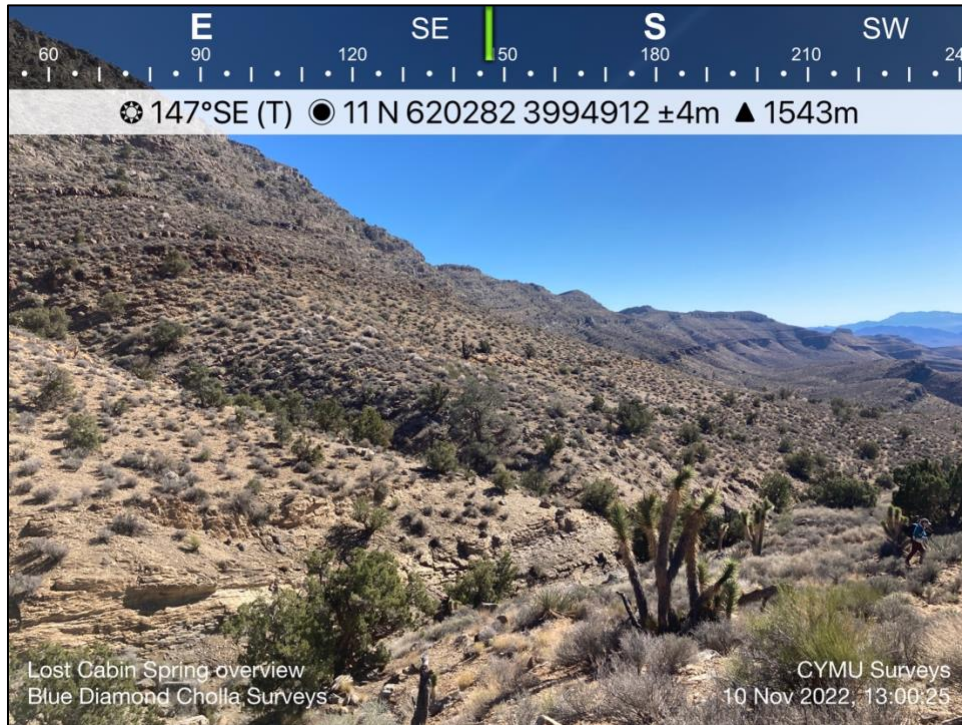


Photo A-6. Lost Cabin Spring habitat overview

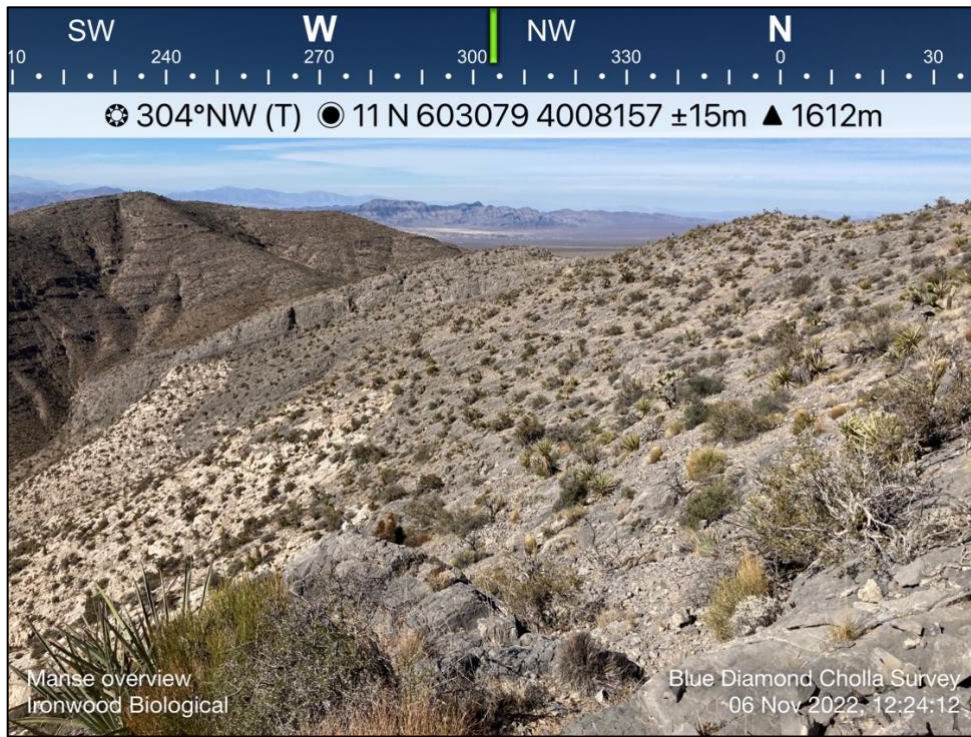


Photo A-7. Manse habitat overview

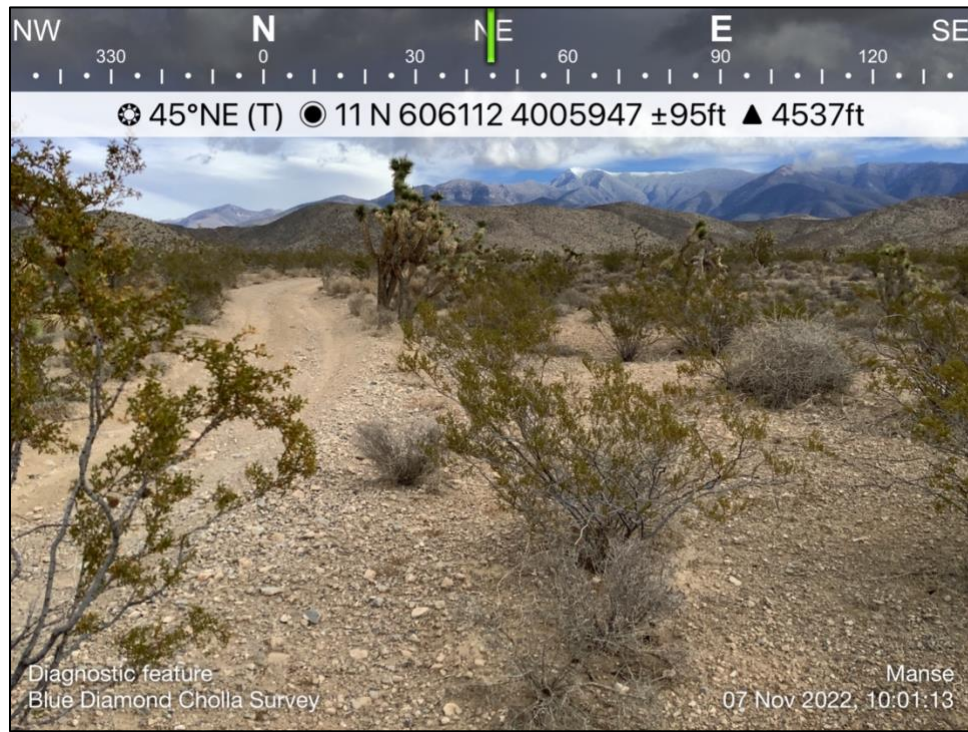


Photo A-8. Manse habitat overview



Photo A-9. Trout Canyon habitat overview



Photo A-10. Trout Canyon habitat overview