Appendix Q

Yellow Pine Solar Project Decommissioning, Abandonment, and Site Reclamation Plan

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PREPARED FOR

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YELLOW PINE SOLAR PROJECT DECOMMISSIONING, ABANDONMENT, AND SITE RECLAMATION PLAN

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Attachment Q-1. Yellow Pine Solar Project General Floristic Inventory
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Attachment Q-3. Yellow Pine Solar Project Reclamation Cost Estimate Summary Sheet

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1 INTRODUCTION

On October 21, 2011, Boulevard Associates, LLC, a subsidiary of NextEra Energy Resources, LLC (NextEra), filed an application for a right-of-way (ROW) grant (N-90788) with the Bureau of Land Management (BLM) Southern Nevada District Office for the Sandy Valley Solar Project on 3,272 acres of land. On June 24, 2016, Yellow Pine Solar, LLC (herein called the Applicant), a subsidiary of NextEra, submitted an amended application with a new project name, the Yellow Pine Solar Project (YPSP, or project). The Applicant is proposing to develop the YPSP in order to construct, operate, and maintain an efficient, economic, reliable, safe, and environmentally sound solar-powered generating facility.

As proposed, the YPSP would consist of photovoltaic (PV) solar panels and lithium ion–based (or similar) energy storage (batteries) located on approximately 3,000 acres of public lands managed by the BLM, Southern Nevada District, Las Vegas Field Office. The YPSP would provide renewable energy to the electrical transmission grid at a newly constructed substation, the Trout Canyon Substation (TCS), owned by GridLiance West LLC (GLW) (N-98565). The plant would generate electricity using multiple arrays of PV panels electrically connected to associated power inverter units. The current from the power inverters would be gathered by an internal electrical collection system and transformed to transmission voltage prior to leaving the project area. PV panels generate electricity using the photoelectric effect, whereby the materials in the panels absorb energy from sunlight in the form of photons and release electrons. The capture of these free electrons produces an electrical current, which can be collected and supplied to the electrical power grid.

Current technology allows for 1 megawatt (MW) per 6 to 9 acres, depending on buildable area available, alternating current/direct current (AC/DC) ratio, and ground cover ratio, allowing for approximately 500-MW electrical production within the approximately 3,000-acre project area. However, PV technology is rapidly improving, and the potential MW/acre is likely to increase. The exact final project output within the approximately 3,000-acre project area may be higher or lower, depending on the procured panel technology. The project would be in operation for approximately 30 to 40 years from the commercial operation date (COD).

Yellow Pine Solar, LLC, is submitting this Decommissioning, Abandonment, and Site Reclamation Plan (Plan) as an appendix to the YPSP Plan of Development (POD) in support of its existing BLM ROW application. This document has been compiled with currently available information and is based on preliminary engineering calculations and estimates; it is subject to change and may be modified as the project undergoes final engineering and design. Figure 1 shows anticipated disturbance areas within the project area.

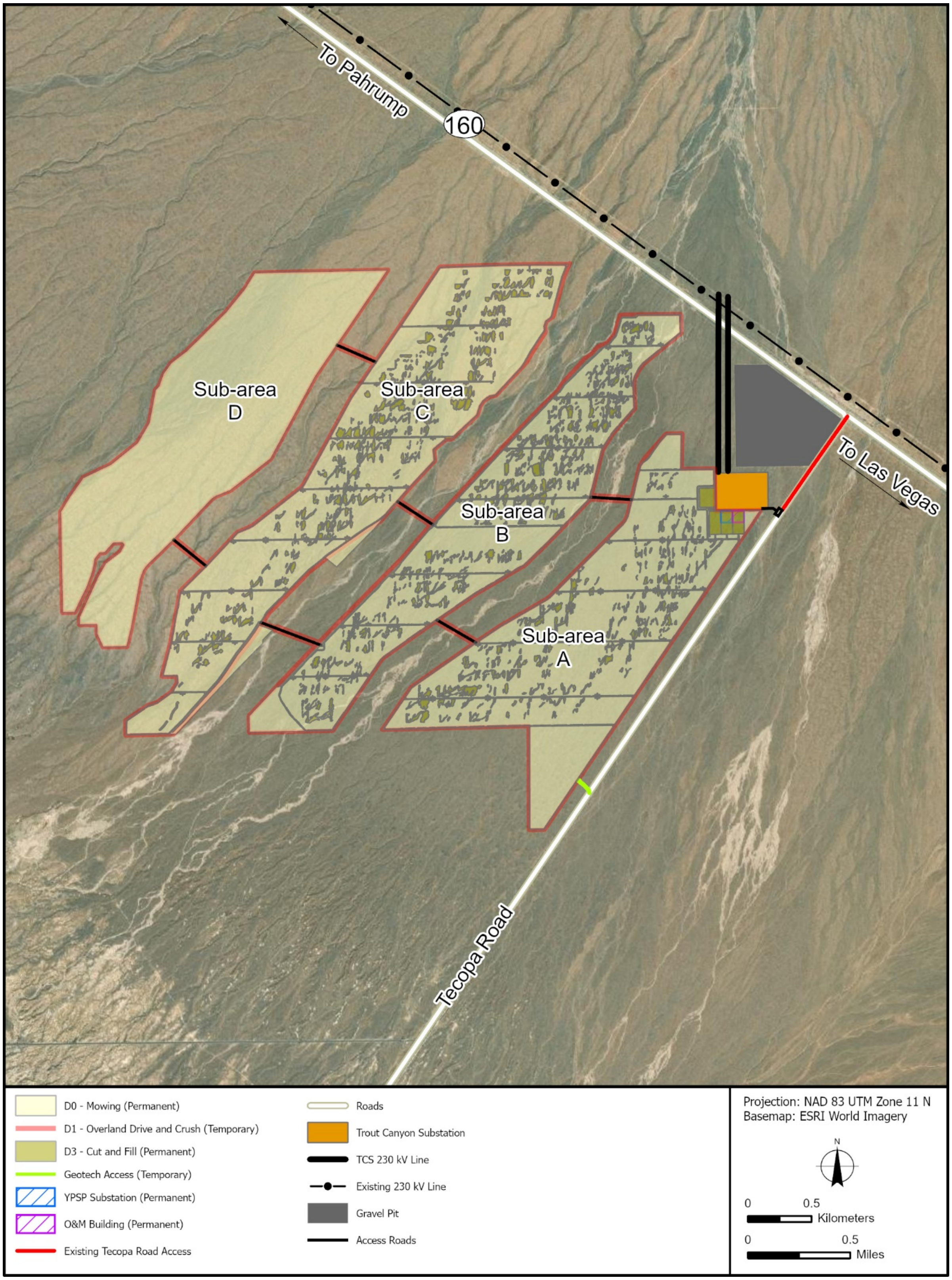

Figure 1. Project area with anticipated disturbance areas. ***Note: D3 disturbance for Sub-area D will occur at a later time, after Sub-areas A, B, and C. The location of the disturbance areas may change based on construction needs but would remain within the approved amounts.***

1.1 Type of Use for Total Disturbance of the Project

This plan defines two broad types of disturbance conditions: temporal and spatial structure. (Note, previous disturbances are not part of this plan.) Physical boundaries include the shape of the area.

A. Temporal Use
   1. Long-Term Use Areas (also referred to in this plan as permanent use/disturbance areas)
      The use of these areas is long term and the landscape is permanently altered through removing vegetation, site leveling, modifying natural drainages, fencing, and constructing facilities, towers, and other structures. Permanent disturbance also includes constructing access roads needed for regularly scheduled maintenance of facilities and structures.
   2. Temporary Use Areas (also referred to in this plan as temporary disturbance areas)
      Temporary use is defined as using an area only for the amount of time it takes to construct the project. Examples include utilizing various types of heavy equipment to install towers or pipelines, driving across public land gain access to the project site, and parking vehicles, equipment, and materials in designated staging areas.

The following sections define the levels of disturbance, the impacts to the land, and the components of restoration required.

B. Spatial Structure
   Understanding the spatial structure of the disturbances is important for restoration considerations, weed management and risk of spread, and monitoring methodology. Many projects are a mix of these disturbance types.
   1. Linear—Short (< 5 miles)
   2. Linear—Long (> 5 miles)
   3. Small Area (< 1 acre)
   4. Large Area (>1 acre; < 20 acres)
   5. Very Large Area (> 20 acres)

This project includes a number of linear facilities that would be developed external to the solar facility security fence and may include the following:

- Main access road
- A 230-kilovolt gen-tie line to carry electricity to the TCS
- Distribution power for buildings and backup for control systems
- Communications cables or lines

The project's PV panel array facilities would be located within the project Sub-areas A–D on approximately 3,000 acres in the project area (see Figure 1). The entire solar facility footprint would be enclosed by fences. The YPSP facilities would include the following major components or systems:

- PV modules/arrays
- Solar trackers or fixed support structures
- DC or AC collection cable and combiner or switch boxes
- Solar power inverters and medium-voltage transformers
- An energy storage (batteries) system with capacity not exceeding the final solar project capacity
- Electrical collection system (34.5-kilovolt lines)

- Main step-up transformers and high-voltage electrical equipment in the on-site substation
- Gen-tie line connecting into a new TCS
- Administration/operations and maintenance building and local warehouses

Table 1 presents acreages of each type of use for the project area.

Table 1. Project Impact Totals by Type of Use

Temporal or Spatial Use	Project Main Access Road (acres)	Sub-area Access Roads/Collection Lines (acres)	Sub-areas A–D including All Project Components (acres)	Temporary Tortoise Fencing (acres)	Project Total (acres)
Temporary	0.0	22.92	61.53	8.6	93.05
Long-term	1.80	3.07	2,889.38	0.0	2,894.25
Total	**1.80**	**25.99**	**2,950.91**	**8.6**	**2,987.30**
Linear–Short (<5 miles)	1.80	25.99	–	8.6	36.06
Linear–Long (>5 miles)	–	–	–	–	–
Small Area (<1 acre)	–	–	–	–	–
Large Area (>1 acre)	–	–	–	–	–
Very Large Area (>20 acres)	–	–	2,950.91	–	2,950.91
Total	**1.80**	**25.99**	**2,950.91**	**8.6**	**2,987.30**

1.2 Disturbance Levels for Each Portion of Project

The disturbance levels are the intensity of disturbance that would be caused by the methods used in construction, maintenance, and decommissioning (if applicable). These varying levels of soil compaction, vegetation removal, and soil removal will necessitate the level of restoration required. Vegetation and soil removal will result in restoration efforts that are an order of magnitude more expensive and lengthier, potentially requiring upwards of 10 years until the bond will be released. Utilization of the drive and crush method is highly encouraged whenever possible in order to minimize restoration time.

D-0. Mowing. Mowing is a new technique being utilized to conserve vegetative resources within a large project area. Vegetation is mowed to a height of no less than 18 inches during construction. Depending on site objectives, vegetation can be allowed to reach a normal height or kept trimmed to a height between 18 inches and the plant's full height potential. Crushing of vegetation will be minimal and this disturbance level is designed to have a minimal impact on existing vegetation. Cacti and yucca can be left in place in this disturbance level; yucca may be cut or ground down to 18 inches and allowed to resprout. Cacti taller than 18 inches (primarily *Cylindropuntia* spp.) may be cut at 18 inches, with the cut portion left on the ground. This method is least likely to result in invasions of non-native plant species.

D-1. Overland Drive and Crush. Disturbance caused by accessing a site without significantly modifying the landscape. Vegetation is crushed but not cropped. Soil is compacted, but no surface soil is removed. Examples include utility line tensioning and pulling areas, tower pad sites, overland access to fiber-optic meter sites, and spur roads to towers. Even though vegetation may be damaged and even destroyed, the surface soil and seed bank remains in place. Some crushed vegetation will likely sprout after disturbance ceases. These activities would result in minimal to moderate disturbance. This type of disturbance will result in the fastest recovery time for vegetation and is preferred by the BLM (second only to mowing). Soil seed banks remain largely in place, perennial vegetation can grow back, and minimal external efforts are necessary. This method is less likely to result in invasions of non-native plant species. This would involve crushing or mowing vegetation to less than 16 inches in height.

D-2. Clear and Cut. Disturbance caused by accessing the project site, but having to brush off all vegetation in order to improve or provide suitable access for other equipment. All vegetation is removed, soils are compacted, but no surface soil is removed. Examples include temporary access roads where the road is improved for access and could include some examples from D-1 above. Clear and cut activities would result in moderate disturbance. This type of disturbance will result in moderate recovery times for vegetation. This method has a moderate risk for invasion of non-native plant species. An example is imprinting to crush vegetation down into the soil.

D-3. Clear and Cut with Soil Removal. Disturbance is caused by removing all vegetation in the impact zone, the soils are compacted and the surface soil is displaced, and for projects requiring underground installation, the subsurface soils are displaced as well. These activities result in heavy disturbance. Examples include pipelines, buried fiber-optic lines, and access roads that require grading and filling. This type of disturbance results in an extensive recovery time for vegetation, and is most likely to lead to invasions of non-native plant species, which can result in lengthy and expensive control efforts. Includes disc-and-roll construction, and other traditional construction methods where no vegetation is left.

As described in the project's POD, the Applicant will use a variety of site preparation methods to prepare the site using the least impactful method that meets development, engineering, construction requirements, and safety requirements. Tables 2 and 3 present estimates of long-term and temporary use acreages by disturbance level for the project area. Estimates are based on full build-out of the 2,894.25-acre long-term use area, plus the temporary use area of 93.05 acres. Each site preparation method identified would be implemented for construction. However, the amounts provided are estimates only; actual amounts would vary based on multiple factors, including vegetation type and density, topography, soils, geology, panel and racking manufacturer, AC/DC ratio, ground cover ratio, energy storage type, and safety considerations.

D0 will include areas of vegetation mowing to a height of approximately 18 to 24 inches, while leaving soils in place. In some areas, drive and crush (D1) would be used during construction and would be limited to those areas used for storage of certain materials that cannot be damaged by vegetation, two-track access roads, and buffer areas where construction work is not directly taking place (i.e., around temporary fencing). See Figure 1 for details.

Clear and cut with soil removal (D3) would be minimized and limited to areas requiring elevation changes to accommodate the tracker/racking system tolerances, site drainage, roads, laydown areas, and foundations. Areas where grading would be required include roadways, access ways, and areas where concrete foundations are used for inverter equipment, substations, drainage facilities, and other structures (see Figure 1). Grading would consist of the excavation and compaction of earth to meet the design requirements. Grading within the solar field would match existing contours to the extent feasible. Some existing contours would need to be smoothed out for access purposes, but the macro-level topography and stormwater drainage would remain similar to pre-graded conditions. To the extent practical, grading of an area would take place shortly before trenching and post-installation in order to minimize the area of open, uncovered ground present at any one time during construction. The portions of the project site that would be graded are expected to result in a balanced cut-and-fill quantity of earthwork to maintain the existing conditions to the extent practical for the protection of the equipment and facilities. Fill would be compacted as necessary, and appropriate dust abatement measures would be implemented in accordance with the project Fugitive Dust Control Plan (POD Appendix M). These measures may include restriction of vehicle speeds, watering of active areas, watering of stockpiles, watering on roadways, track-out control at site exits, and other measures.

Table 2. Project Long-term Use Totals by Disturbance Level

Disturbance Level	Project Main Access Road (acres)	Sub-areas A–C Access Roads/Collection Lines (acres)	Sub-area D Access Roads/Collection Lines (acres)	Sub-areas A–C including All Project Components (acres)	Sub-area D including All Project Components (acres)	Temporary Desert Tortoise Fencing (acres)	Project Total (acres)
D0 – Mowing	–	–	–	1,809.78	607.40	0	2,417.18
D1 – Overland Drive and Crush	–	–	–	0	–	–	–
D2 – Clear and Cut	–	–	–	0	–	–	–
D3 – Clear and Cut with Soil Removal[1]	1.8	2.07	1.00	394.98	86.37	–	486.22
Total	**1.8**	**2.07**	**1.00**	**2,204.76**	**693.77**	**0.0**	**2,903.4**

1Currently, the pre-construction design for D3 Clear and Cut in Sub-areas A-C consists of 343.11 long-term acres. However, as allowed for in the FEIS, 51.87 additional acres of D3 disturbance in Sub-areas A-C for up to 500 acres of total D3 disturbance have been added to the Plan to account for changes in the field related to construction and engineering needs. . Final D3 acreage will depend on in-field construction and engineering constraints, and will be included in the as-built drawings.

Table 3. Project Temporary Use Totals by Disturbance Level

Disturbance Level	Project Main Access Road (acres)	Sub-areas A–C Access Roads/ Collection Lines (acres)	Sub-area D Access Roads/ Collection Lines (acres)	Sub-areas A–C including All Project Components (acres)	Sub-area D including All Project Components (acres)	Temporary Desert Tortoise Fencing (acres)	Project Total (acres)
D0 – Mowing	–	–	–	–	–	–	–
D1 – Overland Drive and Crush	–	–	–	46.19	15.33	8.6	70.12
D2 – Clear and Cut	–	–	–	–	–	–	–
D3 – Clear and Cut with Soil Removal	–	6.37	7.41	–	–	–	13.78
Total	**0.0**	**6.37**	**7.41**	**46.19**	**15.33**	**8.6**	**83.9**

Table 4. Project Long-term Impact Totals by Restoration Level

Restoration Level	Project Access Road (acres)	Sub-area Access Roads/Collection Lines (acres)	Solar Site including All Project Components (acres)	Temporary Tortoise Fencing (acres)	Project Total (acres)
R1	–	–	–	–	–

Restoration Level	Project Access Road (acres)	Sub-area Access Roads/Collection Lines (acres)	Solar Site including All Project Components (acres)	Temporary Tortoise Fencing (acres)	Project Total (acres)
R2	–	–	–	–	–
R3	–	–	–	–	–
R4	1.8	3.07	2,889.38	0.0	2,894.25
Total	**1.8**	**3.07**	**2,889.38**	**0.0**	**2,894.25**

Table 5. Project Temporary Impact Totals by Restoration Level

Restoration Level	Project Access Road (acres)	Sub-area Access Roads/Collection Lines (acres)	Solar Site including All Project Components (acres)	Temporary Tortoise Fencing (acres)	Project Total (acres)
R1	–	–	–	–	–
R2	–	–	–	–	–
R3	–	–	–	–	–
R4	0.0	22.92	61.53	8.6	93.05
Total	**0.0**	**22.92**	**61.53**	**8.6**	**93.05**

1.3 BASELINE DATA

A summary of original surveys—habitat type, what sampling revealed, baseline condition that will be used as the restoration standard (density, species comp, cover, diversity, etc.), species list, sensitive species found, weed inventories and risk assessment, etc.—is required and is attached to this plan. See Attachments Q-1 and Q-2 for botanical resources surveys and results for the project.

2 PURPOSE AND OBJECTIVE

This Plan generally outlines the procedures for decommissioning the project and restoring lands to their original condition. Decommissioning procedures involve the physical removal of certain facilities, structures, and components associated with the project; the disposal of solid and hazardous waste; and identification of physical elements that may remain on the property at the discretion of the participating property owners. Restoration includes the soil stabilization and revegetation of the project site to minimize erosion and facilitate subsequent land uses.

3 DECOMMISSIONING

In the context of this Plan, decommissioning is the act of removing the solar energy system from service. Decommissioning is a step-by-step deconstruction process that involves carefully and safely removing and appropriately salvaging, recycling, and disposing of project infrastructure and appurtenant facilities.

Project decommissioning includes the physical removal of facility-associated structures and components (including portions of the foundations) from the project area. In accordance with the proposed BLM ROW application, decommissioning of the project will include the following:

- Aboveground equipment, including panels, concrete pads (excluding foundations), anchors, guy wires, fences, fixtures, materials, buildings, structures, improvements, and personal property installed by the Applicant or by its agents, will be removed and recycled or disposed of at approved off-site facilities.
- Where feasible, panels and ancillary facility materials will be removed in a manner to allow for refurbishment and resale of each component. Removal will require the use of cranes, construction of temporary crane pads, plus some improvements to access roads to accommodate large cranes and trucks.
- Foundations will be removed to a depth of 3 feet below the surface. Structures and debris located below the soil surface will also be removed to a depth of 3 feet below the surface (or more, if required under the applicable lease agreement). All pit holes, trenches, and other borings or excavations (excluding those related to the construction of roads) created during decommissioning will be properly filled and compacted.
- Underground power and communication lines will be decommissioned in place. Underground cables will be cut off at ground surface at their cabinets. Transformers will be removed from the site.
- Solid waste and hazardous material will be disposed of off-site in accordance with applicable state and federal regulations. Decommissioned gearboxes, transformers, and hydraulic systems will be drained of fluids, put into appropriate containers, dismantled, and then transported and disposed of off-site in accordance with state and federal regulations.
- The transmission line and towers may be removed. Some structures and equipment may be required to remain in place based on final interconnection agreements. Conductors and tower steel removed from the site would be sold for reuse or recycling. The YPSP substation, including all structures and fencing, would be removed.

During decommissioning activities, the site would remain fenced and gated. Materials removed from the site that could be reused or recycled would be sold. Materials that could neither be reused nor recycled would be dismantled and hauled to the nearest approved landfill. Hazardous materials that could not be reused or recycled would be disposed of at approved facilities.

3.1 Pre-demolition Activities

Decommissioning activities would be initiated by preparing the project area for demolition. A pre-demolition meeting that includes safety and environmental training would be held on-site for pertinent project staff, all construction personnel, and all environmental monitors. The solar power plant would be de-energized and completely disconnected from the substation. The site also would be surveyed and marked for demolition.

Pre-demolition activities would include removal of products such as diesel fuel, hydraulic oil, lubricants, mineral oil, and other materials to reduce personnel health and environmental risk during demolition work. Hazardous materials and petroleum containers would be rinsed clean when feasible and the rinsate collected for off-site disposal. These materials generally would be transferred directly into tanker trucks or other transport vessels and removed from the site at the point of generation to minimize the need for hazardous material and waste storage at the project site.

The project fencing, electrical power, and water facilities would be maintained in place and operational to be available for limited use by decommissioning and site restoration workers until these facilities are no longer needed.

Temporary exclusion fencing would be placed at the direction of environmental monitors to keep construction crews out of sensitive environmental or cultural areas.

3.2 Decommissioning Tasks

Decommissioning activities would involve use of heavy machinery to disassemble and remove buildings and fixtures used during operations. These activities would only occur within existing disturbed areas to the greatest extent practicable.

3.2.1 *Demolition of Aboveground Structures*

Mechanized equipment operated by trained personnel would be used to dismantle each structure or facility. Decommissioning would be undertaken using traditional heavy construction equipment including, but not limited to, front-end loaders, cranes, track-mounted and rubber-tired excavators, bulldozers, and scrapers. Dismantling and demolition of aboveground structures would be followed by concrete removal, as needed, to ensure that no concrete structures (e.g., floor slabs, belowground walls, and footings) remain within 3 feet of the final surface grade. Underground utilities associated with demolished aboveground structures would then be dismantled and removed. Excavation and removal of soils would be conducted, as needed, followed by final site contouring, as needed.

PV modules would be disconnected from each other and removed from the racks. These modules would be returned to PV manufacturer storage sites or recycling centers. Batteries would be removed and disposed of in accordance with the Waste and Hazardous Materials Management Plan (POD Appendix P). Direct current string wiring that is connected to the racking would be removed and salvaged. Racks would be disassembled and removed from the site and delivered to recycling centers. Steel posts that support the PV racking system would be pulled out of the ground and delivered to recycling centers. Electrical cabling would be disconnected from combiner boxes, inverters, transformers, and overhead transmission poles and removed from the site. Inverter and transformer skids would be electrically disconnected, unbolted, and lifted onto trucks for removal from the site. The supervisory control and data acquisition system would be disconnected, removed, and salvaged by the electrical demolition contractor.

Electrical and mechanical systems in the operation and maintenance building would be properly isolated and demolished. All salvageable parts and parts to be disposed of would be removed from the site. Walls, doors, and windows would be removed and recycled or disposed of at an approved landfill. Parking lot gravel would be loaded into a dump truck and transported off-site. Aboveground foundations would be demolished within 3 feet of the final surface grade and the rubble would be loaded onto dump trucks and transported to the nearest landfill or recycling center. Batteries would be removed and recycled or disposed of in accordance with the Waste and Hazardous Materials Management Plan (POD Appendix P).

Dismantled materials would be transported by heavy-haul dump trucks to a temporary central recycling staging area on-site where the debris would be processed for transport to an off-site recycler. An on-site project recycling staging center would be established to:

- Stage PV panels for transport to an off-site recycler
- Crush concrete and remove support posts and rebar
- Store support posts and rebar for transport to an off-site recycler

- Temporarily store and act as a shipping point for any hazardous materials to an approved treatment, storage, or disposal facility

Limited quantities, if any, of aggregate are anticipated to be used temporarily on access roads to ensure surface stability. Any temporary aggregate surfacing, if present, would be removed. Areas where aggregate surfacing has been removed would be graded to ensure suitable drainage. The removed aggregate would be loaded into a dump truck and the demolition contractor would take ownership of the aggregate for reuse.

3.2.2 *Demolition of Belowground Facilities and Utilities*

Belowground facilities (e.g., concrete slabs and footings) would be removed to a depth of 3 feet below grade after final contouring. Concrete slabs include concrete foundations of various project components, such as substation equipment, operations and maintenance building, and generation-tie poles. Footings include concrete piers (approximately 18 to 24 inches [46 to 61 centimeters] wide) or posts (approximately 6 to 8 inches [15 to 20 centimeters] wide) used for the solar panels. Rinsate would be temporarily stored on-site prior to transporting to an off-site facility for disposal or recycling.

Underground cables would be removed and salvaged, according to BLM requirements. Underground electrical systems are typically installed by trenching to a depth of 3 feet with cables directly buried (i.e., no conduit is used). Underground direct current (DC) cabling from module arrays to combiner boxes and from the combiner boxes to the DC fuse boxes would be removed and salvaged. AC cables from the inverter stations to PVCSs would also be removed and salvaged. Inverters would be removed and salvaged, and the inverter housing and pad would be destroyed.

Excavated and removed materials would be transported to the on-site recycling staging area for processing prior to transporting for off-site recycling. Any cavities resulting from structure removal would be backfilled with suitable material of similar consistency and permeability as the surrounding native materials. It would be compacted according to the guidelines for revegetation. All project access roads would be decompacted according to BLM requirements in place at the time of decommissioning.

3.2.3 *Demolition Debris Management, Disposal, and Recycling*

Demolition debris would be placed in temporary on-site storage area(s) pending treatment at the on-site recycling staging area, and final transportation and disposal/recycling would occur according to the procedures listed below.

Demolition debris and removed equipment would be cut up or dismantled into pieces that can be safely lifted or carried with the on-site equipment. Most glass and steel would be processed for transportation and delivery to an off-site recycling center. Some specific equipment such as PV panels, transformers, and generators may be transported as intact components, or size-reduced on-site with cutting torches or similar equipment.

A front-end loader, backhoe, or other appropriate equipment would be used to crush or compact compressible materials. These materials would be laid out in the recycling staging area to facilitate crushing or compacting with equipment prior to transport off-site for disposal/recycling. Steel, glass, and other materials would be temporarily stockpiled at the recycling staging area pending transport to an appropriate off-site recycling facility. Concrete foundations would be removed to a depth of at least 3 feet below final grade. Upon removal of rebar from concrete rubble, the residual crushed concrete may be layered beneath the ground surface to fill cavities, but only at locations that would remain greater than 3 feet below final grade, which would reduce waste volume and transportation requirements.

A full-time crew would be responsible for maintaining site cleanliness during decommissioning. The crew would be responsible for cleaning up micro-trash at temporary facilities as well as at the various work areas. All trash would be collected in containers with secure lids. All hazardous and nonhazardous waste would be stored in appropriate containers for off-site disposal.

3.2.4 *Soil Cleanup and Excavation*

Evidence of the presence of contaminated soil or the release of hazardous materials or wastes observed during decommissioning activities would be reported to the Applicant and the BLM. The need for, depth, and lateral extent of contaminated soil excavation would be evaluated by an environmental professional with experience in contaminated soils investigation procedures. The evaluation would be based on observation of soil conditions and analysis of soil samples after removal of hazardous materials storage areas, and upon closure of the temporary recycling center and waste storage areas used during Project decommissioning. Soil excavation would be conducted to the extent required to meet regulatory cleanup criteria for the protection of soil, groundwater, and surface water resources. If contaminated soil removal occurs, excavations would be backfilled with clean (uncontaminated) native soil of similar permeability and consistency as the surrounding materials, and compacted and revegetated.

3.2.5 *Recontouring*

Minimal recontouring of affected areas of the site would be conducted using standard grading equipment to return the land surface to close as reasonable preconstruction conditions. Grading activities would be limited to previously disturbed areas that require recontouring. Efforts would be made to minimize disturbance of natural drainage and vegetation. Concrete rubble would be removed from the site unless engineering dictates the need for it in which case concrete rubble would be crushed. Concrete rubble would be crushed to approximately 2 inches (5 centimeters) in diameter or smaller, would be placed in the lower portions of fill areas, at depths at least 3 feet below final grade. Backfill would be compacted by wheel- or track-rolling to avoid over-compaction of soils. Revegetation and habitat rehabilitation are described in Section 5.

4 ABANDONMENT

In the context of this Plan, abandonment is the process of identifying physical elements that may remain on the property at the discretion of the property owner. Some transmission line and towers structures and equipment may be required to remain in place based on final interconnection agreements. Underground foundations greater than 3 feet below ground surface would be abandoned in place.

5 SITE RECLAMATION

In the context of this Plan, reclamation is the process of restoring lands affected by the project or its dependent components to a land use condition that complies with BLM requirements. The process may require grading and recontouring ground surfaces, decompaction or removal of compacted soils, stabilizing soils, revegetating, and controlling drainage after decommissioning activities are completed.

Reclamation of the project will include the following:

- Disturbed on-site soils and vegetation will be reasonably restored to site conditions as described below. Reclamation procedures will be based on site-specific requirements and techniques commonly employed at the time the area is reclaimed. If the land is to be reclaimed to its natural state, reclamation will include regrading, seedbed preparation, and revegetation with native seed.
- Following removal of project roads, these roads will be scarified, decompacted, and recontoured as needed to provide a condition that will facilitate revegetation, allow for proper drainage, and prevent erosion.

During these reclamation operations, it is anticipated that fugitive dust abatement measures comparable to those applied during the YPSP construction would be implemented. Weed control would be implemented as described in Section 1.3.7 of the project POD and the Invasive Plant Species and Noxious Weed Plan (POD Appendix G).

Prior to implementing site reclamation, a detailed site reclamation plan will be developed 2 years prior to decommissioning and provided to the BLM for review and approval. The detailed reclamation plan will identify specific restoration methods and incorporate typical BMPs and BLM standards in use at the time of decommissioning. Actual site conditions will be used to determine appropriate site reclamation actions. Reclamation plan must be designed to meet Reclamation Success Standards as described in Section 5.1.4.

5.1 Reclamation Tasks

5.1.1 *Site Preparation*

The Applicant does not anticipate substantial grading or soil removal during site reclamation; therefore, measures for topsoil salvage, storage, or replacement are not needed. Any trenches, bores, or other excavations created during decommissioning activities would be backfilled with native soils to original grade and recompacted in accordance with accepted engineering practices.

Reclamation activities would be determined on a site-by-site basis, with consideration of the advantages and disadvantages of soil treatment and site preparation methods to restore natural contours, protect the site from damage by wind or water erosion, and maximize likelihood of vegetation recovery. Specific site preparation measures would be selected prior to initiation of reclamation work in coordination with BLM reclamation staff.

Soil decompaction can increase soil vulnerability to weeds or erosion, increase dust, and cause further damage to surviving rootstocks that may be present. Therefore, the need for soil compaction or decompaction would be evaluated based on site-specific conditions, and treatment would be prescribed based on this evaluation. The evaluation may recommend no treatment, limited treatment using hand tools, light harrowing or disking with a tractor, or deeper disking or ripping. Where soil decompaction is implemented, follow-up measures to control dust and erosion would also be prescribed.

Surface treatment such as soil imprinting may be prescribed, based on the extent of areas to be reseeded, local soil condition, and availability of imprinting or similar equipment. Where decommissioning or prior project-related disturbance resulted in alterations to natural channel morphology or runoff patterns, recontouring or other measures would be prescribed. Any materials used to implement best management practices at any work site shall be certified weed-free.

Mulch used for erosion control would be produced from native vegetation cleared from the site, where feasible. Vegetation removed during decommissioning may be stockpiled on-site and used as crushed mulch or as “vertical mulch” to reduce sun and wind exposure to the soil surface and germinating plants.

5.1.2 Plant Materials

The Applicant would re-seed reclaimed areas with a native seed mix. The determination whether to re-seed and, if so, seeding rates (i.e., pounds per acre) would be determined by the BLM based on the nature of disturbance, condition of soils, and evidence (if any) of re-sprouting from rootstocks.

The seed mixture will be purchased through a commercial vendor or collected. If the applicant decides to collect seed, seed collection activities would be conducted onsite prior to commencement of construction activities by a qualified seed company or other BLM-approved method (e.g., trained volunteers). Standard seed collection protocol would be followed. Sites for seed collection would be coordinated in advance with the BLM botanist and will be from the appropriate Mojave seed-transfer zone (coordinate with BLM botanist). Permits are necessary for seed collection permits outside of the ROW or collected by a third-party contractor. Only mature seed will be collected. Pounds of seeds required would be based on the approved seed mix and estimate of acres of temporary disturbance for the project. Seeds would be collected, cleaned, tested for pounds live seed (PLS), certified weed free, and stored by the contractor until they are ready for use, unless other arrangements approved by BLM are made.

Refer to the Site Restoration and Revegetation Plan (POD Appendix E), for more information about seeding rates. Species seeded should include species within reference sites.

5.1.3 Reclamation and Revegetation Site Maintenance

Reclaimed and revegetated sites would not be irrigated. The sites would be monitored for weed presence and abundance, and weed control would be implemented as needed, according to the Invasive Plant Species and Noxious Weed Plan (POD Appendix G). Additional maintenance activities may consist of erosion control, soil stabilization, or other measures, as needed based on the conditions observed during monitoring.

5.1.4 Reclamation Success Standards

At this time, reclamation success standards will be based on current BLM restoration success standards. Success standards may change in the future and should be considered during reclamation planning. Current restoration success standards are presented in the project restoration plan (Appendix E) and are also provided below.

For sites larger than 1 acre, restoration is considered successful and sites are released from monitoring based on the success standard outlined below.

Restoration will be considered successful if plant cover, density, and species richness of native perennial vegetation is equal to or exceeds a designated percentage of the values for these parameters in undisturbed reference areas. The standards required for the land management designation that this project falls within is 60% for R4. If these standards are met on a restored site in a 6-year time period, the site may be released from further input and monitoring as long as cover, density, or diversity of weed species is not higher in the restoration areas than in reference conditions for a minimum of 2 years prior to proposed site release.

Success Standards:[1]

- Cover of Perennial Species (60% of reference site): This does not include cacti or yucca.
- Density of Perennial Species (60% of reference site): This does not include cacti or yucca.
- Richness of Perennial Species (60% of reference site): This does not include cacti or yucca.
- Number of Dominant Species (60% of reference site): This does not include cacti or yucca.
- Annual Species (60% Cover (Compared to reference site)
- Non-native Species Richness (Compared to reference site)
- Resistance to non-native species
- Seedling recruitment
- Lack of significant erosion
- Evidence of wildlife use

Sites will be released at the discretion of the BLM authorized officer. Remedial actions to meet restoration plan criteria will be taken when sites are not progressing towards meeting criteria in the scheduled time period. Monitoring timeframes will be extended, and may be intensified, until restoration criteria are met.

Sites will not be considered successfully restored if cover, density, or diversity of weed species is higher in the restoration sites than in reference conditions. Sites must show lower densities of weed species the 2 years prior to anticipated success standards being met for other restoration standards. Weeds will continue to be treated and kept at an equal or lower density than adjacent habitat until the site is released.

See Restoration Plan for reclamation monitoring descriptions – robust quantitative monitoring must be done to document site's progression towards reclamation standards.

6 SCHEDULE

The solar panels proposed for use in the project are expected to be operational for 30 to 40 years. It is anticipated that, as these panels reach the end of their expected life, technological advances may allow for a repowering by upgrading or replacing of the existing panels with more efficient and cost-effective generators and other infrastructure, extending the life of the project. Many older solar energy facilities have been repowered by upgrading or replacing existing towers and other infrastructure with more efficient panels and related equipment.

Should the operation of the project be terminated, the Applicant would provide BLM with a written Notice of Termination of Operations. The date of the Notice of Termination of Operations will be the Termination Date. The notice will be provided within 30 days of terminating operation of the system.

Decommissioning and reclamation prior to the end of the 30- to 40-year life expectancy of the project could occur under certain unlikely conditions, such as condemnation or the cessation of power generation by the project.

[1]As described in the project restoration plan (Appendix E), impacts to biotic soils are being minimized through the selected mowing alternative, and biocrust salvage is not required (and will not be performed) as mitigation for this project (according to the FEIS and ROW grant stipulations). Success standards for biocrust cover are not relevant to monitoring of restoration for this project or site release and will not be required for success monitoring or site release.

7 ESTIMATED DECOMISSIONING AND RECLAMATION COSTS

A reclamation cost estimate is provided in Attachment Q-1. The estimated reclamation cost is $22,327,611.90, with a total bond amount of $30,107,444.99. Total decommissioning and reclamation costs will be partially offset by the salvage value of panels and associated facilities that would be sold or reused.

8 RESPONSIBILITY

The Applicant, and its successors or assigns or heirs, would be responsible for decommissioning, abandonment, and site reclamation, as well as all associated costs. The Applicant will be responsible for ensuring that decommissioning, abandonment, and site reclamation activities occur in accordance with this Plan. Upon completion, the BLM will have the right to review final decommissioning, abandonment, and site reclamation to confirm that they were conducted in a manner consistent with this Plan.
If decommissioning does not proceed in accordance with this Plan, BLM will have the right to enter the property and cause the appropriate decommissioning, abandonment, and site reclamation measures as determined by this Plan.

9 FINANCIAL ASSURANCE

Financial assurance will be provided by the Applicant in a manner sufficient to adequately satisfy decommissioning, abandonment, and site reclamation commitments under this Plan. Financial assurance will be provided in the form of a surety bond. The Applicant will provide an estimate of the price for decommissioning, abandonment, and site reclamation for the project facilities as described in this Plan.

Any surety bond shall be given by a corporate surety authorized to do business in the State of Nevada. The surety bond shall conform to and be subject to the reasonable requirements of the BLM.

The BLM reserves the right to reject collateral that is deemed inappropriate or insufficient. Collateral may be in the form of a letter of credit offered by a banking institution or a financial institution or company that is a major United States commercial bank or foreign bank with a United States branch office, with a senior unsecured bond rating (unenhanced by third-party support), equivalent to A- or better as determined by Standard & Poor's or A3 or better as determined by Moody's; or in the form of a performance bond offered by an insurance company that has a B+ rating or better as determined by Standard & Poor's. The BLM further reserves the right to require the Applicant to obtain replacement collateral if the rating of the financial institution providing any collateral drops below the levels stated above. Replacement collateral shall be submitted by the Applicant within 60 days of the BLM's notice to the Applicant that the rating has fallen and that the collateral must be replaced. The Applicant may not terminate existing collateral until replacement collateral has been secured.

ATTACHMENT Q-1

Yellow Pine Solar Project General Floristic Inventory

SWCA ENVIRONMENTAL CONSULTANTS
Sound Science. Creative Solutions.®

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www.swca.com

TECHNICAL MEMORANDUM

To: Eric Koster
Yellow Pine Solar, LLC
700 Universe Boulevard
Juno Beach, Florida 33408

From: Henrik Christensen, Natural Resources Program Lead

Date: March 29, 2019

Re: **Results of a General Floristic Inventory for the Yellow Pine Solar Project / SWCA Project No. 37332**

INTRODUCTION

On March 4, 2019, the Bureau of Land Management Southern Nevada District Office (BLM) issued a Notice to Yellow Pine Solar, LLC requesting additional information for a Right-of-Way Application to construct a 250-megawatt photovoltaic power project (N-90788) located on public lands near Pahrump within Clark County, Nevada. As described in the Notice, the BLM requested that Yellow Pine Solar provide "a general floristic inventory during the spring of 2019." SWCA Environmental Consultants (SWCA) was contracted by Yellow Pine Solar to complete a general floristic inventory of a sensitive resource area within the proposed Yellow Pine Solar Project Area on March 28, 2019; the results of this inventory are described herein.

BACKGROUND

In June 2017, SWCA completed a special-status plant habitat assessment for the proposed Yellow Pine Solar Project (SWCA 2017). A variety of publicly available data sources was used to inform the desktop analysis of soil, vegetation, and sensitive plant resources in the area. Field reconnaissance surveys were also done in order to assess the presence of suitable habitat within the application area and examine known sensitive plant populations. Observations from desktop analysis and field reconnaissance were used to delineate a proposed sensitive plant survey area for the BLM.

An NNHP data request did not result in the identification of any special-status plants within the application area but did identify three BLM Sensitive species within 5 miles of the application area: halfring milkvetch (*Astragalus mohavensis* var. *mohavensis*), Mojave milkvetch (*Astragalus mohavensis* var. *hemigyrus*), and Pahrump Valley buckwheat (*Eriogonum bifurcatum*). The application area does not provide suitable habitat for halfring milkvetch or Mojave milkvetch, which are typically found in rocky habitats that include ledges and terraces. Pahrump Valley buckwheat occurs on alkaline sand flats and slopes, within saltbush communities at elevations of 600–800 m (1,969–2,700 feet). This species also occurs on adjacent shore terraces and stabilized sand dunes with saltbush species (*Atriplex* spp.), honey mesquite (*Prosopis glandulosa*), seablite (*Suaeda moquinii*), and spiny hopsage (*Grayia spinosa*) (NNHP 2001). Pahrump Valley buckwheat are known to straddle the Nevada/California state line, from Stewart, Pahrump, and Mesquite Valleys in Nye and Clark Counties, Nevada, as well as Inyo and San Bernardino Counties, California (NRCS 2018; NNHP 2001).

Based on previous efforts locating Pahrump Valley buckwheat in the general vicinity of the application area, SWCA has found that soil type is most informative for delineating suitable habitat for this species. Therefore, we considered the Corncreek-Badland-Pahrump association as suitable habitat due to its salinity and association with relict lakebeds and lake terraces. The Corncreek-Badland-Pahrump soil association is limited to a 115-acre area in the far southwest corner of the application area (hereafter referred to as the Survey Area) and may provide suitable soil conditions for Pahrump Valley Buckwheat. Evaluation of this soil type during reconnaissance surveys on March 30, 2017 indicated that habitat is limited in comparison with known reference populations. The Survey Area lacks the loose sandy soils where Pahrump Valley buckwheat is typically identified. The reference population was located prior to conducting the protocol survey. Despite the timing of the reference site visit, individual Pahrump Valley buckwheat were identifiable and distinguished from other annual buckwheat. Special status surveys conducted on June 16 and 17, 2018 did not encounter individuals of Pahrump Valley buckwheat within the Survey Area. Furthermore, on October 24, 2018, quantitative survey transects were completed within the Corncreek-Badland-Pahrump soil association. During these surveys, individuals of Pahrump Valley buckwheat were not observed.

METHODS

SWCA completed a general floristic inventory within the 115-acre Survey Area on March 28, 2019 (Figure 1). The purpose of the inventory was to document general flora within the area, and to survey for Pahrump Valley Buckwheat and other BLM-sensitive plant species. BLM-approved botanist Ian McCowen and biologist Mike Swink performed the general floristic inventory by walking meandering pedestrian transects throughout the Survey Area.

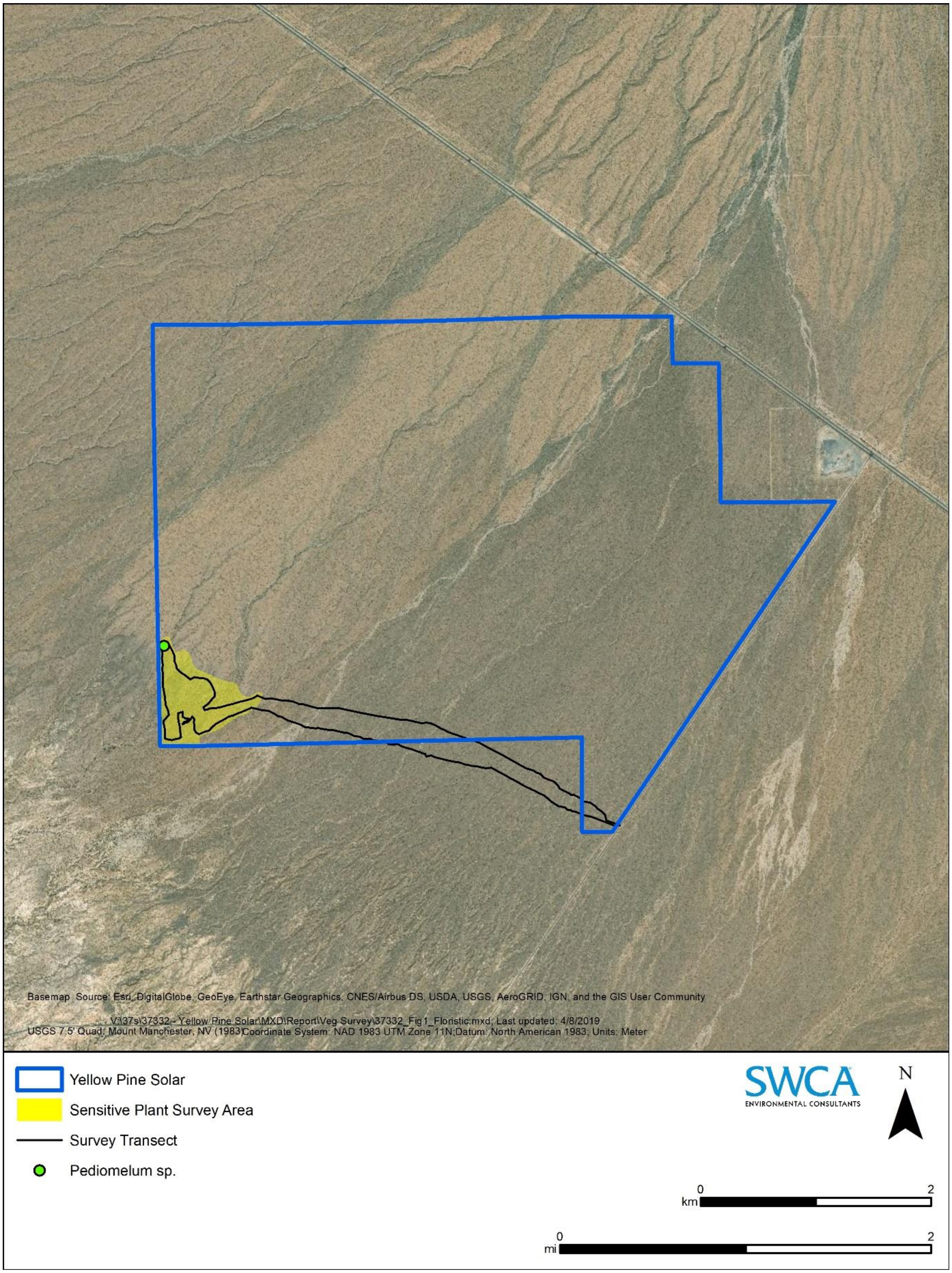
RESULTS

No Pahrump Valley Buckwheat were observed within the Survey Area. A single plant belonging to the genus *Pediomelum* was observed in the Survey Area. It was an immature plant and lacked suitable characters necessary for identification to species. *Pediomelum castoreum* is listed by the BLM as Sensitive (BLM 2017). A complete list of all plant taxa identified during the survey is included in Table 1. Representative photographs of the Survey Area are provided as Figures 2 and 3.

Table 1. Plant Species Observed during the General Floristic Inventory of the Yellow Pine Solar Project Area.

Family	Scientific Name	Common Name
Amaranthaceae	*Atriplex confertifolia*	shadscale
	Krascheninnikovia lanata	winterfat
Asparagaceae	*Yucca schidigera*	Mojave yucca
Asteraceae	*Acamptopappus shockleyi*	Shockley’s goldenhead
	Ambrosia dumosa	white burrobush
	Hymenoclea salsola	burrobush

Family	Scientific Name	Common Name
	Encelia virginensis	Virgin River brittlebush
	Gutierrezia microcephala	small-head snakeweed
	Stephanomeria pauciflora	brown-plume wire-lettuce
	Xylorhiza tortifolia	Mojave woody-aster
Boraginaceae	*Cryptantha sp.*	--
Brassicaceae	*Guillenia lasiophylla*	California mustard
	Descurainia sp.	--
Cactaceae	*Cylindropuntia ramosissima*	Darning-needle cholla
	Echinocactus polycephalus	cotton-top cactus
	Echinocereus engelmannii	saints cactus
	Opuntia basilaris	beaver-tail cactus
Ephedraceae	*Ephedra nevadensis*	Nevada joint-fir
Fabaceae	*Pediomelum sp.*	--
Geraniaceae	*Erodium cicutarium*	red-stem stork's bill
Hydrophyllaceae	*Phacelia sp.*	--
Lamiaceae	*Salazaria mexicana*	Mexican bladdersage
	Salvia dorrii	gray ball sage
Loasaceae	*Petalonyx nitidus*	shiny-leaf sandpaper plant
Malvaceae	*Sphaeralcea ambigua*	apricot globe-mallow
Nyctaginaceae	*Mirabilis sp.*	--
Oleaceae	*Menodora spinescens*	spiny Mendodora
Onagraceae	*Camissonia sp.*	--
Papaveraceae	*Eschscholzia sp.*	--
Poaceae	*Achnatherum hymenoides*	Indian rice grass
	Achnatherum sp.	--
	Bromus madritensis var. rubens	red brome
	Schismus barbatus	common Mediterranean grass
Polygonaceae	*Chorizanthe rigida*	devil's spineflower
	Eriogonum inflatum	Indian-pipeweed
	Eriogonum trichopes	little desert trumpet
Rosaceae	*Prunus fasciculata*	desert almond
Solanaceae	*Lycium andersonii*	red-berry desert thorn
Zygophyllaceae	*Larrea tridentata*	creosote-bush



Basemap Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
V:\37s\37332 - Yellow Pine Solar\MXD\Report\Veg Survey\37332_Fig1_Floristic.mxd; Last updated: 4/8/2019
USGS 7.5' Quad: Mount Manchester, NV (1983)Coordinate System: NAD 1983 UTM Zone 11N;Datum: North American 1983; Units: Meter
Yellow Pine Solar
Sensitive Plant Survey Area
Survey Transect
Pediomelum sp.
SWCA
ENVIRONMENTAL CONSULTANTS
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Figure 1. General Floristic Inventory Survey Area.

Figure 2. Photograph of the Survey Area, looking west.

Figure 3. Photograph of the Survey Area, looking northeast.

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Nevada Natural Heritage Program (NNHP). 2001. *Rare Plant Atlas.* Available at: http://heritage.nv.gov/atlas. Accessed April 10, 2017.

SWCA Environmental Consultants (SWCA). 2017. Special-status Plant Habitat Assessment for the Proposed Yellow Pine Solar Project. June.

ATTACHMENT Q-2

Yellow Pine Solar Project Botanical Survey Report

Yellow Pine Solar Project
Draft Botanical Survey Report

FEBRUARY 2019

PREPARED FOR

Yellow Pine Solar, LLC

PREPARED BY

SWCA Environmental Consultants

YELLOW PINE SOLAR PROJECT
DRAFT BOTANICAL SURVEY REPORT

DOI-BLM-NV-S010-2017-0110-EIS

Prepared for

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SWCA Project No. 37729

February 2019

EXECUTIVE SUMMARY

Yellow Pine Solar, LLC, a wholly owned subsidiary of NextEra Energy Resources, LLC, is proposing to develop the Yellow Pine Solar Project, which would consist of photovoltaic solar panels and lithium-ion– based or similar energy storage located on approximately 3,000 acres of public lands managed by the Bureau of Land Management (BLM), Southern Nevada District, Las Vegas Field Office. The Yellow Pine Solar Project would be located within Pahrump Valley, approximately 10 miles (16 kilometers [km]) southeast of Pahrump, Nevada, and approximately 32 miles (51 km) west of Las Vegas, Nevada. The project would be bounded by Nevada State Route 160 to the north and Tecopa Road to the east. The Yellow Pine Solar Project would provide renewable energy to the electrical transmission grid at a newly constructed substation, the Trout Canyon Substation, owned by GridLiance West, LLC. SWCA Environmental Consultants (SWCA) was retained by Yellow Pine Solar, LLC to perform baseline botanical surveys for the proposed project area. To capture the botanical species of interest and project area, the surveys were expanded outside the 3,000 acres of project area to include 5,032 acres, herein referred to as the Study Area.

SWCA botanists used a combination of geographic information system desktop analysis, field reconnaissance, and consultation with the BLM Southern Nevada District Office to identify the potential BLM special status plant species that may occur within the proposed project area. Following the BLM Assessment, Inventory, and Monitoring Strategy protocol for Grassland, Shrubland, and Savanna Ecosystems, SWCA botanists completed field surveys in late spring and fall 2018 to 1) map special status plant and non-native and noxious weed populations; 2) calculate cacti/yucca density estimates based on soil types within the project area; and 3) collect quantitative vegetation cover data in undisturbed areas to inform post-construction restoration efforts. Two special status species (BLM sensitive) were identified as having the potential to occur within the Study Area. This report provides a description of survey methods and results, as well as a discussion of significant findings. Figures and tables are provided for all resources assessed, including soils, vegetation, and special status plant data.

Surveys for the Yellow Pine Solar Project have been conducted over multiple months. Sensitive species reconnaissance surveys were conducted on March 30, 2017, while targeted sensitive species surveys were conducted on June 16 and 17, 2018, and all other botanical baseline surveys began on October 8 and continued through October 27, 2018.

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ACRONYMS AND ABBREVIATIONS LIST

AIM	Assessment, Inventory, and Monitoring
Applicant	NextEra Energy Resources, LLC
BLM	Bureau of Land Management
CIPC	California Invasive Plant Council
cm	centimeters
COOP	Cooperative Observer Program
DOE	U.S. Department of Energy
EIS	Environmental Impact Statement
GIS	geographic information system
GridLiance	GridLiance West, LLC
km	kilometers
kV	kilovolts
LPI	line-point intercept
m	meters
mm	millimeters
MW	megawatts
NDA	Nevada Department of Agriculture
NNHP	Nevada Natural Heritage Program
NOAA	National Ocean and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NWS	National Weather Service
PV	photovoltaic
ROD	Record of Decision
ROW	right-of-way
SR	State Route
SSURGO	Soil Survey Geographic Database
SWCA	SWCA Environmental Consultants
SWReGAP	Southwest Regional Gap Analysis Project
USGS	U.S. Geological Survey
WRCC	Western Regional Climate Center
Yellow Pine Solar	Yellow Pine Solar, LLC
YPSP	Yellow Pine Solar Project

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1 INTRODUCTION

1.1 Project Description

Yellow Pine Solar, LLC (Yellow Pine Solar), a wholly owned subsidiary of NextEra Energy Resources, LLC (the Applicant) is proposing to develop the Yellow Pine Solar Project (YPSP), which would consist of photovoltaic (PV) solar panels and lithium-ion–based or similar energy storage (battery) located on approximately 3,000 acres of public lands managed by the BLM, Southern Nevada District, Las Vegas Field Office. The YPSP would be located within Pahrump Valley, approximately 10 miles (16 kilometers [km]) southeast of Pahrump, Nevada, and approximately 32 miles (51 km) west of Las Vegas, Nevada (Figure 1). The project would be bounded by Nevada State Route (SR) 160 to the north and Tecopa Road to the east. The YPSP would provide renewable energy to the electrical transmission grid at a newly constructed substation, the Trout Canyon Substation, owned by GridLiance West, LLC (GridLiance). The plant would generate electricity using multiple arrays of PV panels electrically connected to associated power inverter units. The current from the power inverters would be gathered by an internal electrical collection system and transformed to transmission voltage prior to leaving the project area. The energy storage system would be sized to be no larger than the maximum solar output and would allow for energy from the solar panels to be stored and released into the electrical grid at a later time.

Current technology allows for between 6 and 9 megawatts (MW) per acre depending on buildable area available, allowing for approximately 500-MW electrical production within the unconstrained 3,000-acre site. However, PV technology is rapidly improving, and the potential MW/acre is likely to increase. The exact final project output may be higher or lower depending on the procured panel technology. The exact siting of the project area has not been finalized and will be designed to avoid resource concerns, where applicable.

1.2 Application History

In October 2011, Boulevard Associates, LLC, a subsidiary of the Applicant, filed an application for a right-of-way (ROW) grant (N-090788) with the BLM's Southern Nevada District Office for 3,272 acres of land for the proposed Sandy Valley Solar Project (herein referred to as the Original Application Area). The Sandy Valley Solar Project has not been built to date. However, the application was filed prior to the BLM's *Final Solar Programmatic Environmental Impact Statement* (BLM and U.S. Department of Energy [DOE] 2012), and, as a pending solar application at the time of this publication, the project is not subject to the decisions adopted by the *Record of Decision (ROD) for Solar Energy Development in Six Southwestern States* (BLM 2012).

In June 2016, Yellow Pine Solar submitted an amended application, with a new project name, the Yellow Pine Solar Project. The Applicant is proposing to construct, operate, and maintain an efficient, economic, reliable, safe, and environmentally sound solar-powered generating facility. Based on preliminary discussions with the BLM and initial evaluation of resource concerns, expansion to the northwest of the original 3,272-acre application area was proposed. This expansion provides more flexibility for avoiding resource conflicts within a larger 9,290-acre area (herein referred to as the Application Area).

Based on comments submitted during the public scoping process for the Environmental Impact Statement (EIS) for the project, the focus for the proposed development of the YPSP shifted to include only the 4,624-acre portion of the Application Area northwest of Tecopa Road (herein referred to as the Survey Area). The Survey Area was targeted for in-depth baseline botanical surveys. Areas along SR 160 and a gravel pit at the intersection of SR 160 and Tecopa Road were excluded from surveys. An additional 222 acres on the north side of SR 160 were included to accommodate a 230-kilovolt (kV) transmission line from the Trout Canyon Substation to the GridLiance Pahrump to Mead 230-kV transmission line for a total Survey Area of 5,032 acres (see Figure 1). The Survey Area is the entire area that may be impacted by development activities, including associated infrastructure.

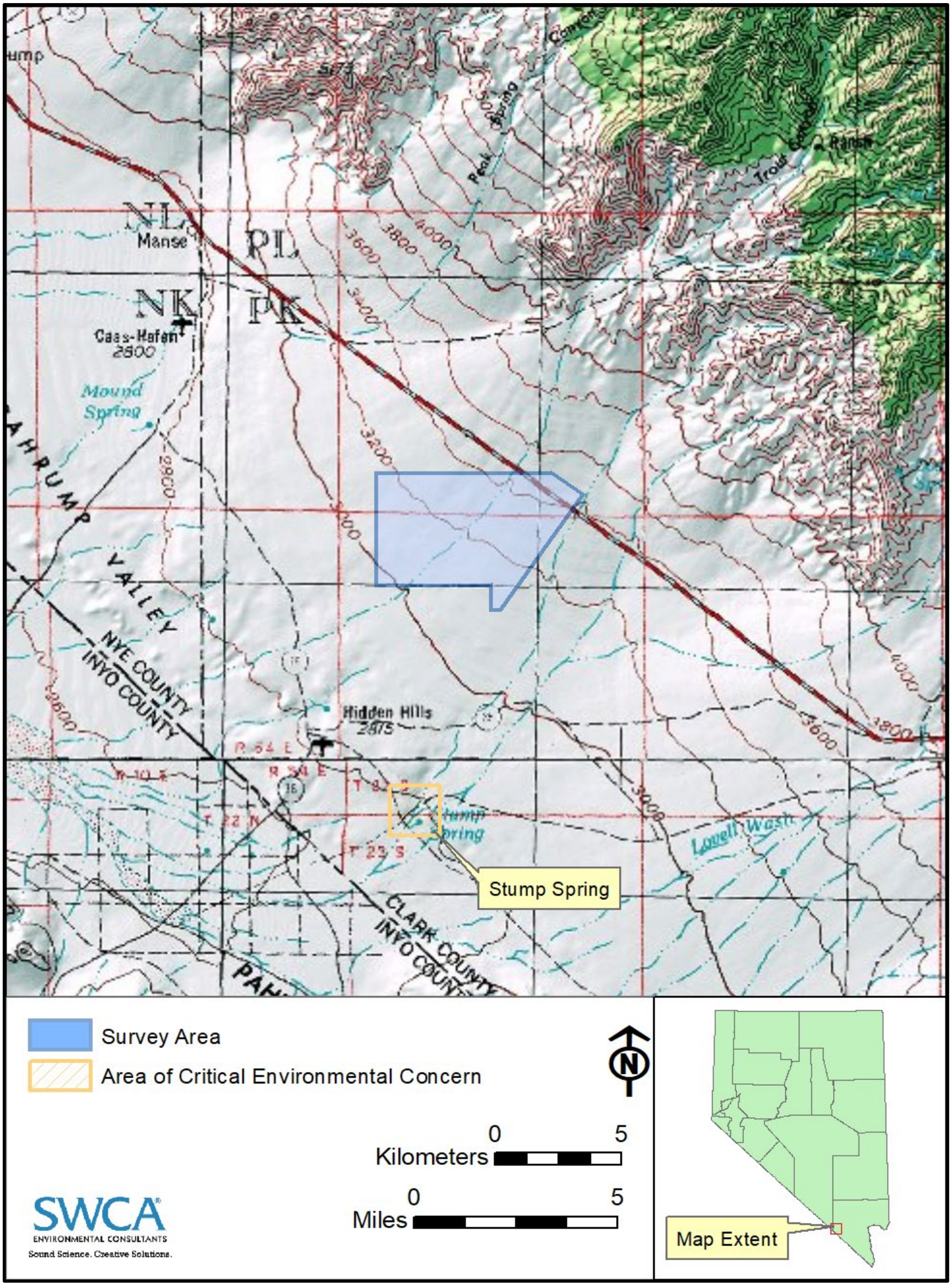

Figure 1. Yellow Pine Solar Project Survey Area.

1.3 Environmental Setting

The YPSP is located in Pahrump Valley within the central portion of the Mojave Desert, west of the Spring Mountains and east of the Nopah Range. Terrain within the YPSP Survey Area consists of valleys and ephemeral washes ranging in elevation from 3,000 to 3,500 feet above mean sea level. The watershed flows from the Spring Mountains in the northeast to the Pahrump Valley floor in the southwest. Vegetation within the project area is predominantly Sonora-Mojave Creosote Bush-White Bursage Desert Scrub (U.S. Geological Survey [USGS] 2004). There is little to no existing disturbance throughout the Survey Area. Dirt roads are present in the area surrounding the Survey Area and appear to be used for recreational off-road travel and access to existing transmission lines. Tecopa Road is a paved route and is situated perpendicular to SR 160. A known hydrologic feature, Stump Spring, is located approximately 4 miles downslope of the project area, to the south of Tecopa Road (Figure 1). Stump Spring was designated by the BLM as an Area of Critical Environmental Concern.

The climate is typical of a high desert environment, with clear skies and strong fluctuations of daily temperatures. Nearly half of the average annual rainfall occurs during the winter, between December and March. For the summer months between July and September, rainfall occurs regularly (Table 1) (Western Regional Climate Center [WRCC] 2018). Temperature and precipitation for the Survey Area were estimated from the National Weather Service (NWS) Cooperative Observer Program (COOP) Pahrump Station, about 11 miles to the east-northeast of the Survey Area. The period of record is from March 1914 to June 2016 (WRCC 2018). The NWS COOP Pahrump Station is about 2,180–2,680 feet above the Survey Area; therefore, it is likely that precipitation and temperature are higher and lower, respectively, than what may occur in the Survey Area.

Table 1. Historical Average Monthly Temperature and Precipitation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average High (˚F)	57.4	62.5	68.0	75.5	85.2	95.2	101.6	99.8	92.6	81.5	67.3	57.8	78.7
Average Low (˚F)	27.0	32.1	36.9	43.2	52.2	60	67.3	65.7	56.8	44.8	33.8	26.6	45.5
Precipitation (in.)	0.7	0.8	0.5	0.3	0.2	0.1	0.3	0.3	0.3	0.2	0.4	0.5	4.7

Note: Data from Pahrump, Nevada National Climatic Data Center COOP 265890 (1914-2016) (WRCC 2018).

In Pahrump Valley, for 2018, the average annual temperature was recorded as higher than average, at 80.3 ˚F, compared with the historical annual average of 78.7 ˚F. Precipitation was lower than average for this year, at 3.48 inches annual accumulation, as compared with the historical annual average of 4.7 inches (Table 2).

Table 2. Average Monthly Temperature and Precipitation in 2018

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average High (˚F)	62.5	62.3	65.1	81.3	85.9	99.0	104.8	102.3	96.1	79.1	67.5	57.6	80.3
Average Low (˚F)	31.1	30.3	39.6	48.1	55.0	61.2	73.7	69.3	56.9	46.5	30.4	28.8	47.6
Precipitation (in.)	1.72	.15	.51	.00	.22	.00	.15	.00	.00	.19	.24	.3	3.48

Note: Data from Pahrump, Nevada NOAA US1NVNY0002 (2018) (National Oceanic and Atmospheric Administration [NOAA] 2018).

1.3.1 General Vegetation

Land cover data (USGS 2004) were assessed for the Survey Area, resulting in the identification of four vegetation communities (Table 3, Figure 2). One vegetation community covers approximately 79% of the Survey Area: Sonora-Mojave Creosote Bush-White Bursage Desert Scrub (creosote bush). Mojave Mid- Elevation Mixed Desert Scrub (mixed desert scrub) covers approximately 20% of the Survey Area. It should be noted that these data are developed using remote-sensing techniques for very large areas, which can result in inaccuracies at a project-specific level, missing communities with small percentages of an area. However, these data do provide a good understanding of the major vegetation communities in the general vicinity. A map displaying the distribution of vegetation communities within the Survey Area is included below in Figure 2.

Table 3. Vegetation Communities within the Survey Area

Vegetation Community	Acres	Percentage of Survey Area
Sonora-Mojave Creosote Bush-White Bursage Desert Scrub	3,998	79%
Mojave Mid-Elevation Mixed Desert Scrub	1,000	20%
Inter-Mountain Basins Semi-Desert Shrub Steppe	32	<1%
Sonora-Mojave Mixed Salt Desert Scrub	2	<1%
Total	**5,032**	**100%**

Source: USGS (2004)

General descriptions of the vegetation communities and associated flora are provided below.

Sonora-Mojave Creosote Bush-White Bursage Desert Scrub: This vegetation community occurs in broad valleys, lower bajadas, plains, and low hills in the Mojave Desert and lower Sonoran Desert. This system ranges from sparse to moderately dense layer (2%–50% cover). Creosote bush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*) are the typical dominant species, but a variety of shrub, dwarf-shrub, and cacti may be present to co-dominant. Additional species may include fourwing saltbush (*Atriplex canescens*), desert holly (*Atriplex hymenelytra*), brittlebush (*Encelia farinosa*), ephedra (*Ephedra* spp.), ocotillo (*Fouquieria splendens*), wolfberry (*Lycium andersonii*), and beavertail pricklypear (*Opuntia basilaris*). Herbaceous species are sparse but may be seasonally abundant with annual species such as sandmat (*Chamaesyce* spp.), desert trumpet (*Eriogonum inflatum*), wooly fluffgrass (*Dasyochloa pulchella*), forget-me-not (*Cryptantha* sp.), and scorpion weed (*Phacelia* sp.) (USGS 2004).

Mojave Mid-Elevation Mixed Desert Scrub: This vegetation community consists of desert scrub in the transition zone above creosote-bursage scrub and below the montane woodlands occurring in the eastern and central Mojave Desert. The vegetation composing this ecological system is quite variable but generally consists of blackbrush (*Coleogyne ramosissima*), California buckwheat (*Eriogonum fasciculatum*), ephedra, hopsage (*Grayia spinosa*), spiny menodora (*Menodora spinescens*), beargrass (*Nolina* sp.), buckhorn cholla (*Cylindropuntia acanthocarpa*), bladdersage (*Salazaria mexicana*), Parish's goldeneye (*Viguiera parishii*), Joshua tree (*Yucca brevifolia*), and Mojave yucca (*Yucca schidigera*). A variety of grasses may be found and could include Indian ricegrass (*Achnatherum hymenoides)*, desert muhly (*Muhlenbergia porter*), James' galleta (*Pleuraphis jamesii*), and big galleta (*Pleuraphis rigida*). Scattered Utah juniper (*Juniperus osteosperma*) may also be present (USGS 2004).

Inter-Mountain Basins Semi-Desert Shrub Steppe: This vegetation community occurs at lower elevations on alluvial fans and flats with moderate to deep soils. This semiarid shrub-steppe ecological system is typically dominated by graminoids but has an open shrub layer. Typical grass species include

Indian ricegrass, blue grama (*Bouteloua gracilis*), saltgrass (*Distichlis spicata*), needle and thread (*Hesperostipa comata*), Sandberg bluegrass (*Poa secunda*), and alkali sacaton (*Sporobolus airoides*). The shrub layer includes fourwing saltbush, big sagebrush (*Artemisia tridentata*), rubber rabbitbrush (*Ericameria nauseosa*), snakeweed (*Gutierrezia sarothrae*), and winterfat (*Krascheninnikovia lanata*) (USGS 2004).

Sonora-Mojave Mixed Salt Desert Scrub: This system includes open-canopy shrub communities occurring in saline basins in the Mojave and Sonoran Deserts and can generally be found around playas. Vegetation is typically composed of one or more saltbush species such as fourwing saltbush or cattle saltbush (*Atriplex polycarpa*), along with other species of saltbush. Species of salt-tolerant plants, such as iodine bush (*Allenrolfea occidentalis*), pickleweed (*Salicornia* sp.), and seepweed (*Suaeda* sp.), are generally co-dominant. Some grass species, such as alkali sacaton or saltgrass, may be present at varying densities (USGS 2004).

1.3.2 Soils

There are four soil types within the Survey Area (Table 4) (Natural Resources Conservation Service [NRCS] 2018a). Over half of the Survey Area is made up of the Commski-Oldspan-Lastchance association, which covers 59% of the Survey Area. Figure 3 shows the distribution of soil types across the Survey Area. In general, these soil associations consist of sandy loam that are well drained. As with land cover data, NRCS data are prepared at a large scale and can have inaccuracies at the project-specific scale.

The dominant soil type, Commski-Oldspan-Lastchance association, occurs along fan remnants and consists of well-drained, non-saline to moderately saline soils derived from limestone and dolomite parent materials. Soils vary from very gravelly to extremely gravelly and comprise loam, sandy loam, and very fine sandy loam textures.

Although only a minor component of the soils within the Survey Area, the Corncreek-Badland-Pahrump association is of interest due to its potential to support Pahrump Valley buckwheat, which is listed as a Nevada BLM sensitive species (see Appendix A). This association is found along fan skirts, relict lakebeds, and lake terraces, and consists of very slightly saline to strongly saline soils formed in limestone-derived alluvium and lacustrine deposits. Soils vary from gravelly to extremely gravelly and comprise fine sandy loam, loam, and silt loam textures.

Table 4. Soil Associations within the Survey Area

Soil Association	Acres	Percentage of Survey Area
Commski-Oldspan-Lastchance association	2,977	59%
Lastchance-Commski association	1,604	32%
Commski-Lastchance association	336	7%
Corncreek-Badland-Pahrump association	115	2%
Total	**5,032**	**100%**

Source: NRCS (2018a)

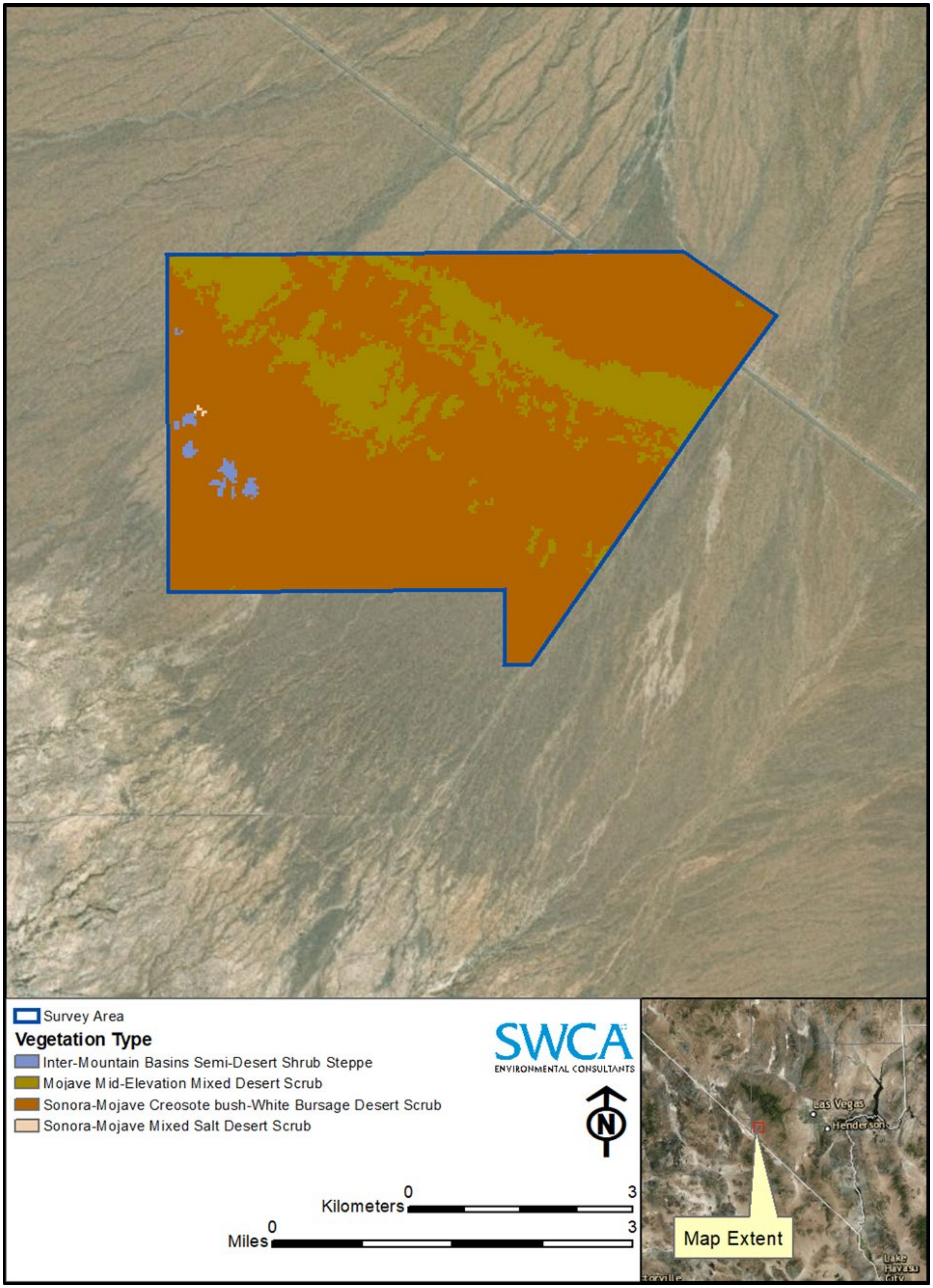

Figure 2. Vegetation communities within the Survey Area

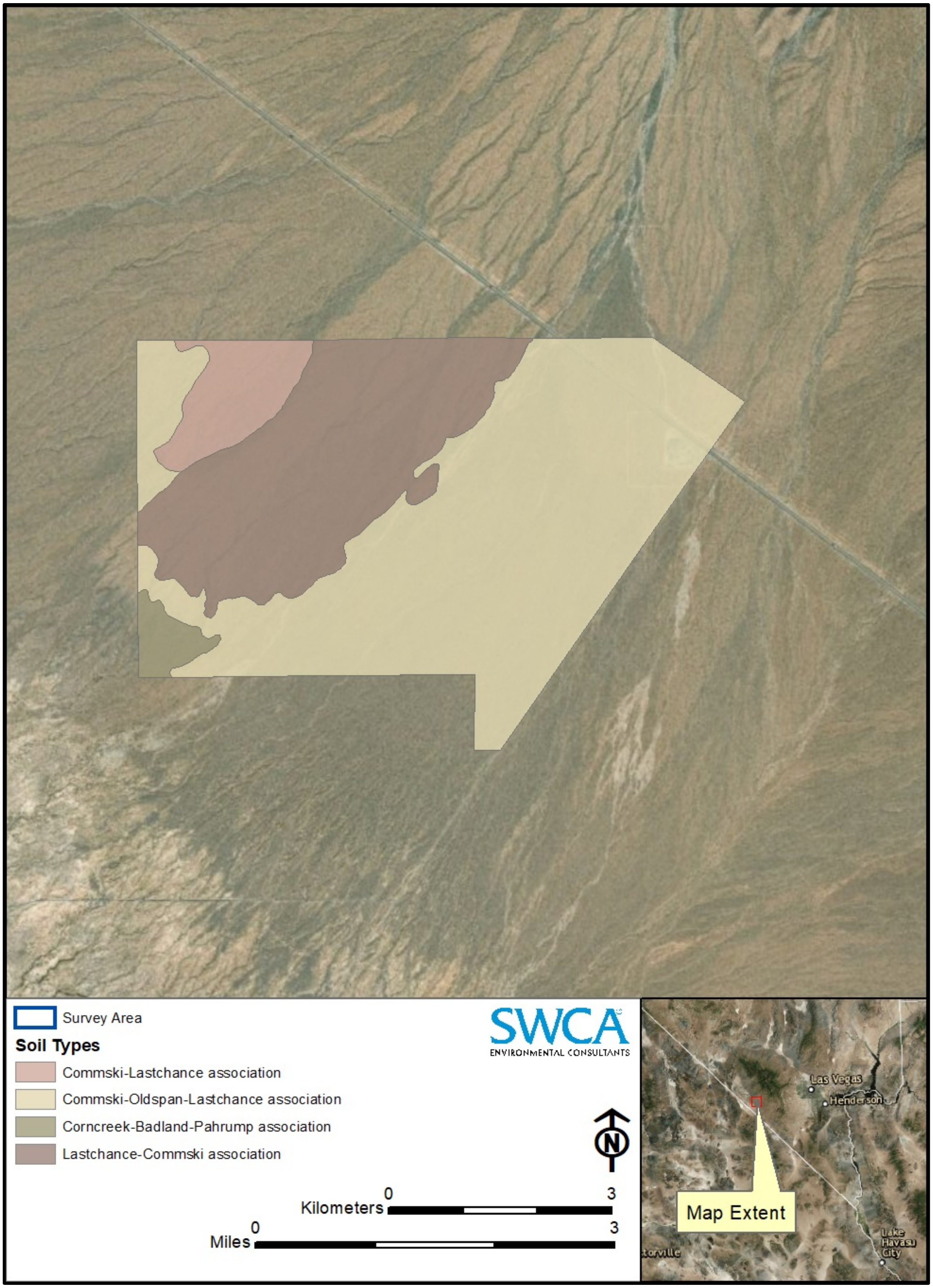

Figure 3. Soil Associations within the Survey Area.

2 METHODS

2.1 Special Status Plants and Invasive and Noxious Weeds

2.1.1 Pre-project Review

A number of tasks were performed prior to embarking on targeted ground surveys for vegetation. A desktop, geographic information system (GIS)–based review was initially used to evaluate the Survey Area for a Special Status Plant Habitat Assessment (see Appendix A). The following GIS data sources were considered during that analysis:

- Southwest Regional Gap Analysis Project (SWReGAP) land cover data (USGS 2004) for the Survey Area
- Soil Survey Geographic Database (SSURGO) soils data (NRCS 2018a) for the Survey Area
- Nevada Natural Heritage Program (NNHP) data (NNHP 2017) for the Survey Area and surrounding 5-mile buffer

NNHP (2018) data for special status plants species located within the Survey Area and 5-mile buffer (see Appendix B) were evaluated in conjunction with SWReGAP land cover (USGS 2004) and SSURGO soils data (NRCS 2018a) to determine the unique land cover and soil combinations that support special status plant species. To complete this analysis, all special status plant data within the 5-mile buffer were included. Unique combinations of soil and land cover were then determined for the proposed Survey Area. Any soil and land cover combinations that exactly matched those identified from special status species polygons were considered suitable habitat.

2.1.2 Reconnaissance Visits

Field reconnaissance was conducted on March 30, 2017, by a BLM-approved botanist, Matt Villaneva. During this effort the Survey Area and initial survey area delineation for suitable special status plant habitat were evaluated. Nearby special status plant populations identified through desktop analysis were visited to assess habitat characteristics that support these species. Habitat characteristics evaluated included relative vegetation cover, co-occurring plant species, and general soil characteristics.

Following the evaluation of habitat characteristics supporting nearby special status plant populations, SWCA biologists then determined if the habitat within the Survey Area contained similar characteristics that may support targeted special status plants (Appendix B). The initial survey area was evaluated during a reconnaissance visit through meandering surveys and by traveling along available access roads. SWCA biologists created a general species list and photographs at discrete locations within the reference populations and initial survey area.

2.1.3 Targeted Special Status Plant Surveys

After the Habitat Assessment for special status plants and site reconnaissance determined the potential for rare plants to occur in potentially suitable habitat, site visits to known locations of special status plants were conducted. These reference populations allow botanists to compare plant assemblages and habitats to calibrate themselves to conditions of known plant populations. Following the reference plant population site visit, surveys for special status plants were performed utilizing typical BLM targeted rare plant survey protocols. Surveyors walked transects within potentially suitable habitat, and transects were spaced at 30-meter (m) intervals to examine all plants within the view of the surveyor. Plants observed were identified to species level, unless an annual plant was too far outside the optimal phenology for the plant, in which case these plants were only identified to Genus level. Botanists utilized GPS devices to track transects and created a complete list of plants identified during the survey.

2.1.4 Invasive and Noxious Weeds

Invasive and noxious weeds were sampled concurrently with the special status plant surveys, as well as the cactus and yucca and quantitative survey transects. Surveyors mapped all occurrences of noxious weeds using GPS or electronic tablet. Noxious weeds included all species listed on the Nevada Department of Agriculture (NDA) Nevada Noxious Weed List (NDA 2019). Invasive weeds and their relative densities were surveyed and calculated using data from the quantitative survey transects. Due to the ubiquitous nature of invasive weed species, occurrences were not mapped.

2.2 Cactus and Yucca Density Estimates

From October 8 to 27, 2018, SWCA botanists performed cactus and yucca density surveys to facilitate BLM salvage planning for post-construction restoration monitoring. Cactus and yucca surveys were performed using density estimates collected at a total of 66 belt transects. Using a constrained random approach, cactus and yucca survey transects were distributed proportionately among the four soil types within the Survey Area. All transects were 20 meters (m) wide, while the length varied, depending on the area and shape of unique soil types, between 500 and 1,000 m. Combined, the transects covered approximately 264 acres, or 5% of the total project acreage. A team of three individuals surveyed the transects, two following the transect border using handheld GPS and a third in the middle. The surveyor in the middle tallied the number of all individual cactus and yucca observed by the team within the transect. Additionally, surveyors recorded the number of Mojave yucca clusters within the transect, as well as the height class (<6 feet; 6–12 feet; >12 feet) of each individual. At the end of each transect, surveyors totaled the number of individuals of each species and recorded the totals on a digital data sheet with an electronic tablet.

In addition to cactus and yucca data, SWCA botanists recorded the percent cover of biological soil crust and desert pavement within each belt transect. In order to limit variation, the three surveyors observed both biological soil crust and desert pavement (see Section 4.5.1 for definitions) within the Survey Area. They then delineated and observed a 20 × 10–m area equaling 1 percent cover of a 1,000-m belt transect (or 2 percent cover of a 500-m belt transect). Once all three surveyors understood what to look for and how much area equaled 1 percent cover, each surveyor recorded their own independent estimate of percent cover for biological soil crust and desert pavement. At the end of each transect surveyors averaged these data, rounded to the nearest 1 percent, and recorded the totals on a digital data sheet with an electronic tablet.

2.3 Quantitative Survey Transects

During the same period as the cactus and yucca surveys, SWCA botanists performed quantitative vegetation surveys to establish baseline site conditions against which site-specific restoration standards can be assessed. Following BLM's Assessment, Inventory, and Monitoring (AIM) protocol (ARS 2018) surveyors completed sampling to assess vegetation cover, vegetation height, density, species richness, species diversity, and average soil stability. A total of 30 plots were surveyed within the Survey Area, which covered approximately 21 acres (0.4% of the Survey Area). Vegetation plots were randomly located on one corner of a subset of the cactus and yucca transects described above. Individual plots were located using a handheld GPS unit. Once the plot's center was established by using a compass to determine heading, three 25-m transects were established at 0, 120, and 240 degrees. To minimize disturbance, transects began 5 m from the plot's center and all measurements were taken from the left side of the transect tape, while any trampling was limited to the right side (facing the transect from plot center). For each transect, digital photos were taken to establish a photo record. These photos were taken at a 1.5-m height while standing at plot center, facing towards the start of the transect. Transects were identified using a small photo ID board that was placed at the beginning of each transect. All quantitative survey data was recorded on paper data forms acquired from the BLM AIM protocol (ARS 2018) and entered into Microsoft Excel at the office.

2.3.1 Line-Point Intercepts

Line-point intercepts (LPIs) were conducted by dropping a pin flag along the left side of the transect tape and recording what was intercepted with the pin, along with the soil surface type. Starting at 50 centimeters (cm), a total of 50 points were surveyed in 50-cm intervals. For every point, each plant intercepted was recorded once, the first time it was intercepted, starting with the uppermost plant and working down towards the soil surface. The soil surface was recorded as Herbaceous Litter (HL), Woody Litter (WL), Non-vegetative Litter (NL) (i.e., plastic, metal, or decomposing animal matter), Soil (S), Rock (R), Lichen (LC), or, if the pin landed on a rooted stem, the appropriate four-letter species code (e.g., YUSC [*Yucca schidigera*]). If any of the vegetation recorded was dead, the species code was circled on the data sheet.

2.3.2 Vegetation Height

Vegetation height was measured along the left side of the transect tape starting at 2.5-m and continued along the tape at 2.5-m intervals. A 30-cm-diameter disk with a meter stick through its center was placed tangent to the transect tape. The disk slid down the meter stick until it encountered the tallest woody plant, at which point the height was recorded to the nearest 1 cm. The same procedure was conducted for the tallest herbaceous plant at the same point. Plants rooted outside of the 30-cm disk were still counted as long as any plant element (e.g., stem, leaf, branch) encountered the disk and was taller than any other eligible plant element. The height was determined as the perpendicular distance from the soil surface to the tallest plant element. Any uneven, mounded, or rocky soil was disregarded while taking the measurement.

2.3.3 Canopy and Basal Gaps

Canopy gaps were measured along the left side of the transect tape beginning at the start of the tape (0 m); moving from 0 to 25 m, surveyors recorded the beginning and end of each gap between plant canopies to the nearest 1 cm. Canopy was defined as any amount of vegetation that covers 50 percent of any 3-cm segment of transect while looking down to the ground from above the graduated side of the tape. A gap was defined as any segment equal to or greater than 20 cm between canopies.

Basal gaps were measured along the left side of the transect tape starting at 0 m. Moving from 0 to 25 m, surveyors recorded the beginning and end of each basal gap to the nearest 1 cm. A plant base was defined as any plant stem emerging from the soil surface while looking down to the ground from above the left side (while facing away from the plot center) of the tape. A gap was defined as any segment equal to or greater than 20 cm between plant bases. All shrubs, cactus, yucca, and perennial forbs were included during the canopy and basal gap measurements. Since these surveys took place in October while most annuals were past their growing season, annual grasses and forbs were disregarded for both canopy and basal gaps.

There was a misinterpretation of the protocol for the canopy and basal gap sampling. The surveyor started at 0 m as the protocol stated but did not start recording intercepts until after the first intercept. For example, if a transect had two 1-cm basal intercepts (i.e., two 1-cm stems emerging from the ground intercepted by the imaginary plane created from the graduated side of the transect tape), one at 230 cm and one at 1,500 cm, then the first start gap on the data sheet was recorded at 231 cm and the end gap was recorded at 1,500 cm. This continues down the transect, with the next start gap at 1,501 cm and the end gap at 2,500 cm (i.e., the end of the transect). The data from this example implies only two gaps, while there are three. The gap that has been left out is between 0 cm (i.e., the start of the transect) and 230 cm. Both basal and canopy gap sampling were affected by this error.

This error was resolved by comparing the LPI data with the canopy and gap intercept data, finding the nearest LPI to the recorded canopy or basal start gap, and recording that interval. For example, if the canopy gap started at 523 cm and there was an LPI at Point 10 (i.e., 500 cm), then the first gap was recorded as 0 cm to 500 cm. The basal gap data were more difficult to determine due to surveyors not being certain of what was intercepted during the LPI (i.e., the LPI intercept could have been a stem, or it could have been a leaf several centimeters away from the emerging stem). These data were resolved by finding the average stem width and subtracting that from the start gap. For example, if a stem emerged at 799 cm and the average stem width was 6 cm, then the first gap was recorded as 0 cm to 793 cm. SWCA calculated the average stem width by comparing LPI data and the data between where a basal gap ended and started again.

2.3.4 Soil Stability

Soil stability measurements were taken at six points along each transect starting at 4 m for a total of 18 measurements per plot. Each soil sample was taken 21 cm away from the left side (while facing away from the plot center) of the transect tape to avoid any disturbances from the previous measurements. Each soil fragment was collected and carefully trimmed to 2–3 mm thick and 6–8 mm in diameter. If the area was disturbed at the point where the soil sample was to be taken, the surveyor moved to an alternate sample point 15 cm down the transect tape and tried again. For each measurement surveyors recorded the position where the sample was taken as well as the dominant soil canopy. The dominant soil canopy was defined as any vegetation class (e.g., Shrub, Grass, Forb) that covered greater than 50 percent of the sample point. If a rock greater than 5 mm was intercepted at both the original and alternative sample points, surveyors recorded an “R” on the data sheet and moved to the next sample.

Once all the soil fragments were collected, each sample was tested to determine the stability class. Using distilled water, each soil fragment was immersed within an associated sieve for 5 minutes, followed by five controlled dips, and the appropriate erosion class was recorded on the data sheet. No subsurface samples were taken.

2.3.5 Plant Species Inventory for Diversity

Once all previous measurements were completed, SWCA botanists performed a plot-level assessment for plant diversity. This allowed for detection of plant species that had not been recorded during the LPI. Each plot was systematically and uniformly searched for a total of 15 minutes. Plant species encountered were recorded on the data sheet along with the functional group (e.g., shrub, perennial grass, annual grass). Unidentified species were marked with a pin flag and were later identified in the field using a dichotomous key.

3 RESULTS

3.1 Special Status Plants and Invasive and Noxious Weeds

SWCA assessed the likelihood of presence for special status plants (including species listed by the BLM, U.S. Fish and Wildlife Service, and the State of Nevada) within the Survey Area and surrounding 5-mile buffer. Through a plant habitat assessment conducted prior to field visits (see Appendix B), two special status plant species were identified within 5 miles of the Survey Area: halfring milkvetch (*Astragalus mohavensis* var. *hemigyrus*) and Pahrump Valley buckwheat (*Eriogonum bifurcatum*). Vegetation and soil data were compared at reference populations and within the Survey Area as a screening tool to narrow the focus of field reconnaissance.

The field reconnaissance conducted on March 30, 2017, indicated that potentially suitable habitat was not present for halfring milkvetch. Reference populations for these species occur within rockier habitat, among terraces, and are generally located at the base of the Spring Mountains, within the uppermost alluvial fans. NNHP (2001) descriptions of these species (see Section 3.3.1) support this characterization of preferred habitat for these species. The Corncreek-Badland-Pahrump soil association was determined to be potentially suitable habitat for Pahrump Valley buckwheat due to the soil’s salinity and association with relict lakebeds and lake terraces. Evaluation of this soil type during reconnaissance survey indicated that habitat is limited in comparison with the known reference population (see Appendix B). The Survey Area lacks the loose sandy soils where Pahrump Valley buckwheat is typically identified.

The reference population is in relative proximity to the Survey Area at less than 1.5 miles to the north of the northern edge of the project boundary. Surveys for Pahrump Valley buckwheat were performed June 16 and June 17, 2018 (Figure 4). The reference population was located prior to conducting the protocol survey. Despite the timing of the reference site visit, individual Pahrump Valley buckwheat were identifiable and distinguished from other annual buckwheat. Surveys did not encounter individuals of Pahrump Valley buckwheat within the Survey Area. A complete list of all plant taxa identified during the survey is included in Appendix C.

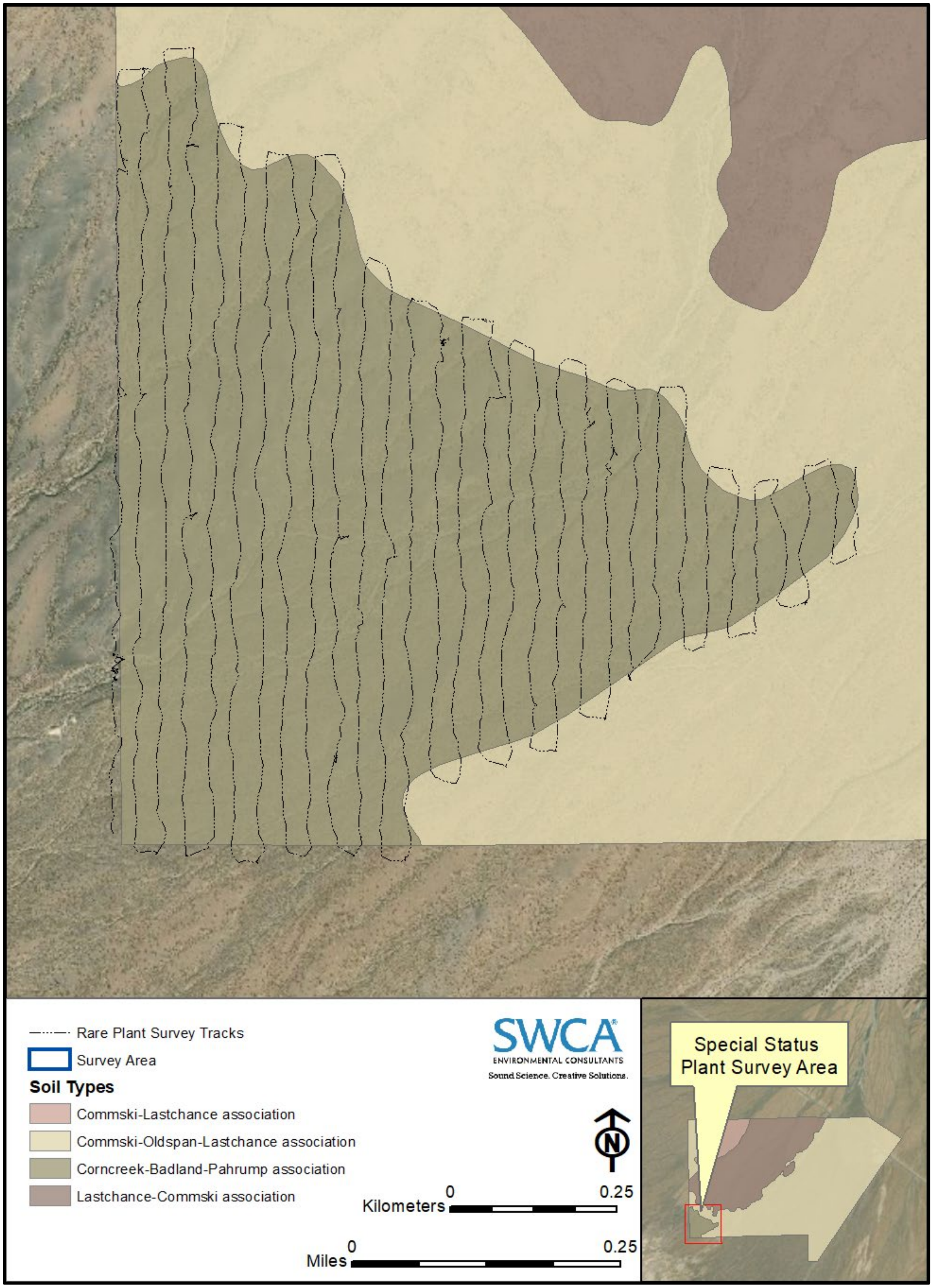

Figure 4. Special status plant survey tracks within the Survey Area.

3.1.1 Invasive and Noxious Weeds

Three exotic species were recorded within the Survey Area: red brome (*Bromus madritensis* ssp. *rubens*), cheatgrass (*Bromus tectorum*), and Mediterranean grass (*Schismus barbatus*). Only red brome and Mediterranean grass were present in notable numbers. Noxious weeds were not encountered within the Survey Area during vegetation sampling. The estimated populations and densities of these exotic species are listed below in Table 5.

Table 5. Estimated population and density of exotics by soil association

Soil Association	Estimated Population		Total Estimated Exotic Population	Estimated Density (plants/acre)		Total Estimated Density (plants/acre)
	B. madritensis* spp. *rubens	***S. barbatus***		***B. madritensis* spp. *rubens***	***S. barbatus***	
Commski-Oldspan-Lastchance	12,050	93,327	105,377	4	31	**35**
Lastchance-Commski	255	42,773	43,028	>1	27	**27**
Commski-Lastchance	1,200	11,040	12,240	4	33	**37**
Corncreek-Badland-Pahrump	0	493	493	0	4	**4**
Total	**13,505**	**147,633**	**161,138**	**2**	**24**	**26**

3.1.1.1 RED BROME (BROMUS MADRITENSIS SSP. RUBENS)

Red brome was ubiquitous within the Survey Area. This species was found in 26 of the 30 plots and across all soil associations. The estimated total population of red brome is approximately 13,505 individuals over 5,032 acres, with a density of 2.0 plants per acre. The highest density was recorded in the Commski-Oldspan-Lastchance soil association at 4.0 plants per acre (see Table 5).

3.1.1.2 CHEATGRASS (BROMUS TECTORUM)

Of the 30 quantitative survey plots sampled, only three had the presence of cheatgrass. These were found in Plots 14, 19, and 29. These plots are all located within the Commski-Oldspan-Lastchance soil association, towards the northeastern side of the Survey Area. Only one of these was found during the LPI transects; the other two were identified during the plant diversity inventory. As such, this species has been excluded from the density and population estimates due to having too small of a sample size.

3.1.1.3 MEDITERRANEAN GRASS (SCHISMUS BARBATUS)

Mediterranean grass was widespread throughout the Survey Area. This species was found in every plot and across all soil associations. The estimated total population of Mediterranean grass is approximately 147,633 individuals over 5,032 acres, with a density of 23.8 plants per acre. The highest density was recorded in the Commski-Lastchance soil association at 32.9 plants per acre (see Table 5).

3.2 Cactus and Yucca Density Estimates

A total of 66 belt transects were surveyed for cacti and yucca throughout the Survey Area (Figure 5). Table 6 shows the number and total lengths of transects distributed throughout the four soil associations. A total of 5.3% of the approximately 5,032-acre Survey Area was surveyed, including 163.1 acres (5.5%)

of the Commski-Oldspan-Lastchance association, 79.1 acres (4.9%) of the Lastchance-Commski association, 17.3 acres (5.1%) of the Commski-Lastchance association, and 4.9 acres (4.3%) of the Corncreek-Badland-Pahrump association.

Table 6. Summary Cactus and Yucca transects surveyed with total acres, density, and estimated population by soil association

Soil Association	Number of Transects	Total Length Surveyed	Total Acres Surveyed	Total Individuals	Total Acres in Survey Area	Density (Individuals / Acre)	Estimated cacti/yucca Population
Commski-Oldspan-Lastchance	38	33,000	163.1	6,826	2,977	41.9	124,736
Lastchance-Commski	19	16,000	79.1	1,851	1,604	23.4	37,534
Commski-Lastchance	7	3,500	17.3	872	336	50.4	16,934
Corncreek-Badland-Pahrump	2	1,000	4.9	134	115	27.3	3,140
Total Survey Area	**66**	**53,500**	**264.4**	**9,683**	**5,032**	**36.6**	**182,344**

Within the Survey Area, six species of cacti occurred, including buckhorn cholla (*Cylindropuntia acanthocarpa*), Wiggins' cholla (*Cylindropuntia echinocarpa*), Engelmann's cactus (*Echinocereus engelmannii*), cottontop cactus (*Echinocactus polycephalus*), matted cholla (*Grusonia parishii*), and beavertail pricklypear. There were two species of yucca, the Mojave yucca and Joshua tree (Table 7). Every soil association within the Survey Area had at least one of each cactus and yucca species observed, except for the Corncreek-Badland-Pahrump association, which only had three of the cacti species and one yucca species (Table 8).

Table 7. Walkover Table of Cactus and Yucca Species Observed in the Survey Area

4-Letter Code	Scientific Name	Common Name
CYAC	*Cylindropuntia acanthocarpa*	buckhorn cholla
CYEC	*Cylindropuntia echinocarpa*	Wiggins' cholla
ECEN	*Echinocereus engelmannii*	Engelmann's cactus
ECPO	*Echinocactus polycephalus*	cottontop cactus
GRPA	*Grusonia parishii*	matted cholla
OPBA	*Opuntia basilaris*	beavertail pricklypear
YUBR	*Yucca brevifolia*	Joshua tree
YUSC	*Yucca schidigera*	Mojave yucca

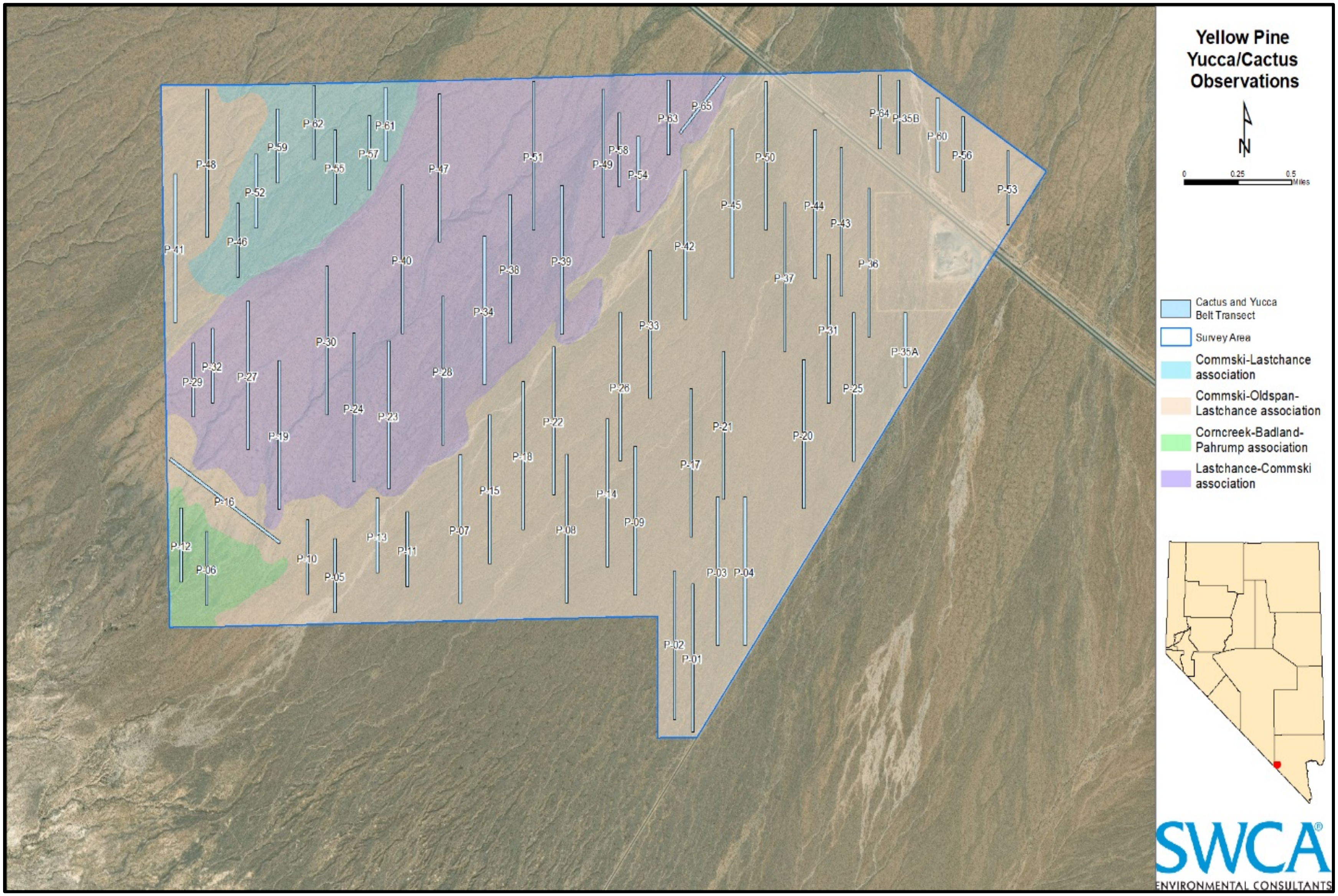

Figure 5. Cactus and yucca belt transects within the Survey Area.

Table 8. Number of individuals of each species by soil association (raw data)

Soil Association	CYAC	CYEC	ECEN	ECPO	GRPA	OPBA	YUSH	YUBR
Commski-Oldspan-Lastchance	30	249	119	124	273	282	5,746	3
Lastchance-Commski	19	39	5	50	19	35	1,684	0
Commski-Lastchance	9	19	2	15	6	15	806	0
Corncreek-Badland-Pahrump	2	0	0	1	0	9	122	0
Total Survey Area	60	307	126	190	298	341	8,358	3

The top three cacti species that occurred in the Survey Area were beavertail pricklypear at 341 individuals and 1.3 plants per acre, Wiggins' cholla at 307 individuals and 1.2 plants per acre, and matted cholla at 298 individuals and 1.1 plants per acre. Between the two species of yucca identified in the Survey Area, Mojave yucca had the highest population with 8,358 individuals at 31.6 plants per acre, while Joshua tree only had three individuals. The three Joshua tree individuals were observed in two belt transects (P-53 and P-56; see Figure 5) within the Commski-Oldspan-Lastchance soil association. Furthermore, both transects were in the southernmost portion of the Survey Area, east of highway SR 160.

Table 9. Density of each Cactus and Yucca species by soil association (raw data)

Soil Association	CYAC	CYEC	ECEN	ECPO	GRPA	OPBA	YUSH	YUBR
Commski-Oldspan-Lastchance	0.2	1.5	0.7	0.8	1.7	1.7	35.2	<0.1
Lastchance-Commski	0.2	0.5	0.1	0.6	0.2	0.4	21.3	0
Commski-Lastchance	0.5	1.1	0.1	0.9	0.3	0.9	46.6	0
Corncreek-Badland-Pahrump	0.4	0	0	0.2	0	1.8	24.9	0
Total Survey Area	**0.2**	**1.2**	**0.5**	**0.7**	**1.1**	**1.3**	**31.6**	**<0.1**

Table 9 shows the density of each cactus and yucca species per acre. Table 10 shows the estimated density of cacti and yucca within each soil association in the Survey Area, as extrapolated from the results of the belt transect survey.

Table 10. Estimated density of each Cactus and Yucca species by soil association for the Survey Area (extrapolated data)

Soil Association	CYAC	CYEC	ECEN	ECPO	GRPA	OPBA	YUSH	YUBR
Commski-Oldspan-Lastchance	547	4,543	2,171	2,263	4,981	5,146	104,844	55
Lastchance-Commski	385	791	101	1,014	385	710	34,148	0
Commski-Lastchance	175	369	39	291	117	291	15,654	0
Corncreek-Badland-Pahrump	47	0	0	23	0	211	2,863	0
Total Survey Area	**1,154**	**5,703**	**2,311**	**3,591**	**5,483**	**6,358**	**157,509**	**55**

3.2.1 Biological Soil Crust and Desert Pavement

Desert pavement and biocrust were found on every soil type within the Survey Area. The Corncreek-Badland-Pahrump soil association had the highest percent cover of desert pavement at 27%, with Lastchance-Commski, Commski-Lastchance, and Commski-Oldspan-Lastchance following at 15%, 13%, and 10%, respectively. The Lastchance-Commski soil association had the highest percent cover of biocrust at 4%. The total estimated percent cover of desert pavement for the Survey Area is 12%, or approximately 614 acres, while biocrust is estimated at 3%, or approximately 161 acres. Table 11 below summarizes the estimated amount of biocrust and desert pavement observed during belt transect sampling.

Table 11. Estimated area and percent cover of biocrust and desert pavement by soil association

Soil Association	Estimated Area (acres)		Area Surveyed (acres)	Percent Cover	
	Biocrust	Desert Pavement		Biocrust	Desert Pavement
Commski-Oldspan-Lastchance	89	298	163.1	3%	10%
Lastchance-Commski	64	241	79.1	4%	15%
Commski-Lastchance	7	44	17.3	2%	13%
Corncreek-Badland-Pahrump	1	31	4.9	1%	27%
Total	**161**	**614**	**264.4**	**3%**	**12%**

3.3 Quantitative Survey

3.3.1 Vegetation Sampling

LPI transect sampling was conducted for each of the 30 plots to estimate the cover, density, and species richness for each soil association (Figure 6). Eighteen plots were sampled in the Commski-Oldspan-Lastchance soil association, nine in the Lastchance-Commski soil association, two in the Commski-Lastchance soil association, and one in the Corncreek-Badland-Pahrump soil association. Soil types in the Survey Area are quantified in Table 4 and mapped in Figure 3. Plant cover, density, and species richness were assessed in each plot using LPI transects following the BLM AIM protocol (ARS 2018). The table below (Table 12) summarizes the percent cover, density, average species richness, and total number of species recorded during LPI transects, as well as total number of taxa recorded during the LPI and diversity inventory combined.

Table 12. Summary of percent cover, density, species richness, and total species for each soil association

Soil Association	Number of Plots	Estimated Percent Foliar Cover	Density (plants / acre)	Species Richness (number of species / acre)	Total Taxa (LPI only)	Total Taxa (LPI & inventory)
Commski-Oldspan-Lastchance	18	25.1%	73	6.7 [2.0][1]	19	53
Lastchance-Commski	9	17.7%	51	6.4 [1.9]	15	43
Commski-Lastchance	2	28.7%	81	11.5 [N/A]	14	35
Corncreek-Badland-Pahrump	1	8.7%	23	4 [N/A]	4	22

[1]Average [Standard Deviation]

The sampling indicated that Commski-Lastchance soil association supported vegetation, which had the highest percent foliar cover and plant density at 28.7% and 81 plants per acre, respectively. This was followed by the Commski-Oldspan-Lastchance soil association at 25.1% foliar cover and density of 73 plants per acre. The Lastchance-Commski soil association supported plants that were measured at

17.7% foliar cover and a density of 51 plants per acre, while the Corncreek-Badland-Pahrump soil association had the lowest percent foliar cover at 8.7% and a density of 23 plants per acre (see Table 12).

The Commski-Lastchance soil association also had the highest average species richness, calculated using data from LPI, at 11.5 species per plot, followed by Commski-Oldspan-Lastchance and Lastchance-Commski soil associations at 6.7 and 6.4 species per plot, respectively. Corncreek-Badland-Pahrump had the least, at 4 species per plot.

The Commski-Oldspan-Lastchance soil association had the most plant diversity between all the plots, with 19 species identified through LPI and 53 species identified during the diversity inventory. The Lastchance-Commski and Commski-Lastchance soil associations had the next highest plant diversity with 15 and 14 species identified through LPI, as well as 43 and 35 species identified during the diversity inventory, respectively. The Corncreek-Badland-Pahrump soil association had the lowest diversity with 4 species identified through LPI and 22 species identified during the diversity inventory.

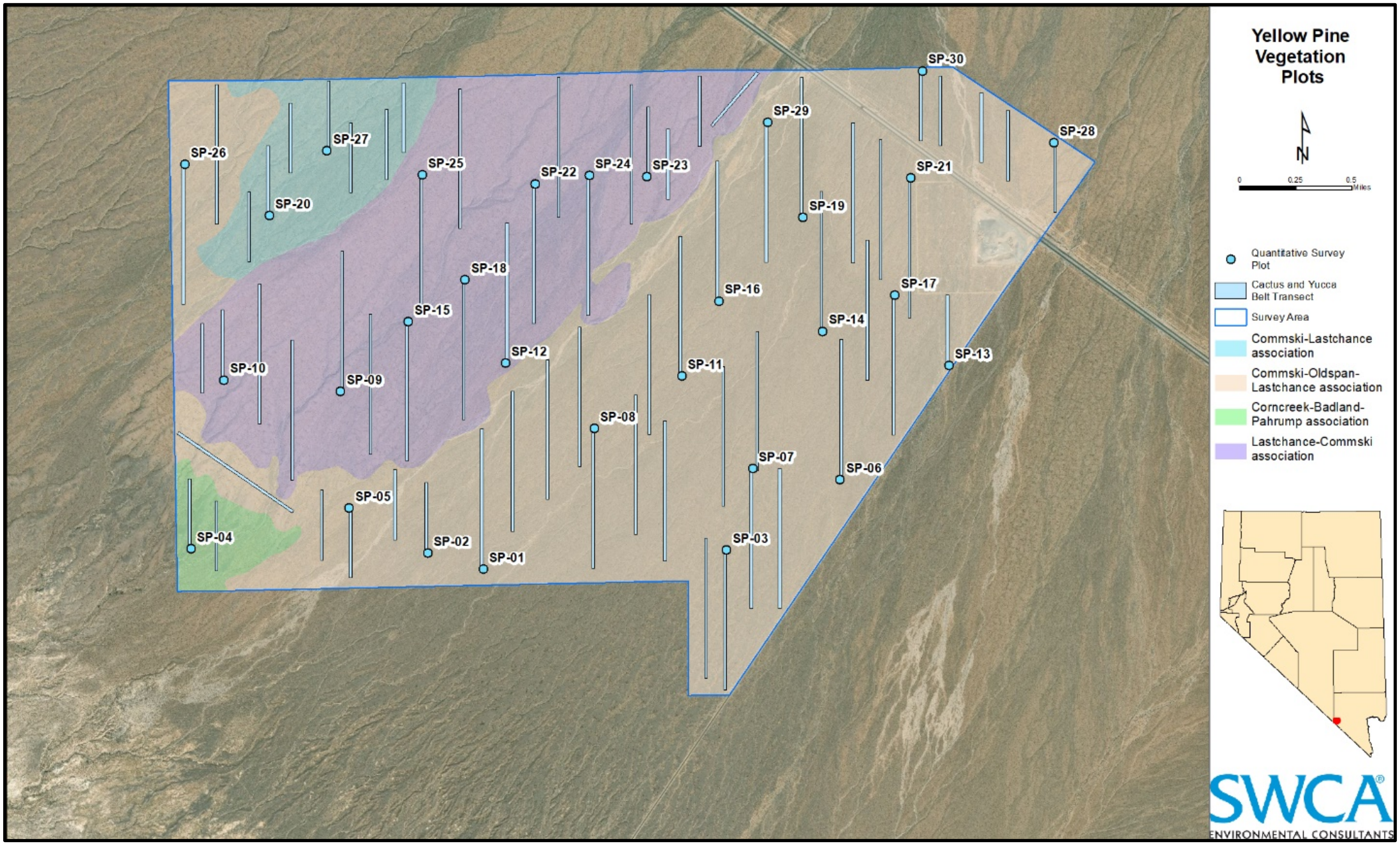

Figure 6. Quantitative vegetation plots within the Survey Area.

3.3.2 Commski-Oldspan-Lastchance

The Commski-Oldspan-Lastchance soil association is composed of 35% Commski, 30% Oldspan, 20% Lastchance, and 15% other minor components (NRCS 2018a). This soil association totals 2,977 acres of the Survey Area (see Table 4).

3.3.2.1 PERCENT FOLIAR COVER

The average percent foliar cover for plots within the Commski-Oldspan-Lastchance soil association was 25.1% from 19 species (Table 13). The species with the highest estimated cover was the invasive Mediterranean grass at 14.6%, followed by white bursage and creosote bush at 6.6% and 5.8% cover, respectively. Red brome had the fourth highest foliar cover at 1.9%. Throughout this soil type, commonly occurring species include littleleaf ratany (*Krameria erecta*), Mojave yucca, Nevada ephedra (*Ephedra nevadensis*), water jacket (*Lycium andersonii*), little desert buckwheat (*Eriogonum trichopes*), Mexican bladder sage (*Salazaria mexicana*), rayless goldenhead (*Acamptopappus sphaerocephalus* var. *hirtellus*), desert Indianwheat (*Plantago ovata*), and Virgin River brittlebush (*Encelia virginensis*). The species and their percent foliar cover are listed in Table 13.

Table 13. Percent foliar cover by species for the Commski-Oldspan-Lastchance soil association

Scientific Name	Common Name	Average Percent Foliar Cover
Schismus barbatus	Mediterranean grass	14.6
Ambrosia dumosa	white bursage	6.6
Larrea tridentata	creosote bush	5.8
Bromus madritensis var. *rubens*	red brome	1.9
Krameria erecta	littleleaf ratany	1.5
Yucca schidigera	Mojave yucca	0.9
Ephedra nevadensis	Nevada ephedra	0.7
Lycium andersonii	water jacket	0.6
Eriogonum trichopes	little desert buckwheat	0.5
Salazaria mexicana	Mexican bladder sage	0.3
Acamptopappus sphaerocephalus var. *hirtellus*	rayless goldenhead	0.2
Plantago ovata	desert Indianwheat	0.2
Ambrosia salsola	burrobrush	<0.1
Bromus tectorum	cheatgrass	<0.1
Descurainia pinnata	western tansy mustard	<0.1
Encelia virginensis	Virgin River brittlebush	<0.1
Krascheninnikovia lanata	winter fat	<0.1
Menodora spinescens	spiny desert olive	<0.1
Opuntia basilaris	beavertail cactus	<0.1

3.3.2.2 DENSITY

The plant density for plots within the Commski-Oldspan-Lastchance soil association was approximately 70 plants per acre from 10 species (Table 14). The species with the highest densities in this soil type were Mediterranean grass, white bursage, and creosote bush with approximately 31, 14, and 12 plants per acre, respectively.

Table 14. Plant density by species for the Commski-Oldspan-Lastchance soil association

Scientific Name	Common Name	Plants / Acre
Schismus barbatus	Mediterranean grass	31
Ambrosia dumosa	white bursage	14
Larrea tridentata	creosote bush	12
Bromus madritensis var. *rubens*	red brome	4
Krameria erecta	littleleaf ratany	3
Yucca schidigera	Mojave yucca	2
Ephedra nevadensis	Nevada ephedra	1
Eriogonum trichopes	little desert buckwheat	1
Lycium andersonii	water jacket	1
Salazaria mexicana	Mexican bladder sage	1
Total		**70**

There were several species recorded while conducting the LPI that were encountered infrequently. These species were excluded from the total number of plants per acre and instead are included here, making up the remainder of the 73 plants per acre from Table 12. Rayless goldenhead, desert Indianwheat, and Virgin River brittlebush had the highest densities from this group at about one plant for every 2, 3, and 6 acres, respectively. The remainder of the species, Burrobrush, cheatgrass, western tansy mustard, winter fat, spiny desert olive, and beavertail cactus were at densities of about one plant for every 13 acres.

3.3.2.3 SPECIES RICHNESS AND PLANT DIVERSITY

The average species richness for the plots within the Commski-Oldspan-Lastchance soil association is 6.7 species per acre with a standard deviation of 2.0. The total number of species intercepted during the LPI was 19, while the diversity inventory and LPI combined recorded 53 species, including variations and subspecies. A list of all species encountered within the quantitative survey, as well as the diversity inventory, can be found in Appendix C.

3.3.3 Lastchance-Commski

The Lastchance-Commski soil association is composed of 70% Lastchance, 15% Commski, and 15% other minor components (NRCS 2018a). This soil association totals 1,604 acres of the Survey Area (see Table 4).

3.3.3.1 PERCENT FOLIAR COVER

The average percent foliar cover for plots within the Lastchance-Commski soil association was 17.7% from 15 species (Table 15). The species with the highest estimated cover was the invasive Mediterranean grass at 12.4%, followed by creosote bush and white bursage at 4.0% and 2.7%, respectively. Throughout this soil type, commonly occurring species include littleleaf ratany, water jacket, Nevada ephedra, desert Indianwheat, spiny desert olive, Virgin River brittlebush, winter fat, desert almond (*Prunus fasciculata*), red brome, Mojave yucca, cattle saltbush (*Atriplex polycarpa*), and devil's spineflower (*Chorizanthe rigida*). The species and their average percent cover are listed in Table 15.

Table 15. Average Foliar Cover by Species for the Lastchance-Commski Soil Association

Scientific Name	Common Name	Percent Average Foliar Cover
Schismus barbatus	Mediterranean grass	12.4
Larrea tridentata	creosote bush	4.0
Ambrosia dumosa	white bursage	2.7
Krameria erecta	littleleaf ratany	1.4
Lycium andersonii	water jacket	1.3
Ephedra nevadensis	Nevada ephedra	0.6
Plantago ovata	desert Indianwheat	0.4
Encelia virginensis	Virgin River brittlebush	0.2
Krascheninnikovia lanata	winter fat	0.2
Menodora spinescens	spiny desert olive	0.2
Prunus fasciculata	desert almond	0.2
Atriplex polycarpa	cattle saltbush	<0.1
Bromus madritensis var. *rubens*	red brome	<0.1
Chorizanthe rigida	devil's spineflower	<0.1
Yucca schidigera	Mojave yucca	<0.1

3.3.3.2 DENSITY

The plant density for the plots within the Lastchance-Commski soil association is approximately 50 plants per acre from seven species (Table 16). The species with the highest densities in this soil type were Mediterranean grass, creosote bush, and white bursage with approximately 27, 9, and 6 plants per acre, respectively.

Table 16. Density by Species for the Lastchance-Commski Soil Association

Scientific Name	Common Name	Plants / Acre
Schismus barbatus	Mediterranean grass	27
Larrea tridentata	creosote bush	9
Ambrosia dumosa	white bursage	6
Krameria erecta	littleleaf ratany	3
Lycium andersonii	water jacket	3
Ephedra nevadensis	Nevada ephedra	1
Plantago ovata	desert Indianwheat	1
Total		**50**

There were several species recorded while conducting the LPI that were encountered infrequently. These species were excluded from the total number of plants per acre and are included here, making up the remainder of the 51 plants per acre from Table 12. Virgin River brittlebush, winter fat, spiny desert olive, and desert almond all had densities of about one plant for every 2 acres. Red brome, Mojave yucca, cattle saltbush, and devil's spineflower all had densities of about one plant for every 6 acres.

3.3.3.3 SPECIES RICHNESS AND PLANT DIVERSITY

The average species richness for the plots within the Lastchance-Commski soil association was 6.4 species per acre with a standard deviation of 1.9. The total number of species intercepted during the LPI was 15, while the diversity inventory and LPI combined recorded 43 total species, including variations and subspecies. A list of all species encountered within the quantitative survey, as well as the diversity inventory, can be found in Appendix C.

3.3.4 Commski-Lastchance

The Commski-Lastchance soil association is composed of 70% Commski, 15% Lastchance, and 15% other minor components (NRCS 2018a). This soil association totals 336 acres of the Survey Area (see Table 4).

3.3.4.1 PERCENT FOLIAR COVER

The average percent foliar cover for the plots within the Commski-Lastchance soil association was 28.7% by 14 species (Table 17). The species with the highest estimated cover was the invasive Mediterranean grass at 15.3%, followed by white bursage and creosote at 8.0% and 3.0%, respectively. Throughout this soil type, commonly occurring species include Nevada ephedra, littleleaf ratany, red brome, Virgin River brittlebush, desert Indianwheat, Mojave yucca, burrobrush, water jacket, rayless goldenhead, buckhorn cholla, and California buckwheat. The species and their relative percent cover are listed in Table 17.

Table 17. Average Foliar Cover by Species for the Commski-Lastchance Soil Association

Scientific Name	Common Name	Percent Average Foliar Cover
Schismus barbatus	Mediterranean grass	15.3
Ambrosia dumosa	white bursage	8.0
Larrea tridentata	creosote bush	3.0
Ephedra nevadensis	Nevada ephedra	2.7
Krameria erecta	littleleaf ratany	2.0
Bromus madritensis var. *rubens*	red brome	1.7
Encelia virginensis	Virgin River brittlebush	1.3
Plantago ovata	desert Indianwheat	1.0
Ambrosia salsola	burrobrush	0.7
Yucca schidigera	Mojave yucca	0.7
Acamptopappus sphaerocephalus var. *hirtellus*	rayless goldenhead	0.3
Cylindropuntia acanthocarpa	buckhorn cholla	0.3
Eriogonum fasciculatum	California buckwheat	0.3
Lycium andersonii	water jacket	0.3

3.3.4.2 DENSITY

The plant density for the plots within the Commski-Lastchance soil association is approximately 81 plants per acre from 14 species (Table 18). The species with the highest densities in this soil type were Mediterranean grass and white bursage with approximately 33 and 17 plants per acre, respectively.

Table 18. Density by Species for the Commski-Lastchance Soil Association

Scientific Name	Common Name	Plants / Acre
Schismus barbatus	Mediterranean grass	33
Ambrosia dumosa	white bursage	17
Ephedra nevadensis	Nevada ephedra	6

Scientific Name	Common Name	Plants / Acre
Larrea tridentata	creosote bush	6
Bromus madritensis var. *rubens*	red brome	4
Krameria erecta	littleleaf ratany	4
Encelia virginensis	Virgin River brittlebush	3
Plantago ovata	desert Indianwheat	2
Acamptopappus sphaerocephalus var. *hirtellus*	rayless goldenhead	1
Ambrosia salsola	burrobrush	1
Cylindropuntia acanthocarpa	buckhorn cholla	1
Eriogonum fasciculatum	California buckwheat	1
Lycium andersonii	water jacket	1
Yucca schidigera	Mojave yucca	1
Total		**81**

3.3.4.3 SPECIES RICHNESS AND PLANT DIVERSITY

The average species richness for the plots within the Commski-Lastchance soil association is 11.5 species per acre. Since we get this average from only two data points, we cannot calculate the standard deviation. The total number of species intercepted during the LPI was 14, while the diversity inventory and LPI combined recorded 35 total species, including variations and subspecies. A list of all species encountered within the quantitative survey, as well as the plant diversity inventory, can be found in Appendix C.

3.3.5 Corncreek-Badland-Pahrump

The Corncreek-Badland-Pahrump soil association is composed of 35% Corncreek, 30% Badland, 20% Pahrump, and 15% other minor components (NRCS 2018a) This soil association totals approximately 115 acres of the Survey Area (see Table 4).

3.3.5.1 PERCENT FOLIAR COVER

The average percent foliar cover for the plot within the Corncreek-Badland-Pahrump soil association was 8.7% by four species (Table 19). The species with the highest estimated cover was white bursage at 6.0%, followed bythe invasive Mediterranean grass and creosote bush at 2.0% each. The other commonly occurring species was spiny desert olive at 0.7% foliar cover. The species and their relative percent cover are listed in Table 19.

Table 19. Average Foliar Cover by Species for the Corncreek-Badland-Pahrump Soil Association

Scientific Name	Common Name	Percent Average Foliar Cover
Ambrosia dumosa	white bursage	6.0
Larrea tridentate	creosote bush	2.0
Schismus barbatus	Mediterranean grass	2.0
Menodora spinescens	spiny desert olive	0.7

3.3.5.2 DENSITY

The plant density for the plot in the Corncreek-Badland-Pahrump soil association is approximately 23 plants per acre from four species (Table 20). The species with the highest density in this soil type was white bursage with approximately 13 plants per acre.

Table 20. Density by Species for the Corncreek-Badland-Pahrump Soil Association

Scientific Name	Common Name	Plants / Acre
Ambrosia dumosa	white bursage	13
Larrea tridentate	creosote bush	4
Schismus barbatus	Mediterranean grass	4
Menodora spinescens	spiny desert olive	1
Total		**22**

3.3.5.3 SPECIES RICHNESS AND PLANT DIVERSITY

The species richness for the plot within the Corncreek-Badland-Pahrump soil association is 4 species per acre. Since we get this number from only one data point, we cannot calculate the standard deviation. There were four total species intercepted during the LPI, while the diversity inventory and LPI combined recorded 22 total species, including variations and subspecies. A list of all species encountered within the quantitative survey, as well as the diversity inventory, can be found in Appendix C.

3.3.6 Vegetation Height

The Corncreek-Badland-Pahrump soil association had the highest average woody vegetation height within the Survey Area at 56.2 cm, while the Commski-Oldspan-Lastchance soil association had the second highest average woody height at 45.8 cm. The Commski-Oldspan-Lastchance soil association also had the highest herbaceous height at 6.3 cm. The average vegetation height for the soil associations within the Survey Area are provided in Table 21.

Table 21. Average Woody and Herbaceous Vegetation Height by Soil Association

Soil Association	Average Woody Height (cm)	Average Herbaceous Height (cm)
Commski-Oldspan-Lastchance	45.8	6.3
Lastchance-Commski	44.3	4.5
Commski-Lastchance	40.3	4.6
Corncreek-Badland-Pahrump	56.2	5.1
Total Average	46.7	5.1

3.3.7 Canopy and Basal Gaps

The average percent canopy and basal gap for each soil association within the Survey Area are provided in Table 22.

Table 22. Average Percent Canopy and Basal Gaps by Size Class and Soil Association

Soil Association	Canopy Gap in %					Basal Gap in %				
	<25	25-50	51-100	101-200	>200	<25	25-50	51-100	101-200	>200
Commski-Oldspan-Lastchance	11.7%	0.5%	2.1%	8.3%	77.5%	2.8%	0.3%	0.5%	2.4%	94.0%
Lastchance-Commski	9.5%	0.4%	1.4%	3.8%	84.9%	1.0%	0.0%	0.4%	0.6%	98.0%
Commski-Lastchance	13.7%	0.9%	3.3%	8.8%	73.3%	0.9%	0.0%	0.5%	3.2%	95.4%
Corncreek-Badland-Pahrump	4.8%	0.0%	0.0%	5.8%	89.4%	0.6%	0.0%	0.0%	0.0%	99.4%
Total	10.9%	0.5%	1.9%	6.9%	79.8%	2.0%	0.2%	0.4%	1.8%	95.5%

3.3.8 Soil Stability

The Corncreek-Badland-Pahrump soil association had the highest soil stability rating. Soil stability was averaged for both unprotected samples and protected samples. Protected samples had 50% or greater vegetative cover from either shrubs, forbs, or grass, while unprotected samples had less than 50% cover. The average soil stability for each soil association within the Survey Area is provided in Table 23.

Table 23. Average Soil Stability Rating by Soil Association

Soil Association	Soil Cover		Total Average
	Unprotected	Protected	
Commski-Oldspan-Lastchance	3.71	4.42	4.16
Lastchance-Commski	3.40	4.03	3.81
Commski-Lastchance	3.55	4.63	4.01
Corncreek-Badland-Pahrump	N/A	4.67	4.67
Average Total	**3.71**	**4.42**	**4.16**

Note: Values in the table are soil stability ratings, in a range from 1 to 6, with 1 equal to the lowest soil stability and 6 equal to the highest soil stability. N/A is due to all samples collected within that soil association having some form of cover (i.e., covered by tree, shrub, forb, or grass)

4 RATIONALE AND SYNOPSIS OF RESULTS

4.1 Soil Associations

Vegetation surveys were organized and analyzed through the perspective of the soil associations present within the Survey Area. In our experience, a soil centric approach, in conjunction with vegetation community data, may predict potential habitat for Mojave Desert special status plant species compared to assessing using vegetation community alone. Four soil associations were present within the Survey Area: Commski-Oldspan-Lastchance, Lastchance-Commski, Commski-Lastchance, and Corncreek-Badland-Pahrump.

The Commski-Oldspan-Lastchance soil association is characterized by well-drained, gravelly fine sandy loam, derived from limestone, dolomite, and sandstone parental material, and deposited in fan remnants (NRCS 2018a). This soil association is one of the more common in southern Clark County, Nevada, covering about 2% of the area (NRCS 2018b). Although not uniquely related with Commski-Oldspan-Lastchance soil associations, creosote bush is the dominant vegetation community covering this soil type within the Survey Area.

The Lastchance-Commski soil association is characterized by well-drained, extremely gravelly to very gravelly loam, derived from limestone and dolomite parental material, and deposited in fan remnants (NRCS 2018a). This soil association is relatively common within southern Clark County, Nevada, covering about 0.2% of the area (NRCS 2018b). Mojave Mid-Elevation Mixed Desert Scrub is the dominant vegetation community covering this soil type within the Survey Area.

The Commski-Lastchance soil association, similar to the previous soil associations, has well-drained, very gravelly to extremely gravelly sandy loam, derived from limestone and dolomite, and deposited alluvially into inset fans (NRCS 2018a). This soil association is common in southern Clark County, Nevada, covering about 0.5% of the area (NRCS 2018b).

Although comprising only a small portion of acreage within the Survey Area, the Corncreek-Badland-Pahrump soil association was of interest due to its potential to support special status species. Located in the southwestern corner of the Survey Area, this soil association is characterized by very slightly saline to strongly saline soils formed in limestone-derived alluvium and lacustrine deposits. Soils vary from gravelly to extremely gravelly, comprise fine sandy loam, loam, and silt loam textures, and are found along fan skirts, relict lakebeds, and lake terraces (NRCS 2018a). Within the Survey Area this soil association is completely covered by the creosote bush vegetation community.

4.2 Special Status Plants

During the desktop analysis we identified two species with the potential to occur within the Survey Area: halfring milkvetch and Pahrump Valley buckwheat. Halfring milkvetch is an early-flowering annual in the Pea Family (Fabaceae). This variety is very similar in appearance to the Mojave milkvetch (*Astragalus mohavensis* var. *mohavensis*), but unlike Mojave milkvetch, halfring milkvetch have slightly smaller flowers and shorter, curved or coiled fruits (NNHP 2001).

Halfring milkvetch is known to occur in carbonate gravels and derivative soils on terraced hills and ledges, open slopes, and along washes in creosote bush, blackbrush, and mixed shrub zones (NNHP 2001). Halfring milkvetch are also known to occur at an elevation between 914 and 1,706 m (3,000–5,600 feet) in Nye, Lincoln, and Clark Counties in southern Nevada, and historically in Inyo County, California, but has since been extirpated (NRCS 2018c; NNHP 2001). Some habitat is vulnerable to off-road vehicle use and other recreational activities, dumping, and feral horse and burro trampling (NNHP 2001). Vulnerabilities from invasive species are not well known but are likely sensitive to resource and spatial competition.

Our field reconnaissance conducted in August 2017 indicated that potentially suitable habitat was not present for halfring milkvetch. Reference populations for this species occur within rockier habitat, among terraces, and are generally located in the foothills of the Spring Mountains. These observations are supported by the NNHP (2001) characterization of preferred habitat above.

Pahrump Valley buckwheat is a late-spring annual in the Buckwheat Family (Polygonaceae). Plants are usually solitary and low-growing with a basal rosette of leaves, 10–40 cm tall with inflorescence. The leaves are generally 1–3 cm long, more or less round and covered with wooly hairs. Inflorescences can be 5–30 cm in length and 10–50 cm wide, generally spreading and branched without hairs. Flowers are typically sessile or, if stalked, the peduncle is quite small. Petals are white to faintly pink with outer obovate-cordate lobes and inner lanceolate lobes. Fruits are 2–2.3 mm long, brown, and hairless

(Reveal and Rosatti 2012). This species is most closely related to *Eriogonum insigne* and it is difficult to distinguish between immature specimens (NNHP 2001).

Pahrump Valley buckwheat occurs on alkaline sand flats and slopes, within saltbush communities at elevations of 600–800 m (1,969–2,700 feet). This species also occurs on adjacent shore terraces and stabilized sand dunes with saltbush species (*Atriplex* spp.), honey mesquite (*Prosopis glandulosa*), seablite (*Suaeda moquinii*), and spiny hopsage (*Grayia spinosa*) (NNHP 2001). Pahrump Valley buckwheat are known to straddle the Nevada/California state line, from Stewart, Pahrump, and Mesquite Valleys in Nye and Clark Counties, Nevada, as well as Inyo and San Bernardino Counties, California (NRCS 2018c; NNHP 2001). Although this species tolerates moderate transient disturbance, its habitat is vulnerable to commercial and residential development, agricultural conversion, off-road vehicle activities, and dumping (NNHP 2001).

SWCA considered the Corncreek-Badland-Pahrump soil association as potentially suitable habitat for Pahrump Valley buckwheat due to its salinity and association with relict lakebeds and lake terraces. Evaluation of this soil type during reconnaissance surveys on March 30, 2017 indicated that habitat is limited in comparison with known reference populations. The Survey Area lacks the loose sandy soils where Pahrump Valley buckwheat is typically identified. The reference population was located prior to conducting the protocol survey. Despite the timing of the reference site visit, individual Pahrump Valley buckwheat were identifiable and distinguished from other annual buckwheat. Special status surveys conducted on June 16 and 17, 2018 did not encounter individuals of Pahrump Valley buckwheat within the Survey Area. Furthermore, on October 24, 2018, quantitative survey transects were completed within the Corncreek-Badland-Pahrump soil association. During these surveys, individuals of Pahrump Valley buckwheat were not observed. A complete list of all plant taxa identified during the survey is included in Appendix C.

4.3 Noxious and Invasive Weeds

Invasive weeds were ubiquitous throughout the Survey Area. The most prevalent of the invasive species identified was Mediterranean grass (*Schismus barbatus*) with an estimated population of nearly 150,000 individuals. Mediterranean grass is an annual in the Grass Family (Poaceae) native to southwest Asia. Two species are commonly found in the southwestern states, *S. arabicus* and *S. barbatus*. They are difficult to distinguish between each other but have similar ecological effects. Invading mostly disturbed areas and deserts, these species contribute to the conversion of desert shrubland into annual grassland by carrying fire across open areas, where they ignite and kill native shrubs (California Invasive Plant Council [CIPC] 2018). They are known to occur at an elevation below 6,233 feet in most of southern California, as well as Nye and Clark Counties in Nevada (NRCS 2018c).

Also present within the Survey Area, but to a lesser extent, were two brome species: red brome and cheatgrass. Red brome is winter annual in the Grass Family (Poaceae) native to southern and southwestern Europe. This species invades disturbed areas including roadsides, agricultural fields, rangelands in a variety of habitats including desert shrublands, pinyon-juniper communities, pine woodlands, and coastal scrub (CIPC 2018). They are known to occur at an elevation below 7,000 feet in much of the western United States including southern Nevada, documented within Clark, Nye, and Lincoln Counties and much of southern California (NRCS 2018c). Red brome invasion contributes to increases in fire frequency and converts natural habitat to annual grassland (CIPC 2018).

Cheatgrass is a winter annual in the Grass Family (Poaceae) native to Eurasia and North Africa. This species invades disturbed and overgrazed ground around rangelands, fields, sand dunes, road verges, and waste areas. It is highly competitive and dominates rapidly after fire, especially in sagebrush areas. The resulting dense, fine fuels permanently shorten the fire-return interval, further hindering reestablishment of native species. Cheatgrass now dominates large areas of the sagebrush ecosystem of the western United States. Cheatgrass is known to occur within every state within the United States. It occurs at elevations below 11,154 feet in every county within Nevada (Gould 1980; NRCS 2018c).

Each of these invasive species are ecosystem engineers in respect to their capacity to alter natural fire regimes. Increased presence of these species can increase the chance of wildfire. During construction of the Project there is risk to transport and spread these invasive species to new, previously unaffected areas throughout the site. They may also have a negative effect on restoration success once the project is decommissioned. Care should be taken during construction, and especially during salvage efforts, to not spread these species.

No noxious weeds were found within the Survey Area. There is a risk in transmission of noxious weeds into the Survey Area during construction from commercial and personal vehicles. Care should be taken during construction and salvage efforts to reduce the spread of noxious weeds.

4.4 Vegetation Communities

The native vegetation communities that comprise the Survey Area are common desert shrubland and wash communities of the Mojave Desert and are typical natural communities of the region.

During the quantitative vegetation surveys and using the BLM AIM protocol, SWCA botanists measured several metrics to better understand key ecosystem attributes of the baseline, pre-construction conditions, which will in turn aid salvage efforts in the future. These metrics include vegetation height, canopy and basal gaps, and soil stability, as well as the usual metrics informed from conducting LPI transects such as vegetation composition.

4.5 Cactus and Yucca Density Estimates

The cacti and yucca populations in the Survey Area are typical of that found within the Mojave Desert.

4.5.1 Biological Soil Crust and Desert Pavement

Biological soil crust, or biocrust, is an association between soil particles and cyanobacteria, algae, microfungi, lichens, and bryophytes living within or on top of the uppermost millimeters (mm) of soil (Rosentreter et al. 2007). Biocrusts are an important factor in soil stability, nutrient cycling, and water infiltration (Rosentreter et al. 2007). Desert pavement is a surface layer of loosely cemented pebbles and cobblestones where the wind has swept away all smaller particles. The presence of desert pavement, like biocrust, helps stabilize the soil from wind erosion and water infiltration.

The biocrust and desert pavement observed within the Survey Area are typical of that found within the Mojave Desert.

5 SURVEYOR QUALIFICATIONS

The following botanical survey staff conducted the botanical inventory including the vegetation, cacti/yucca, invasive weed, biocrust/desert pavement, and soil sampling activities. Resumes for all biologists were submitted to Lara Kobelt, Southern Nevada District Botanist for the BLM, and were approved prior to the start of field work.

Ian McCowen: B.S. in Botany from Humboldt State University, Arcata, California (2017). Ian McCowen has been working as a field biologist for a variety of research programs since 2014. A trained botanist, he has worked in environments ranging from basins and deserts to foothills and alpine environments. He has worked throughout much of the western United States including surveys in California, the Rocky Mountains, and the Mojave Desert. Mr. McCowen conducted the cacti/yucca density estimates and quantitative vegetation survey transects, as well as assisted on the technical report.

Kevin Thomas: B.S. in Botany and Wildlife from Humboldt State University, Arcata, California (2004). Kevin Thomas has been working as a field biologist and biological consultant since 2000. Acquiring much of his field experience in the western United States, Mr. Thomas has extensive knowledge in desert ecosystems identifying native and non-native plant species, leading a field crew, and monitoring construction projects. Mr. Thomas conducted the special status plant inventory, cacti/yucca density estimates, and quantitative vegetation survey transects.

Nichole Nesbihal: B.S. from Kansas State University, Manhattan, Kansas (2011). Nichole Nesbihal has been working as a field assistant since 2016. Most of her work has been in arid and semi-arid environments in California and Nevada. She has experience with identifying native and non-native species, as well as with construction monitoring for sensitive species such as the desert tortoise. Ms. Nesbihal conducted the special status plant inventory, cacti/yucca density estimates, and quantitative vegetation survey transects.

Rich Crawford: M.S. in Botany; University of Northern Arizona, Flagstaff, Arizona (2015). Rich Crawford has been conducting biological field surveys in the southwestern U.S. since 2005. Through this time spent performing field surveys, he has familiarized himself with desert flora. Mr. Crawford has completed plant inventories, cacti/yucca density estimates, and quantitative vegetation survey transects on projects throughout the Desert Southwest. Mr. Crawford has also published several papers describing regional flora and new plant species.

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APPENDIX A

YPSP Habitat Assessment

SWCA® ENVIRONMENTAL CONSULTANTS

Sound Science. Creative Solutions.®

Special-Status Plant Habitat Assessment for the Proposed Yellow Pine Solar Project

Prepared for

NextEra Energy Resources

Prepared by

SWCA Environmental Consultants

June 2017

SPECIAL-STATUS PLANT HABITAT ASSESSMENT FOR THE PROPOSED YELLOW PINE SOLAR PROJECT

Prepared for

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SWCA Project No. 37332

June 2017

1.0 INTRODUCTION

SWCA Environmental Consultants (SWCA) was retained by NextEra Energy Resources, LLC (NextEra), to complete a special-status plant habitat assessment for their proposed Yellow Pine Solar Project, a solar power generation facility located near Pahrump within Clark County, Nevada. For this analysis, we consider NextEra's application area, which is located to the southwest of the intersection of State Route 160 and Tecopa Road (Figure 1) and is situated entirely on lands managed by the Bureau of Land Management (BLM). NextEra will identify a smaller project area within the application area prior to project design. The application area is bounded by the Spring Mountain Range to the northeast and the Nopah Mountain Range to the southwest. The application area can be found in the following locations as depicted on the U.S. Geological Survey (USGS) Hidden Hills Ranch and Lost Cabin Spring 7.5-minute quadrangles:

- Portions of Sections 31–34, Township 21 South, Range 55 East
- Sections 1–14 (excludes some portions of Sections 1–3, 6–9), Township 22 South, Range 55 East
- Sections 7, 17, and 18 (excludes some portions of Sections 7 and 17), Township 22 South, Range 56 East

A habitat assessment is a screening method that is typically employed for projects on BLM-managed lands. The habitat assessment seeks to quantify the extent of suitable habitat for special-status plant species (including species listed by the BLM, U.S. Fish and Wildlife Service, and the State of Nevada) based on a desktop review of habitat and known plant occurrences and supporting field reconnaissance surveys. Based on the findings of the habitat assessment, the need and extent of targeted surveys is presented, along with proposed survey methods.

A variety of publically available data sources was used to inform the desktop analysis of soil, vegetation, and sensitive plant resources in the area. Field reconnaissance surveys were also done in order to assess the presence of suitable habitat within the application area and examine known sensitive plant populations. Observations from desktop analysis and field reconnaissance were used to delineate a proposed sensitive plant survey area for the BLM. The details of this process are provided herein.

2.0 METHODS

This habitat assessment was informed by a combination of desktop analyses and field reconnaissance, which were used in conjunction to delineate a proposed survey area.

2.1 Desktop Analysis

Desktop analysis of the application area was done using ArcMap geographic information system (GIS) software. The following data sources were considered during analysis:

- Southwest Regional Gap Analysis Project (SWReGAP) land cover data (USGS 2004) for the application area.
- Soil Survey Geographic (SSURGO) soils data (Natural Resources Conservation Service [NRCS] 2017) for the application area.
- Nevada Natural Heritage Program (NNHP) data (Appendix A) for the application area surrounding
5-mile buffer.

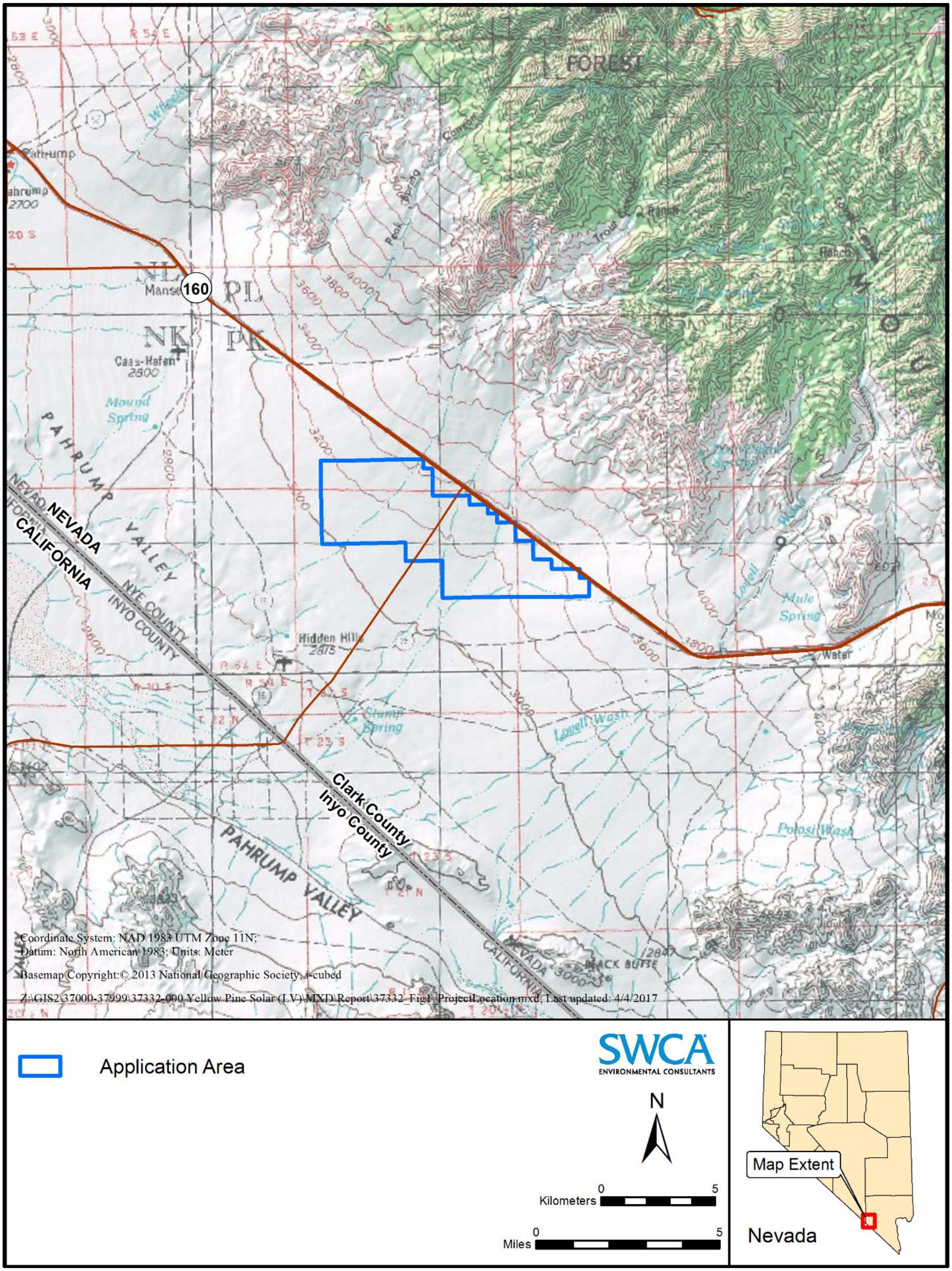

Figure 1. Application area overview.

2.2 Initial Survey Area Delineation

A GIS-based approach was used to delineate the survey area for sensitive plant species with potential to occur within the application area. NNHP (2017) data for sensitive plants species located within the application area and 5-mile buffer (see Appendix A) were evaluated in conjunction with SWReGAP land cover (USGS 2004) and SSURGO soils data (NRCS 2017) to determine the unique land cover and soil combinations which support sensitive species. To complete this analysis, all sensitive plant data within the 5-mile buffer were included.

Unique combinations of soil and land cover were then determined for the proposed application area. Any soil and land cover combinations that exactly matched those identified from sensitive species polygons were considered suitable habitat.

2.3 Field Reconnaissance

Field reconnaissance was led by BLM-approved botanist, Matt Villaneva. During this effort the application area and initial survey area delineation for suitable sensitive plant habitat were evaluated. Nearby sensitive plant populations identified through desktop analysis were visited to assess habitat characteristics that support these species. Habitat characteristics evaluated included relative vegetation cover, co-occurring plant species, and general soil characteristics.

Following the evaluation of the habitat characteristics supporting nearby sensitive plant populations, SWCA biologists evaluated the same criteria within the areas identified for survey (i.e., the initial survey area; see Section 2.2). The initial survey area was evaluated through meandering surveys and traveling along available access roads. SWCA biologists created a general species list and photographs at discrete locations within the reference populations and initial survey area.

2.4 Proposed Survey Area

SWCA evaluated observational field data in conjunction with the results of the desktop analysis. Based on this evaluation, SWCA delineated the proposed survey area using GIS-based tools. The proposed survey area includes all portions of the application area considered to have potential to support sensitive plants.

3.0 RESULTS

3.1 Desktop Analysis

3.1.1 SWReGAP Land Cover Data

Land cover data (USGS 2004) were assessed for the application area, resulting in the identification of four types of vegetation cover (Table 1; Figure 2). One land cover type accounts for approximately 68% of the application area: Sonora-Mojave Creosotebush-White Bursage Desert Scrub (creosote bush), followed by the Mojave Mid-Elevation Mixed Desert Scrub (mixed desert scrub) community which comprises approximately 30% of the application area. None of the land cover types identified are unique or known to support special-status plants. It should be noted that these land cover data are developed using remote-sensing techniques for very large areas, which can result in inaccuracies at a project-specific level, especially related to communities with small percentages of an area. However, land cover data do provide a good understanding of the major vegetation communities in the general vicinity.

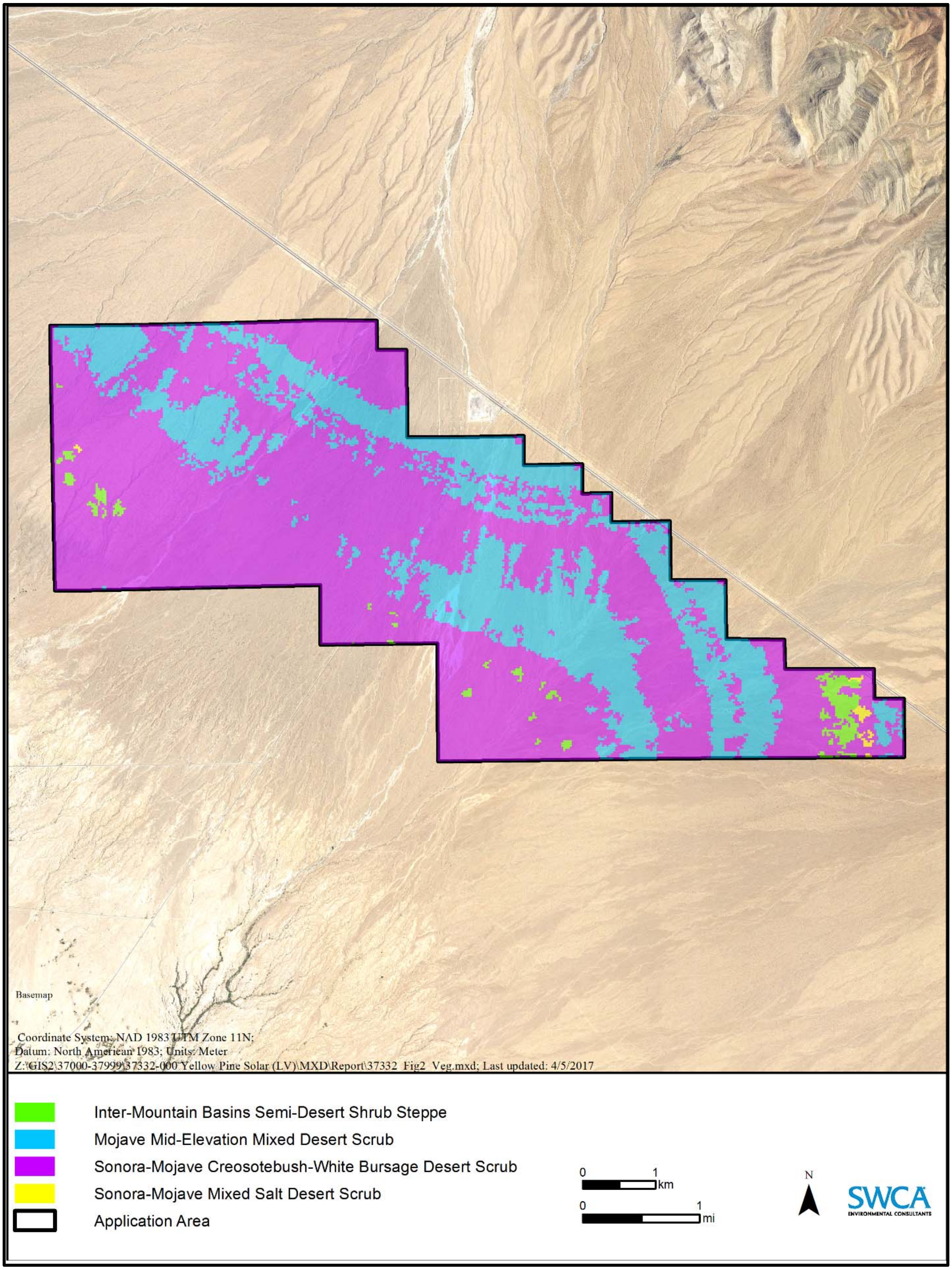

Figure 2. Vegetation land cover types in the application area.

Table 1. Vegetation Communities within the Application Area based on USGS 2004 data

Vegetation Community	Acres	Percentage of Application Area
Inter-Mountain Basins Semi-Desert Shrub Steppe	140.18	1.51
Mojave Mid-Elevation Mixed Desert Scrub	2,778.75	29.91
Sonora-Mojave Creosotebush-White Bursage Desert Scrub	6,353.67	68.39
Sonora-Mojave Mixed Salt Desert Scrub	18.04	0.19
Total	**9,290.64**	**100.00**

3.1.2 SSURGO Soils Data

There are five soil types present within the application area (Table 2; NRCS 2017). One soil type, the Commski-Oldspan-Lastchance association, makes up the majority of the application area, covering 77% of the application area. The second most common association is the Lastchance-Commski association, covering 17% of the site. Figure 3 shows the distribution of soil types across the application area. In general, these soil associations consist of sandy loam that are well drained. As with land cover data, SSURGO data are prepared at a large scale and can have inaccuracies at the project-specific scale.

The dominant soils type, Commski-Oldspan-Lastchance association, occurs along fan remnants and consists of well-drained, non-saline to moderately saline soils derived from limestone and dolomite parent materials. Soils vary from very gravelly to extremely gravelly and comprise loam, sandy loam, and very fine sandy loam textures.

Although only a minor component of the soils within the application area, the Corncreek-Badland-Pahrump association is of interest due to its potential to support target species. This association is found along fan skirts, relict lakebeds, and lake terraces, and consists of very slightly saline to strongly saline soils formed in limestone-derived alluvium and lacustrine deposits. Soils vary from gravelly to extremely gravelly and comprise fine sandy loam, loam, and silt loam textures.

Table 2. Soil Associations within the Application Area

Soil Association	Acres	Percentage of Application Area
Commski-Lastchance association	335.24	3.61
Commski-Oldspan-Lastchance association	7,156.16	77.03
Corncreek-Badland-Pahrump association	114.96	1.24
Irongold-Weiser association	81.59	0.88
Lastchance-Commski association	1,602.69	17.25
Total	**9,290.64**	**100.00**

3.1.3 Nevada Natural Heritage Program / Data Query

An NNHP data request did not result in the identification of any special-status plants within the application area, but did identify three BLM Sensitive species within 5 miles of the application area: halfring milkvetch (*Astragalus mohavensis* var. *mohavensis*), Mojave milkvetch (*Astragalus mohavensis* var. *hemigyrus*), and Pahrump Valley buckwheat (*Eriogonum bifurcatum*) (see Appendix A; Table 3, Figure 4). Ivory-spined agave (*Agave utahensis* var. *eborispina*) was identified but not analyzed. This species is no longer a BLM special-status species and would be treated in the same manner as all cactus and yucca species occurring in the application area.

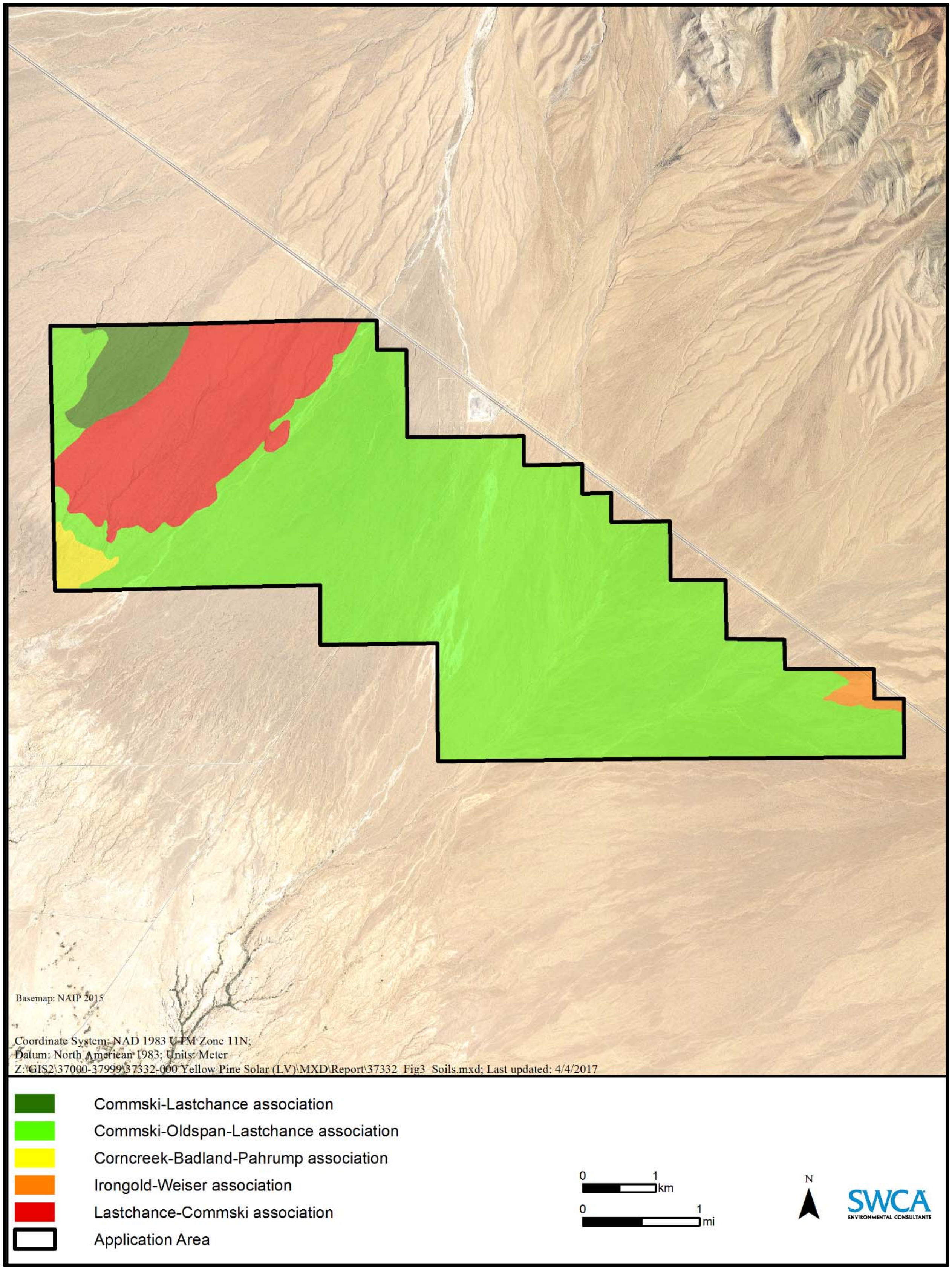

Figure 3. Soil types in the application area.

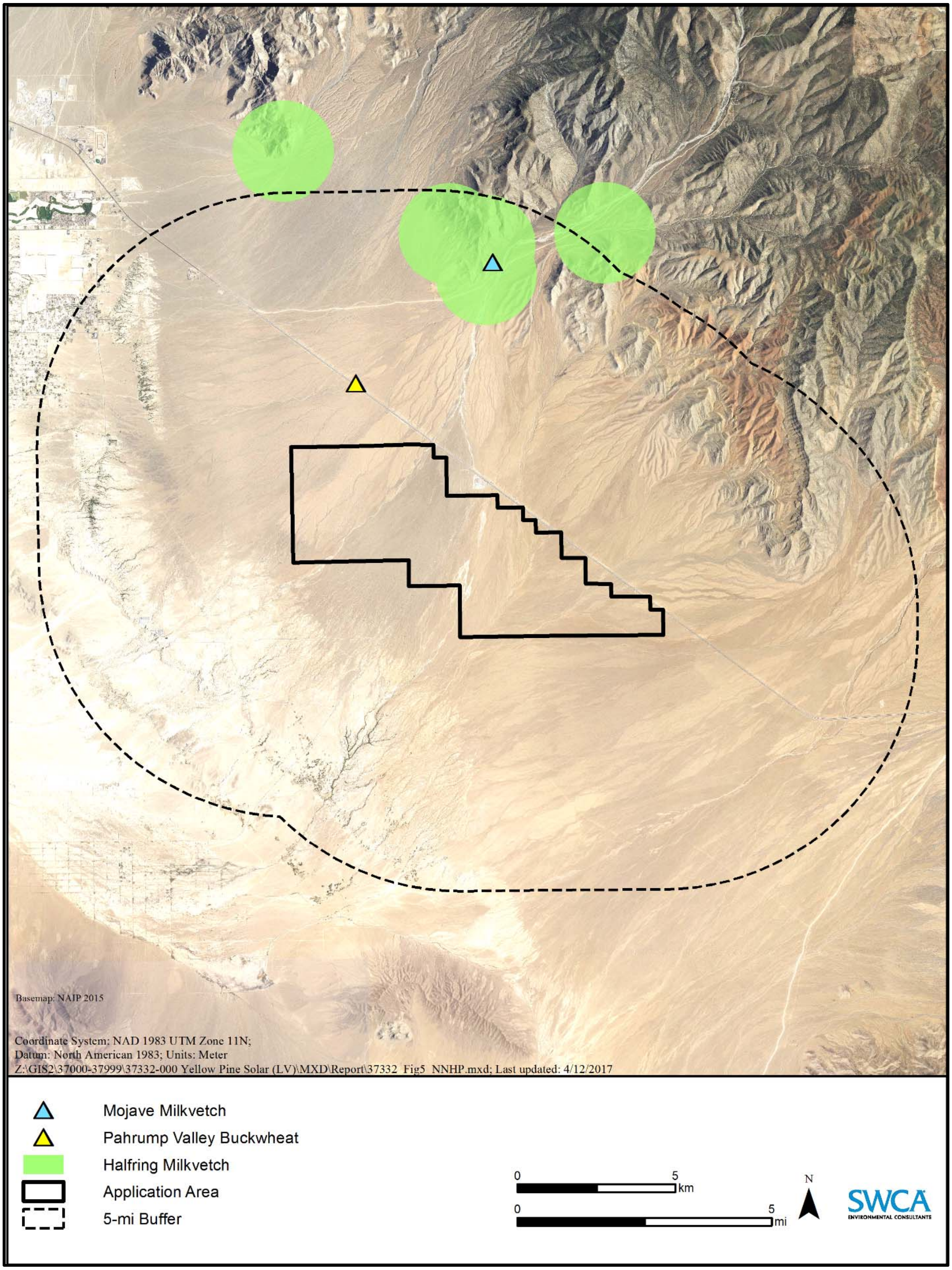

Figure 4. Sensitive plant data within the 5-mile buffer.

Table 3. Sensitive Plant Species with Potential to Occur in the Application Area

Common Name	Scientific Name	Status*	Habitat Characteristics
Halfring milkvetch	*Astragalus mohavensis* var. *hemigyrus*	S	Flowers in early spring with most typical survey months being April–June. Annual or short-lived perennial species occurring in carbonate gravels and derivative soils on terraced hills and ledges, open slopes, and along washes in creosote-bursage, blackbrush, and mixed shrub zones (NNHP 2001).
Mojave milkvetch	*Astragalus mohavensis* var. *mohavensis*	S	Habitat requirements the same as those for halfring milkvetch.
Pahrump Valley buckwheat	*Eriogonum bifurcatum*	S	Flowers May–June. This annual herb occurs in barren, saline, heavy clay, or silty hardpan soils on or near dry playa margins. This species also occurs on adjacent shore terraces and stabilized sand dunes with saltbush species (*Atriplex* spp.), honey mesquite (*Prosopis glandulosa*), seablite (*Suaeda moquinii*), and spiny hopsage (*Grayia spinosa*) (NNHP 2001).

* Status: S = Species designated Sensitive by State Director of Nevada BLM. BLM Nevada special-status species.

3.2 Field Reconnaissance

Plant species observed during the field reconnaissance were consistent with species typically found in the Sonora-Mojave Creosotebush-White Bursage Desert Scrub (Table 4; see Figure 2) (USGS 2004). The portions of the application area that were assessed were co-dominated by creosote bush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*). Reconnaissance was focused in areas with soils of interest (Figure 5) that included Corncreek-Badland-Pahrump and Commski-Lastchance associations.

No habitat that clearly support Pahrump Valley buckwheat were observed, such as gypsiferous soils, badlands, or deep sand and sand dunes. Sandy soils in the Corncreek-Badland-Pahrump association appeared to have the highest potential. This soil type was very sandy, although it had a higher surface gravel component relative to know Pahrump Valley buckwheat populations. The remaining species—halfring milkvetch and Mojave milkvetch—are typically found in rocky habitats that include ledges and terraces, none of which were observed within the application area.

Table 4. Plant Species Observed during Field Reconnaissance of the Application Area

Scientific Name	Common Name	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6
Acamptopappus schockleyi	Schockley's goldenhead		x		x	x	
Ambrosia dumosa	White bursage	x	x	x	x	x	x
Arabis sp.	Rockcress	x			x	x	
Atriplex confertifolia	Shadscale	x	x				
Bromus rubens	Red brome	x	x	x	x		x
Camissonia sp.	Suncups		x				
Coleogyne ramosissima	Blackbrush	x	x				
Descurainia pinnata	Western tansymustard		x				
Echinocereus engelmannii	Hedgehog cactus				x		
Encelia virginensis	Brittlebush		x				x
Ephedra nevadensis	Mormon tea	x	x	x	x		x
Eschscholzia sp.	California poppy	x					
Grayia spinosa	Hopsage				x		

Scientific Name	Common Name	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6
Gutierrezia sarothrae	Snakeweed		x				
Hymenoclea salsola	Burrobush	x					x
Krameria erecta	White ratany	x	x	x		x	x
Krascheninnikovia lanata	Winterfat			x			
Larrea tridentata	Creosote bush	x	x	x	x	x	x
Lycium andersonii	Wolfberry	x	x	x	x		x
Mentzelia albicaulis	White-stemmed blazingstar	x			x		
Mirabilus sp.	Mirabilus	x					
Opuntia basilaris	Beaver-tailed prickly pear		x				
Pectocarya recurvata	Curvenut combseed	x					
Pediomelum sp.	Indian breadroot						x
Petalonyx nitidus	Sandpaper bush	x					
Phacelia fremontii	Fremont's phacelia	x	x				
Plantago sp.	Plantain		x	x	x		
Prunus fasciculata	Desert almond		x				
Rafinesquia neomexicana	Chicory	x	x		x	x	
Salazaria mexicana	Paper bag bush		x				
Schismus sp.	Mediterranean grass	x	x	x	x	x	x
Sphaeralcea ambigua	Globemallow						x
Yucca brevifolia	Joshua tree						x
Yucca schidigera	Mojave yucca		x	x	x	x	x

3.3 Proposed Survey Area

Based on the combination of desktop analysis and field reconnaissance, the proposed survey area is limited to the Corncreek-Badland-Pahrump soil association (NRCS 2017), which comprises 115 acres (see Figure 5). This soil type may provide suitable habitat for Pahrump Valley buckwheat due to the gypsum content, salinity, and known association with relict lakebeds and lake terraces. While NNHP data (2017; see Appendix A) indicate that halfring milkvetch and Mojave milkvetch are found within 5 miles of the application area, habitat appears to be unsuitable due to the lack of rock outcrops and carbonate ledges where these species occur (NNHP 2001).

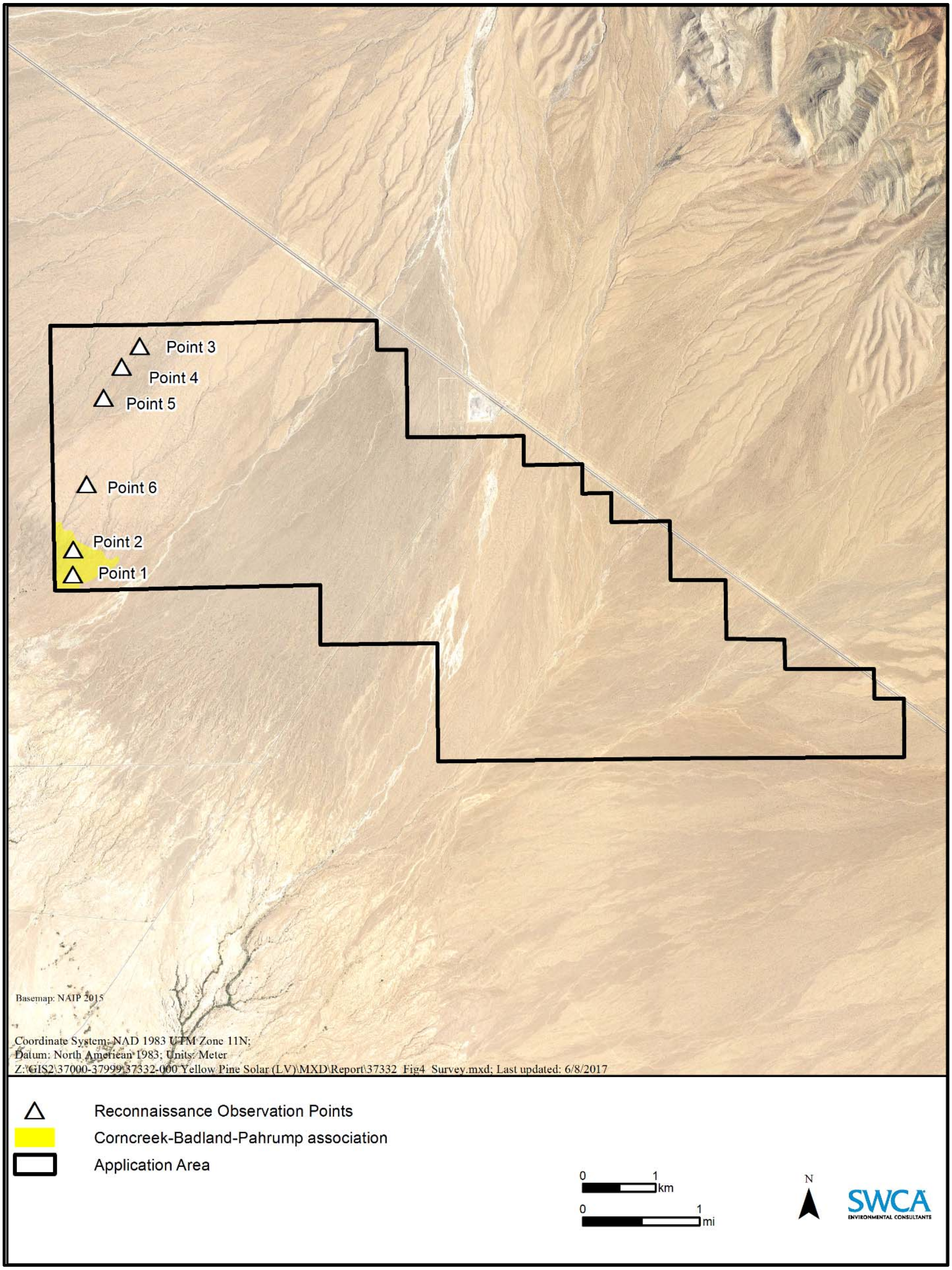

Figure 5. Proposed sensitive plant survey area.

4.0 CONCLUSIONS

SWCA has assessed the likelihood of presence for special-status plants (including species listed by the BLM, U.S. Fish and Wildlife Service, and State of Nevada) within the application area and surrounding 5-mile buffer. Through this process, three special-status plant species were identified within 5 miles of the proposed application area: halfring milkvetch, Mojave milkvetch, and Pahrump Valley buckwheat. Vegetation and soil data were compared at reference populations and within the application area as a screening tool to narrow the focus of field reconnaissance.

Our field reconnaissance findings indicate that no suitable habitat is present for halfring milkvetch or Mojave milkvetch. Reference populations for these species occur within rockier habitat, among terraces, and are generally located in the foothills of the Spring Mountains. NNHP (2001) descriptions of these species support this characterization of preferred habitat for these species.

Based on previous efforts locating Pahrump Valley buckwheat in the general vicinity of the application area, SWCA has found that the soil type is most informative for the suitable habitat. Therefore, we considered the Corncreek-Badland-Pahrump association as suitable habitat due to its salinity and association with relict lakebeds and lake terraces. Evaluation of this soil type during reconnaissance surveys indicated that habitat is marginal in comparison with known populations. The application area lacks the loose sandy soils where Pahrump Valley buckwheat is typically identified. However, out of an abundance of caution, SWCA recommends protocol-level surveys within the Corncreek-Badland-Pahrump association, should development be planned for this area. The extent of this soil type within the application area is 115 acres.

LITERATURE CITED

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APPENDIX A

Nevada Natural Heritage Program Response to Data Request

Brian Sandoval
Governor

Bradley Crowell
Director

Kristin Szabo
Administrator

STATE OF NEVADA

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

Nevada Natural Heritage Program

06 March 2017

Matt Villaneva
SWCA Environmental Consultants
675 Sierra Rose Drive, Suite 104
Reno, NV 89511

Dear Mr. Villaneva:

Please find shape files containing the recorded endangered, threatened, candidate, and At Risk plant and animal elements (taxa) within the Yellow Pine Solar Project recorded in Nevada (assumed to be extant, unless mentioned otherwise). This data set is packaged in GIS ArcMap10 Format (projected, UTM Zone 11, NAD 1983). The files contain a shape file set which contain the recorded element source feature occurrence records within Nevada and their associated attributes. The files are labeled, SWCA_Yellow_Pine_Solar_Poly.xxx. Please refer to the Biotics Metadata (in the xml files included) for explanations and interpretations of each data set along with its respective attributes.

The Nevada Department of Wildlife (NDOW) manages, protects, and restores Nevada's wildlife resources and associated habitat. Please contact Bonnie Weller, NDOW GIS Biologist (775) 688-1439 to obtain further information regarding wildlife resources within and near your area of interest. Removal or destruction of state protected flora species (NAC 527.010) requires a special permit from Nevada Division of Forestry (NRS 527.270).

Please note that your use of these data is contingent upon your acknowledgment of the enclosed DATA LIMITATIONS AND RESTRICTIONS (revised 30 November 2010). In particular, please be aware that we furnish data with the understanding that these data are privileged and are not to be provided to a third party without our consent. Products derived from our data should cite the Nevada Natural Heritage Program as a source, along with the month and year in which we provided the data.

Many of our documents, including species lists and keys to our symbols, can be found on our website www.state.nv.us/nvnhp/. Please visit our website to learn more about our program and the sensitive species of Nevada.

Sincerely,

Eric S. Miskow
Biologist/Data Manager

901 S. Stewart Street, Suite 5002 Carson City, NV 89701-5245 Tel: 775-684-2900 Fax: 775-684-2909 http://heritage.nv.gov

APPENDIX B

YPSP NNHP Data Request

06 March 2017

Matt Villaneva
SWCA Environmental Consultants
675 Sierra Rose Drive, Suite 104
Reno, NV 89511

Dear Mr. Villaneva:

Please find shape files containing the recorded endangered, threatened, candidate, and At Risk plant and animal elements (taxa) within the Yellow Pine Solar Project recorded in Nevada (assumed to be extant, unless mentioned otherwise). This data set is packaged in GIS ArcMap10 Format (projected, UTM Zone 11, NAD 1983). The files contain a shape file set which contain the recorded element source feature occurrence records within Nevada and their associated attributes. The files are labeled, SWCA_Yellow_Pine_Solar_Poly.xxx. Please refer to the Biotics Metadata (in the xml files included) for explanations and interpretations of each data set along with its respective attributes.

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Many of our documents, including species lists and keys to our symbols, can be found on our website www.state.nv.us/nvnhp/. Please visit our website to learn more about our program and the sensitive species of Nevada.

Sincerely,

Eric S. Miskow
Biologist/Data Manager

APPENDIX C

YPSP Observed Taxa

Yellow Pine Solar Project

Authors: Ian McCowen, Kevin Thomas, Nichole Nesbihal

Families: 18
Genera: 42
Species: 57 (species rank)
Total Taxa: 57 (including subsp. and var.)

AMARANTHACEAE

Atriplex confertifolia **- Shadscale**
Atriplex hymenelytra **- Desert-holly**
Atriplex polycarpa **- Cattle-spinach**
Krascheninnikovia lanata **- Winterfat**

ASPARAGACEAE

Yucca schidigera **- Mojave yucca**

ASTERACEAE

Acamptopappus sphaerocephalus var. hirtellus – Rayless goldenhead
Adenophyllum cooperi – Cooper's dogweed
Ambrosia dumosa **- White burrobush**
Ambrosia salsola **- White ragweed**
Baileya sp.
Baileya multiradiata **- Showy desert-marigold**
Chaenactis sp. - Pincushion
Encelia virginensis **- Virgin river brittlebush**
Gutierrezia microcephala **- Small-head snakeweed**
Psilostrophe cooperi **- White-stem paper-flower**
Stephanomeria exigua – Small wirelettuce
Stephanomeria pauciflora **- Brown-plume wire-lettuce**
Xylorhiza tortifolia **- Mojave woody-aster**

BORAGINACEAE

Amsinckia tessellata **- Devil's-lettuce**
Cryptantha sp.
Cryptantha pterocarya **- Wing-nut cat's-eye**
Phacelia crenulata var. ambigua **- Purplestem phacelia**

BRASSICACEAE

Descurainia pinnata **- Western tansy-mustard**
Lepidium lasiocarpum **- Hairy-pod pepperwort**

CACTACEAE

Cylindropuntia acanthocarpa - Buckhorn cholla
Cylindropuntia echinocarpa - Golden cholla
Cylindropuntia ramosissima - Darning-needle cholla
Echinocactus cylindraceus – Desert barrel cactus
Echinocactus polycephalus - Cotton-top cactus
Echinocereus engelmannii - Saints cactus
Grusonia parishii - Matted club-cholla
Opuntia basilaris - Beaver-tail cactus

EPHEDRACEAE

Ephedra nevadensis - Nevada joint-fir
Ephedra funerea – Death Valley jointfir

KRAMERIACEAE

Krameria erecta - Small-flower ratany

LAMIACEAE

Salazaria mexicana - Mexican bladdersage
Salvia dorrii - Gray ball sage

MALVACEAE

Sphaeralcea ambigua - Apricot globe-mallow

OLEACEAE

Menodora spinescens - Spiny menodora

ONAGRACEAE

Camissonia boothii - Shredding mooncup

PLANTAGINACEAE

Plantago ovata - Blond plantain

POACEAE

Achnatherum hymenoides - Indian rice grass
Achnatherum speciosum - Desert needle grass
Bromus madritensis var. *rubens* - Red brome
Bromus tectorum – Cheat grass
Dasyochloa pulchella - False fluff grass
Hilaria rigida - Big galleta
Muhlenbergia porteri – Bush muhly
Schismus barbatus - Common mediterranean grass

POLYGONACEAE

Chorizanthe rigida **- Devil's spineflower**
Eriogonum fasciculatum **- Eastern mojave wild buckwheat**
Eriogonum inflatum **- Indian-pipeweed**
Eriogonum trichopes **- Little desert trumpet**

ROSACEAE

Prunus fasciculata **- Desert almond**

SOLANACEAE

Lycium andersonii **- Red-berry desert-thorn**
Lycium sp. – Desert-thorn

ZYGOPHYLLACEAE

Larrea tridentata **- Creosote-bush**

ATTACHMENT Q-3

Yellow Pine Solar Project Reclamation Cost Estimate Summary Sheet

YELLOW PINE SOLAR PROJECT **FINAL**
RECLAMATION CONSTRUCTION COST - BID ESTIMATE SHEET
For ROW Grants, Leases & Permits

PROJECT DESCRIPTION

Project S.O.W.
Yellow Pine Solar Project is located approximately 10 miles southeast of Pahrump, and approximately 32 miles west of Las Vegas in Clark County, NV. The 3072-acre site encompasses protions of Sections 31, 32, 33, 34, and 35 in Township 21 South, Range 55 East; portions of Sections 2, 3, 6, 7, 8, 9, and 10 in Township 22 South, Range 55 East; and all of Sections 4 and 5 in Township 22 South, Range 55 East. The site is accessible by way of State Route 160 off of Tecopa Springs Road, both of which are paved roadways and provide all-season access. Site improvements include a 3,500 SF Operation & Maintenance building; solar fields and associated substation, poles, and wiring (both overhead and underground); storage containers; underground utilities for water, fire protection, and sanitary sewer (spetic tank with leach field); drainage culverts and riprap protection; onsite graded and paved roadways; and fencing. Decommissioning the site will include removing the prefabricated O&M building and concrete pad; solar arrays, posts, and inverter skids; substation components, wiring, and poles; storage containers and contents; underground wiring and utilities; paved entrance road; and chain link fence, with and without barbed wire and tortoise mesh, gates, tortoise guards, and wildlife crossings. All in- or under-ground removals such as fence and solar array posts, poles, wiring, and utilities, will require filling holes or trenches with native material. Graded roads and other disturbed areas will require scarification of the surface, minor recontouring, re-spreading of topsoil, and reseeding. All removed, man-made materials will require proper disposal and will include hazardous materials (e.g., batteries). No deep or rock excavation is anticipated.

ITEM NO.	ITEM DESCRIPTION	UNITS	QTY	UNIT PRICE	TOTAL PRICE
1	Remove 2-String Solar	EA	1,286	$695.00	$893,770.00
2	Remove 3-String Solar	EA	11,917	$795.00	$9,474,015.00
3	Remove Operations &	LS	1	$75,000.00	$75,000.00
4	Remove Project	LS	1	$310,000.00	$310,000.00
5	Remove BESS Facility	EA	3	$343,000.00	$1,029,000.00
6	Remove CONEX Box	EA	2	$5,000.00	$10,000.00
7	Remove Inverter Skid	EA	177	$7,500.00	$1,327,500.00
8	Remove Dead-end	EA	1	$90,000.00	$90,000.00
9	Remove Underground	LS	1	$207,500.00	$207,500.00
10	Remove Underground	LS	1	$350,000.00	$350,000.00
11	Remove Drainage	LS	1	$780,000.00	$780,000.00
12	Remove 72" Fence and Gates (With and Without Barbed Wire),	LF	135,800	$5.00	$679,000.00
13	~~Remove Sidewalk,~~	~~SF~~	~~750~~	~~$0.00~~	~~$0.00~~
14	Remove 24-ft Wide Paved Entrance Road	SF	25,744	$1.00	$25,744.00
15	Remove 1000-gal Septic Tank	EA	1	$1,700.00	$1,700.00
16	HAZMAT Material Haul	LS	1	$750,000.00	$750,000.00
17	Haul and Disposal	LS	1	$1,250,000.00	$1,250,000.00
18	Scarify Disturbed Areas	AC	431	$4,600.00	$1,982,600.00
19	Leach Field	LS	1	$200,000.00	$200,000.00
20	Hydroseeding	AC	431	$2,000.00	$862,000.00
	RCE DECONSTRUCTION SUBTOTAL				$20,297,829.00
	ion	LS	10%		$2,029,782.90
	RCE DECONSTRUCTION TOTAL COST ESTIMATE				**$22,327,611.90**

CONSTRUCTION BID

The following are costs BLM would incur on Federal Construction Conracts and must be figured and added to the RCE Deconstruction Total Cost Estimate for the Bond Total

Engineering Costs (ED&C)	4% - 8%	6%	$1,339,656.71	BLM requires the RCE to estimate the value to contract an ED&C at 4
Contingency	4% - 10%	6%	$1,339,656.71	BLM requires that the contingency be estimated using 4 to
Insurance	1.5%	1.50%	$334,914.18	
Bond	3.0%	3%	$669,828.36	Federal construction contracts exceeding $100,000 require a
Contractor Profit	10.0%	8%	$1,786,208.95	As per BLM requirements,
BLM Administration Cost	6% - 10%	8%	$1,786,208.95	Ranges from 6 to 10% of Deconstruction Operational &
BLM Indirect Cost	FY 2021 rate	21.93%	$523,359.22	Indirect cost rate is subject to change annually. Contact FO
(RECOMMENDED)			$30,107,444.99	

Prepared By: J. Reilly
Date: 7/15/2021

Basis of Estimate

Item #	Description	Comment	
1	Remove 2-String Solar Array	938 in 60% plans + 348 in Area 4 = 1286 arrays	Avg./Area1-3 = 2934 arrays. Assume Area 4 has 50% more = 4401 arrays. Orig. total = 1265 (2) + 14,808 (3) = 16, 073 arrays. 2-String = 7.9% total, so Area 4 has 348 2-String arrays.
2	Remove 3-String Solar Array	7864 in 60% plans + 4053 in Area 4 = 11,917 arrays	
3	Remove Operations & Maintenance Facility	No change	BLM #39: 70,000CF bldg * $0.5/CF = $35,000; BLM #38: 6500SF conc pad *$5/SF = $32,500. Adj 2% for 2021 = $68,850.
4	Remove Project Substation	Reduced by applying BLM Items 5 & 45 - 47 with multiplier to account for increased substation capacity.	(5) $6567.01/AC * 4.6AC = $30,208.25; (47) $36,250/34kv * 6.5 multiplier = $235,625; (45) $555/EA panelboard * 18 (est) = $9990; (46) $1710/EA transformer * 18 (est) = $30,780. Sum = $306,605.
5	Remove BESS Facility	Three sites, changed quantity.	Estimate 234 boxes * $5000/EA = $1,170,000 - (5) at $6567.01/AC * 12.4AC = $81,410 (incl. in Items 18 & 20) ==> $108,859.
6	Remove CONEX Box	No change	
7	Remove Inverter Skid	Based on Expanded Area 4 Exhibit	44 inverters in Area 4 + 133 in Areas 1-3 = 177
8	Remove Dead-end Monopole Structure	No change	
9	Remove Underground Wiring	No change	
10	Remove Underground Utilities	No change	
11	Remove Drainage Structures & Riprap	Increased quantity estimates for concrete cutoff walls and riprap for all areas.	Approx. qtys: Conc. = 5370 CY, D50=3" = 15,268 cy, D50=12" = 122,800 cy' for Areas 1-3, plus pipe, end pieces, riprap aprons, and manholes, increase to $600,000. Increase 30% for Area 4 (more avoid areas) ==> $780,000.
12	Remove 72" Fence and Gates (With and Without Barbed Wire), Wildlife Crossings, and Tortoise Guards	Description revised to clarify scope of work	
13	Remove Sidewalk, Curb, and Gutter	Deleted, included in O&M Bldg. pad removal.	Only applies to Area 1.
14	Remove 24-ft Wide Paved Entrance Road	Quantity based on 60% plans	Only applies to Area 1.
15	Remove 1000-gal Septic Tank	No change	Only applies to Area 1.
16	HAZMAT Material Haul and Disposal	No change	
17	Haul and Disposal	No change	
18	Scarify Disturbed Areas	Based on Expanded Area 4 Exhibit	Areas 1 - 3 = 215AC + 216AC = 431AC for Areas 1 - 4
19	Leach Field Remediation	No change	
20	Hydroseeding	Quantity estimated for Areas 1 - 4	Areas 1 - 3 = 215AC + 216AC = 431AC for Areas 1 - 4