BrightSource

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11-AFC-4	
DATE	Jan 11 2012
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January 11, 2011

Pierre Martinez
Project Manager
Systems Assessment & Facility Siting Division
California Energy Commission
1516 Ninth Street, MS-15
Sacramento, CA 95814

SUBJECT: Rio Mesa Solar Electric Generating Facility (11-AFC-4) Applicant's Fall 2011 Botany Report

Dear Mr. Martinez:

Rio Mesa Solar I, LLC, Rio Mesa Solar II, LLC, and Rio Mesa Solar III, collectively the "Applicant" for the Rio Mesa Solar Electric Generating Facility project ("Rio Mesa SEGF"), are pleased to provide the attached Fall 2011 Botany Report.

Biologists monitored weather conditions remotely and visited the site, prior to conducting the fall 2011 surveys, in order to assess the entire project site for fall plant growth. Two visits during the first and third week of September 2011 provided sufficient confirmation that rainfall and fall plant growth were restricted to the most northwest portion of the transmission line right-of-way corridor that runs southeast to northwest including the Substation interconnect area (Figure 2).

Survey coverage of the entire site was not conducted due to limited rainfall in the following areas:

- All acreages within the MWD lands
- All BLM lands associated with project site development
- Private lands south of the intersection of the Western Area Power Administration (WAPA) and Imperial Irrigation Districts 161kV transmission lines right-of way (Figure 1).

Included in the site visits conducted in the transmission line right-of-way corridor identified above was an inspection of an Abrams' spurge reference population, which indicated that this rare plant and other fall blooming species should have been detectable if present on site.

During the surveys no Rank 1 and 2 plants from the California Rare Plant List were detected in the designated survey area (Figure 2); however, two Rank 4 plants from the California Rare Plant list were found during the fall 2011 survey: Utah vine milkweed and desert unicorn plant.

Sincerely,

Todd Stewart
Senior Director of Project Development

BrightSource Energy, Inc.
1999 Harrison Street
Suite 2150
Oakland, CA 94612

www.BrightSourceEnergy.com

R E P O R T

FALL 2011 BOTANY REPORT FOR THE RIO MESA SOLAR ELECTRIC GENERATING FACILITY RIVERSIDE COUNTY, CALIFORNIA

(11-AFC-04)

Prepared for

BrightSource Energy, Inc.
1999 Harrison St., Suite 2150
Oakland, CA 94612

URS Project No. 27651003

December 2011

URS

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SECTION 1 INTRODUCTION

BrightSource Energy, Inc. (BrightSource or Applicant) filed an Application for Certification (AFC) for the Rio Mesa Solar Electric Generating Facility (Rio Mesa SEGF or Project) with the California Energy Commission on October 14, 2011. The AFC was deemed data adequate by the CEC on December 14, 2011.

1.1 PROJECT LOCATION

The proposed site for the Rio Mesa SEGF is situated 13 miles southwest of Blythe, California, and is located partially on private land owned by Metropolitan Water District of Southern California (MWD), a California public agency, and partially on public land administered by the Bureau of Land Management (BLM) (Figure 1). The site is located in the Colorado Desert region of the Sonoran Desert on the Palo Verde Mesa in Riverside County, California.

The Project will include three concentrating solar thermal power plants and a shared common area to include shared systems. Each plant will have a nominal output of 250 MW. The Project will be executed in three phases. Each 250 MW plant requires about 1,850 acres (2.9 square miles), for a total project area of approximately 5,750 acres required for all three plants. These three plants will be connected via a common overhead 220 kilovolt (kV) generator tie-line (gen-tie line) to the newly approved Southern California Edison (SCE) Colorado River Substation (CRS) approximately 9.7 miles to the north.

The Biological Study Area (BSA) for the Project consists of the main project site where the three solar plants and common area are proposed (plus a 500-foot buffer), the gen-tie line along existing transmission lines that extend to the proposed Colorado River Substation (plus a 650-foot buffer), and access areas from State Route 78 via Bradshaw Trail and 34th Avenue (plus a 100-foot buffer). The BSA totals 11,277 acres. Since spring surveys of the BSA, the gen-tie line has been more precisely located and a 100-foot right-of-way with a 250-foot survey buffer (for a total width of 600 feet) is required to be surveyed.

1.2 SCOPE OF FALL 2011 SURVEY

This report documents the survey methodology and protocol survey results for the fall 2011 botanical survey conducted for the Project. The scope of the survey focuses only on the northern portion of the Project gen-tie line, and not the entire project site. BrightSource and URS biologists discussed this approach with the staff from the CEC, BLM, and California Department of Fish and Game (CDFG) in a conference call on September 27, 2011. Staff from the U.S. Fish and Wildlife Service (USFWS) was invited to attend the conference call but was not able to attend. The request for limited surveys was made by BrightSource and URS because rainfall amounts in the Project area were low during the summer and early fall of 2011 as measured at local weather stations (see more information in Section 2 of this report). All parties attending the conference call agreed that only the northern portion of the gen-tie line had received a suitable amount of rainfall needed for the fall 2011 survey. All parties further agreed that fall-blooming special status plants would not be detectable in most of the BSA due to lack of rainfall. It was further agreed that the remainder of the Project site would be surveyed in the fall of 2012.

URS biologists conducted the limited survey on October 4, 2011. The survey transects and fall survey area are shown on Figure 2. The fall survey area is approximately 200 acres. The northernmost portion of the BSA can be accessed via Wiley Well Road and an existing power line road located directly south of I-10 or via the gen-tie line linked to Bradshaw Trail. Further information regarding the survey is included in Section 2 of this report.

SECTION 2 SPECIAL STATUS PLANT SURVEYS

2.1 BACKGROUND

Special status fall plant surveys are conducted at the time of year when species are both evident and identifiable (i.e., flowering and/or fruiting). This involves multiple visits to the same site (i.e. during fall, and early and late spring survey for flowering plants) to capture the floristic diversity at a level necessary to determine if special status plants are present. The timing and number of visits are determined by geographic location, the natural communities present, and the weather patterns of the year in which the surveys are conducted. The dates on which focused, special status botanical surveys were conducted at the project site are presented in Appendix A.

Nearby weather station precipitation records were monitored for rainfall activity in the months preceding fall rare plant surveys. An average of precipitation from weather stations KBLH Blythe Airport and MCBRA3 Cibola show that the BSA likely received 0.00, 1.44, 0.35, and 0.05 inches during the months of June, July, August, and September 2011, respectively (Table 1) (Weather 2011). This low rainfall amount during August and September may have resulted in a lower incidence of plant growth and seed germination. Although several sensitive species were found on site, their relatively small density may be an underrepresentation of their actual presence had greater precipitation occurred in August and September. Table 1 shows average recorded rainfall near the BSA in the months preceding the survey for the weather stations nearest the Project.

Table 1
Rainfall Near BSA in Months Preceding Survey

Station	Month	Rainfall (in.)
KBLH Blythe Airport	June	0
	July	1.64
	August	0
	September	0.08
MCBRA3 Cibola	June	0
	July	1.23
	August	0.79
	September	0.02
Average of KBLH Blythe Airport and MCBRA3 Cibola	June	0
	July	1.44
	August	0.35
	September	0.05

Monthly temperatures were also monitored in preparation for field efforts. The KBLH Blythe Airport weather station, located approximately 10 miles east of the project area, recorded average high and low temperatures of 103° F and 73° F; 107° F and 81° F; 111° F and 85° F; and 103° F and 76° F for June, July, August, and September, respectively, and are presented in Table 2 (Weather 2011). These temperatures are on par with average temperatures recorded for June, July, August, and September in the Blythe area. It is likely that temperature would not be a factor in determining presence or absence of special status species for fall 2011. Table 2 shows average high and low temperatures near the BSA in the months preceding the survey for the weather station nearest the Project.

Table 2
Temperature Near BSA in Months Preceding Survey

Station	Month	Avg. High Temp	Avg. Low Temp
KBLH Blythe Airport	June	103	73
	July	107	81
	August	111	85
	September	103	76

Biologists monitored weather conditions remotely and visited the project site prior to conducting the fall 2011 survey in order to assess the entire project area for fall plant growth. Two visits during the first and third week of September 2011 provided sufficient confirmation that rainfall and fall plant growth were restricted to the majority of the transmission line corridor that runs southeast to northwest including the gen-tie area. The second site visit, on September 20, 2011, included an Abrams' spurge (*Chamasyce abramsiana*) reference population visit, which indicated that this rare plant and other fall blooming species should have been detectable if present on site.

2.2 SPECIAL STATUS PLANT PROTOCOL SURVEY METHODS

2.2.1 Special Status Potential to Occur

A preliminary list of potentially occurring special status plants was compiled from multiple field offices in the California Desert District (BLM, 2010 a through c), and by conducting nine United States Geological Survey (USGS) quadrangle map searches of the CNDDB RareFind3 database (CDFG, 2011) and the CNPS On-line Inventory (CNPS, 2011). The Project is primarily located within the Roosevelt Mine 7.5' USGS quadrangle (USGS, 1983a). The Roosevelt Mine, McCoy Spring (USGS, 1983b), McCoy Peak (USGS, 1983c), McCoy Wash (USGS, 1975a), Hopkins Well (USGS, 1983d), Ripley (USGS, 1975b), Thumb Peak (USGS, 1971a), Wiley Well (USGS, 1971b), and Palo Verde (USGS, 1983e) 7.5' USGS quadrangles were included in the nine-quadrangle search. The preliminary list was revised after reviewing habitat and distribution information from the following primary sources:

- The Jepson Desert Manual; Vascular Plant of Southeastern California (Baldwin et al., 2002);
- CNPS Inventory of Rare and Endangered Plants (on-line edition) (CNPS, 2011); and
- CalFlora: What Grows Here on-line database (CalFlora, 2011).

Information obtained during the literature review and the reconnaissance field visit was used to create Appendix B which summarizes information on special status plants with potential to occur within the BSA. Information on flowering time, status, habitat preferences, geographic distribution, elevation range, and known locations within the vicinity of the BSA was researched prior to the initiation of the field protocol surveys conducted on October 4, 2011. Based on these constraints, a sub-group of species was selected that was deemed most likely to occur in the BSA during the fall rare plant surveys. These species include Abram's spurge, desert unicorn plant *(Proboscidea althaeifolia)* and Utah vine milkweed *(Funastrum utahense).*

Many species protected under the California Desert Species Act (California Food and Agriculture Code, 1981) were also deemed likely to be found in the area surveyed, including but not limited to, ocotillo (*Fouquieria splendens*), mesquite (*Prosopis* spp.), blue palo verde (*Parkinsonia florida*), catclaw acacia (*Acacia greggii*), desert-holly (*Atriplex hymenelytra*) and desert ironwood (*Olneya tesota*). Additionally, all species of Cactaceae, including but not limited to, California barrel cactus (*Ferocactus cylindraceus*) and Wiggin's cholla (*Cylindropuntia echinocarpa* [*Opuntia wigginsii*]) are also protected under the California Desert Species Act.

2.2.2 Survey Methods

Protocol-level surveys for special status plants were floristic in nature and followed, to the degree feasible, the USFWS's *Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed Plants* (USFWS, 1996). Surveys conducted for this Project also followed, to the degree feasible, the recommendations of the botanical survey guidelines of the CDFG (CDFG, 2009), the CNPS (CNPS, 2001), and the BLM (BLM, 2009).

The goal of the protocol-level special status plant survey was to census and map every special status plant encountered. For those special status plants species listed exclusively by the California Desert Species Act, e.g., mesquite or catclaw acacia, only a census and mapping occurred. Protocol-level 100 percent surveys were conducted throughout the portion of the BSA that received sufficient rainfall to sustain plant life during the fall survey. Figure 2 shows GPS track logs as they were recorded by biologists during the fall rare plant survey.

Surveyors walked transects spaced at 30 meters. This narrow spacing was selected to permit detection of small, cryptically colored special status plants, which were expected to be scarce and patchily distributed. Survey team leaders carried paper maps, detailing the survey grid. The survey sections shown on the maps corresponded to images in files on the GPS units that were used to navigate and take data in the field. GPS units used during the survey were a Garmin 60CSx, Rino 520, or similar model having a three-to-five meter accuracy.

Surveyors searched for special status plants by scanning the ground 15 meters to either side of their transect line while also frequently turning to look behind them to search for special status plants located at the base of shrubs. Survey team members stayed more or less together while walking each transect. Each time a living special status plant was encountered, a census per unit area was taken of the individual or the population, the special status plant was then mapped with the GPS unit, and recorded on a field form (Appendix C), or in the field notes of the survey team leader. Habitat data included: scientific name, number of individuals, phenology (vegetative, in bud, in flower, old flowers, in fruit), substrate,

vegetation type, associated species, and disturbance condition. For those special status plant species listed exclusively by the California Desert Species Act, only a census and mapping occurred as described above. In addition, when quantifying invasive, non-native species, a census and mapping occurred by the same methods that were used for species listed by the California Desert Species Act.

2.2.3 Botanists' Qualifications

All surveyors conducting botanical surveys possessed the following qualifications (Appendix D):

- Experience conducting floristic field surveys;
- Knowledge of plant taxonomy and plant community ecology and classification;
- Familiarity with the plants of the area, including special status and locally significant plants;
- Familiarity with the appropriate state and federal statutes related to plants and plant collecting; and,
- Lead botanists must have experience with analyzing impacts of a project on native plants and communities.

2.3 SPECIAL STATUS PLANT SPECIES SURVEY RESULTS

California Rare Plant Rank List 1 and 2 plants were not detected in the fall survey area (Figure 3); however, two California Rare Plant Rank list 4 plants were found during the fall 2011 survey: Utah vine milkweed and desert unicorn plant. Due to low rainfall in the southern portions of the BSA, including all MWD and BLM lands, only the northernmost 200 acres of the gen-tie line were surveyed (Figure 3). A complete list of all plants detected during fall 2011 survey is provided in Appendix E. The results of the spring 2011 and fall 2011 rare plant surveys are shown on Figure 4.

2.3.1 Utah Vine Milkweed

Regulatory Status: Federal: None; State: None; CA Rare Plant Rank: 4.2; State Rank S3.2

Utah vine milkweed is a perennial herb that is native to California, Arizona, Utah, and Nevada. Found typically at elevations of 150 to 1,435 meters, this species prefers dry, sandy or gravelly soils in Mojave and Sonoran desert scrub habitats. The blooming period for this species occurs from April until June. Before the 2011 spring protocol surveys, there were no known observations in the CNDDB (CDFG, 2011) for the BSA and vicinity. During fall 2011 survey, a total of eight individuals were identified and mapped within the fall survey area (Figure 3).

2.3.2 Desert Unicorn Plant

Regulatory Status: Federal: None; State: None; CA Rare Plant Rank: 4.3; State Rank S3.3

Desert unicorn plant was detected during fall 2011 protocol survey. This perennial herb is typically found in Sonoran creosote bush shrub at elevations ranging from 150 to 1,000 meters. A total of 45 individuals of desert unicorn plant were detected within the fall survey area (Figure 3). The desert unicorn plant has

no known threats other than development and vehicles, and is not endangered or vulnerable in California. Populations of this species occur outside of California in Arizona, New Mexico, Baja California, and Sonora, Mexico. When considering the populations existing outside of California, the desert unicorn plant is considered secure.

2.3.3 Invasive Species

Invasive species found during the fall survey were documented for use in future weed management plans. Invasive species were noted when found on fall rare plant focused surveys. The predominant invasive species found on the survey was Asian mustard (*Brassica tournefortii)*, an annual herb not native to California. Although this plant blooms from late winter through spring, biologists were able to identify this species from skeletons that remain present after the end of the plant's lifecycle. In previous surveys, Asian mustard was found throughout the BSA, but was prevalent in the northern section of the BSA along the existing transmission line. Fall surveys confirmed that this invasive species remains widespread throughout the gen-tie line portion of the BSA. This documentation of invasive species found on the BSA will continue during upcoming focused surveys and will provide a better picture of the level of effort necessary to control invasive species.

2.3.4 Incidental Sightings

Incidental sightings during the fall 2011 rare plant surveys were recorded in field notes of the observer and GPS waypoints were taken whenever possible. One Mojave fringe-toed lizard (*Uma scoparia*) and two kit fox (*Vulpes macrotis arsipus)* dens were found during fall surveys. Appendix F provides a list of all incidentally-observed wildlife in the fall survey area.

SECTION 3 CONCLUSIONS

During the fall 2011 botanical survey, no California Rare Plant Rank List 1 and 2 plants were detected; however, two California Rare Plant Rank List 4 plants were found: Utah vine milkweed and desert unicorn plant. Target species for the survey were Abram's spurge, desert unicorn plant, and Utah vine milkweed. An Abrams' spurge reference population visit indicated that this rare plant and other fall blooming species should have been detectable if present on site.

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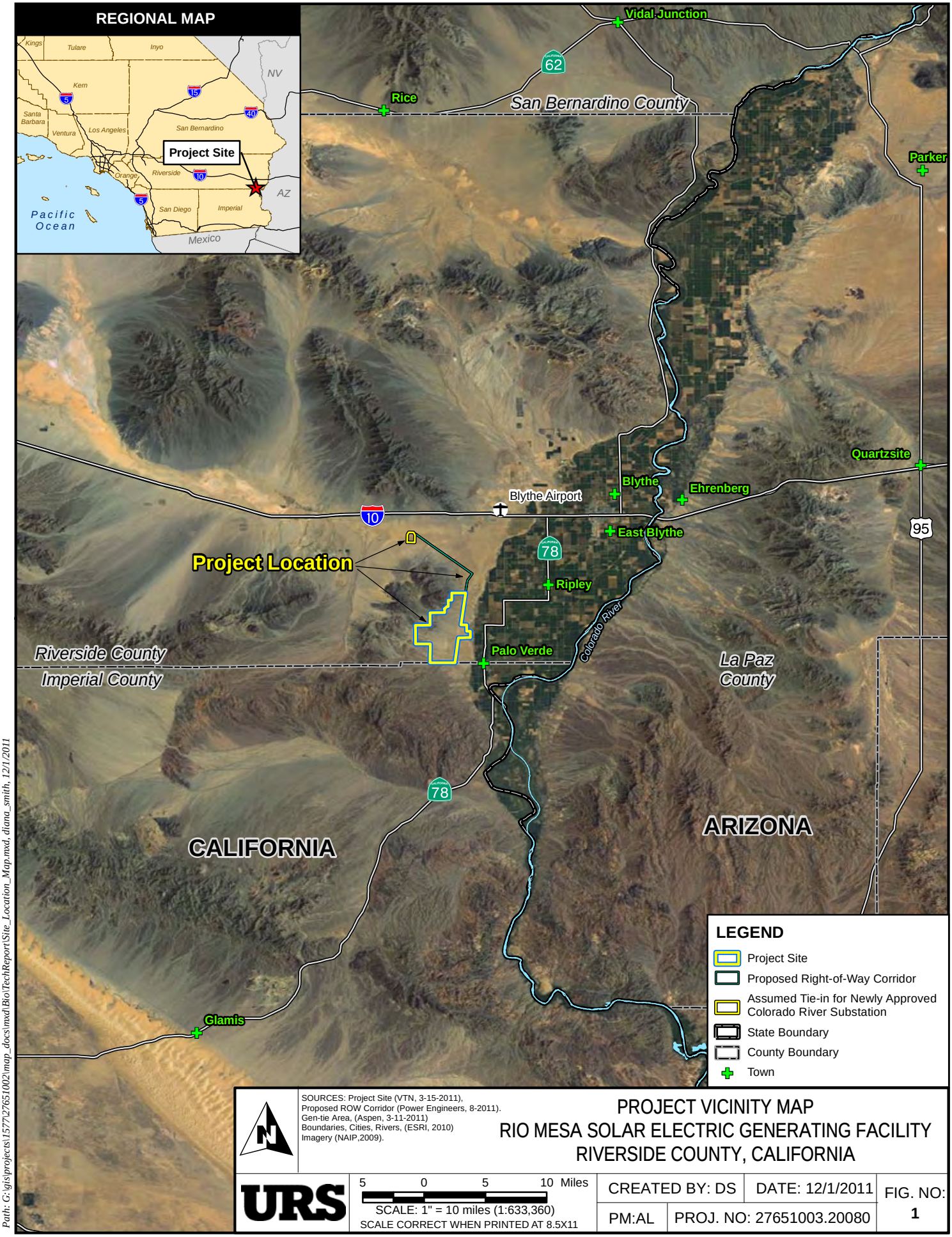

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Survey Transect

Proposed Transmission Line Access Road

Proposed Transmission Line Pole and Construction Buffer

Proposed Project 230kV Transmission Line Centerline (approx. 9.7 mi)

Proposed 230 kV ROW Corridor approx. 115 ac. (100 ft. corridor, approx 50ft. from c/l; approx acres: 80 BLM, 35 Private)

Biological Resources Buffer (600 ft. corridor, approx 250 ft. from 100 ft. ROW Corridor)

Original ROW Corridor approx. 1,228 ac. (1,300 ft. corridor, approx 650ft. from c/l; approx acres: 841 BLM, 387 Private)

Colorado River Substation (CRS)

Newly Approved Colorado River Substation (77 ac.)

Assumed Tie-in Area for Newly Approved Colorado River Substation (approx. 124 ac.)

Land Ownership

US Bureau of Land Management

Unclassified

OVERVIEW MAP

Northern Extent of Fall Botany Survey

Southern Extent of Fall Botany Survey

SOURCES:
Project Site, Original ROW Corridor (VTN, 3-15-2011).
Transmission Line Centerline, Proposed ROW Corridor (Power Engineers, 8-2011).
CRS Substation, Potential Gen-tie Area (Aspen, 3-11-2011).
Poles, Access Roads (BSE, 2011). Aerial (NAIP, 2005).
Transects (URS, 2011). Land Ownership (BLM, 2011).

TRANSECTS
FALL BOTANY SURVEY
RIO MESA SOLAR
ELECTRIC GENERATING FACILITY

URS

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Fall 2011 Rare Plants (Regulatory Status and Total Count)

Utah Vine Milkweed *(Funastrum utahense)*
(CA Rare Plant: 4.2, State Rank: S3.2) (8)

Desert Unicorn Plant *(Proboscidea althaeifolia)*
(CA Rare Plant Rank: 4.3, State Rank: S3.3) (45)

Proposed Transmission Line Access Road

Proposed Transmission Line Pole and Construction Buffer

Biological Resources Buffer
(600 ft. corridor, approx 250 ft. from 100 ft. ROW Corridor)

Proposed Project 230kV Transmission Line Centerline
(approx. 9.7 mi)

Proposed 230 kV ROW Corridor approx. 115 ac.
(100 ft. corridor, approx 50ft. from c/l;
approx acres: 80 BLM, 35 Private)

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Newly Approved Colorado River Substation (77 ac.)

Assumed Tie-in Area for Newly Approved
Colorado River Substation (approx. 124 ac.)

Land Ownership

US Bureau of Land Management

Unclassified

Northern Extent of Fall Botany Survey

Southern Extent of Fall Botany Survey

2

2

2

8

8

4

4

OVERVIEW MAP

SOURCES:
Project Site, Original ROW Corridor (VTN, 3-15-2011).
Transmission Line Centerline, Proposed ROW Corridor (Power Engineers, 8-2011).
CRS Substation, Potential Gen-tie Area (Aspen, 3-11-2011).
Poles, Access Roads (BSE, 2011). Aerial (NAIP, 2005).
Rare plants - Fall, Bio Buffer (URS, 2011).
Land Ownership (BLM, 2011).

FALL BOTANY SURVEY RESULTS
FALL BOTANY SURVEY
RIO MESA SOLAR
ELECTRIC GENERATING FACILITY

URS

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Fall 2011 Rare Plants (Regulatory Status and Total Count)

- Utah Vine Milkweed *(Funastrum utahense)* (CA Rare Plant: 4.2, State Rank: S3.2) (8)
- Desert Unicorn Plant *(Proboscidea althaeifolia)* (CA Rare Plant Rank: 4.3, State Rank: S3.3) (45)

Spring 2011 Rare Plants (Regulatory Status and Total Count)

- Harwood's Milkvetch *(Astragalus insularis var. harwoodii)* (CA Rare Plant Rank: 2.2, State Rank: S2.2?) (57)
- Ribbed Cryptantha *(Cryptantha costata)* (CA Rare Plant Rank: 4.3, State Rank: S3.3) (12,530)
- Harwood's Eriastrum *(Eriastrum harwoodii)* (BLM-Sensitive) (CA Rare Plant Rank: 1B.2, State Rank: S2) (131)
- Proposed Transmission Line Access Road
- Proposed Transmission Line Pole and Construction Buffer
- Biological Resources Buffer (600 ft. corridor, approx 250 ft. from 100 ft. ROW Corridor)
- Proposed Project 230kV Transmission Line Centerline (approx. 9.7 mi)
- Proposed 230 kV ROW Corridor approx. 115 ac. (100 ft. corridor, approx 50ft. from c/l; approx acres: 80 BLM, 35 Private)
- Original ROW Corridor approx. 1,228 ac. (1,300 ft. corridor, approx 650ft. from c/l; approx acres: 841 BLM, 387 Private)

Colorado River Substation (CRS)

- Newly Approved Colorado River Substation (77 ac.)
- Assumed Tie-in Area for Newly Approved Colorado River Substation (approx. 124 ac.)

Land Ownership

- US Bureau of Land Management
- Unclassified

Northern Extent of Fall Botany Survey

2600 5000 100 1000 500 1000 1560 2 45 345 52 4 1 300 1 3 100 9 3 11 2 20 2 25 3 2 2 25 5 8 8 4 4

Southern Extent of Fall Botany Survey

OVERVIEW MAP

SOURCES:
Project Site, Original ROW Corridor (VTN, 3-15-2011).
Transmission Line Centerline, Proposed ROW Corridor (Power Engineers, 8-2011).
CRS Substation, Potential Gen-tie Area (Aspen, 3-11-2011).
Poles, Access Roads (BSE, 2011). Aerial (NAIP, 2005).
Rare plants - Spring and Fall, Bio Buffer (URS, 2011).
Land Ownership (BLM, 2011).

FALL AND SPRING BOTANY RESULTS
FALL BOTANY SURVEY
RIO MESA SOLAR
ELECTRIC GENERATING FACILITY

URS

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BSE Rio Mesa Fall '11 Botany Surveys		
Survey Date	**Survey Type**	**Survey Staff**
4-Oct-11	Fall Botany	GW, HR, KC, Mbalk, NK, SR, ST
Notes:		
URS Staff: HR-Heather Rothbard		
Subcontractors: GW-Gwen Waring (independent), KC-Kyle Christie (independent), Mbalk-Michelle Balk (Balk Biological), NK-Neal Kramer (Kramer Botanical), SR-Suzanne Rhodes (Bill Boarman's group), ST-Steve Till (independent)		

	SPECIES			SENSITIVITY STATUS			HABITAT ASSOCIATIONS	POTENTIAL TO OCCUR ON PROJECT SITE	STATUS ONSITE	Plant Species Code
Family	Common Name	*Scientific Name*	Growth Habit	Federal/BLM	State	CNPS				
Asclepiadaceae	Utah vine milkweed	*Funastrum utahense (Cynanchum utahense)*	Perennial Herb/Vine	None	None	Was a 4.2	Sonoran and Mojavean desert scrub. Creosote bush scrub, dry, sandy, gravelly, areas. Blooms April-June.	High	Observed on site.	CYUT
Asteraceae	Bitter hymenoxys	*Hymenoxys odorata*	Annual Forb/Herb	None	None	2	Sonoran desert scrub, riparian scrub (sandy); blooms February-November	Moderate	Suitable habitat present onsite. Known adjacent occurrences.	HYOD
Boraginaceae	Ribbed cryptantha, Ashen Forget me not	*Cryptantha costata*	Annual Forb/Herb	None	None	4.3	Mojavean and Sonoran desert scrub, Creosote Bush Scrub, Desert Dunes (sandy); blooms February-May	Moderate	Suitable habitat present onsite.	CRCO15
Boraginaceae	Winged cryptantha, Rough stemmed Forget me not	*Cryptantha holoptera*	Annual Perennial Forb/Herb	None	None	4.3	Mojavean and Sonoran desert scrub, Creosote Bush Scrub, Joshua Tree Woodland; blooms March-April	Moderate	Suitable habitat present onsite.	CRHO3
Cactaceae	Saguaro	*Carnegiea gigantea*	Perennial Tree	None	None	2.2	Sonoran desert scrub (rocky); blooms May-June	Low - Moderate	Suitable habitat present onsite. Historical reference for known location adjacent to project area.	CAGI10
Cactaceae	Munz's cholla	*Cylindropuntia munzii*	Perennial Shrub	BLM Sensitive	None	1B.3	Sonoran desert scrub (sandy or gravelly); blooms May	Low - Moderate	Suitable habitat present onsite.	CYMU12
Cactaceae	Wiggin's cholla	*Cylindropuntia echinocarpa (Opuntia wigginsii)*	Perennial Shrub	None	None	3.3	Sonoran desert scrub (sandy); blooms March	High	Suitable habitat, present onsite. Known adjacent occurrences.	CYEC3
Cactaceae	Foxtail Cactus	*Escobaria alversonii (Coryphantha alversonii)*	Perennial Stem Succulent	None	None	4.3	Sandy or rocky, usually granitic. Mojavean desert scrub, Sonoran desert scrub. Blooms April-June	Moderate	Suitable habitat present onsite. Historical reference for known location in vicinity to project area.	ESAL2

	SPECIES			SENSITIVITY STATUS			HABITAT ASSOCIATIONS	POTENTIAL TO OCCUR ON PROJECT SITE	STATUS ONSITE	Plant Species Code
Family	Common Name	*Scientific Name*	Growth Habit	Federal/BLM	State	CNPS				
Euphorbiaceae	Abrams' sandmat, Abrams' prostrate spurge	*Chamaesyce abramsiana*	Annual Forb/Herb	None	None	2.2	Mojavean and Sonoran desert scrub Creosote Bush Scrub; blooms September-November	Moderate	Suitable habitat present onsite. Known adjacent occurrence	CHAB2
Euphorbiaceae	California silverbush	*Agrythamnia californica (Ditaxis serrata var. californica)*	Annual Perennial Subshrub Shrub Forb/Herb	None	None	3.2	Sonoran desert scrub, Creosote Bush Scrub; blooms March-December	Moderate	Suitable habitat present onsite	ARCA19
Fabaceae	Harwood's milk-vetch	*Astragalus insularis* var. *harwoodii*	Annual Forb/Herb	None	None	2.2	Desert dunes (sandy or gravelly); blooms January-May.	High	Suitable habitat present onsite. Several known adjacent occurrences.	ASINH
Fabaceae	Borrego milkvetch, Borrego milk vetch	*Astragalus lentiginosus var. borreganus*	Annual Perennial Forb/Herb	None	None	4.3	Mojavean and Sonoran desert scrub, Creosote Bush Scrub (sandy); blooms February-May	Moderate	Suitable habitat present onsite.	ASLEB
Fabaceae	Pink fairy-duster	*Calliandra eriophylla*	Perennial Subshrub Shrub	None	None	2.3	Sonoran desert scrub (sandy or rocky); blooms January-March.	Moderate	Suitable habitat present onsite. Known adjacent occurrences.	CAER
Lamiaceae	Dwarf germander	*Teucrium cubense ssp. depressum*	Annual Perennial Forb/Herb	None	None	2.2	Sandy soils, washes, fields; blooms March-May.	Moderate	Suitable habitat present onsite. Known adjacent occurrences.	TECUD2
Loasaceae	Darlington's blazing star	*Mentzelia oreophilia (Mentzelia puberula)*	Biennial Perennial Forb/Herb Subshrub	None	None	2.2	Mojavean and Sonoran desert scrub (rocky or sandy); blooms March-May.	Moderate	Suitable habitat present onsite. Known adjacent occurrences.	MEOR3
Loasceae	Spinyhair blazing star	*Mentzelia tricuspis*	Annual Herb	None	None	2.1	Mojavean desert scrub, Creosote Bush Scrub, sandy, gravelly, slopes and washes. Blooms March-May.	Low	Moderate habitat. No known occurances adjacent or close to site.	METR2
Nyctaginaceae	Desert sand verbena	*Abronia villosa var. aurita*	Annual Herb	BLM Sensitive	None	1B.1	Sandy Chaparral, Coastal scrub, Desert dunes. Blooms January-September	Low-Moderate	Suitable habitat present. No known adjacent occurrences.	ABVIA

	SPECIES			SENSITIVITY STATUS			HABITAT ASSOCIATIONS	POTENTIAL TO OCCUR ON PROJECT SITE	STATUS ONSITE	Plant Species Code
Family	Common Name	*Scientific Name*	Growth Habit	Federal/BLM	State	CNPS				
Nyctaginaceae	Angel trumpets	*Acleisanthes longiflora*	Perennial Herb	None	None	2.3	Sonoran desert scrub (carbonate), Creosote Bush Scrub, Blooms May	Low-Moderate	One known occurrence in Maria Mountains.	ACOL2
Onagraceae	Sand evening primrose	*Camissonia arenaria*	Annual Perennial Forb/Herb	None	None	2.2	Sonoran desert scrub (sandy or rocky); blooms March-May	Moderate	Suitable habitat present onsite.	CAAR20
Pedaliaceae	Desert unicorn plant, desert devil's claw	*Proboscidea althaeifolia*	Perennial Forb/Herb	None	None	4.3	Sonoran desert scrub, Creosote Bush Scrub (sandy; blooms May-August	Moderate	Suitable habitat present onsite.	PRAL4
Poaceae	California satintail	*Imperata brevifolia*	Perennial Rhizomatus Herb	None	None	2.1	Mesic. Chaparral, Coastal scrub, Mojavean desert scrub. Meadows and seeps often alkali. Riparian scrub. Blooms September-May.	Low	Habitat on site has low to no occurrences of mesic areas.	IMBR2
Polemoniaceae	Harwood's eriastrum	*Eriastrum harwoodii*	Perennial Forb/Herb	BLM Sensitive	None	1B.2	Desert dunes; blooms March-June	Moderate	Suitable habitat present onsite.	ERHA
Rhamnaceae	Las Animas columbrina	*Colubrina californica*	Perennial Deciduous Shrub	None	None	2.3	Sonoran desert scrub, Creosote Bush Scrub. Blooms April-June	Moderate	Suitable habitat present onsite. Recorded occurrences in vicinity.	COBA18
Rhamnaceae	Spiny crucillo, bitter snakewood, spiny abrojo	*Condalia globosa var. pubescens*	Perennial Tree Shrub	None	None	4.2	Creosote Bush Scrub (sandy); blooms May-August	Moderate	Suitable habitat present onsite.	COGLP
Simaroubaceae	Emory's crucifixion thorn	*Castela emoryi*	Perennial Shrub Tree	None	None	2.3	Dry, rocky desert washes, slopes and plains; blooms June-July.	Moderate	Suitable habitat present onsite.	CAEM4
Themidaceae	Small-flowered androstephium	*Androstephium breviflorum*	Perennial bulbiferous (corm) herb	None	None	2.2	Desert dunes, Mojavean desert scrub (bajadas). Blooms March-April	Low-Moderate	Suitable habitat onsite	ANBR4
Species List for - California Code - Division 23: CALIFORNIA DESERT NATIVE PLANTS [80001. - 80201.] (Act)										
Section 80072 Species List										
Burseraceae	Elephant Tree	*Bursera*	Perennial		80072	2.3	Blooms Early Summer	Low	Not observed on site	BUMI

	SPECIES			SENSITIVITY STATUS			HABITAT ASSOCIATIONS	POTENTIAL TO OCCUR ON PROJECT SITE	STATUS ONSITE	Plant Species Code
Family	Common Name	*Scientific Name*	Growth Habit	Federal/BLM	State	CNPS				
		microphylla	Tree, Shrub						during initial review. Localized populations not mapped on site or within vicinity of the site.	
Cactaceae	California Barrel Cactus	*Ferocactus cylindraceus (Ferocactus acanthoides)*	Perennial Shrub		80072		Sonoran desert scrub, Creosote Bush Scrub Blooms April-May	High	Observed on site during initial review.	FECY
Crassulaceae	Panamint liveforever	*Dudleya saxosa, Dudleya saxosa ssp. saxosa (1B.3)*	Perennial Forb/Herb		80072	1B.3	Blooms April-June	Moderate	Rocky desert slopes present on site	DUSA
Pinaceae	Bristlecone Pine	*Pinus longaeva*	Perennial Tree		80072	4.3	Unknown	Low	Localized populations not mapped on site. Not observed on site during initial review	PILO
Arecaceae	California Fan Palm	*Washingtonia filifera*	Perennial Tree		80072		Blooms June	Low	Localized populations not mapped on site. Not observed on site during initial review.	WAFI
Section 80073 Species List										
Agavaceae	Century Plants, Yuccas, Nolinas	*All Species*	Perennial Shrub, Tree		80073		Sonoran desert scrub, Creosote Bush Scrub	Moderate	Not observed on site during initial review.	
Cactaceae		*All Species*	Perennial Shrub, Tree		80073		Sonoran desert scrub, Creosote Bush Scrub	High	<u>Observed on site:</u>	
									Cylindropuntia echinocarpa	CYEC
									Cylindropuntia ramosissima	CYRA
									Ferocactus cylindraceus	FECY
									Mammillaria	MATE

	SPECIES			SENSITIVITY STATUS			HABITAT ASSOCIATIONS	POTENTIAL TO OCCUR ON PROJECT SITE	STATUS ONSITE	Plant Species Code
Family	Common Name	*Scientific Name*	Growth Habit	Federal/BLM	State	CNPS				
									tetrancistra	
									Mammillaria grahamii	MAGR
									Opunita basilaris	OPBA
									Echinocactus polycephalus	ECPO
Fouquieriaceae	Ocotillo, candlewood	*Fouquieria splendens*	Perennial Shrub		80073		Sonoran desert scrub, Creosote Bush Scrub Blooms March-July	High	Observed on site	FOSP2
Fabaceae	Mesquite	*Prosopis sp. All Species*	Perennial Tree, Shrub		80073		Sonoran desert scrub, Creosote Bush Scrub Blooms April-Sept	High	Observed on site	PRGL
Fabaceae	Palo Verde	*Parkinsonia sp./ All Species*	Perennial Tree, Shrub		80073		Sonoran desert scrub, Blooms April-May	High	Observed on site	PAFL
Fabaceae	Catclaw Acacia	*Acacia greggii*	Perennial Shrub		80073		Sonoran desert scrub, Creosote Bush Scrub Blooms April-June	High	Observed on site	ACGR
Chenopodiaceae	Desert-Holly	*Atriplex hymenelytra*	Perennial Shrub		80073		Sonoran desert scrub, Creosote Bush Scrub Blooms Jan-April	High	Observed on site	ATHY
Fabaceae	Desert Ironwood	*Olneya tesota*	including both dead and live desert ironwood		80073		Sonoran desert scrub, Blooms April-May	High	Observed on site	OLTE

Status:
Federal Endangered (FE)
Federal Threatened (FT)
Federal Candidate (FC)
Federal Species of Concern (FSC)
State Endangered (SE)
State Threatened (ST)
State Species of Special Concern (SSC)

CNPS Lists:
List 1A Plants Presumed Extinct in California
List 1B Plants Rare, Threatened or Endangered in California and Elsewhere
List 2 Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere
List 3 Plants About Which We Need More Information, A Review List
List 4 Plants of Limited Distribution, A Watch List
List is followed by threat code (e.g. CNPS List 1B.2)
.1 - Seriously endangered in California (over 80% of occurrences threatened / high degree and

	SPECIES			SENSITIVITY STATUS			HABITAT ASSOCIATIONS	POTENTIAL TO OCCUR ON PROJECT SITE	STATUS ONSITE	Plant Species Code
Family	Common Name	*Scientific Name*	Growth Habit	Federal/BLM	State	CNPS				

State Fully Protected (SFP)
California Native Plant Society listed (CNPS).

immediacy of threat)
.2 – Fairly endangered in California (20-80% occurrences threatened)
.3 – Not very endangered in California (<20% of occurrences threatened)

Rare Plant Found on This Checklist ☐

Observers:_____

Date:_____

Cell #'s:_____

GPS Unit Name:_____

	Family Name/Species Name	Rare Plant Code
	Acanthaceae	
	Justicia californica	
	Aizoaseaeae	
	Trianthema portulacastrum	
	Agavaceae	See desert list
	Amaranthaceae	
	*Amaranthus albus**	AMAL
	Amaranthus blitoides	
	Amaranthus palmeri	
	Tidestromia oblongifolia	
	Anacardiaceae	
	Rhus integrifolia	
	Arecaceae	
	Washingtonia filifera	**WAFI**
	Asclepiadaceae	
	Asclepias albicans	
	Asclepias erosa	
	Asclepias subulata	
	Cynanchum utahense	**CYUT**
	Funastrum cynanchoides (Sarcostemma cynanchoides)	
	Funastrum cynanchoides ssp. heterophyllum (Sarcostemma cynanchoides var. hartwegii)	
	Funastrum hirtellum (Sarcostemma hirtellum)	
	Asteraceae	
	*Acroptilon repens**	ACRE3
	Adenophyllum porophylloides	
	Ambrosia acanthicarpa	
	Ambrosia artemisiifolia	
	Ambrosia dumosa	
	Ambrosia ilicifolia	
	Antheropeas wallacei	
	Atrichoseris platyphylla	
	Baccharis salicifolia	
	Baccharis sarothroides	
	Baileya pauciradiata	
	Baileya pleniradiata	
	Bebbia juncea	
	Brickellia californica	
	Calycoseris wrightii	
	Chaenactis carphoclinia	
	Chaenactis fremontii	
	Chaenactis stevioides	
	Chloricantha spinosa	
	Chrysothamnus nauseosus	
	*Conyza bonariensis**	COBO
	Dicoria canescens	
	Encelia farinosa	
	Encelia frutescens	
	Geraea canescens	
	Hymenoclea salsola	
	Hymenoxys odorata	**HYOD**
	*Lactuca serriola**	LASE
	Logfia depressa	
	Malacothrix glabrata	
	Monoptilon belliforme	
	Monoptilon belliodes	
	Palafoxia arida	

	Family Name/Species Name	Rare Plant Code
	Pectis papposa	
	Perityle emoryi	
	Peucephyllum schottii	
	Pleurocoronis pluriseta	
	Pluchea sericea	
	Porophyllum gracile	
	Prenanthella exigua	
	Psathyrotes ramosissima	
	Rafinesquia neomexicana	
	Senecio mohavensis	
	*Sonchus oleraceus**	SOOL
	Stephanomeria pauciflora	
	Stylocline micropoides	
	Symphyotrichum subulatum var. parviflorum	
	Trixis californica	
	Trichoptilum incisum	
	Verbesina encelioides	
	Boraginaceae	
	Amsinckia menziesii	
	Amsinckia tessellata	
	Cryptantha angustifolia	
	Cryptantha barbigera	
	Cryptantha costata	**CRCO15**
	Cryptantha circumscissa	
	Cryptantha dumetorum	
	Cryptantha holoptera	**CRHO3**
	Cryptantha maritima	
	Cryptantha micrantha	
	Cryptantha nevadensis	
	Cryptantha pterocarya	
	Cryptantha sp.	
	Heliotropium curassavicum	
	Pectocarya heterocarpa	
	Pectocarya penicillata	
	Pectocarya platycarpa	
	Pectocarya recurvata	
	Plagiobothrys jonesii	
	Plagiobothrys sp.	
	Tiquilia canescens var. pulchella	
	Tiquilia palmeri	
	Tiquilia plicata	
	Brassicaceae	
	*Brassica rapa**	BRRA
	*Brassica tournefortii**	BRTO
	Cressa truxillensis	
	Descurainia pinnata	
	Dithyrea californica	
	Guillenia lasiophylla (Caulanthus lasiophyllus)	
	*Hirschfeldia incana**	HIIN3
	Lepidium lasiocarpum	
	Lepidium fremontii	
	*Sisymbrium altissimum**	SIAL2
	*Sisymbrium irio**	SIIR
	Streptanthella longirostris	
	Thysanocarpus curvipes	
	Burseraceae	
	Bursera microphylla	**BUMI**
	Cactaceae	
	Carnegiea gigantea	**CAGI10**

	Family Name/Species Name	Rare Plant Code
	Cylindropuntia acanthocarpa	**CYAC8**
	Cylindropuntia bigelovii	**CYBI9**
	Cylindropuntia echinocarpa (Opuntia wigginsii)	**CYEC3**
	Cylindropuntia munzii	**CYMU12**
	Cylindropuntia ramosissima	**CYRA9**
	Echinocactus polycephalus	**ECPO2**
	Echinocereus engelmannii	**ECEN**
	Escobaria alversonii	**ESAL2**
	Ferocactus cylindraceus	**FECY**
	Mammillaria grahamii	**MAGR9**
	Mammillaria tetrancistra	**MATE4**
	Mammillaria sp.	See desert list
	Opuntia basilaris	**OPBA2**
	Campanulaceae	
	Nemacladus glanduliferus	
	Nemacladus rubescens	
	Nemacladus tenuis var. aliformis	
	Capparaceae	
	Wislizenia refracta ssp. palmari	**WIREP**
	Wislizenia refracta ssp. refracta	**WIRER**
	Caryophyllaceae	
	Achyronychia cooperi	
	Chenopodiaceae	
	Atriplex canescens	
	Atriplex hymenelytra	**ATHY**
	Atriplex lentiformis	
	Atriplex muelleri	
	Atriplex polycarpa	
	Atriplex semibaccata	
	Bassia hyssopifolia	
	*Chenopodium album var. missouriense**	CHALM2
	Chenopodium murale	
	Chenopodium sp.	
	Monolepis nuttalliana	
	*Salsola paulsenii**	SAPA8
	*Salsola tragus**	SATR12
	Sueda moquinii	
	Convolvulaceae	
	*Convolvulus arvensis**	COAR4
	Crassulaceae	
	Crassula connata	
	Dudleya saxosa	**DUSA**
	Cucurbitaceae	
	Brandegea bigelovii	
	Cucurbita digitata	
	Cucurbita palmata	
	Marah macrocarpus	
	Cuscutaceae	
	Cuscuta denticulata	
	Cyperaceae	
	Schoenoplectus pungens var. longispicatus	
	Ephedraceae	
	Ephedra aspera	
	Ephedra fasciculata	
	Ephedra nevadensis	
	Ephedra trifurca	
	Euphorbiaceae	
	Argythamnia californica (Ditaxis serrata var. californica)	**ARCA19**
	Argythamnia claryana (Ditaxis claryana)	**ARCL2**
	Argythamnia lanceolata (Ditaxis lanceolata)	
	Argythamnia neomexicana (Ditaxis neomexicana)	
	Chamaesyce abramsiana	**CHAB2**
	Chamaesyce micromera	

	Family Name/Species Name	Rare Plant Code
	Chamaesyce pediculifera	
	Chamaesyce polycarpa	
	Chamaesyce serpyllifolia ssp serpyllifolia	
	Chamaesyce setiloba	
	Croton californicus	
	Stillingia linearifolia	
	Stillingia spinulosa	
	Fabaceae	
	Acacia greggii	**ACGR**
	Alhagi maurorum	ALMA12
	Astragalus aridus	
	Astragalus didymocarpus	
	Astragalus insularis var. harwoodii	**ASINH**
	Astragalus lentiginosus var. borreganus	**ASLEB**
	Astragalus lentiginosus var. coachellae	**ASLEC2**
	Astragalus nuttalianus	
	Calliandra eriophylla	**CAER**
	Dalea mollis	
	Dalea mollissima	
	Hoffmannseggia glauca	
	Hoffmannseggia microphylla (Caesalpinia virgate)	
	Lotus strigosus	
	Lupinus arizonica	
	Marina parryi	
	*Melilotus officinalis**	MEOF
	Olneya tesota	**OLTE**
	Parkinsonia florida	**PAFL6**
	Prosopis glandulosa	**PRGL2**
	Prosopis glandulosa var. torreyana	**PRGLT**
	Psorothamnus emoryi	
	Psorothamnus schotti	
	Psorothamnus spinosus	
	Senna armata	
	*Senna obtusifolia**	SEOB4
	Sesbania herbacea	
	Fouquieriaceae	
	Fouquieria splendens	**FOSP2**
	Geraniaceae	
	*Erodium cicutarium**	ERCI6
	Erodium taxanum	
	Hydrophyllaceae	
	Emmenanthe penduliflora	
	Eucrypta chrysanthemifolia	
	Eucrypta micrantha	
	Nama demissum	
	Nama hispidum var. spathulatum	
	Nama pusillum	
	Phacelia affinis	
	Phacelia crenulata	
	Phacelia crenulata var. ambigua (Phacelia ambigua)	
	Phacelia crenulata var. crenulata	
	Phacelia crenulata var. minutiflora	
	Phacelia distans	
	Phacelia ivesiana	
	Phacelia neglecta	
	Phacelia tanacetifolia	
	Krameriaceae	
	Krameria erecta	
	Krameria grayi	
	Lamiaceae	
	Hyptis emoryi	
	Salazaria mexicana	
	Salvia columbariae	
	Teucrium cubense ssp. depressum	**TECUD2**

	Family Name/Species Name	Rare Plant Code
	Liliaceae	
	Hesperocallis undulata	
	Loasaceae	
	Mentzelia affinis	
	Mentzelia albicaulis	
	Mentzelia involucrata	
	Mentzelia multiflora var. longiloba	
	Mentzelia oreophilia (M. puberula)	**MEOR3**
	Mentzelia tricuspis	**METR2**
	Petalonyx thurberi	
	Malvaceae	
	Eremalche exilis	
	Eremalche rotundifolia	
	Hibiscus denudatus	
	*Malva parviflora**	MAPA5
	*Malvella leprosa**	MALE3
	Sphaeralcea ambigua	
	Sphaeralcea ambigua ssp. ambigua	
	Sphaeralcea angustifolia	
	Nyctaginaceae	
	Abronia villosa var. aurita	**ABVIA**
	Abronia villosa var. villosa	
	Acleisanthes longiflora	**ACOL2**
	Allionia incarnata	
	Boerhavia coulteri	
	Boerhavia intermedia (B. erecta var. intermedia)	
	Boerhavia triquetra	
	Boerhavia wrightii	
	Mirabilis californica	
	Mirabilis laevis var. villosa	
	Onagraceae	
	Camissonia arenaria	**CAAR20**
	Camissonia boothii	
	Camissonia boothii ssp. arizonica	
	Camissonia boothii ssp. condensata	
	Camissonia boothii ssp. desertorum	
	Camissonia boothii ssp. pallidula	
	Camissonia brevipes	
	Camissonia brevipes ssp. arizonica	
	Camissonia brevipes ssp. brevipes	
	Camissonia brevipes spp. pallidula	
	Camissonia cardiophylla	
	Camissonia chamaenerioides	
	Camissonia claviformis	
	Camissonia claviformis ssp. aurantiaca	
	Camissonia pallida	
	Camissonia refracta	
	Camissonia sp.	
	Oenothera deltoides	
	Orobanchaceae	
	Orobanche cooperi	
	Papaveraceae	
	Argemone munita	
	Eschscholtzia glyptosperma	
	Eschscholtzia minutiflora	
	Pedaliaceae	
	Proboscidea althaeifolia	**PRAL4**
	Plantaginaceae	
	Plantago ovata	
	Poaceae	
	Achnatherum hymenoides	
	Aristida adscensionis	
	Aristida californica	
	Aristida purpurea	
	Bouteloua aristidoides	

	Family Name/Species Name	Rare Plant Code
	Bouteloua aristidoides var. aristidoides	
	Bouteloua barbata	
	*Bromus rubens**	BRRU2
	Cenchrus ciliaris	
	*Chloris virgata**	CHVI4
	*Cynodon dactylon**	CYDA
	Dactylis glomerata	
	Echinochloa colona	
	Eragrostis pectinacea	
	Eragrostis pectinacea var. pectinacea	
	Eriochloa acuminata	
	Eriochloa acuminata var. acuminata	
	*Eriochloa contracta**	ERCO8
	Erioneuron pulchellum	
	*Heteropogon contortus**	HECO10
	*Hordeum murinum**	
	Imperata brevifolia	**IMBR2**
	Leptochloa panicea ssp. brachiate (Leptochloa filiformis)	
	Leptochloa uninervia	
	Muhlenbergia microsperma	
	*Oryza sativa**	ORSA
	Panicum hirticaule	
	*Phalaris minor**	PHMI3
	Pleuraphis rigida	
	*Polypogon monspeliensis**	POMO5
	*Saccharum ravennae**	SARA3
	*Schismus arabicus**	SCAR
	*Schismus barbatus**	SCBA
	*Setaria pumila**	SEPU8
	*Setaria viridis**	SEVI4
	*Sorghum halepense**	SOHA
	*Vulpia bromoides **	VUBR
	Vulpia octoflora var. octoflora (Festuca octoflora)	
	Polemoniaceae	
	Eriastrum harwoodii	**ERHA**
	Gilia latifolia	
	Gilia scopulorum	
	Gilia stellata	
	Gilia sp.	
	Langloisia setosissima ssp. setosissima	
	Linanthus filiformis	
	Linanthus jonesii	
	Linanthus lemmonii	
	Linanthus schottii	
	Loeseliastrum matthewsii	
	Polygonaceae	
	Centrostegia thurberi	
	Chorizanthe brevicornu	
	Chorizanthe brevicornu var. brevicornu	
	Chorizanthe corrugata	
	Chorizanthe rigida	
	Eriogonum deflexum	
	Eriogonum deflexum var. deflexum	
	Eriogonum inflatum	
	Eriogonum inflatum var. deflexum	
	Eriogonum reniforme	
	Eriogonum sp.	
	Eriogonum thomasii	
	Eriogonum trichopes	
	*Polygonum arenastrum**	POAR11
	*Polygonum argyrocoleon**	POAR5
	*Polygonum persicaria**	POPE3
	*Polygonum ramosissium**	PORA3
	Portulacaceae	

	Family Name/Species Name	Rare Plant Code
	Calyptridium monandrum	
	Cistanthe ambigua (Calandrinia ambigua)	
	*Portulaca oleracea**	POOL
	Resedaceae	
	Oligomeris linifolia	
	Rhamnaceae	
	Colubrina californica	**COBA18**
	Condalia globosa var. pubescens	**COGLP**
	Scophulariaceae	
	Mimulus bigelovii	
	Mohavea confertiflora	
	Neogaerrhinum filipes	
	Penstemon pseudospectabilis	
	Simaroubaceae	
	Castela emoryi	**CAEM4**
	Simmondsiaceae	
	Simmondsia chinensis	
	Solanaceae	
	Callibrachoa parviflora (Petunia parviflora)	
	Datura discolor	
	Datura wrightii	
	Lycium andersonii	
	Lycium pallidum	
	*Nicotiana glauca**	NIGA
	Nicotiana obtusifolla	
	Physalis crassifolia	
	*Solanum elaeagnifolium**	SOEL
	Tamaricaceae	
	*Tamarix parviflora**	TAPA4
	*Tamarix ramosissima**	TARA
	Themidaceae	
	Androstephium breviflorum	**ANBR4**
	Urticaceae	
	Parietaria hespera	
	Visaceae	
	Phoradendron californicum	
	Zygophyllaceae	
	Fagonia laevis	
	Fagonia pachyacantha	
	Kallstroemia californica	
	Kallstroemia grandiflora	
	Larrea tridentata	
	*Tribulus terrestris**	TRTE
	Additional Families/Species	

GPS File Log	Number / Radius
Enter GPS files with the following naming convention:	
species code_user initials_occurence number	
Example: HYOD_KS_001	**35 / 100m^2**
HYOD_KS_002	**225 / 500m^2**

GPS File Log	Number / Radius

Heather Rothbard

Staff Botanist/Wetland Biologist/Planner

Areas of Expertise

- Botanical Surveys
- Wetland Delineations
- NEPA Documentation
- Biological Surveys including Desert Tortoise and Burrowing Owl
- Habitat Enhancement and Restoration Site Development
- Monitoring and Management
- 401/404 Jurisdictional Delineations and Permitting
- Phase I Environmental Site Assessments
- Integrated Natural Resource Management Plans
- Pest Management Plans
- Biological Reviews

Years of Experience

With URS: <1 year
With Other Firms: 7 Years

Education

BS/Botany: Emphasis in Environmental Science and Ecology / 2003/ Arizona University, Tempe, Arizona

Permits

CDFG Voucher Collecting Permit, Threatened and Endangered Plant Species, 2010

Overview

Ms. Rothbard has eight years of experience in botanical/biological survey and environmental regulatory compliance. Her experience includes rare and sensitive plant surveys, noxious weed surveys, percent cover surveys, rangeland studies including flora identification, habitat enhancement and restoration site development, monitoring, management, biomass and species diversity data collection, biological surveys for desert tortoise and burrowing owl, National Environmental Policy Act (NEPA) documentation, environmental site assessments, Section 404 delineation and permitting including ephemeral washes, intermittent and perennial steams, and freshwater, tree-dominated wetlands, Phase I Environmental Site Assessments, Integrated Natural Resource Management Plans and Pest Management Plans, and biological reviews. Ms. Rothbard has managed and performed numerous plant surveys, 401/404 jurisdictional delineations, managed and performed a biological and soil salinity study on a major oilseed crop for the USDA-ARS, and held responsibility for arthropod collection and identification, identification of native and non-indigenous plants, soil and plant root collection for mycorrhizal fungi detection, and vegetation sampling and monitoring at sites in the Phoenix metro and surrounding area for the Central Arizona Phoenix Long-Term Ecological Research Project (CAP-LTER). Vegetative areas of study include low to high desert, chaparral, coastal chaparral, juniper/pinyon pine, coniferous and hardwood forests, grasslands, and rangelands.

Project Specific Experience

Clean Water Act Section 404 Delineation and Permitting

Ms. Rothbard has prepared Section 401/404 jurisdictional delineations for waters of the U.S., including ephemeral washes, intermittent and perennial steams, and freshwater, tree-dominated wetlands. She has also prepared nationwide and individual permit applications. Her Section 404 work includes projects in Arizona, Oklahoma, California, and South Carolina.

National Environmental Policy Act

Ms. Rothbard has prepared National Environmental Policy Act (NEPA) environmental assessments (EAs), Integrated Natural Resource Management Plans (INRMPs), and technical studies for environmental impact statements (EISs) for water distribution and collection, utility, development, aviation, and transportation projects in Arizona, Hawaii, Oklahoma, Nevada, Kansas, California, and Japan. Clients include municipalities, transportation departments, United States Air Force Bases, United States Naval Bases, United States Marine Corps Air Stations, National Guard Training Facilities, and private developers.

Restoration/Habitat Enhancement

Ms. Rothbard has served as assistant project manager/field manager for restoration and habitat enhancement projects for United States Marine

Corps Stations, United States Border Protection, and private developers in California and Arizona. Projects include habitat enhancement for endangered species, wetland creation and monitoring, invasive plant removal and monitoring, and developing plans for restoration/habitat enhancement sites.

Botanical/Biological Surveys

Ms. Rothbard has conducted numerous botanical surveys including noxious weed, rare plant, percent cover, botanical inventories, and rangeland diversity surveys in Arizona, California, and New Mexico. Vegetative areas include low to high desert, coastal-shrub chaparral, coastal dunes, juniper/pinyon pine, coniferous forest, grasslands, and rangelands. Clients include utilities, railroads, and local, state, and federal land management departments. Ms. Rothbard has also conducted several biological surveys for desert tortoise (Gopherus agassizii), burrowing owl (Athene cunicularia), fairy shrimp, and habitat for threatened and endangered bat species in California and Arizona.

Environmental Site Assessments

Ms. Rothbard has conducted Phase I Environmental Site Assessments (ESAs) of undeveloped, industrial, residential, and commercial facilities in Arizona. Clients included municipalities, commercial developers, Native American Tribes, and residential developers.

Botanical/Biological Surveys

Staff Botanist/Biologist – Field Leader, Rio Mesa Solar Project, Riverside County, CA; BrightSource Energy (BSE), 2011: Ms Rothbard served as Botany Field Lead responsible for the in-part field leadership for the botanical resource and state and federal waters jurisdictional determination tasks. The 13,000 acre site is located near Blythe, California in the southern Mojave Desert adjacent to the Colorado River and included federal and private lands. Ms Rothbard used ArcView to digitize jurisdictional wash boundaries according to agreed protocol with the US Army Corps of Engineers. Botanical surveys were conducted based on a synthesis of protocols outlined by Bureau of Land Management, California Dept. of Fish and Game and the California Native Plant Society. A sampling based inventory was also devised for California Desert native Plants Act species to support a Desert Plant Species Salvage Plan per the requirements of the California Energy Commission.

Staff Botanist - Endangered Species Surveys, San Diego Air Force Space Surveillance Station, CA. (2010). Ms Rothbard served as field botanist for Otay tar plant (*Deinandra conjugens*) endangered species surveys for the US Air Force. The U.S. Air Force contracted AMEC to provide on-going monitoring for this 100-acre antenna array site. Tasks included transect surveys and mapping of Otay tarplant individuals and populations.

Botanist/Field Manager - Spring Canyon Riparian Restoration Project, US Army Corps of Engineers, San Diego County, CA (2009-2010). Ms. Rothbard served as Field manager for this 5-acre site that has

restored, enhanced, and created riparian habitat mitigation associated with impacts from border fence projects. Long-term activities include habitat enhancement, monitoring, and reporting. Yearly surveys included belt, point and transect surveys to evaluate tree survivorship, health of the ecosystem and create a botanical inventory of present species.

Biological Monitor for Environmental Compliance – San Onofre Nuclear Generating Station Replacement Steam Generator Project, SCE, San Diego, CA (2010). Ms Rothbard served as a Biological Monitor coordinating with a team of eight monitors during the around the clock operation spanning several weeks for each move. As a biologist, Ms Rothbard conducted environmental education and training to all personnel involved with the transport of the replacement steam generators across environmentally sensitive habitats including beaches, dunes, and upland habitat on Camp Pendleton. Ms Rothbard and other monitors marked all sensitive habitats along the transport route, including beach, river outlet crossings, dune habitat, and upland habitat, and worked closely with transport personnel to ensure all persons on site knew what potential impacts could occur each day. During transport, Ms Rothbard provided biological monitoring on up to four different sites along the transport route. Throughout the transport, she worked closely with biologists from SCE, Marine Corps Base Camp Pendleton and the Public Utilities Commission to ensure impacts remained minimal. Biologists with specialized permits for California Least Tern, Snowy Plover, Fairy Shrimp, and Tidewater Goby conducted pre-transport surveys and delineated areas on the beach section of the route designated for stop over areas, which were required during the transport.

Botanist/Field Manager - Endangered Willowy Monardella Habitat Enhancement, MCAS Miramar, San Diego, CA: (2009-2010). Ms Rothbard served as Field manager for this enhancement project with the overall goal to protect existing populations of willowy monardella (*Monardella viminea*) and improve current habitat conditions so that these populations can expand. She managed and participated in censoring, mapping, and conducting habitat assessments of existing willowy monardella populations and assisted in the development of on-going enhancement and monitoring techniques.

Botanist/Field Manager - Spring Canyon Riparian Restoration Project, San Diego County, CA (2009-2010). Ms Rothbard served as Field manager for this 5-acre site that has restored, enhanced, and created riparian habitat mitigation associated with impacts from border fence projects. Long-term activities include habitat enhancement, monitoring, and reporting.

Botanist/Assistant Project Manager - Imperial Irrigation District Managed Marsh Planting, Calipatria, CA: (2009-2010). Ms Rothbard served as Assistant Project Manager for developing, planning, and planting of a 365 acre created marsh. The Imperial Irrigation District is developing over 900 acres of a Managed Marsh for the benefit of certain listed species, including the Yuma Clapper Rail and the California Black Rail. This project encompasses 365 acres in 20 cells, and is Phase 1 of the

larger 900 acre project. The team began the planting in early September 2009, with a required completion date of October 31, 2009, which was met. This schedule required the development of a planting and water management plan that would assure the plants adequate water during the hot weather, yet without excessively inundating plants in the lower portions of the cells. The team completed the project on schedule, and with excellent survivorship and health of the introduced plant material. Ms Rothbard supervised the field crews in the planting activities, and handled daily water management tasks in accordance with the needs of the plants and in collaboration with the client.

Staff Botanist - Invasive Plant Species Control at Marine Corps Air Station Miramar, San Diego, CA. (2010). Ms Rothbard served as staff botanist and coordinator for the control of invasive weeds in the canyon environments of Marine Corps Air Station Miramar. Target species were sought, mapped, treated, and evaluated in the riparian areas of San Clemente and Rose Canyons on the Base. Ms Rothbard participated in thoroughly surveying all areas of San Clemente Canyon and Rose Canyon on the Station to which access was granted. The purpose was to locate and treat invasive weeds and move towards their total eradication from these selected areas of the Station. Target species included trees, perennial herbs, and annual species. Ms Rothbard served as a biological monitor to assure that sensitive species were protected during treatment events. When new weed species were identified, Ms Rothbard aided in consultation with the Station botanist to determine a plan of action for their treatment. Ms Rothbard also provided photo documentation of the treatment activities, and submitted quarterly reports for this project, including maps, geodatabase updates, and photographs.

Staff Biologist - Burrowing Owl Presence/Absence Survey of the Lake Havasu City Wastewater System Expansion Program Conventional Gravity Sewer Collection System (2010), Lake Havasu City Arizona: Ms. Rothbard served as Assistant Project Manager/Field Leader for conducting Burrowing Owl (*Athene cunicularia*) presence/absence pre-construction surveys for sewer pipe installation in the eastern section of Lake Havasu City. Ms Rothbard also prepared a biological assessment outlining recommendations and instructions according to Arizona Burrowing Owl Working Group's *Burrowing Owl Project Clearance Protocol.*

Biologist - Dye Road Burrowing Owl Clearance Surveys, Ramona, California. (Summer and Winter 2009): Ms. Rothbard performed biological surveys in the right of way footprint for the realignment of Dye Road. These surveys included summer and wintering presence/absence surveys for burrowing owl (*Athene cunicularia*) Ms Rothbard followed California Fish and Game Burrowing Owl Consortium Guidelines.

Staff Botanist - Rare Plant Survey, San Vicente Road, Poway, California. San Diego County. (2009): Ms. Rothbard performed rare plant surveys along 7 miles of right of way along San Vicente Road in Poway, California. Plants surveyed for included a dozen species on the San Diego County Sensitive Species List.

Staff Botanist/Assistant Project Manager - Vegetation Identification through Airborne Photography, Statewide, Arizona. Private Client (2009-2010): Ms. Rothbard managed and performed plant identification along 4,000-miles of right-of-way using airborne photographs, taken by helicopter. The project included identifying vegetation to species, determining dominant species, and determining percent cover by vegetation type. All plant identification, vegetative habitat determination, and technical writing was performed by Ms. Rothbard. Under this contract, Ms. Rothbard assembled a training manual and training presentation to aid technicians in vegetation identification within and around 4,000 miles of right-of-way using the airborne photographs. Ms. Rothbard quality controlled all vegetation identification before submittal to the end client.

Staff Botanist/Field Manager - Noxious Weed Survey for Palo Verde-North Gila 500kV Conductor Maintenance Project, Arizona Public Service (APS) and BLM Yuma Field Office, Yuma to Gila Bend, Arizona (May 2006, July 2008, March 2009, and 2010): Ms. Rothbard managed and performed noxious weed surveys in the right-of-way of a high voltage power line that extends from Yuma to Gila Bend, AZ. All plant identification, vegetative habitat determination, and technical writing was performed by Ms. Rothbard. The surveys were performed in accordance with an agreement between the APS Land Department and the United States Bureau of Land Management (BLM). For purposes of this survey, noxious and invasive weeds are defined as species included on the Arizona Department of Agriculture's (ADA) Prohibited, Regulated, and Restricted Noxious Weeds List, and the Noxious Weed List for the Yuma Field Office (YFO) of the BLM. The project received funding through Arizona Public Service however all data collection was performed on state and federal lands including BLM and the Yuma Proving Grounds.

Staff Botanist/Field Manager - Revegetation Assessment, Gallup, McKinley County, New Mexico (November-December 2008): Ms. Rothbard managed and performed vegetation surveys within the project site and at nearby point bars to evaluate vegetation recovery resulting from reseeding activities conducted by BNSF Railroad in November 2006. The surveys were conducted to evaluate project site recovery using a random meter^2 plot method to determine if percent cover was within the parameters as specified by the 2006 USACE 404 permit requirements for the project site. Ms. Rothbard prepared a report that summarized information on the recorded occurrence of species, native status, and comparisons between, the project site and a nearby undisturbed site to evaluate vegetation recovery to pre-construction conditions. In addition, recommendations and suggestions were given for future evaluation and timeline of vegetation recovery at the site.

Biologist - Palmdale Power Plant Biological Surveys, Palmdale, California. (April 2008, March 2010): Ms. Rothbard performed biological surveys in the right of way of a high voltage power line. These surveys included rare and sensitive plants, desert tortoise (*Gopherus agassizii*), and burrowing owl (*Athene cunicularia*) surveys.

Botanist/Biologist - Threatened and Endangered Species Surveys, United States/Mexico Border Fence Project – Tucson Sector, Gulf South Research Corporation (GSRC)/U.S. Army Corps of Engineers Fort Worth District, Pima and Santa Cruz Counties, Arizona (20008): AMEC has worked as a sub-consultant to GSRC to perform biological surveys along portions of the border fence within the Tucson Sector. Ms. Rothbard performed biological surveys along the United States and Mexico Border for T&E species including Pima pineapple cactus (*Coryphantha scheeri var ropustispina*), Acuna cactus (*Echinomastus erectocentrus var acunensis*), Chiricahua leopard frog (*Rana chiricahuensis*) and habitat for threatened and endangered bat species.

Botanist/Forester - Rare Plant Survey of 6 Mow Areas for the Prescott 500kV Transmission Line Maintenance Project, Chino Valley Ranger District, Prescott National Forest, Arizona. (Spring 2006): Ms. Rothbard managed and performed a plant survey for rare and sensitive plant species in the right of way of a high voltage power line. All plant identification, vegetative habitat determination, and technical writing was performed by Ms. Rothbard. The project received funding through Arizona Public Service however all data collection was performed on the Prescott National Forest.

Botanist - Rangeland Survey of the Roswell Grazing Allotment, BLM Roswell Field Office, New Mexico (Oct 2005): Ms. Rothbard performed plant identification, biomass determination, and species richness and diversity classification on grazing allotments in the Roswell, New Mexico area. Funding was provided by the BLM Roswell Field Office however the project was managed by Southwest Botanical Research, Chino Valley, Arizona.

Biological Technician - Arizona State University Central Arizona Project – Long-Term Ecological Research, Phoenix, Arizona (2004-2005): Ms. Rothbard performed arthropod collections and identification, native and non-indigenous plant identification, vegetation sampling and monitoring at over 32 sites in the Phoenix Metro Area. Funding was provided by the National Science Foundation however all work was managed and performed by the International Institute for Sustainability at Arizona State University.

Publications

Dierig, D.A., Tomasi, P.R., Dahlquist, G.H., Dawson, H.K*. Measurements of *Lesquerella* Interspecific Hybrids and Parents. Abstract 2003.

Dierig, D.A., Rodriguez, D., Foster, M.A., Grieves, C.M., **Dawson, H.K***., Rodriguez, R. Effects of Salinity on *Lesquerella* at Three Locations. Agronomy Abstracts. 2003.

*Dawson was Ms. Rothbard's married name at the time of publication.

Specialized Training

Yellow-billed Cuckoo Survey Training, 2010

DoD Plant Conservation Workshop, 2009

40-hour HAZWOPER Training, 2008 and 8-hr Refresher, 2009

Wetland Delineation Training, 2008

Desert Tortoise Survey and Handling Workshop, 2007

Chiricahua Leopard Frog Survey Training, 2007

Southwestern Willow Flycatcher Survey Training, 2007

Integrated Weed Management Workshop, 2007

USFWS Biological Assessment Workshop

Southwest Noxious Weed Short Course, 2006, 2007

Red Brome (*Bromus rubens*) Grass Symposium, 2006

Arizona Wildfire Academy, 2006

Sahara Mustard (*Brassica tournefortii*) Workshop, 2005

Chronology

Dec 2010-present: Staff Botanist, URS Corp., San Diego, California

May 2009 – Nov 2010: Botanist/Restoration Ecologist/Planner, AMEC Earth & Environmental, Inc., San Diego, California

2006 – May 2009: Botanist/Environmental Scientist/Planner, AMEC Earth & Environmental, Inc., Tempe, Arizona

2005 - 2006: Botanist/Forestry Planner, Arizona Public Service, Cottonwood, Arizona

2004 - 2005: Field Research Technician, International Institute for Sustainability, Arizona State University, Tempe, Arizona

2002 – 2004: Research Technician, USDA-ARS Water Conservation Lab., Phoenix, Arizona.

Resume
Michelle Balk, Owner/Principal Biologist

Balk Biological Consulting • P.O. Box 235316 • Encinitas, CA 92023-5316 • 760.672.4559 (mobile)

EDUCATION

- M.S., Biology with Ecology and Evolution emphasis, University of Akron (1999)
- B.S., Zoology, Iowa State University (1997)

PROFESSIONAL AFFILIATIONS

- California Native Plant Society
- Southern California Botanists
- California Botanical Society

PROFESSIONAL CERTIFICATIONS

- CDFG Rare, Threatened, and Endangered Plant Voucher Collection Permit
- Balk Biological Consulting has been certified as a Small Business Enterprise through the Coalition of Southern California Public Agencies and as a Small Business/Microbusiness through the State of California Department of General Services. The company is also registered in the U.S. Government's Central Contractor Registration (CCR) database as a Small Business and a Woman-Owned business.

PROFESSIONAL PROFILE

Ms. Balk has over 10 years of experience as a biological consultant in California. Project experience includes general and sensitive floral and wildlife surveys, vegetation mapping, wetlands delineation and permitting, mitigation monitoring, construction monitoring, and environmental document preparation. She has also participated in the development of habitat conservation plans pursuant to Section 10 of the Federal Endangered Species Act, and frequently teaches botany classes and workshops for the California Native Plant Society and Rancho Santa Ana Botanic Gardens.

SELECT RELEVANT PROJECT EXPERIENCE

Project Botanist, Ausra Carrizo Plain Solar Farm Project, San Luis Obispo County, California; Sterling Energy Solutions Solar 1, 2, 3, and 6 Projects (Now Calico Solar and Imperial Valley Solar Projects); San Bernardino and Imperial Counties, California. March 2008 – September 2010. Performed rare plant surveys for proposed solar farm projects totaling approximately 40,000 acres. Project sites were located on the Carrizo Plains of San Luis Obispo County, west of the City of El Centro in Imperial County, and east of Barstow in San Bernardino County, California.

Project Botanist, Station Fire Reforestation Project, United States Forest Service, San Gabriel Mountains, California. August – September 2010. Performed rare plant surveys in approximately 3,000 acres of potential conifer reforestation area.

CalNev Pipeline Expansion Project, Kinder Morgan Energy Partners, San Bernardino County, California, June – July 2009. Surveyed approximately 17 miles of proposed and existing petroleum pipeline alignment for late-blooming sensitive plants. Project site included sensitive areas of western San Bernardino County from the Cajon Pass in the north, along the Cajon Creek Wash in the San Bernardino National Forest, to approximately the City of Devore in the south. Project included visiting of reference populations of rare plants

and coordinating with Forest Service staff.

Project Botanist, Trilobite Solar Energy Generating Project, Pacific Gas and Electric Company, San Bernardino County, California. March – June 2009. Served as crew leader in the performance of rare plant surveys and vegetation characterization for approximately 6,400-acre proposed solar energy generating site in the central Mojave Desert. Prepared botanical survey report describing results for inclusion into Application for Certification by the California Energy Commission.

Project Botanist, Tehachapi Renewable Transmission Project, Southern California Edison, Los Angeles County, California, April 2010 – present. Led teams of botanists and coordinated work effort for rare plant surveys, vegetation mapping, and tree surveys along proposed energy transmission project. Monitored construction crews for conformance to biological mitigation measures during installation of utility line. Project traverses diverse vegetation communities including foothills, mountains, and desert.

Project Biologist/Botanist, State Route 79 Realignment Project, Riverside County Transportation Commission, Cities of Hemet and San Jacinto, CA; and County of Riverside, CA. March – September 2006. Performed wetlands delineations and surveyed for rare upland and wetland sensitive plant species along alternatives for proposed roadway realignment through the cities of Hemet and San Jacinto, CA.

Project Botanist, Mid-County Parkway, County of Riverside (Lake Mathews-Estelle Mountain Reserve and adjacent privately-owned lands), California. February – May 2005. Served as team leader for sensitive plant surveys on publicly- and privately-owned parcels within potential roadway alignment. Verified/updated vegetation mapping for project site.

Project Biologist, Pole Maintenance Project/Bark Beetle Project, Southern California Edison, San Bernardino and San Jacinto Mountains, San Bernardino and Riverside Counties, California. 2003 – 2006. Conducted botanical surveys and habitat assessments for sensitive plants at pole replacement locations and along electric lines at numerous locations in the San Bernardino and San Jacinto Mountains and the Mojave Desert. Coordinated with tree removal contractors regarding least biologically impactive methods of tree removal.

Project Botanist, Murrieta Hills Project, Riverside County, California. Spring - Summer 2008. Performed rare plant surveys for Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP) Criteria Area Species Survey Area (CASSA) and Narrow-endemic Plant Species Survey Area (NEPSSA) species and other sensitive species across a 1,280-acre survey area.

Project Botanist, Parcel D Project, Otay Land Company, County of San Diego, California. 2009. Performed surveys for a variety of rare plant species on mitigation site in the foothills of the Cuyamaca Mountains.

Project Botanist, Tejon Mountain Village Project, Kern and Los Angeles Counties, California. February – September 2007. Mapped vegetation and served as team leader for rare plant surveys on 28,000-acre proposed housing development project located in the

Tehachapi Mountains of southern Kern and northern Los Angeles Counties.

Project Biologist/Botanist, Fanita Ranch Project, Santee, California, Barratt American, Inc. 2004-2006. Performed vegetation mapping, wetlands delineation, rare plant surveys, and Quino checkerspot butterfly surveys on 2,000 acre property and potential mitigation site.

Project Biologist, Villages of San Jacinto Project, D.R. Horton, San Jacinto, California. March – June 2005. Performed vegetation mapping, wetlands delineation, and rare plant surveys on 475-acre property. Prepared biological technical report for California Environmental Quality Act documentation.

Project Botanist, Marine Corps Base Camp Pendleton, County of San Diego, California. 2005. Conducted rare plant surveys for Pendleton button celery (*Eryngium pendletonensis*) on 246 acres.

Project Biologist/Botanist, Village 3 Project, Otay Ranch Company, City of Chula Vista, California. 2003. Conducted vernal pool floristic surveys and rare plant surveys, including focused surveys for the federally-listed threatened and state-listed endangered Otay tarplant, on 263 acre site.

Project Biologist/Botanist, High Meadow Ranch Residential Development Project, Vicar Ventures, LLC, Community of Lakeside, County of San Diego, California. 2004 – 2006. Performed wetlands delineation and prepared wetlands permit applications, including conceptual mitigation plan, for 800-acre residential development project. Coordinated and negotiated with wetlands resource agencies and the U.S. Fish and Wildlife Service regarding sensitive species issues onsite.

OTHER RELEVANT EXPERIENCE

Co-instructor, "Rare Plants of Western San Diego County", February 2008; "Survey of the Sunflower Family (Asteraceae): Introduction to the Fall Bloomers", October 2005 and October 2006; "Survey of the Sunflower Family (Asteraceae): Introduction to the Spring Bloomers", March 2007; "Southern California Winter Plant Identification For Field Biologists", February 2006", Rare Plant Identification and Survey Techniques for Southern California", March 2006.

Participant, California Native Plant Society (CNPS) workshops: "Vegetation Mapping", October 13-15, 2009, and "Cyperaceae", July 22-24, 2008; Jepson Herbarium workshops: "Poaceae (Grass family)" May 7-8, 2005; "Spring Flora across Kern County" May 6-9, 2004; "Summer Annuals and Fall-Blooming Shrubs of the Eastern Mojave Desert" September 2003; "Morphology and Identification of Flowering Plants" March, 2003.

Participant, "Basic Wetland Delineation" presented by the Wetland Training Institute, Inc. August 2-6, 2004.

NEAL KRAMER, M.S. Botanist/Ecologist, Certified Arborist

EDUCATION/TRAINING

1981	***BA Botany,*** University of California, Berkeley
1984	***MS Forest Ecology,*** University of Idaho, Moscow
1996-2007	30 different floristic workshops (including ***Eastern Mojave Desert Flora***) University of California, Jepson Herbarium
2006	***Basic Wetland Delineation Certification***, Wetland Training Institute
2007	***Arborist Certification***, International Society of Arborists

PROFESSIONAL EXPERIENCE

1995- present	Botanical/Ecological Consulting, Kramer Botanical, Montara CA
1985-2005	Nursery Management, Nurserymen's Exchange, Half Moon Bay CA
1982-1984	Graduate Research/Teaching Assistant, Moscow ID
	Published *"Mature forest seed banks of three habitat types in central Idaho"*, Canadian Journal of Botany, Vol. 65, 1987
1975-1979	Wildfire Suppression/Helicopter Forman, USFS & BLM, Calif. & Wyoming

Mr. Kramer has experience with native flora and plant communities in 28 different California counties, in Arizona, Idaho, Nevada and Oregon, and internationally in the countries of Honduras, Ecuador and Peru. His experience includes plant inventories, rare plant surveys, tree surveys, invasive plant survey and eradication work, wetland delineations and revegetation projects for a wide variety of habitats. Rare plant surveys have included more than a dozen different San Francisco Bay Area sites, vernal pools in Fresno and Madera Counties and Delta marshland in Sacramento County. Neal is experienced in wetland delineation for a variety of wetland types including vernal pools. He has extensive experience using GPS systems for the purpose of mapping rare plants, invasive weeds and wetland delineations.

In 2008, Mr. Kramer participated in multi-season floristic surveys across the Mojave Desert for the CalNev pipeline project between Las Vegas and San Bernardino. He has also conducted numerous intensive, multi-season floristic surveys for solar energy development and mining projects in the Mohave and Sonoran Deserts.

Mr. Kramer has 20 years of management experience as a lead grower with Nurserymen's Exchange in Half Moon Bay, Ca. where he was directly responsible for potted plant production on 35 acres of greenhouses and fields with a full time staff of 130 and up to 300 additional seasonal employees.

Neal is an experienced photographer with more than 1100 digital images posted on the Calphotos website. His photos can be found on the California Native Plant Society's online Inventory of Rare and Endangered Plants, and have been used in publications by the Peninsula Open Space Trust, Oregon State University Extension, UC Santa Barbara Department of Geology, and PG&E.

Kyle Christie, M.S.

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Flagstaff, AZ 86001
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kylechristie1@hotmail.com

EXPERTISE

- Floristics of the Southwestern United States, including the Colorado Plateau, Mojave Desert, Sonoran Desert, southern Rocky Mountains; and high Sierra Nevada
- Rare plant surveys, floristic inventories, vegetation mapping, ecological monitoring surveys, GIS

EDUCATION

Northern Arizona University, Flagstaff, AZ May 2006
- Master of Science *with Distinction*. Major: Botany
- Biology Department *Best Master's Thesis of 2007*

Colorado College, Colorado Springs, CO May 2001
- Bachelor of Arts. Major: Biology

EXPERIENCE

Vegetation Ecologist, Kass Green and Associates, Berkeley, CA Summer 2009 - present
- Assisted in the development of a mapping scheme, and provided field reconnaissance to develop mapping signatures of plant communities at Grand Canyon National Park
- Analyzed and edited spatial and tabular data using ArcGIS to map vegetation communities

Biological Technician - Sensitive Plants, USFS, South Lake Tahoe, CA Summer 2010, Summer 2011
- Surveyed project areas for sensitive vascular and non-vascular plant species in the Sierra Nevada mountains of California and Nevada

Consulting Botanist, H.T. Harvey and Associates, Los Gatos, CA Spring 2010, Spring 2011
- Conducted rare plant surveys in the Central Valley of California

Consulting Botanist, TetraTech, Irvine, CA Spring 2010
- Conducted rare plant surveys in the Mojave Desert of southwestern Nevada, and in the Great Basin Desert of western Nevada

Consulting Botanist, Conservation Science Research and Consulting, Spring Valley, CA Spring 2010
- Conducted rare plant surveys in the Mojave Desert of southern California

Research Specialist, Northern Arizona University, Flagstaff, AZ Fall 2007 - Spring 2010
- Conducted vegetation surveys for the USGS-NPS National Vegetation Classification and Mapping Program at Grand Canyon National Park
- Supervised an 8-person field crew; authored project reports; managed project data
- Collaborated with *NatureServe* scientists to write vegetation community descriptions

Consulting Botanist, National Park Service, Flagstaff, AZ Fall 2009
- Inventoried springs in Grand Canyon National Park potentially at-risk from uranium mining
- Authored a final status report for the National Park Service

Botanist/Crew Leader, Ecological Restoration Institute, Flagstaff, AZ Summer 2009
- Sampled vegetation monitoring plots in the southern Rocky Mountains of Colorado
- Supervised a 4-person field crew

Consulting Botanist, USGS/Grand Canyon Monitoring and Research Center, Flagstaff, AZ Summer 2009
- Assessed the accuracy of a USGS-NPS vegetation map of the Colorado River corridor

Consulting Botanist, Kiva Biological Consulting, Inyokern, CA Spring 2009
- Conducted rare plant surveys in the Mojave Desert of southern Nevada

Consulting Botanist, Pinnacle Mapping Technologies, Flagstaff, AZ Spring 2009
- Mapped vegetation communities along arroyo complexes in the Chihuahuan Desert of southern New Mexico

Consulting Botanist, E^2M, Englewood, CO Spring - Summer 2007
- Conducted vegetation surveys for the USGS-NPS National Vegetation Classification and Mapping Program at Grand Canyon National Park

Botany Technician, United States Geologic Survey, Flagstaff, AZ Fall 2006
- Conducted an accuracy assessment for the USGS-NPS National Vegetation Mapping Program at Petrified Forest National Park

Botany Technician, Colorado Natural Heritage Program, Fort Collins, CO Summer 2006
- Conducted backcountry vegetation surveys for the USGS-NPS National Vegetation Classification and Mapping Program at Great Sand Dunes National Park

Database Analyst, Southwest Rare Plant Task Force, Flagstaff, AZ Spring 2006
- Collaborated with *NatureServe* database managers to create a list of rare plant species in the Southwestern United States for a regional conference

Consulting Botanist, National Park Service, Flagstaff AZ Summer 2005
- Collaborated on the *Herbarium Specimen Verification and Databasing Project* for the Southern Colorado Plateau network of National Parks

Consulting Botanist, Navajo Natural Heritage Program, Window Rock, AZ Summer 2004
- Conducted field surveys for *Erigeron rhizomatus*; a federally listed rare plant species; discovered 10 new populations of the species
- Authored a final status report for the United States Fish and Wildlife Service

PUBLICATIONS

- K. Christie. 2011 (in review). Floristic dynamics across a semi-arid chronosequence in Northern Arizona. *The Southwestern Naturalist*.
- K. Christie, G. Rink, and T. Ayers. 2011 (in press). Additions to the flora of Grand Canyon National Park resulting from National Vegetation Mapping Program fieldwork. *Canotia*.
- K. Christie. 2009. Phytogeography and floristics of Pinyon-Juniper woodlands in northern Arizona. *Western North American Naturalist* 69(2): 155-164.
- K. Christie. 2008. Vascular flora of the lower San Francisco Volcanic Field, Coconino County, Arizona. *Madroño* 55(1): 1-14.
- K. Christie. 2006. Noteworthy Collections - Arizona. *Madroño* 53(4): 409.
- K. Christie, M. Currie, L.S. Davis, M. Hill, S. Neal, and T. Ayers. 2006. Vascular Plants of Arizona: Rhamnaceae (Buckthorn Family). *Canotia* 2(1): 23-46.

REFERENCES

- Dr. Tina Ayers, Professor, Northern Arizona University, (928) 523-9482, tina.ayers@nau.edu
- Dr. Michael Kearsley, Vegetation Mapping Coordinator, Grand Canyon National Park, (928) 638-7462, michael_kearsley@nps.gov
- Shana Gross, Ecologist, United States Forest Service - Lake Tahoe Basin Management Unit, (530) 543-2752, segross@fs.fed.us

Steven Patrick Till

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EDUCATION

- 1999-2002 B.S. in Botany, Northern Arizona University. Flagstaff, AZ. Graduated December 2002. Chemistry minor.
- 1998-1999 Catholic University of America. Washington, D.C.; attended on full-tuition academic scholarship.

EMPLOYMENT

2011 *Botanist, URS Corporation and Ironwood Consulting, Inc.*

- Conducted rare plant surveys in the Mojave deserts of California and Nevada.
- Gathered census data for protected plant species and completed lists of plant species on site.

2010 *Botanist, Tetra Tech Inc.*

- Conducted rare plant surveys in the Mojave desert of Nevada.
- Worked in gathering a comprehensive species list for a solar development project.

2008-2010 *Senior Research Specialist. Northern Arizona University.*

- Performed botanical inventories at National Parks and Monuments in the southwest.
- Collected, keyed and identified plant species from a wide variety of desert to montane habitats.

2007-2008 *Senior Research Specialist. Northern Arizona University, in conjunction with NPS.*

- Utilized backcountry knowledge and plant identification skills to assist in development and execution of the vegetation mapping ground work in Grand Canyon National Park.
- Led crews on remote and challenging collection field trips.
- Applied electronic data collection, GPS, satellite phone, national vegetation classification protocol and plant identification/collection skills.

2006-2008 *Botanist. Grand Canyon Trust.*

- Worked on the North Rim assessing botanical changes post forest fire and cattle grazing, led invasive plant management teams at Grand Canyon and Paria Canyon.
- Advised coordinator of tamarisk/Russian olive monitoring program in project planning.

2002-2007 *Backcountry Tamarisk Eradication Crew Leader. Grand Canyon Foundation, Grand Canyon Wildlands Council, Grand Canyon Trust and the National Park Service.*

- Gained expert knowledge of project planning, safety protocols, field work methods, and logistical planning of river, backcountry and front-country trips.
- Organized, communicated restoration goals, and supervised volunteer groups of 6-8 into remote backcountry settings with outstanding results of volunteer satisfaction, return rate, and completion of plant eradication from worksites.
- Provided written/photographic documentation that led to acquisition of grants.
- Worked as a botanist for two Colorado River Management Plan monitoring trips.

2003-2005 *Botanist. Ecological Restoration Institute of NAU.*

- Executed field botanist duties of plant collection/identification and understory/overstory analysis in fire effects and forest management studies.
- Developed expert skills in vegetation sampling, field navigation, maintenance/inventorying of field equipment, and solving database issues.
- Assisted project leaders in logistical planning, filled leadership role when necessary, and built strong communication lines between crew members.

2003 *Botany field technician. USGS and Colorado Plateau Field Station at NAU.*

- Utilized backcountry knowledge and plant identification skills to assist in development and execution of the vegetation mapping ground work at Petrified Forest National Park.
- Completed the field work following standardized vegetation mapping protocols.

2002 *Botanist. Stevens Ecological Consulting with Bucknell University.*

- Worked independently on an elevational plant study of Grand Canyon and the San Francisco Peaks.
- Assisted in the biological inventory of springs in Arizona and Utah.
- Collected/identified plant species, processed data, practiced basic surveying skills.

Resume

CURRICULUM VITAE

GWENDOLYN L. WARING

ADDRESS: 412 W. Juniper Ave
Flagstaff AZ 86001

TELEPHONE: (928) 226-1126

ACADEMIC DEGREES

Ph.D. Zoology, May 1987
Northern Arizona University
Flagstaff, Arizona

M.S. Entomology, August 1981
University of Arizona
Tucson, Arizona

B.S. Biology, June 1979
Northern Arizona University
Flagstaff, Arizona

POSTDOCTORAL WORK:

Studies of population genetic structure and genetic differentiation in herbivorous insects undergoing host plant shifts, Sponsored by Warren G. Abrahamson, and Daniel J. Howard, and NSF, 1987-1989.

POSITIONS HELD:

2011	Botanist, Rare plant survey, southern Mohave Desert, Pishgah to Lugo, CA
2010-2011	Research ecologist and lecturer, A study of the ecology of grassland fire at Buffalo Park, Flagstaff AZ, City of Flagstaff grant
2009-2010	Research ecologist, A study of honey mesquite and its changing ecology in Grand Canyon, USGS
2009-2010	Taxonomic survey of regional springs, northern Arizona, Grand Canyon Wildlands Council.
2009	Taxonomic survey of a wild land park, Flagstaff AZ, Grand Canyon Wildlands Council.
2008-2009	Lecturer, natural history and art, The Star School, Leupp AZ.

2007-2008	Lecturer, natural history series, The Mountain School. Flagstaff AZ
2003-2007	Lecturer, Public natural history series. Flagstaff AZ
2006-2007	Lecturer, Coconino Juvenile Detention Center, Flagstaff AZ
2000-2008	Public, school and detention center lectures on the natural history of the southern Rockies & Intermountain West. Grant-supported.
2003-2008	Commissioner, Open Space Commission, Flagstaff AZ.
2000-2010	Art teacher, Coconino Community College, and Flagstaff Arboretum, Flagstaff AZ.
2007-2008	Survey for Desert Tortoise, Fort Irwin, CA.
2002-2003	Teacher of regional natural history, Marshall Elementary School, Flagstaff, AZ
2001-2002	Ecologist, Dry-farming Hopi corn study at Wupatki, Desert Archeology, Tucson AZ
2000-2001	Ecologist, Desert Archeology, Devised and conducted experiments on growth of 'Hopi corn' under different conditions and along an elevational gradient.
2000-2001	Ecological consultant, City of Flagstaff, organize and implement large-scale habitat restoration programs on several sites within Flagstaff.
2001-2002	Consultant, Ecologist-restorationist, Museum of Northern Arizona.
1998-2000	Plant taxonomist, Plant surveys in the Sonoran Desert, Az National Guard.
1997-	Owner, Restored Landscapes. A Flagstaff company devoted to restoring wild and urban landscapes with native species and providing education about these landscapes.
1994-1996	Member, Arizona Commission on Water Resource Protection. Arizona Department of Water Resources.
1994	Rare plant survey, AT&T
1992-2005	River guide and naturalist, San Juan River and Grand Canyon, AZ
1993-1998	Founder, Co-Owner, Flagstaff Native Plant & Seed. A Flagstaff company devoted to landscaping with native plants.
1993-1996	Adjunct Assistant Professor, School of Forestry, Northern Arizona University, Flagstaff, AZ.

1993-1996 Research Ecologist, Glen Canyon Environmental Studies, Photogrametric/GIS analysis of the history of vegetation change along the Colorado River in Grand Canyon.

1992-1993 Research Ecologist, Bureau of Reclamation, literature review on the impact of dams on riparian vegetation.

1991-1995 Research ecologist, National Park Service, Glen Canyon National Recreation Area, A study of interactions between native and exotic species of riparian plants and animal communities associated with exotic plants along Lake Powell.

1991-1992 Research Ecologist, The Nature Conservancy, A study of the impact of tamarisk and Russian olive on plant and insect diversity in riparian habitats along the San Juan River.

1990-1991 Research Ecologist, The Nature Conservancy, A study to determine recruitment requirements of Salix bebbiana in northern Arizona.

1988 Postdoctoral fellowship, with Warren G. Abrahamson, MNA and Bucknell University, A study of the genetics of populations of the gallforming herbivore, *Eurosta solidaginis*, colonizing new host plant species.

1987-1988 Postdoctoral fellowship, with Daniel Howard, MNA, A study of genetic differentiation in field crickets.

1984-1986 Research ecologist, National Park Service, Grand Canyon National Park, A study of the effects of flooding on the riparian plant community along the Colorado River in Grand Canyon.

1981-1987 Graduate research, with Peter W. Price, NAU, A study of the ecology and evolution of a gallforming group on the desert-adapted plant, creosote bush (Larrea tridentata), including a study of the effects of water stress on plant physiology and susceptibility to herbivores.

1981-1986 Research assistantship, with Peter W. Price, NAU, A study of the effects of water and nutrient stress in willow (Salix lasiolepis) on an associated gallforming insect; this work involved a series of water and fertilizer experiments and a biochemical assessment of plant quality.

1980-1983 Instructor, UA Renewable Resources Department, Forest insect workshop for forestry students at UA. Biology and methodology for studying forest insects.

1979-1981 Research assistantship, with Dr. Robert L. Smith, UA: A comparative study of insect herbivory in Agave spp. in wild and urban settings; this study involved comparing the success of herbivores on agaves in the wild and cultivation, and the bases for observed differences.

1977-1979 Research assistant, USFS Rocky Mountain Station, Flagstaff, AZ. A comparative study of insect populations in healthy ponderosa pine forests

and in dog-hair thickets, in Coconino National Forest.

AWARDS, GRANTS AND CONTRACTS:

2010	Grant to study the impact of fire on Buffalo Park grasslands, Flagstaff Community Foundation, with Flagstaff High School students, $8,000
2009	Grant to conduct a pilot study on honey mesquite in Grand Canyon, USGS, $30,000.
2007	Grant to review USGS experimental flood research in Grand Canyon, $20,000
2007	Botanical illustration for book on ponderosa pine, Dr, Michael Wagner. $3,000.
2000-2008	Flagstaff Arts & Sciences Commission Grants. Teach natural history of northern Arizona to a public forum and in Flagstaff schools.
2005	Grant to teach natural history in public forum, Flagstaff AZ. $7,000.
2004	Grant to teach natural history in public forum, Flagstaff AZ. $7,000.
2004	Grant to write a book on the natural history of the western United States, A Natural History of the Intermountain West, Its Ecological and Evolutionary Story, private grantor. $30,000.
2004	Grant to teach natural history in public forum, Flagstaff AZ. $8,000.
2002	Grant to teach natural history in local schools, Flagstaff AZ. $1,000.
1998-2000	Botanical surveys, Arizona National Guard Bases, Camp Navajo (northern Arizona), and Florence (southern Arizona).
2001	Principal investigator, City of Flagstaff, road survey work and development of a plant list for restoration efforts. $1,200.
2000	Principal investigator, Desert Archeology, Hopi Corn experiments, $7,000. Dry-farming Hopi corn near Wupatki
2000	Principal investigator, City of Flagstaff, restoration projects, $25,000.
1996	Endangered plant survey for roadway expansion project, central Arizona, funded by AT&T.
1996	Owner, lending grant of $350,000 to establish Flagstaff Native Plant & Seed.
1995	Principal investigator-research ecologist, GCES contract to evaluate

species-specific historical change of riparian vegetation along the Colorado River in Grand Canyon using GIS. $88,000.

1994 Principal investigator-research ecologist, GCES contract to evaluate historical change of riparian vegetation along the Colorado River in Grand Canyon using GIS. $145,000.

1993 Principal investigator-research ecologist, GCES contract to evaluate historical change of riparian vegetation along Colorado River using GIS. $120,000.

1992 Principal investigator-research ecologist, Bureau of Reclamation contract to summarize literature on effects of dams on riparian ecosystems. $17,000.

1991 Principal investigator-research ecologist, The Nature Conservancy study grant, research on the impact of tamarisk and Russian olive on plant and insect diversity along the San Juan River, Utah. $11,000.

1990 Principal investigator-research ecologist, The Nature Conservancy study grant, experimental study of germination and establishment requirements of Salix bebbiana. $9,000.00.

1990 Native plant inventory and survey for Navajo Bridge expansion and habitat restoration project. Arizona Department of Transportation.

1988 Travel Grant, ESA, to present invited paper at ESA Vancouver meetings.

1988 Principal investigator-research ecologist, NPS study grant, experimental study of interactions of native and exotic plants in a developing riparian plant community in southern Utah. $44,500.00.

1985 Organized Research Grant, NAU

1985 Travel grant, NAU, funding to participate in an ESA symposium on gallforming insects

1985 Principal investigator-research ecologist, NPS study grant #4-AA 40-01930, experimental study of flooding effects on riparian vegetation in the Grand Canyon. $25,000.00.

1984 Sigma Xi Grants-in-Aid of Research

1982 Sigma Xi Grants-in-Aid of Research.

INVITED PAPERS:

1996, 1997 Restoration of native plants in northern Arizona', Arizona Native Plant Society.

1988 'The ecology and evolution of a gallforming group on creosote bush (Larrea tridentata) in the southwestern United States', invited for the Workshop on gallforming herbivores, Int'l. Ent. Congress, Vancouver, B.C., Canada.

1985 'Galls in harsh environments', presented in Symposium on Gallforming Insects, Ent. Soc. Amer. Nat'l. Meetings, Hollywood, Fla.

EXHIBITS PREPARED:

2009 Elemental show, Coconino Center for the Arts, Flagstaff, November

2003-2010 Flagstaff Open Studios

2000-2002 Northland Hospice show

2001 Tucson Winter Fest

1998-2003 The Artist's Gallery, Flagstaff AZ

1999-2000 Sedona Art Festival

1999 Phoenix Temple of Music and Art exhibit

1999-2002 Art in the Park, Flagstaff AZ

1989 'The History of Extinction', Museum of Northern Arizona, Flagstaff, Arizona.

PAPERS PRESENTED:

2011 The changing ecology of mesquite in Grand Canyon, Grand Canyon Utilities Group, Phoenix AZ

1992 'The impact of exotic plants on riparian faunal diversity along a southwestern river', Arizona, Riparian Council, Cottonwood, Arizona.

1989 'Plant stress and herbivore responses', Southwestern Association of Population Biologists, Ghost Ranch, New Mexico.

1988 'Genetic differentiation in the gallformer Eurosta solidaginis along host plant lines', Southwestern Association of Population Biologists, Portal, Arizona.

1983 'Coexistence of a species groups (Cecidomyiidae: *Asphondylia*) on

creosote bush', Guild of Rocky Mountain Population Biologists, Gothic,Colorado.

1987 'The ecological consequences of evolutionary steps in a gallforming group on creosote bush', Southwestern Association of Population Biologists, Payson, Arizona.

COURSES TAUGHT:

2000-2008 Natural History of the Flagstaff Area/Lecture Series

1995 Landscaping with Flagstaff's native plants, Museum of Northern Arizona.

1992-1993 Dendrology, NAU, Flagstaff, Arizona.

1985 The natural history of northern Arizona, NAU, Flagstaff, Arizona.

1980-1983 Forest insect ecology, UA, Tucson, Arizona.

BOOKS PUBLISHED:

2011 A Natural History of the Intermountain West: Its Ecological and Evolutionary Story. University of Utah Press, SLC.

PUBLICATIONS, TECHNICAL REPORTS:

2009 Waring, G.L. The biodiversity of plants on the Colorado Plateau. Arizona Native Plant Society Journal, Spring.

2008. Waring, G.L. Landscaping with native drought-hearty plants. Arizona Native Plant Society Journal. Spring.

2008 Waring, G.L. Hopi corn and volcanic cinders: a test of the relationship between tephra and agriculture in northern Arizona. Center for Desert Archaeology. Anthropological Papers No. 33:59-68.

1996 Current and historical riparian vegetation trends in Grand Canyon, using multitemporal remote sensing analysis of GIS sites. NAU-NPS Cooperative Agreement CA 8000-8-0002.

1996 Historical vegetation patterns along the Colorado River in Grand Canyon: a proposal to identify large scale and species-specific trends. NAU-NPS Cooperative Agreement CA 8000-8-0002.

1996. Mast, J. and G.L. Waring. Historical vegetation patterns along the Colorado River in Grand Canyon: changes in Goodding Willow detected with dendrochronology. Proceedings of the Third Biennial Conference of Research on the Colorado Plateau, pp 115-127.

1993 Howard, D.J., G.L. Waring, C.A. Tibbets, and P.G. Gregory. Survival of hybrids in a mosaic hybrid zone. Evolution 47:789-800.

1993 Waring, G.L. The impact of dams on riparian vegetation. Special Report to the Bureau of Reclamation, SLC, Utah.

1993 Waring, G.L. The impact of exotic plants on faunal diversity along a southwestern river. Special Report to The Nature Conservancy. 33pp.

1992 Waring, G.L. and N. Cobb. The impact of plant stress on herbivore population dynamics. Insect-Plant interactions. 6:171-233.

1991 Howard, D.J. and G.L. Waring. Topographic diversity, zone width, and the strength of reproductive isolation in a zone of overlap and hybridization. Evolution. 45:1120-1135.

1990 Gagne, R.J. and G.L. Waring. The Asphondylia (Cecidomyiida:Diptera) on creosote bush (Larrea tridentata) in North America. Proc. Ent. Soc. Wash. 92:649-671.

1990 Waring, G.L., W.G. Abrahamson and D.J. Howard. Genetic differences among host-associated populations in the gallmaker Eurosta solidaginis (Diptera:Tephritidae). Evolution. 44:1648-1655.

1990 Waring, G.L. and P.W. Price. Plant water stress and gallformation (Cecidomyiidae:Asphondylia) on creosote bush. Ecological Entomology. 15:87-95.

1990. Waring, G.L. Developing shoreline communities and potential for natural vegetation in Glen Canyon National Recreation Area, Arizona-Utah. In Boyce, M.S. & G.E. Plumb, eds., National Park Service Research Center, 14th Annual Report. Laramie, WY. Pp73-75.

1989 Price, P.W., G.L. Waring, R. Julkunen-Tiitto, J. Tahavaninen, H.A. Mooney and T.P. Craig. Carbon/nutrient balance hypothesis in within species phytochemical variation of Salix lasiolepis. Journal of Chemical Ecology, 15:1117-1131.

1989 Waring, G.L. and P.W. Price. Parasitoid pressure and the radiation of a gallforming group (Cecidomyiidae:Asphondylia spp.) on creosote bush (Larrea tridentata). Oecologia 79:293-299.

1988 Craig, T.M., P.W. Price, G.L. Waring, K.M. Clancy and C.F. Sacchi. Forces preventing coevolution in the three trophic level system: Willow, a gallforming herbivore, and parasitoids. In Chemical mediation of coevolution, K. Spencer (ed.). Pergamon, New York.

1988 Waring, G.L. and P.W. Price. Consequences of host plant chemical and physical variability to an associated herbivore. Ecological Research 3:205-216.

1988 Stevens, L.E. and G.L. Waring. 1988. Effects of post-dam flooding on riparian substrates, vegetation and invertebrate populations in the Colorado River corridor in Grand Canyon, Arizona. USBR Glen Canyon Environmental Studies Publication No. 21, 79 pp. US Dept. Commerce, Springfield, VA.

1988 Waring,G.L. and L.E. Stevens. 1988. The effects of recent flooding on riparian plant establishment along the Colorado River in Grand Canyon. USBR Glen Canyon Environmental Studies Publication No. 21, 79 pp. US Dept. Commerce, Springfield, VA.

1987 Waring, G.L. and R.L. Smith. Patterns of faunal succession in Agave palmeri. Southwestern Naturalist 32:489-497.

1987 Price, P.W., G.W. Fernandes and G.L. Waring. Adaptive nature of insect galls. Forum, Environmental Entomology. 16:15-24.

1986 Price, P.W., G.L. Waring and G.W. Fernandes. Hypotheses on the adaptive nature of galls. Proceedings of the Entomological Society of Washington 88:361-363.

1986 Waring, G.L. Galls in harsh environments. Proceedings of the Entomological Society of Washington. 88:376-380.

1986 Waring, G.L. The ecological and evolutionary history of creosote bush (Larrea tridentata Cov.) in North America. Agave 2:3-15.

1986 Waring, G.L. and R.L. Smith. Natural history and ecology of Scyphophorus acupunctatus (Coleoptera: Curculionidae) and its associated microbes in cultivated and native agaves. Annals of the Entomological Society of America 79:334-340.

1985 Stevens, L.E. and G.L. Waring. Effects of prolonged flooding on riparian vegetation in Grand Canyon. In Riparian ecosystems and their management, R.R. Johnson (ed.). USDA Technical Report. RM-120. Fort Collins.

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Education, Training, and Certifications

- M.A., Sustainable Landscape Design and Planning, Conway School of Landscape Design, Conway, Massachusetts, June 2009
- B.S., Botany, minor in Anthropology, Northern Arizona University, Flagstaff, December 1999
- PSMJ Resources, Inc. Project Manager Boot Camp, 2007
- NEPA training, 2004

Areas of Expertise

I am an experienced botanist familiar with the riparian and terrestrial plant communities of the mountains, canyons, and deserts of the Southwest, including special-status and non-native plant species and vegetation types. I have conducted surveys and mapped vegetation in both the high desert and lower desert areas of Arizona, California, Colorado, New Mexico, Nevada, and Utah. I am adept with vegetation mapping and map interpretation. I have extensive field experience; including the use of Garmin and Trimble GPS units, hiking in remote and challenging terrain and driving four-wheel drive vehicles in difficult topography. In addition to plants, I have conducted surveys for protected fish and avifauna.

Professional Experience

Botanist, Self-employed; Flagstaff, AZ (2009-present): Participated in numerous rare plant surveys, riparian restoration, and vegetation mapping projects throughout Arizona, southern California, Nevada, and New Mexico.

Botanist, Natural Channel Design; Flagstaff, AZ (2009): Conducted vegetation mapping and vegetation identification for a riparian restoration project near Phoenix, AZ**.**

Botanist, SWCA Environmental Consultants; Flagstaff, Arizona (2000–2008): Conducted habitat assessments and collected field data concerning the Endangered Species Act, Clean Water Act, National Environmental Policy Act, organized and interpreted field data, wrote technical documents and correspondence, managed projects and coordinated with clients, other project managers, and technical staff.

Botany Consultant–Subcontractor, Rob Weber for the Hopi Tribe; Arizona (1999): Provided field interpretation and baseline vegetation inventory incorporating airborne imagery and aerial photography to create vegetation distribution maps for long term monitoring on the Blue Canyon Restoration and Monitoring Pilot Project.

Botanist–Subcontractor, Dr. Thomas Mitchell-Olds for The Max-Planck Institute for Ecology; Jena, Germany (1999): Performed independent field work involving collection and identification of voucher specimens and seed samples from isolated populations of *Arabis* in the southwestern United States.

Assistant Curator, Deaver Herbarium, Northern Arizona University; Flagstaff (1998–2000): Processed herbarium specimens, maintained computer database, managed loan and exchange programs, ordered supplies, and assisted visitors.

Research Assistant, Dr. Michael Kearsley at Northern Arizona University; Flagstaff (1997-2001): Entered and analyzed data, created hand-drawn vegetation distribution maps, and provided plant identification for the Grand Canyon riparian vegetation monitoring program in the field and the office.

Selected Projects

Wetland Plant Identification Workshop-White Mountain Apache Tribe, Whiteriver, Arizona (2010): Led a one day workshop on wetland plant identification. Provided hard copies of plant reference materials on common and site-specific wetland plants, taught field characteristics to help identify wetland plants, and conducted on site wetland plant identification workshop to a group of eight tribal members. Client: Natural Channel Design

Riparian Vegetation Mapping- Santa Clara Pueblo, Rio Arriba County, New Mexico (2010): Vegetation mapping of riparian and upland areas in the floodplain of the Rio Grande as it flows through the Santa Clara Pueblo in northern New Mexico. Used aerial photos and Trimble GPS to locate vegetation polygons and 300-foot long transects to support Pueblo and Army Corp of Engineers invasive species eradication and native species restoration efforts. Classified vegetation using Hink and Ohmart, National Wetlands Inventory (NWI), and the Combined Habitat Assessment Protocol (CHAP) protocols developed by P. Ashley. Client: SWCA Inc.

Vegetation Inventory and Rare Plant Identification, Pahranagat National Wildlife Refuge, Lincoln County, Nevada (2010): Provided botanical expertise in identifying common and rare plants including *Arctomecon merriamii, Asclepias eastwoodiana, Astragalus amphioxys* var. *musimonum, Astragalus eurolobus, Astragalus funereus, Astragalus geyeri* var. *triquetrus, Astragalus gilmanii, Camissonia megalantha, Chrysothamnus eremobius, Cryptantha welshii, Cymopterus ripleyi var. saniculoides, Opuntia pulchella, Penstemon concinnus, Phacelia beatleyae, Phacelia parishii, Porophyllum pygmaeum, Sclerocactus schlesseri, and Spiranthes diluvialis* to establish a baseline plant inventory for Refuge managers. Client: SWCA Inc.

Rare Plant Surveys and Vegetation Identification, Amargosa Valley, Nye County, Nevada (2010): Provided botanical expertise in identifying, locating, and documenting rare plants including *Arctomecon merriamii, Eriogonum bifurcatum, Eriogonum contiguum, Penstemon albomarginatus,* and *Penstemon fruticiformis* ssp. *amargosae* on approximately 2,500 acres of public lands proposed for solar power development. Client: Tetra Tech Corporation.

Rare Plant Surveys and Vegetation Identification, San Bernardino County, California (2010): Provided botanical expertise in identifying, locating, and documenting rare plants including *Androstephium breviflorum*, *Astragalus lentiginosus* var. *borreganus*, *Calochortus striatus*, *Castela emoryi*, *Cryptantha clokeyi*, *Cryptantha costata*, *Cryptantha holoptera*, *Cynanchum utahense*, *Eriastrum harwoodii*, *Eriophyllum mohavense*, *Mentzelia tridentata*, *Mimulus mohavensis*, *Muilla coronata*, *Nemacaulis denudata* var. *gracilis*, *Penstemon albomarginatus*, *Phacelia parishii*, and *Polygala acanthoclada* on 8,000 acres of public lands east of Barstow proposed for solar power development. Client: URS Corporation.

Sage Grouse Habitat Classification, Carbon County, Wyoming (2009): Provided botanical expertise in identifying, locating, and classifying sagebrush (*Artemisia*) populations on checkerboard lands proposed for wind turbine construction. Client: Bureau of Land Management.

Rare Plant Surveys; Roan Plateau, Garfield and Rio Blanco Counties, Colorado (2008): Provided botanical expertise in identifying, locating, and documenting rare plant populations including *Arabis fernaldiana* var. *fernaldiana*, *Astragalus detritalis, Cryptantha rollinsii, Eriogonum ephredroides, Gentianella tortusa, Gilia stenothyrsa, Lesqurella conquesta, Lesquerella parviflora, Oenothera acutissima, Penstemon grahamii, Penstemon scariosus* var. *albifluvis*, *Physaria obcordata*, and *Spiranthes divuvialis* on lands proposed for oil and natural gas extraction. Client: Bureau of Land Management.

Noxious Weed Surveys; Gila County, Arizona (2005): Provided botanical expertise in identifying, locating, and documenting noxious weed populations during surveys to determine the effects of the Picture and Rodeo-Chedeski fires on vegetation. Client: Tonto National Forest.

Rare Plant Surveys; St George, Washington County, Utah (2003): Conducted surveys for endangered dwarf bearclaw poppy (*Arctomecon humilis*) for a proposed gas pipeline. Client: Bureau of Land Management.

Rare Plant and Noxious Weed Surveys; Lincoln County, New Mexico (2003): Conducted surveys on 14 miles of road right-of-way for endangered Kuenzler's cactus (*Echinocereus fendleri* var. *kuenzleri*) and noxious weed populations; performed wetland delineation for 30 miles of road improvements and widening of US 70. Client: Sierra Blanca Construction.

Sensitive Plant and Wildlife Surveys; Chaves County, New Mexico (2003): Conducted surveys for sensitive plant and wildlife species on three sites in Chaves County. Client: El Paso Natural Gas.

Sensitive Plant and Wildlife Surveys; Santa Fe County, New Mexico (2003): Conducted surveys for sensitive plant and species and noxious weed populations in Santa Fe County. Client: City of Santa Fe, Santa Fe County, and Las Campañas Limited Partnership.

Sensitive Plant and Wildlife Surveys; Bagdad, Yavapai County, Arizona (2003): Conducted surveys for sensitive plant and wildlife species along a proposed water line near Bagdad. Client: Phelps Dodge Corporation.

Pima Pineapple Cactus Presence/Absence Surveys; Tucson, Pima County, Arizona (2001): Conducted presence/absence surveys for the endangered Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*) southeast of Tucson. Client: El Paso Global Networks Company.

Pima Pineapple Cactus Presence/Absence Surveys; Tucson, Pima County, Arizona (2001): Conducted presence/absence surveys for endangered Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*) on airport land in Tucson. Client: Tucson Airport Authority.

Colorado River Vegetation Mapping; Grand Canyon, Arizona (1999-2007): Identified and mapped vegetation changes at 60 sites along the Colorado River in Grand Canyon. Client: Northern Arizona University.

Rare Plant and Noxious Weed Surveys; Southern New Mexico, Arizona, and California (2001): Identified rare plants and noxious weeds along roadways within a proposed fiber optic right-of-way from El Paso Texas to Los Angeles, California. Client: EPNG Company.

Habitat Identification and Mapping; Prescott National Forest, Arizona (2001): Conducted habitat identification and mapping of rare and sensitive plants (*Heuchera eastwoodiae* and *Lupinus latifolius*) in the Prescott National Forest for a prescribed burn project. Client: Prescott National Forest.

Colorado River Environmental Surveys; Grand Canyon, Arizona (1998): Conducted surveys of seeps and springs along the Colorado River within Grand Canyon National Park. Client: Grand Canyon Monitoring and Research Center.

Publications

Rhodes, S. R. and T.J Ayers. 2010. Two New Taxa of *Scutellaria* Section *Resinosa* (Lamiaceae) from Northern Arizona. The Journal of the Botanical Research Institute of Texas (BRIT).

Rhodes, S. R., J. Beasley, and T.J Ayers. In Press. Vascular Plants of Arizona: Fabaceae, Part I, *Errazurizia, Marina, Parryella,* and *Psorothamnus*

Professional Affiliations and Committees

Southwest Vegetation Management Association

Arizona Native Plant Society

Southwest Vegetation Management Association 2006-2008 Board member

American Society of Landscape Architects 2009

Rio Mesa Fall Rare Plant Survey Plant Species List	
Scientific Name	**Common Name**
ANGIOSPERMS (Flowering plants)	
MONOCOTS	
Liliaceae	**Lily Family**
*Hesperocallis undulata***	desert lily
Poaceae	**Grass Family**
*Aristida adscensionis***	sixweeks three-awn
*Bouteloua barbata***	sixweeks grama
Pleuraphis rigida	big galleta grass
Schismus sp.	Mediterranean grass
EUDICOTS	
Amaranthaceae	**Amaranth Family**
Tidestromia oblongifolia	Arizona honeysweet
Asclepiadaceae	**Milkweed Family**
Asclepias subulata	rush milkweed
Funastrum utahense [1]	Utah vine milkweed
Asteraceae	**Sunflower Family**
Ambrosia dumosa	white bur-sage
Baileya pauciradiata	laxflower
Dicoria canescens	desert dicoria
Encelia farinosa	brittlebush
Encelia frutescens	button brittlebush
*Geraea canescens***	desert-sunflower
Palafoxia arida	Spanish needle
Pectis papposa	chinch-weed
Stephanomeria pauciflora	desert straw
Boraginaceae	**Borage Family**
*Cryptantha angustifolia***	Panamint cryptantha
*Cryptantha sp. **	cryptantha
Tiquilia palmeri	Palmer's coldenia
Tiquilia plicata	fanleaf crinklemat
Brassicaceae	**Mustard Family**
Brassica tournefortii [2] **	Asian mustard
Chenopodiaceae	**Goosefoot Family**
Salsola tragus [2] **	prickly Russian thistle
Euphorbiaceae	**Spurge Family**
Argythamnia californica (Ditaxis serrata var. serrata or Ditaxis serrata var. californica)	California ditaxis
Argythamnia claryana (Ditaxis claryana)	desert silverbush
Argythamnia neomexicana (Ditaxis neomexicana)	New Mexico silverbush
Chamaesyce micromera	Sonoran sandmat
Chamaesyce polycarpa	smallseed sandmat
Chamaesyce setiloba	Yuma sandmat
Croton californicus	California croton
*Stillingia spinulosa***	annual toothleaf
Fabaceae	**Legume Family**
Dalea mollis	hairy prairie clover
Olneya tesota [3]	desert ironwood
Parkinsonia florida [3]	blue palo verde

Prosopis glandulosa [3]	honey mesquite
Prosopis glandulosa var. torreyana	western honey mesquite
Psorothamnus emoryi	dyebush
Krameriaceae	**Rhatany Family**
Krameria grayi	white rhatany
Loasaceae	**Loasa Family**
Mentzelia multiflora var. longiloba	Adonis blazing star
Molluginaceae	**Carpet-weed Family**
Mollugo cerviana	threadstem carpetweed
Nyctaginaceae	**Four O'Clock Family**
Allionia incarnata	trailing windmills
Boerhavia wrightii	Wright's spiderling
Onagraceae	**Evening Primrose Family**
*Oenothera deltoides***	birdcage evening primrose
Pedaliaceae	**Sesame Family**
Proboscidea althaeifolia [1]	desert unicorn plant
Plantaginaceae	**Plantain Family**
*Plantago ovata***	desert Indianwheat
Polygonaceae	**Buckwheat Family**
*Chorizanthe brevicornu***	brittle spineflower
*Chorizanthe rigida***	spiny-herb
Eriogonum inflatum	desert trumpet
*Eriogonum trichopes***	little deserttrumpet
Visaceae	**Mistletoe Family**
Phoradendron sp.	mistletoe
Zygophyllaceae	**Caltrop Family**
Kallstroemia californica	California caltrop
Larrea tridentata	creosote bush
[1] *denotes sensitive species (Fed, State, or CNPS)*	
[2] *denotes invasive non-native species*	
[3] *denotes desert species*	
** *denotes spring plant skeletons*	

Scientific Name	Common Name	Regulatory Status **
Reptiles		
Callisaurus draconoides	zebra-tailed lizard	–
Cnemidophorus tigris	western whiptail	–
Phrynosoma platyrhinos	desert horned lizard	–
Uma scoparia	Mojave Fringe-toed lizard	BLM-S, DFG-SSC
Uta stansburiana	common side blotched lizard	–
Dipsosaurus dorsalis	desert iguana	–
Urosaurus graciosus	long-tailed brush lizard	–
Mammals		
Lepus californicus	black-tailed jackrabbit	–
Birds		
Buteo jamaicenis	red-tailed hawk	MBTA
Cathartes aura	turkey vulture	–
Polioptila caerulea	blue-gray gnatcatcher	–
Zenaida macroura	mourning dove	–

Key	Regulatory Status **
FT	Threatened (U.S. Endangered Species Act)
BLM-S	Sensitive (Bureau of Land Management)
BCC	Bird of Conservation Concern (U.S. Fish and Wildlife Service)
MBTA	Protected (Migratory Bird Treaty Act)
SE	Endangered (California Endangered Species Act)
ST	Threatened (California Endangered Species Act)
DFG-FP	Fully Protected (California Department of Fish and Game)
SSC	Species of Special Concern (California Endangered Species Act)

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA
1516 NINTH STREET, SACRAMENTO, CA 95814
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APPLICATION FOR CERTIFICATION
FOR THE *RIO MESA SOLAR ELECTRIC GENERATING FACILITY PROJECT*

DOCKET NO. 11-AFC-4
PROOF OF SERVICE
(Est. 12/21/11)

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*indicates change

DECLARATION OF SERVICE

I, Angela Leiba , declare that on, January 11, 2011 , I served and filed copies of the attached Rio Mesa Solar: Fall Botany Report , dated December 2011 . The original document, filed with the Docket Unit or the Chief Counsel, as required by the applicable regulation, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at: **[http://www.energy.ca.gov/sitingcases/riomesa/index.html]**.

The document has been sent to the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit or Chief Counsel, as appropriate, in the following manner:

(C*heck all that Apply*)

For service to all other parties:

X Served electronically to all e-mail addresses on the Proof of Service list;

X Served by delivering on this date, either personally, or for mailing with the U.S. Postal Service with first-class postage thereon fully prepaid, to the name and address of the person served, for mailing that same day in the ordinary course of business; that the envelope was sealed and placed for collection and mailing on that date to those addresses **NOT** marked "e-mail preferred."

AND

For filing with the Docket Unit at the Energy Commission:

X by sending an original paper copy and one electronic copy, mailed with the U.S. Postal Service with first class postage thereon fully prepaid and e-mailed respectively, to the address below (preferred method); ***OR***

____ by depositing an original and 12 paper copies in the mail with the U.S. Postal Service with first class postage thereon fully prepaid, as follows:

CALIFORNIA ENERGY COMMISSION – DOCKET UNIT
Attn: Docket No. 11-AFC-4
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512
docket@energy.state.ca.us

OR, if filing a Petition for Reconsideration of Decision or Order pursuant to Title 20, § 1720:

____ Served by delivering on this date one electronic copy by e-mail, and an original paper copy to the Chief Counsel at the following address, either personally, or for mailing with the U.S. Postal Service with first class postage thereon fully prepaid:

California Energy Commission
Michael J. Levy, Chief Counsel
1516 Ninth Street MS-14
Sacramento, CA 95814
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I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct, that I am employed in the county where this mailing occurred, and that I am over the age of 18 years and not a party to the proceeding.