

**U.S. Fish and Wildlife Service (USFWS) Utah Field
Office Guidelines for Conducting and Reporting
Botanical Inventories and Monitoring of Federally
Listed, Proposed and Candidate Plants**



August 31, 2011



Bushy ridge-cress
Joni Brunson, USFWS



Jones cycladenia
Daniela Roth, USFWS



Holmgren milk-vetch
Daniela Roth, USFWS



Utah Basin hookless cactus
Rebecca Hootz, USFWS



Dwarfed hoar-peppy
Daniela Roth, USFWS



Last chance tozerenda
Daniela Roth, USFWS

Utah Field Office Guidelines for Inventory and Monitoring

Purpose

- Minimum standards for plant surveys for “target” species
- To improve data and reporting
- USFWS recommendations only
- **Note: For *Sclerocactus* clearance surveys for Vernal BLM, BLM requirements supersede this guidance**

Format of guidance

- I. Personnel Qualifications
- II. Survey Guidelines
- III. GPS Data
- IV. Reporting Guidelines

I. Personnel Qualifications

- Send resumes (if new or new contract)
 - A. Field Crew leaders
 - Degree in botany and 2 field seasons (recommended) or
 - Education and experience
 - B. Technicians/assistants
 - 1 year biological coursework, plant taxonomy

II. Survey Guidelines

- A. General guidelines
- B. Clearance surveys (most pertinent)
- C. Status surveys
- D. Monitoring surveys

A. General guidelines

- Must maximize likelihood of finding target species (usually during flowering)
 - If outside recommended survey date, should receive prior approval from USFWS
- May need to make multiple site visits
- Reference populations



August 3

August 24



September 30



September 30



- Document:
 - biological setting
 - level of survey effort
 - Vouchers (or photos)
 - Look alike
 - Potential threats

... for complete list, see guidance

Use standard field forms (examples Appendix C)

B. Clearance Surveys

- Objective: cover 100% of project area plus buffer
- Usually done with belt transects, good for 1 year (unless otherwise specified)*
- If target species not found, indicate whether or not surveyed habitat suitable via photos

*Ute ladies'-tresses: Use Interim 1992 Survey Requirements. In suitable habitat for permanent surface disturbance activities we want 3 yrs of surveys (good for 3 yrs); for temporary disturbance (underground pipelines) we want 1 yr of surveys (good for 1yr).

- Adverse conditions (disease, drought, predation, herbivory)—discuss with agency personnel!



C. Status Surveys



- Objective: distribution and abundance in specific area at point in time
 - visits to known locations or new locations
 - less intensive survey, tradeoff with covering broader area

- Visits to all known sites
- Visits to potential habitat
- Note occupied habitat and suitable, unoccupied habitat
- Note existing and former patterns of land use



D. Monitoring Surveys

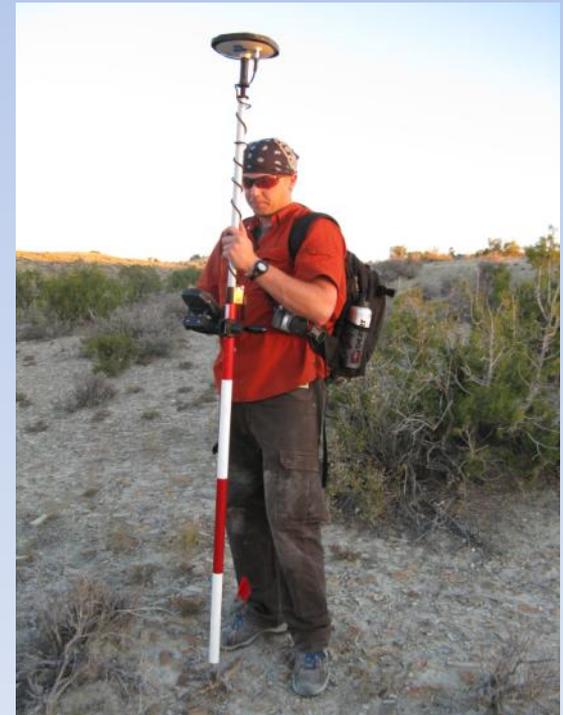
- Objective: structured, repeated assessments of target species to investigate responses
- Monitoring plan developed ahead of time
- Periodic monitoring reports
- Electronic files
- Adaptive management



III. GPS data collection and reporting

- UTM Zone 12 NAD 83
 - Electronic file format, easily imported into GIS:
 - Shapefile, coverage, etc.
 - Spreadsheet
 - .txt file
- Include info about make, model, precision of GPS; differentially correct

- Data to include:
 - Unique location identifier (waypoint ID)
 - Which target species present
 - Date of observation
 - Waypoint accuracy (meters)
 - Photo identifier
 - Number of plants
 - Threats
 - Vigor
 - Positive and negative data



IV. Reporting

A. General guidelines

- All reports should include basics (who, what, when, where, why)
- Send copy of report to UNHP, land owner or manager (BLM, BIA, Ute Tribe, private), USFWS



B. Clearance Surveys

- Maps depicting survey area
- Descriptions of spatial extent of occupied and suitable, unoccupied habitat
 - ... (see guidance for complete list)
- **For *Sclerocactus* clearance surveys, do not send separate reports to Service (we obtain from BLM as needed for consultation)**

C. Status Surveys

- Ecological condition of landscape
- land uses
- relative density of target species
- Acres of occupied habitat at each site and across range
- Have these changed since last survey?
- Draft copies to species' leads for preliminary review and comment



D. Monitoring Reports

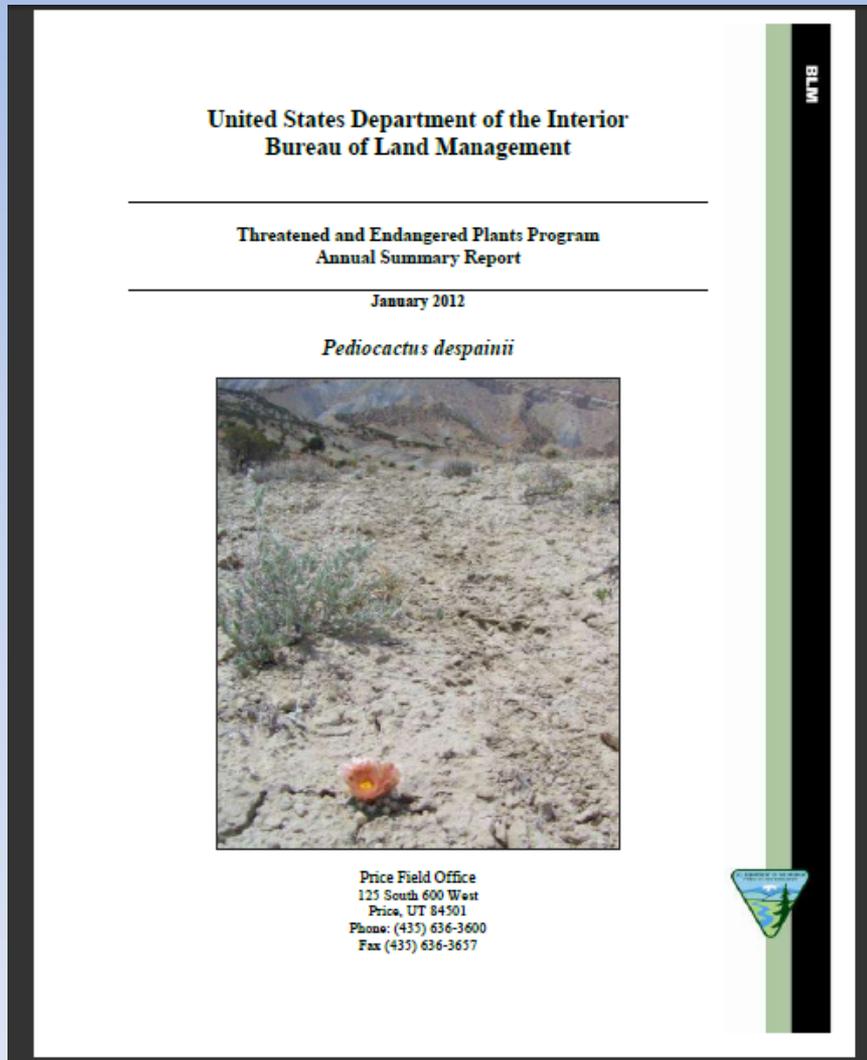
- Monitoring plan
- Format modeled after peer-reviewed scientific papers
- Prior years' reports
- Data summaries and analysis of trends
- Draft copies to species' leads for preliminary review and comment

Species Survey Period

APPENDIX A: SPECIES SPECIFIC SURVEY PERIOD AND TRANSECT WIDTH

<i>SPECIES</i>	<i>SURVEY PERIOD</i>	<i>TRANSECT WIDTH</i> ^a
<i>Arctomecon humilis</i>	Mid April – May	10 – 20 ft
<i>Asclepias welshii</i>	June – September	25 – 50 ft
<i>Astragalus anserinus</i>	May – June	10 – 20 ft
<i>Astragalus ampullarioides</i>	April – May	10 – 20 ft
<i>Astragalus desereticus</i>	May – June	10 – 20 ft
<i>Astragalus holmgreniorum</i>	April – May	10 – 20 ft
<i>Astragalus montii</i>	July – August	10 ft
<i>Carex specuicola</i>	May – September	N/A, habitat not suitable for transects
<i>Cycladenia humilis</i> var. <i>jonesii</i>	April – June	10 – 20 ft
<i>Eriogonum corymbosum</i> var. <i>nilesii</i>	September - October	10 – 20 ft
<i>Eriogonum soledium</i>	Mid June - July	10 – 20 ft
<i>Lepidium barnebyanum</i>	May – June	10 – 20 ft
<i>Lepidium ostleri</i>	Mid June - July	5 ft
<i>Lesquerella tumulosa</i>	May – June	5 – 10 ft
<i>Pediocactus despainii</i>	April – May	3 ft
<i>Pediocactus sileri</i>	April – June	3 – 6 ft
<i>Pediocactus winkleri</i>	March – April	3 ft
<i>Penstemon scariosus</i> var. <i>albifluvis</i>	May – June	10 – 20 ft
<i>Penstemon grahamii</i>	May – June	10 ft
<i>Phacelia argillacea</i>	June	10 ft
<i>Primula maguirei</i>	May	N/A, habitat not suitable for transects
<i>Ranunculus aestivalis</i>	July	5 ft

Examples of Good Monitoring Reports



Price BLM *Pediocactus despainii* monitoring report:

Developed based on our new guidelines ...

What do we like?

- Management goals and objectives clearly stated
 - For example, human-caused mortality less than 5 percent annually
- Standard format: methods, results, discussion, conclusion
- Included tables of summary data

Table 4- *Pediocactus despainii* Localities Visited in 2011

Locality	# plants found in 2011	Risk Category	Primary Threats	% of Plants within 15 cm of any disturbance*
Big Ridge 1	none	Low		n/a
Big Ridge 2	59	Moderate	Horse	<1%
Big Ridge 3	53	Low		0%
Blue Flat Reservoir 1	none	Moderate		n/a
Blue Flat Reservoir 2	4	Moderate		0%

Examples of Good Monitoring Reports

Mesa Verde Cactus 10 year
transplant monitoring report

What do we like?

Mesa Verde Cactus (Sclerocactus mesae-verdae)
10 Year Transplant Monitoring Report
Shiprock Fairgrounds
2001-2011

Prepared by A. F. Hazelton
Navajo Natural Heritage Program
Department of Fish & Wildlife
P.O. Box 1480
Window Rock AZ, 86515



Photo: D. Mikesic

RESULTS

The majority of the cacti that were recorded at the start of the study in 2001 died within two years (Fig. 1). This high mortality has been attributed to exceptionally dry years in 2002 and 2003 (Roth 2008; Fig. 2). Mortality rates were equally high among both transplanted and naturally occurring cacti (Table 2; $\alpha=0.05$). Most of these deaths occurred between the 2002 and 2003 sampling seasons.

As of 2011, the five monitoring plots contained 19 naturally occurring cacti and 19 transplanted cacti. Of the 19 naturally occurring cacti remaining in the plots, only four are survivors from 2001, the year of the transplants. Of the remaining 15, three were first observed in 2003, four were first observed in 2005, five were first observed in 2007, and three were found in 2011.

New germination kept pace with mortality in the naturally occurring population for the last few years. Between 2008 and 2011, three cacti died and three germinated.

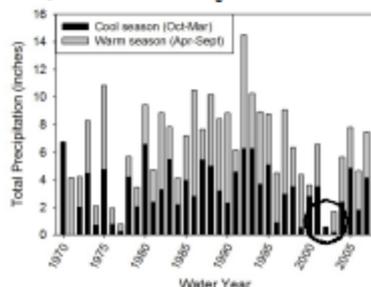


Figure 2. Total precipitation in Shiprock, NM, coded by precipitation falling during the cool season (October-March) and the warm season (April-September) for water years 1970-2007. Water years start the October preceding the calendar year and run through the September of that calendar year.

Table 2. Mortality rates and t-tests testing for differences in mortality rates for naturally occurring vs. transplanted cacti in five monitoring plots at Shiprock Fairgrounds, 2001-2011. There was no mortality in 2006 or 2008, so t-tests could not be performed for those years.

Year	Mortality Rate		t-test results		
	Naturally Occurring	Transplanted	t	df	p
2001-2002	0.12	0.09	0.20	8	0.85
2002-2003	0.77	0.57	0.56	8	0.59
2003-2004	0.23	0.14	0.77	8	0.46
2004-2005	0.17	0	1.61	7	0.51
2005-2006	0	0	N/A		
2006-2007	0.13	0	1.50	7	0.18
2007-2008	0	0	N/A		
2008-2009	0.05	0	1.14	7	0.29
2009-2011	0.06	0.03	0.90	7	0.40

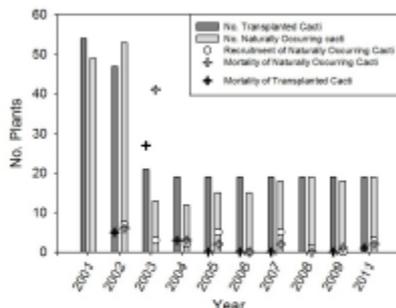


Figure 1. Total number, recruitment, and mortality of naturally occurring and transplanted Mesa Verde cactus clusters in five plots at the Shiprock Fairgrounds transplant site, 2001-2011.

The transplanted population has been holding steady as well; since 2004 there have been 19 living transplants.

In 2008, all naturally occurring cacti and 89% of the transplanted cacti were in excellent health (Fig. 3). Since then, vigor has declined slightly for the naturally occurring population, with 4 cacti, or 12%, classified as "good" rather than excellent in 2011. Of the transplanted cacti, 45% were in excellent health in 2011, 45% were in good health, and 10% were classified as being in fair health.

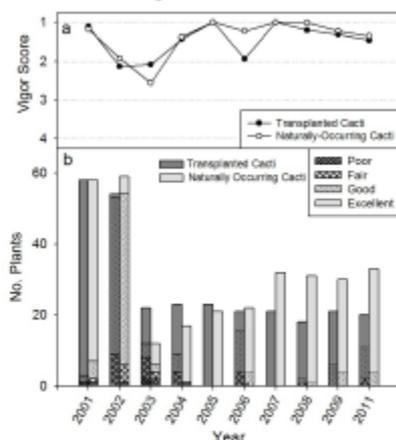


Figure 3. Mean vigor score (a) and number of plants assigned each vigor score (b) for transplanted and naturally occurring Mesa Verde cacti at the Shiprock Fairgrounds transplant site, 2001-2011. Vigor scores range from 1 (excellent), to 4 (poor).

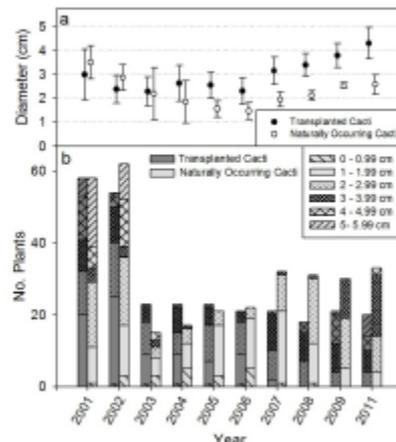


Figure 4. Mean diameter \pm 1 standard error (a) and size class distribution (b) for transplanted and naturally occurring Mesa Verde cacti in five plots at the Shiprock Fairgrounds transplant site, 2001-2011.

Table 3. T-test results testing for differences in plant diameter between transplanted and naturally occurring groups of Mesa Verde cactus in five monitoring plots. Each row reports results of one t-test. * $p < 0.05$. ** $p < 0.01$.

Year	t	df	p
2001	0.90	8	0.39
2002	1.37	8	0.21
2003	-0.16	8	0.88
2004	-1.42	7	0.20
2005	-3.11	7	0.02*
2006	-2.53	7	0.04*
2007	-3.76	7	0.01*
2008	-5.02	7	0.001**
2009	-4.81	7	0.002**
2011	-4.58	7	0.003**

Table 4. Size class distribution for naturally occurring Mesa Verde Cacti in five plots at the Shiprock Fairgrounds transplant site, 2001-2011.

Size class	2001	2002	2003	2004	2005	2006	2007	2008	2009	2011
0-0.99cm	1	3	3	5	3	5	1	1	0	0
1-1.99cm	10	14	5	7	14	14	20	11	5	4
2-2.99cm	18	19	3	4	4	3	10	18	14	10
3-3.99cm	4	3	2	1	0	0	1	1	11	17
4-4.99cm	6	13	2	0	0	0	0	0	0	2
5-5.99cm	19	10	0	0	0	0	0	0	0	0

Table 5. Size class distribution for Mesa Verde Cacti transplanted into five plots at the Shiprock Fairgrounds transplant site, 2001-2011.

Size class	2001	2002	2003	2004	2005	2006	2007	2008	2009	2011
0-0.99cm	0	1	1	1	1	1	0	0	0	0
1-1.99cm	20	24	8	8	6	8	2	0	0	0
2-2.99cm	12	15	9	6	10	9	8	7	4	4
3-3.99cm	9	10	5	7	5	3	10	8	8	6
4-4.99cm	12	3	0	1	1	0	1	3	8	4
5-5.99cm	5	1	0	0	0	0	0	0	1	6

At the beginning of the study, and until 2005, the mean diameter of transplanted cacti and naturally-occurring cacti was statistically identical (Fig. 4a, Table 3, $\alpha=0.05$). Beginning in 2005, transplanted cacti were on average larger than the naturally occurring cacti. For both groups, there was a trend of decreasing diameter in the early 2000s, followed by an increase in the late 2000s. The initial decrease in diameter was more pronounced within the naturally-occurring group, while the later increase was more pronounced for the transplanted cacti (Fig. 4a). Between 2006 and 2011, the naturally occurring population increased from an average 1.5 cm diameter to an average 2.6 cm diameter. Mean diameter of transplants increased from 2.6 cm in 2006 to 4.3 cm in 2011.

In 2011, the majority of naturally occurring cacti (51%) were in the 3-3.99 cm size class, followed by 30% in the 2-2.99 cm size class (Table 4, Fig. 4b). Size class distribution was more even with the transplants, with 50% of cacti less than 4 cm in diameter, and 50% greater than or equal to 4 cm diameter (Table 5, Fig. 4b).

The Surveyor guidelines and 1992 Interim Survey Requirements for Ute ladies'-tresses Orchid can be found online:

<http://www.fws.gov/utahfieldoffice/SurveyorInfo.html>