Siler Pincushion Cactus
(Pediocactus sileri)

5-Year Review:
Summary and Evaluation

Photo: Lee Hughes, BLM

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Arizona Ecological Services Office
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5-YEAR REVIEW

Species reviewed: Siler Pincushion Cactus (*Pediocactus sileri*)

1.0 GENERAL INFORMATION

1.1 Reviewers:

Lead Regional or Headquarters Office: Region 2 (Southwest Region)
Contacts: Wendy Brown, Recovery Coordinator, 505-248-6664; Brady McGee, Recovery Biologist, 505-248-6657

Lead Field Office: Arizona Ecological Services Tucson Sub-Office
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Cooperating Field Office: Arizona Ecological Services Office, Phoenix, Arizona
Contact: Steven L. Spangle, Field Supervisor, 602-242-0210

Cooperating Field Office: Utah Ecological Services Field Office**,** Salt Lake City, Utah
Contact: Heather Barnes, Botanist, 801-975-3330 x 158

Cooperating Regional Office(s): Region 6 (Mountain-Prairie Region)
Contact: Seth Willey, Recovery Coordinator, 303-236-4257

1.2 Methodology used to complete the review:

This review was completed by the Arizona Ecological Services Tucson Sub-Office. In addition to the general solicitation of public comments published in the Federal Register (71 FR 20714), we solicited specific input on new information related to the conservation and natural history of the Siler pincushion cactus (*Pediocactus sileri*) from a number of individuals with a history of working on Siler pincushion cactus research and conservation (see REFERENCES section).

We conducted a review of past and recent literature, public comments, the listing rule, and the recovery plan. The Bureau of Land Management (BLM, Arizona Strip and Cedar City Field Offices) submitted a status report in 2006. Much of the information in this 5-year review was derived from that report. In addition, a meeting was held in St. George, Utah (April 2006), with the BLM, U.S. Fish and Wildlife Service (FWS), and others familiar with the species to discuss the status of the populations in Utah. Interviews with individuals were conducted as needed to clarify or obtain specific information. We prepared a preliminary draft review that was reviewed by the FWS Salt Lake City Ecological Services Office. Comments were incorporated, and the 5-year review was then provided to the FWS Region 2 and Region 6 offices for review and finalization.

1.3 Background:

1.3.1 FR Notice citation announcing initiation of this review: 71 FR 20714

1.3.2 Listing history

Original Listing
FR notice: 44 FR 61786
Date listed: November 26, 1979
Entity listed: Species, in U.S.A.
Classification: Endangered

Revised Listing, if applicable
FR notice: 58 FR 68476
Date listed: December 27, 1993
Entity listed: Species, in U.S.A.
Classification: Threatened

1.3.3 Associated rulemakings: N/A.

1.3.4 Review History: A 5-year review was initiated on July 22, 1985 (50 FR 29901) for all species listed before 1976, and in 1979-1980; a notice of completion with no change in status was published on July 7, 1987 (52 FR 25522). Another 5-year review was initiated on November 6, 1991 (56 FR 56882) for all species listed before 1991, but no document was prepared for this species.

1.3.5 Species' Recovery Priority Number at start of 5-year review: 8 (moderate degree of threat/high recovery potential)

1.3.6 Recovery Plan or Outline

Name of plan or outline: Siler Pincushion Cactus Recovery Plan
Date issued: April 14, 1986
Dates of previous revisions, if applicable: N/A

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate?

_____ **Yes,** go to section 2.1.2.
_ X _ **No,** go to section 2.2.

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan?

_X_ **Yes**, *continue to section 2.2.1.1.*
____ **No**

2.2.1.1 Does the recovery plan contain objective, measurable criteria?

____ **Yes**, *continue to section 2.2.2*
_X_ **No**

Some of the recovery criteria are not measurable and objective, making it difficult to determine if recovery has been achieved. For instance, the criterion referring to long-term stability of the population does not include a time period, define which populations, nor provide a definition of stability.

2.2.2 Adequacy of recovery criteria.

2.2.2.1 Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?

_X_ ***Yes,*** *go to section 2.2.2.2.*
____ ***No****, go to section 2.2.3, and note why these criteria do not reflect the best available information.*

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)?

____ ***Yes****, go to section 2.2.3.*
_X_ ***No****, go to section 2.2.3, and note which factors do not have corresponding criteria.*

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information.

Criteria for downlisting Siler pincushion cactus from endangered to threatened are: 1) develop a habitat management plan (HMP) and mineral feasibility report; 2) census and map known populations; 3) administer mining claims; and 4) establish monitoring plots. Siler pincushion cactus was reclassified to threatened on December 27, 1993 (FR 58 68476). Reasons for reclassification were improved understanding of the species' status and fulfillment of the reclassification criteria. The explanation of how reclassification criteria were met can be found in the final reclassification rule (58 FR 68476).

Criteria for delisting are: 1) demonstration of long-term population stability in population levels; 2) implementation of the HMP; 3) suitability of downlisting actions; and 4) continued assurance of no mineral threats.

By having "implementation of the HMP" as one of the criterion, the delisting criteria address all of the five factors on BLM lands, with the exception of overutilization for commercial, recreational, scientific, or educational purposes (Factor 2). The HMP addresses all threats to the species through a five-factor analysis (BLM 1987). However, there are no recovery criteria to address threats outside of the BLM lands.

Criteria for delisting:

1. Demonstrate long-term stability in population levels:

In order to meet the guidelines for delisting (demonstrate long-term population stability), the BLM developed a HMP and established monitoring plots. The BLM has been monitoring up to 6 sites of Siler pincushion cactus since 1985. Data for all of these plots are summarized in Appendix III of the BLM's 2006 report. A detailed discussion of the monitoring results can be found in Section 2.3.1.2. Monitored populations are not meeting the delisting criterion of long-term stability. Mortality has been exceeding recruitment and concerns exist on even representation of individuals within each age class. Based on the BLM's assumption that having even representation of individuals within each age-class equates to a stable population, then the monitored populations are unstable. The species may have sufficient resources to recover when precipitation patterns return to normal or above-average. Further, based on the non-random selection of the monitoring plots (all are in dense cacti concentrations), we are unable to determine the overall population status.

We recommend that the criterion for long-term stability be revaluated. It may be more meaningful to include a time component that encompasses natural ranges of regional climate variation, such as drought periods. This would allow us to evaluate population fluctuations over a longer period of time to see if populations are able to recover during extended drought periods. In order to make statements about the entire population, monitoring plots should be placed randomly throughout the range, not just in areas where there are dense cacti concentrations. Finally, new recruits in monitoring plots should be tagged and followed through subsequent monitoring visits to determine juvenile survivorship.

2. Implementation of the HMP:

The HMP was developed and finalized in 1987. The BLM has been implementing the HMP since that time. A detailed discussion of the activities and actions completed in the HMP can be found in Sections 2.3.1.1 and 2.3.2.3.

3. Suitability of downlisting actions:

To date, BLM has continued to carry out actions that allowed for downlisting of the species.

4. Continued assurance of no mineral threats:

Threats to individual plants and habitat have not been eliminated. While none of the mineral threats are imminent, they have the potential to occur in the foreseeable future. The BLM has ranked the potential for uranium, gypsum, and oil and gas as moderate to high within areas supporting Siler pincushion cactus. The Federal requirement to consult with FWS regarding mining operations conveys necessary protections to the plant and habitat that would not exist if the plant were delisted. Through section 7 consultation with FWS as required by the Endangered Species Act (16 U.S.C. 1531 *et seq.*), BLM will work with mining applicants to reduce or minimize the effects of their actions through voluntary conservation measures. Mandatory requirements would apply if the project jeopardized the continued existence of the species. The BLM has a proven track record in this regard in dealing with uranium mining plans of operation in Siler pincushion habitat during the 1980s uranium boom.

2.3 Updated Information and Current Species Status

2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology and life history:

We have no new information regarding the species' biology and life history.

2.3.1.2 Abundance, population trends, demographic trends:

The BLM has been monitoring populations of Siler pincushion cactus since 1985 on five plots, located in dense populations on BLM lands in Arizona and Utah. Four plots are located in Arizona and their respective sizes are: Atkin Well (two plots, each four acres (ac); 1.62 hectares (ha)), Yellowstone (0.34 ac; 0.14 ha), and Johnson Spring (0.32 ac; 0.13 ha). The BLM also monitors one plot in Utah, Warner Ridge (three ac; 1.21 ha). The cactus has also been monitored in Utah, at Muggins Flat, from 1993-1998 (0.62 ac; 0.25 ha) by Red Butte Garden and Arboretum (Hreha and Meyer 2001).

The Atkin Well plots were developed to assess potential livestock damage to Siler pincushion cactus and its habitat. Data for all the Arizona plots (1985-2004) are summarized in Table 1. Atkin Well (G) is the grazed plot; Atkin Well (UG) is the enclosure. There are no data for the Warner Ridge plot, Utah, as mortality and recruitment data were not recorded until 2005, and this plot was not read throughout most of the 1990s.

Table 1: Mortality and recruitment of Siler pincushion cactus within BLM monitoring plots (Arizona).

Plot	Mortality	Recruitment
Atkin Well (AW-G)	209	121
Atkin Well (AW-UG)	159	111
Yellowstone (YS)	90	142
Johnson Spring (JS)	129	95*

*Missing data from 1986, 1987, 1997, 1999, 2001, and 2003.

Mortality in all of the plots was attributed to rabbit/rodent predation or natural causes (drought, age-related mortality). For the plots at Atkin Well, mortality exceeded recruitment, but this is not the case for the Yellowstone plot. No conclusion can be drawn for the Johnson Spring plots because of the missing data for recruitment.

During the five-year period that Muggins Flat plot was monitored, researchers noted that the total number of individuals doubled, from an initial count of 88 individuals to 162 by the end of 1997. The average annual recruitment rate was four times greater than the average annual mortality rate. This site has not been formally monitored since 1997, but the site was recently visited in 2007 (H. Barnes pers. comm. and W. Fertig pers. comm. 2007). The visits were conducted independently, but both individuals reported that they located very few cacti and there were many dead plants (cacti skeletons) lying on the ground. They both observed tags with no plants nearby.

The 1987 HMP established population size structures for the monitoring plots (BLM 1987). The management objectives were to maintain the following percentage of size classes, within each plot, in perpetuity: 0-4 cm (20%); 4.1-8 cm (20%); 8.1-12 cm (20%), 12.1-16 cm (20%); and $\geq$16.1 cm (20%).

The BLM assumed that having an even distribution among the size classes would indicate that the populations were stable. Measurements refer to the height of the cacti and percentages refer to the number of individuals in plots that fall within the size class. A detailed analysis is provided in the 2006 BLM report. A summary of age-class distribution for all plots is provided in Table 2.

Table 2: Age-class distribution for *Pediocactus sileri* within BLM plots. WR = Warner Ridge (Utah), AW-UG = Atkins Well Ungrazed, AW-G = Atkins Well Grazed, YS = Yellowstone, JS = Johnson Spring.

Size class	WR 1986	WR 2006	AW-UG 1986	AW-UG 2005	AW-G 1986	AW-G 2005	YS 1986	YS 2005	JS 1986	JS 2004
0-4 cm	8 (6%)	4 (4%)	5 (6%)	24 (38%)	12 (13%)	20 (29%)	11 (11%)	29 (24%)	39 (70%)	20 (50%)
4.1-8	28 (22%)	26 (24%)	13 (16%)	17 (27%)	24 (27%)	28 (41%)	42 (42%)	60 (50%)	16 (29%)	16 (40%)
8.1-12	35 (27%)	32 (30%)	18 (22%)	12 (19%)	20 (23%)	11 (16%)	36 (36%)	20 (16%)	1 (1%)	3 (7%)
12.1-16	34 (26%)	26 (24%)	20 (24%)	6 (10%)	21 (24%)	3 (5%)	9 (9%)	12 (10%)	0	1 (3%)
16.1 +	25 (19%)	18 (18%)	27 (32%)	4 (6%)	12 (13%)	6 (9%)	2 (2%)	0	0	0
TOTAL	130	106 (18 %↓)	83	63 (24% ↓)	89	68 (24% ↓)	100	121 (21% ↑)	56	40 (27% ↓)

Between 1986 and 2006, the Warner Ridge plot decreased in overall numbers (130 to 106), but the relative age-class distribution did not change much. The plot remains low in the smallest age-class, indicating that there is low recruitment and/or high seedling/juvenile mortality. Atkin Well (UG; averaged for the 2 sub-plots) showed an overall decrease from 83 to 63 individuals, with the greatest loss in the older age-classes. Atkin Well (G; averaged for the two sub-plots) showed an overall decrease from 89 to 68 individuals and had a similar trend as the ungrazed plot, in the loss of larger individuals. Yellowstone increased from 100 to 121 plants; the plot had recruitment and survival for most of the age-classes. Johnson Spring (averaged for sub-plots) decreased from 55 to 40; the plot has had a decline in recruitment and a loss of larger plants. With the exception of the Yellowstone plot, all other plots have lost at least 20% of individuals, indicating that recruitment is not keeping up with mortality. Based on the assumption that having even representation of individuals within each age-class equates to a stable population, then the monitored populations are unstable. Even though there has been recruitment and survival of plants, it has not been enough to offset a general decline in plants within the plots.

This information provides a general population trend, but does not give an accurate count of juvenile survival. As new individuals are found, they are not marked and monitored in subsequent years. So, these data present limited information from which to assess the population dynamics of this species. Based on the information provided, we conclude that populations represented by monitoring data are decreasing and showing evidence of reduced recruitment. The highest rates of mortality for Siler pincushion took place in the late 1980's (rabbit/rodent predation) and in the mid-late 1990's (natural causes, most likely

related to drought conditions). Periods of high recruitment seem to be linked with periods of normal or above-normal precipitation in the late 1980's. Total numbers of cacti within the plots, recruitment, and survival have all decreased during the recent drought (late 1990's to the present). Precipitation information provided in BLM's 2006 report supports our conclusions that above-average precipitation results in recruitment, while below-average precipitation results in low to no recruitment, increased levels of predation on larger plants, and mortality, thereby reducing overall numbers within the population.

2.3.1.3 Genetics, genetic variation, or trends in genetic variation:

We have no new information regarding the species' genetics or trends in genetic variation.

2.3.1.4 Taxonomic classification or changes in nomenclature:

We have no new information regarding the species' taxonomic classification. This species has been through several nomenclatural changes and has two recognized synonyms: *Echinocactus sileri* and *Utahia sileri*. According to the Flora of North America, the recognized name for this species is *Pediocactus sileri* (Parfitt and Gibson 2004).

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g., increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g., corrections to the historical range, change in distribution of the species' within its historical range, etc.):

Siler pincushion cactus grows on gypsiferous clay and sandy soils derived from the Moenkopi Formation. The majority of the plants are associated with the Shnabkaib Member of this particular formation. The Shnabkaib Member is composed of 65 percent siltstone, 25 percent gypsum, and 10 percent limestone and dolomite (Stewart et al. 1972). Siler pincushion cacti are also found scattered on the Middle Red Member of the formation, which is a reddish siltstone with thin to thick layers of gypsum. The cacti are found growing on elevations between 2,800 and 5,400 feet, in the Great Basin Desert Shrub community. The geographic range of Siler pincushion cactus extends from southeast of Fredonia, extreme northwestern Coconino County, Arizona, west for about 70 air miles in north-central Mohave County, Arizona. It also includes about 3 miles of southern Utah in Washington and Kane Counties. The majority of the habitat occurs on lands managed by the BLM (Arizona Strip and Cedar City Districts), with smaller amounts of land managed by the Kaibab-Paiute Indian Tribe, Arizona and Utah State trust lands, and lands in private ownership.

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

At the time of listing (1979) the amount of habitat was unknown and there were thought to be less than 1,000 individuals. Since that time, the BLM has conducted extensive surveys and delineated habitat. They currently estimate there are 34,189 acres of habitat and have documented over 10,000 individuals (BLM 2006). There is no population estimate for this species; individuals that have been documented through BLM surveys are not re-inventoried on a regular basis, so we do not know how many plants have survived or if recruitment is taking place. We have no information on the extent of habitat or populations of Siler pincushion on Kaibab-Paiute lands or Utah State trust lands.

2.3.1.7 Other:

Utah information: Conservation efforts for this species in Utah have focused on protection of the area near St. George, known as White Dome. The Nature Conservancy (TNC), School and Institutional Trust Lands Administration, BLM, Utah Department of Transportation, FWS, and the City of St. George have collaborated on plans for creation of the White Dome Nature Preserve (York 2007). The Preserve will protect habitat for several rare species, including the endangered dwarf bear claw poppy and Siler pincushion cactus. The TNC recently purchased 55 acres through private donations and a Recovery Land Acquisition grant from FWS. Additional land purchases are slated for 2008, with the ultimate goal of preserving 800 acres within the next few years. The area will be managed by TNC.

Other populations of Siler pincushion cactus on BLM land in Utah are found near Spendlove Well, located approximately 10 miles east of Warner Ridge and the Muggins Flat population near Kanab (discussed earlier). We have no information on the Spendlove Well population.

2.3.2 Five-Factor Analysis

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:

Threats to the habitat of Siler pincushion cactus include mining, oil and gas leases, off-highway vehicle (OHV) activity, commercial and residential development of habitat, and long-term drought. All of these threats, with the exception of commercial development (which does not occur on the BLM lands) and long-term drought, were considered in the BLM's HMP for the species (BLM 1987). Specific actions were called out to address these threats, mainly consisting of monitoring the species and creating enclosures to protect the species and its habitat from degradation due to OHV use and livestock trampling. These measures have reduced some of the impacts to habitat, but have not been totally

successful (see detailed analysis below). Also, the HMP only addresses these threats on BLM lands in Arizona, not Utah or private and State lands in Arizona and Utah.

Uranium mining and prospecting: From 1980-1985, 81 of 246 uranium mining plans of operations (MPOs) were located in Siler pincushion cactus habitat. Of those, 30 were modified to avoid or minimize impacts to Siler pincushion cactus. Only one of the MPOs occurred in a dense *P. sileri* area near Atkin Well; no cacti were damaged as a result of the drilling. We do not know how much Siler pincushion cactus habitat was affected or modified by these activities. The BLM reports that since 1990, there has been no uranium mining and very little gypsum exploration. The 2005-2006 resurgence in uranium mining was limited to Kaibab limestone near uranium mines that were already active since the 1980s and 1990s.

An article published in the New York Times (Barringer 2006) described a fourfold increase in the price of uranium from 2003 to 2006, to support global demand for nuclear power. High-grade uranium in Arizona is associated with collapse breccia pipes, and according to the United States Geological Survey (USGS), these geologic features will be a major source of future uranium production (USGS 2004). According to an Environmental Working Group report (2007), there has been an 80% increase in active claims since January 2003, throughout the west. Within 5 miles of Grand Canyon National Park, which includes a large portion of BLM lands on the Arizona Strip, there are 815 mining claims, of which 592 are claims with uranium interest. The BLM Arizona Strip office recently completed their draft revised Resource Management Plan (RMP). In the Draft Environmental Impact Statement (DEIS), there is a map of uranium resource potential (U.S. Department of Interior 2005). There are two areas characterized on the map: 1) Sandstone uranium (SSU) high potential, abundant direct evidence, and 2) breccia pipe uranium (BPU) high potential, abundant direct evidence. All areas known to support Siler pincushion habitat are within these units. Based on this information, there is still potential for Siler pincushion plants and their habitat to be negatively affected by new uranium mining claims.

Oil and gas leases: In the DEIS for the revised RMP, BLM states that known oil and gas reserves within the Planning Area are not significant and no economic occurrences of gas or oil have been encountered to date (U.S. Department of Interior 2005). The BLM rated oil and gas potential within the Planning Area; areas in the north central and extreme western portions were rated as moderate potential. Good potential was assigned to the Shnabkaib Member of the Moenkopi Formation, which corresponds to the geologic formation that supports habitat for Siler pincushion cactus. Although we do not consider oil and gas production to be a threat at this time, we cannot rule it out as a future threat due to the increasing interest in domestic sources of oil production. All areas that are mapped as having moderate potential for oil and gas are within Siler pincushion habitat.

Gypsum mining: In the 2005 DEIS, BLM states that within the Planning Area potentially favorable areas for the occurrence of gypsum include sabkha environments associated with marine regressions in Permian and Triassic-aged rocks (U.S. Department of Interior 2005). Large gypsum deposits occur in the northwestern portion of the Planning Area, associated with the Harrisburg Member of the Kaibab Formation (does not support Siler pincushion cactus) and the Moenkopi Formation. Again, the entire area beneath Siler pincushion habitat is classified as high gypsum potential, with abundant direct evidence. According to the BLM (2006), gypsum deposits within areas supporting Siler pincushion cactus were considered non-economically viable, at least in the 1980's when the mineral feasibility report was completed. While we do not consider gypsum mining a threat at this time, given the rapidly changing market for saleable minerals, we cannot rule it out as a future threat for Siler pincushion.

OHV use: This type of use has killed tagged Siler pincushion cactus within the Warner Ridge plot (Utah). The threat from OHV activity is very high in this area due to the proximity of St. George, which is experiencing rapid urban growth. There is increased use of open space around the city for recreational activities. The BLM (Dixie Resource Area) (1999) and the Arizona Strip RMPs established the Fort Pierce and Warner Ridge areas as Areas of Critical Environmental Concern (ACEC). The areas are closed to OHV use and are signed. The areas are patrolled regularly and on peak high-use weekends. The Warner Ridge ACEC is 4,281 acres in size and 1,790 acres are fenced.

In the proposed revised Arizona Strip RMP, under preferred alternative, there would be five ACECs designated for protection of Siler pincushion cactus. Four already exist, but they would increase in size. Table 3 lists the current ACECs, current size, and proposed size under the preferred alterative. Today, there are 16,737 acres within ACECs for the protection of Siler pincushion cactus and its habitat; under the revised RMP, there would be 41,345 acres, an increase of 147% within ACECs.

Table 3: Arizona Strip ACECs: Current and Proposed

ACEC	Current Size (acres)	Proposed Size (acres)
Fort Pearce	916	5,724
Johnson Springs	2,464	3,444
Lost Spring Mountain	8,262	19,248
Moonshine Ridge	5,095	9,310
Shinarump (New)		3,619
TOTAL	16,737	41,345

OHV use is not prohibited within ACECs, but driving off of existing roads is. The general management of ACECs will include: acquiring and managing state and private holdings where needed, developing plans of operation for mining with

special mitigation to avoid endangered species, banning mechanical vegetation manipulation, closing unneeded roads, closing areas for woodland products sales, limiting OHV use to designated roads and trails, and implementing ranger patrols.

Livestock trampling: Siler pincushion cacti can be trampled by livestock. A total of five Siler pincushion cacti mortalities attributable to livestock trampling were documented in all of the BLM monitoring plots for years 1986-2006. This number is small in comparison to the 258 and 322 mortalities attributed to rodent herbivory and natural causes (likely drought related), respectively. The highest mortality from livestock trampling (3) occurred in the Atkins Well grazed plot; the plot is located near a water tank, which typically receives high use. We assume that additional plants are trampled outside of the monitoring plots, because almost all of Siler pincushion habitat is within grazing allotments. However, we suspect that the numbers trampled are small.

In 2007, FWS completed a biological opinion on the effects of livestock grazing on all allotments within Siler pincushion cactus habitat (file # 2-21-05-F-0778). In the biological opinion, BLM agreed to several conservation measures to minimize effects to Siler pincushion cactus from permitted livestock grazing. Measures included continuing evaluation of monitoring plots, expanding surveys in areas of potential habitat, prohibiting OHV use off established roads in occupied habitat, and reducing livestock use during drought periods.

BLM is exercising its authorities to minimize direct effects from livestock grazing on Siler pincushion cactus, but the effects are not being eliminated. Livestock grazing constitutes only a minor threat to Siler pincushion cactus under current management.

New threats: FWS has recently become involved with a permit request from the Utah Board of Water Resources to the Federal Energy Regulatory Commission (FERC) to construct a water pipeline from Lake Powell to St. George. This proposed pipeline plan is in the preliminary stages of development, and there are 3 alignments being considered at this time. One of the alignments would cross through the northern portion of BLM land on the Arizona Strip, which would go through Siler pincushion cactus habitat. Preliminary engineering studies were started in the summer of 2007, and by summer 2009, a completed license application will be submitted to FERC. Under the current timeline, construction would begin in 2013. The project will require section 7 consultation with FWS, but the effects to Siler pincushion cactus and its habitat could be substantial, depending on which alignment is chosen. In addition, the assured water supply to St. George may contribute to increasing development in the general area, which would likely affect Siler pincushion cactus and its habitat near St. George.

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:

At this point, there is no evidence to suggest that Siler pincushion cactus is threatened by unauthorized collection. The BLM has been observing the species on the Arizona Strip for the last 20 years, and they have not noted any collection or theft of plants. We do not know of any reports or observations of collecting in Utah.

2.3.2.3 Disease or predation:

Herbivory and insect predation on Siler pincushion cacti are addressed in the HMP under "Natural Factors". Herbivory and insect predation result in death to individual cacti. Actions taken or recommended were the construction of raptor perches near dense populations of Siler pincushion cacti in order to reduce rodent herbivory and continued monitoring of the species. There were no actions described for reducing or eliminating insect predation.

There have been observations of insect predation on Siler pincushion cactus. The BLM (2006) report indicates that insect larvae hollow out plants, resulting in cacti death. There are six species of *Moneilema* beetles recognized in North America, which were thought to be specialists on *Opuntia* spp. However, recent observations indicate the genus predates other cacti species as well. The Opuntia borer beetle (*Moneilema semipunctatum*) has been observed feeding on and killing the endangered Wright fishhook cactus (*Sclerocactus wrightiae*) in south central Utah (Kass 2001), and the threatened Mesa Verde cactus (*Sclerocactus mesa-verdae*) in New Mexico and Colorado (Smith 2001). Adult beetles feed on cacti and females lay eggs near the base of the plant. Once hatched, larvae tunnel into the plant, often causing death of the infested plant. *Moneilema corrugans* (no common name) has been known to kill the threatened Cochise pincushion cactus (*Coryphantha robbinsorum*) in southeastern Arizona (Zimmerman 1985). Additional research needs to be done to identify insects that infest Siler pincushion cactus and determine effects that insects have on cacti population dynamics. Insect infestations may be correlated with drought cycles; additional work is needed to examine if there is a relationship.

The majority of mortalities (over 98 percent) observed in BLM monitoring plots were attributed to natural causes (likely drought), mammal herbivory, and insect predation. The relationship of these factors to BLM activities is complicated, and the type of monitoring carried out by the BLM does not address cause-and-effect relationships among drought, herbivory, and livestock grazing. As such, it is impossible to determine if activities permitted by the BLM contribute to observed mortality. There is likely a relationship between drought and the amount of herbivory detected on Siler pincushion cactus. Periods of increased herbivory coincide with drought periods, and it is possible that rodents and lagomorphs, lacking other types of herbaceous forage, eat Siler pincushion cactus. The BLM

is committed to reducing livestock use during drought periods; this in turn may reduce the amount of herbivory on Siler pincushion cactus.

2.3.2.4 Inadequacy of existing regulatory mechanisms:

On Federal lands, the BLM's Manual Policy (6840 – Special Status Species Management) states, in part, that the BLM will develop and implement plans and programs that will conserve listed species and their habitat, monitor and evaluate ongoing management activities to ensure conservation objectives, ensure that all activities affecting the populations and habitats of listed species are designed to be consistent with recovery needs and objectives, and ensure that all actions authorized, funded, or carried out by the BLM are in compliance with the Endangered Species Act (ESA). The BLM has made a good faith effort to be in compliance with their policy regarding this species.

On non-Federal lands, the Arizona Native Plant Law (ANPL) provides some protection for this species within Arizona. Siler pincushion is listed as a highly safeguarded species, which is the highest level of protection under the law. The species cannot be collected, except for scientific and educational purposes, and a permit is needed from the Arizona Department of Agriculture (ADA). However, protected plants under the ANPL can be destroyed on private lands, as long as the protected plants are not transported from the site or offered for sale. The landowner must notify ADA of the site destruction, and may opt for salvage of the protected plants on site. The landowner is not required to offer plants for salvage, just to provide public notice that an area will be destroyed. If the landowner agrees to allow salvage, ADA will issue the associated tags and seals for the salvage operation. If protected plants will be destroyed by one of the state's agencies, the agency must notify ADA in writing, at least 60 days prior to plant destruction. If the Director of ADA determines that the proposed action by the state agency may affect a highly safeguarded plant, he/she shall consult with the state agency and issue a written finding as to whether the proposed action would appreciably reduce the likelihood of survival or recovery of the plant taxon in Arizona. If the determination is affirmative, the Director shall also specify reasonable, prudent and distinct alternatives to the proposed project that can be implemented and are consistent with conserving the plant. There are no protections for Utah plants on private or State lands, as there are no Utah laws for plant protection. Potential impacts to the species are considered insignificant under this factor.

2.3.2.5 Other natural or manmade factors affecting its continued existence:

Ongoing drought, which has been in place in much of the southwest since the late 1990's, has affected Siler pincushion cactus populations. Increased mortality and reduced or non-existent germination and recruitment have been observed on the monitoring plots. Other populations in Utah seem to have disappeared, likely due to drought. There are no recovery criteria that address this threat. The only

action called for in the HMP is continued monitoring on BLM lands to quantify the effect. There are no actions to minimize or alleviate this threat to Siler pincushion cacti populations outside of BLM lands.

Periods of drought in the southwest are not uncommon. But, the frequency and duration of droughts may be altered by climate change. Global warming, and associated effects on regional climatic regimes, is not well understood, but weather predictions for the southwestern United States include less overall precipitation and longer periods of drought. Seager et al. (2007) predict, based on broad consensus among 19 climate models, that the southwest will dry in the 21st century and that this drier climate change is already occurring. Increased aridity associated with the current on-going drought and the 1950's drought will become the norm for the American southwest within a timeframe of years to decades if the models are correct. The 2007 Intergovernmental Panel on Climate Change (IPCC) report outlines several scenarios that are virtually certain or very likely to occur in the 21st century. These are: 1) over most land, there will be warmer and fewer cold days and nights, and warmer and more frequent hot days and nights, 2) areas affected by drought will increase, and 3) the frequency of warm spells/heat waves over most land areas will likely increase. The IPPC makes equally sobering predictions for ecosystems; the resilience of many ecosystems is likely to be exceeded this century by an unprecedented combination of climate change, associated disturbances (e.g. flooding, drought, wildfire, insects), and other global drivers (IPPC 2007). With medium confidence, IPPC predicts that approximately 20-30% of plant and animal species assessed so far are likely to be at an increased risk of extinction if increases in global average temperature exceed 1.5 – 2.5ºC (IPPC 2007). Almost certainly this species, along with its habitat, will be affected in some manner by climate change; the magnitude and extent of the change cannot be quantified at this time.

2.4 Synthesis

We acknowledge that the BLM (in Arizona and Utah) has made significant efforts to conserve Siler pincushion cactus. They have expended countless hours to survey habitat and document locations. They have refined the species' range and established long-term monitoring plots. They have used their authorities, within the section 7 process of the Endangered Species Act and the 1872 Mining Law, to conserve Siler pincushion cactus and its habitat. They have established ACECs for this species. All of these conservation actions have benefited the species. The majority of the habitat for this species occurs on BLM lands, but there are populations on private, State, and tribal lands that are not protected.

However, as articulated in the 1986 Recovery Plan (FWS 1986) and in the 1987 HMP (BLM 1987), threats have not been eliminated or reduced to the level where the species can be considered for delisting, nor have the delisting criteria been met. Population data (provided by the BLM from their monitoring plots) do not demonstrate long-term stability, and the proposed water pipeline, increased urban development in Utah,

continued and increasing use of BLM lands for recreational activities such as OHV use, and threats from natural events, perhaps exacerbated by livestock grazing, remain. The long-term status of this species could be affected by regional climate change, especially if frequency and duration of dry periods increase. For these reasons, Siler pincushion cactus should remain classified as threatened.

3.0 RESULTS

3.1 Recommended Classification:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist (*Indicate reasons for delisting per 50 CFR 424.11)*:
____ *Extinction*
____ *Recovery*
____ *Original data for classification in error*
_X_ No change is needed

3.2 New Recovery Priority Number:

We recommend changing the Recovery Priority Number from 8 to 8C. The species appears to be in conflict with numerous economic activities including a proposed water pipeline, increased urban development, increased recreational activities, such as OHV use, and livestock grazing. A Recovery Priority Number of 8C represents a moderate degree of threat, high recovery potential, the listed entity is a species, and there is conflict.

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS (prioritized list)

- The 1986 Recovery Plan should be updated. The recovery criteria need to be measurable and threats based. In addition, the BLM has better maps and location information that should be in the Plan.

- Assistance (technical and monetary) should be provided to the Kaibab Pauite Indian Tribe to conduct surveys and develop conservation measures for Siler pincushion cactus on their lands.

- The BLM monitoring protocol should be revised in order to quantify seedling survivorship. Random plots/transects should be used in order to make estimates for the population as a whole.

- The Siler pincushion cactus population in Utah should be monitored on a regular basis, especially to quantify and address threats from climate change related drought. An adaptive management plan should be developed to address this issue.

- The BLM should pursue mineral withdrawals on the established ACECs or in the areas that support dense concentrations of Siler pincushion cactus.

- The BLM should close areas that support dense concentrations of Siler pincushion cactus to off-road vehicle use.

- Research to examine insect predators on Siler pincushion cactus should be conducted.

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Experts consulted:

Heather Barnes, Botanist, U.S. Fish and Wildlife Service, Salt Lake City, Utah: provided information and reviewed this document.

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John Anderson, State Botanist, Bureau of Land Management, Phoenix, Arizona; provided information.

Bob Douglas, Bureau of Land Management, St. George, Utah; provided information.

Walt Fertig, Private Consultant, Kanab, Utah; email provided to Heather Barres.

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of Siler Pincushion Cactus

Current Classification: Threatened

Recommendation resulting from the 5-Year Review:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
_X_ No change needed

Appropriate Listing/Reclassification Priority Number, if applicable:

Review Conducted By: Mima Falk, U.S. Fish and Wildlife Service, Arizona Ecological Services Tucson Sub-Office

FIELD OFFICE APPROVAL:

Acting
Lead Field Supervisor, Fish and Wildlife Service

Approve Debra T. Bills Date 9/29/08

REGIONAL OFFICE APPROVAL:

Assistant Regional Director, Ecological Services, U.S. Fish and Wildlife Service, Region 2

Approve Nancy G. Gloman Date 10/24/08

Cooperating Regional Director, U.S. Fish and Wildlife Service, Region 6

X Concur ____ Do Not Concur

Signature Richard A. Coleman Date 10/29/08