RECOVERY OUTLINE

for
San Rafael Cactus (*Pediocactus despainii*)
and
Winkler Cactus (*Pediocactus winkleri*)
December 2007

I. INTRODUCTION

This document lays out a preliminary course of action for the recovery of the San Rafael cactus (*Pediocactus despainii*) and the Winkler cactus (*Pediocactus winkleri*). It serves to guide recovery efforts and inform consultation and permitting activities until a comprehensive recovery plan for these species is approved.

- Listing and contact information:

Scientific Name:	*Pediocactus despainii*
Common Name:	San Rafael cactus
Listing Classification:	Endangered
Effective Listing Date:	October 16, 1987 (52 FR 32914, September 16, 1987)
Lead Agency, Region:	U.S. Fish and Wildlife Service, Region 6
Lead Field Office:	Utah Field Office
Contact Biologist:	Larry England, 801-975-3330, larry_england@fws.gov
Cooperating Offices:	None

and

Scientific Name:	*Pediocactus winkleri*
Common Name:	Winkler cactus
Listing Classification:	Threatened
Effective Listing Date:	September 21, 1998 (63 FR 44587, August 20, 1998)
Lead Agency, Region:	U.S. Fish and Wildlife Service, Region 6
Lead Field Office:	Utah Field Office
Contact Biologist:	Larry England (see above)
Cooperating Offices:	None

II. RECOVERY STATUS ASSESSMENT

A. BIOLOGICAL ASSESSMENT

Abundance: Population size estimates for both species are based on information collected by academia (Heil 1984, 1987), private contractors (Neese 1987; Kass 1990, 1997), Federal and State botanists and biologists, and Utah Natural Heritage Program personnel (Clark 1998, 1999, 2007a, 2007b; England 1994, 1997). The most current survey information for both species was summarized by Clark (2007a, 2007b).

Surveys over portions of *P. despainii* known distribution have documented a population of approximately 4,300 individuals (Clark 2007a). Based upon estimates of available habitat, the U.S. Fish and Wildlife Service (USFWS) (England 1997) currently estimates the *P despainii* population at about 20,000 individuals.

P. winkleri has a documented population of approximately 4,500 individuals (Clark 2007b). Based upon estimates of available habitat, Clark (2007b) also estimates the total *P. winkleri* population at about 24,000 individuals.

Distribution: *P. despainii* is known from five populations including Mussentuchit, McKay Flat, Wedge, Short Canyon, and Ferron. The species range is centered on the San Rafael Swell and extends into southwestern Emery County.

P. winkleri is known from four populations including Notom, North Fremont, Hartnet, and Cathedral Valley. The species range includes north central Wayne County along the eastern boundary of Capitol Reef National Park from the vicinity of Highway 24 north to extreme southwest Emery County.

Most of the habitat and population of both species is on Federal lands managed by the Bureau of Land Management (BLM) with a significant portion of *P. winkleri*'s habitat and population within Capitol Reef National Park. Additional population sites for both species occur on scattered sections of State of Utah land administered by the School and Institutional Trust Lands Administration.

Trends: In 1984, the USFWS began monitoring one site for each species including *P. despainii* at the Wedge population and *P. winkleri* at the Notom population. These monitoring studies were assumed by the BLM in 1999 (England 1997; Clark 2007a, 2007b). The National Park Service (NPS) began a long-term demographic monitoring study on *P. winkleri* on the Hartnet population in 1998 (Clark 2007b). In addition, the BLM and NPS randomly monitor all known populations of both species on an informal basis for impacts from off-road vehicle (ORV) trampling and illegal unauthorized collection.

Current monitoring data from a limited number of sites indicates that the populations of both species are declining. These declines are based on the decrease in the number vegetative individuals capable of flowering and

reproduction. The causes of decline are illegal collecting, ORV and livestock trampling, insect parasitism (cactus borer beetle), and an extended drought (England 1997; Clark 2007a, 2007b). The size and longevity of the soil seed of both species is unknown. Germination and seedling establishment may be episodic events (Clark 2007b). Extended monitoring is needed to determine the reproductive status of both species.

Population and habitat monitoring conducted on rigorous statistical basis is needed for both species. Demographic studies will be designed to determine the long term population viability of both species.

Taxonomy: Taxonomic questions concerning *P. despainii* and *P. winkleri* persist. Hochstatter (1995) has proposed that the two species are subspecies of *Pediocactus bradyi*, a federally listed species from northern Arizona. However, Porter (2000, 2004) has demonstrated through genetic analysis that *P. despainii* and *P. winkleri* are more closely related to *P. simpsonii* but distinct from it. There is a zone of possible interspecies hybridization between *P. despainii* and *P. winkleri* in southwestern Emery County (Porter 2004).

B. THREATS ASSESSMENT

The threats facing *P. winkleri* and *P. despainii* described through the listing process included collection for horticultural purposes; ORV and livestock trampling; mineral exploration, including uranium, gypsum, and clay mining; drought; natural herbivory and predation; and known extant areas with fragile ecosystems that are easily degraded. Additional factors reported since the time of listing, to consider during section 7 consultation and in the recovery plan, are global climate change, low fruit/seed output, and the impact of exotic plant species.

As identified in the final rule, the overriding threats to both *P. despainii* and *P. winkleri* are overutilization of wild populations for horticultural use, direct loss of individuals and habitat degradation through impacts associated with ORV and livestock trampling, and mineral exploration and subsequent mining.

Although difficult to cultivate in most horticultural settings, these rare species are highly desired in cactus collections and gardens and have been sought by both hobby and commercial cactus collectors (Hochstätter 1990; Steven Brack, Mesa Gardens, Belen, New Mexico, pers. comm. 1994; Kenneth Heil, San Juan Community College, Farmington, New Mexico, pers. comm. 1993). Cactus collectors are very active in the Colorado Plateau, often going from the habitat of one species of *Pediocactus* to the next to collect a complete set (Kenneth Heil, pers. comm. 1994; USFWS 1987, 1994, 1998). The Endangered Species Act (ESA) directly protect *P. despainii* or *P. winkleri* or their habitat. No State laws or regulations preclude collection. While the NPS and the BLM restrict the collection of plants and plant materials, enforcement has not been effective. The

populations of both species are scattered over unpopulated and remote country, and this makes monitoring and protection from unauthorized collecting difficult, even within Capitol Reef National Park.

The small, restricted populations of *P. despainii* and *P. winkleri* make them highly vulnerable to human-caused habitat disturbances. Their known habitat has been adversely affected by ORV use and livestock trampling (Heil 1984a, 1984b, 1987; Kenneth Hell, per. comm. 1993; Neese 1987; USFWS 1994; Clark 2007b). These cacti have some natural protection from light trampling from humans and soft wheeled vehicles because of their habit of shrinking into the ground for portions of each year. However, these species form flower buds on the surface in the autumn (Heil et al. 1981). The flowering buds are thus very vulnerable to surface disturbance, increasing the potential for reproductive capacity to be lost or diminished due to trampling.

Because of their small size and the shortness of their spines, *P. despainii* and *P. winkleri* are less protected from animals than other spinier cactus species. During periods when the soil is wet, these species are easily dislodged by sharp hooved domestic livestock. Livestock trampling has affected populations of both *P. despainii* and *P. winkleri* both in and out of Capitol Reef National Park (Capitol Reef National Park is open to livestock grazing) (Heil 1987; England 1997; Clark 2007b). Livestock grazing on the species habitat has decreased in recent years, but trampling impacts to some of these species populations continue (Heil 1993; USFWS 1987, 1994, 1998; England 1997; Clark 2007b). The full effect of livestock grazing on *P. despainii* and *P. winkleri* is unknown. Recent NPS research demonstrates that *P. winkleri* plants have ceased to flower and may die within 1 to 4 years of their trampling injury (Clark 2007b). The effects of livestock grazing on desert vegetation may produce indirect impacts on *P. despainii* and *P. winkleri* populations by inducing changes in the plant community structure and fostering the spread of invasive and exotic weeds.

These species are susceptible to infestations of insect larvae, including the cactus borer beetle (*Moneilema semipunctatum*). The cactus borer beetle larvae enter the plant by eating tunnels, usually at ground level in the stem of the plant and ultimately ingest most of the plant stems' succulent cortex. Episodic die offs of significant portions of both species populations due to cactus borer have been observed within the past 20 years (USFWS 1987, 1994, 1998; Neese 1987; Kass 1990; England 1997). This form of mortality is a natural phenomenon of the species ecosystem and is largely beyond human control.

The habitat of *P. despainii* is underlain by potential oil and gas reserves and gypsum deposits. The habitat of *P. winkleri* is underlain by bentonite clay and uranium ore deposits. The development of these deposits and surface disturbance by annual assessment work on mineral claims has the potential for adversely impacting these species and their habitat (USFWS 1987, 1994, 1998; England 1997).

Historically, the Galleta-three awn shrub steppe and salt desert shrub vegetative types, which characterize the habitat of *P. despainii* and *P. winkleri,* have had minimal infestations of introduced exotic weeds. However, within the past 20 years a noticeable increase in cheat grass (*Bromus tectorum*) has occurred within the species' habitat (Clark 2007a, 2007b). The effects of this increase in weedy vegetation on *P despainii* and *P. winkleri* is unknown, but may pose a threat in the future through increased competition, especially for water in the late winter-early spring growing season for both species of cacti and cheat grass, and a change in the natural fire regime.

Cacti in general, and *Pediocactus* species in particular, are adapted to xeric environments. The average rainfall within the range of both *P. despainii* and *P. winkleri* is between 15 and 25 millimeters (6 and 10 inches) annually. Cacti store water in their succulent stems that enables them to survive extended periods with little or no precipitation. *Pediocactus* species also have a shallow root system which enables them to effectively capture the water that does fall. However, extended drought with several years below the 6-inch average annual rainfall has stressed the populations of both species (but especially *P. winkleri*). This impact has caused a significant die-off of their populations and low fruit and seed production (Clark 2007b). Climatic change and potential global warming may have a severe adverse long term impact on both species. Cacti, though endemic to the dry regions of the western hemisphere, are not found in its most extreme deserts--the center of Death Valley in California and the Atacama Desert in Chile (Benson 1982). If precipitation levels decline to amounts received in the hemispheres most xeric deserts, then the prospect of the extirpation of both species from areas that have persistent precipitation levels below 10 millimeters annually is possible.

C. CONSERVATION ASSESSMENT

Limited statutory and regulatory protection is available for endangered and threatened plants through sections 7 and 9 of the ESA. No statutory or regulatory protection exists for plants, federally listed or other wise, under the laws of the State of Utah.

Conservation measures to date are limited to section 7(a)(1) actions protecting endangered plants by the BLM and NPS and through section 7(a)(2) consultation between the USFWS, BLM, NPS, and other Federal agencies for their actions and other activities, as required under the ESA. Surveys for additional populations of the species and extensive demographic research are needed, but largely unfunded.

The BLM and NPS with assistance from the USFWS have initiated protection of the species' habitat from the effects of livestock and ORV trampling. Specifically, the NPS is initiating retirement of grazing permits within Capitol Reef National Park and BLM has been adjusting some livestock grazing rates in occupied habitats. The NPS and BLM have also closed many occupied areas to

ORV use. Finally, these agencies have initiated actions to prevent the uncontrolled direct threats from over-collecting through law enforcement actions. These actions may stabilize the populations of both species and enhance the prospects for their recovery.

In terms of net benefits to the species, the limited conservation measures undertaken to date, primarily life history research, demographic data collected within two population sites, and intermittent site visits to all locations, do not outweigh the continuing threats to the species. A foundation for advancing recovery of the species is overdue.

D. SUMMARY ASSESSMENT

It is not known if the current demographic status of the species is conducive to its long-term persistence in the wild. Both species are currently experiencing population declines. If threats are not adequately ameliorated, both species may trend toward potential extinction in the long term.

The greatest potential threats facing this species are over-collecting and ORV and livestock trampling. At present, mineral exploration and subsequent mining is an infrequent and minor factor affecting both species. Natural factors affecting the species, drought and insect parasites are largely uncontrollable by human actions. However, it should be pointed out that climate change, which in part is human caused, may have an impact on the intensity and frequency of naturally occurring droughts. Climate change also may impact insect populations and plant community structure including the dynamics of invasive and exotic plants. The nature of these impacts is not presently understood.

In sum, the recovery outlook for *P. despainii* and *P. winkleri* depends largely on whether habitat protection can be achieved. The key challenges are finding the means to protect sites where these two species occur, eliminating collection from wild populations, preventing ORV and livestock trampling. More work is needed to understand the species' response to climatic variations, off-site impacts on the species, their demographic and life history characteristics, their taxonomic relationships, and their distribution and range.

III. PRELIMINARY RECOVERY STRATEGY

A. RECOVERY PRIORITY NUMBER WITH RATIONALE

P. despainii is assigned a recovery priority number of 11 based on a moderate degree of threat to its habitat over its range, a low potential for recovery in terms of habitat conservation, and its taxonomic standing as a species. The moderate degree of threat is linked to the danger of irreversible loss of individuals and habitat.

P. winkleri is assigned a recovery priority number of 11c based on a moderate degree of threat to its habitat over its range, a low potential for recovery in terms of habitat conservation, and its taxonomic standing as a species. In addition, the modifier "c" denotes a local economic conflict with desires for recreation ORV use within its occupied habitat. The moderate degree of threat is linked to the danger of irreversible loss of individuals and habitat.

B. RECOVERY VISION

Recovery of *P. despainii* and *P. winkleri* is currently envisioned as follows: Viable populations will persist on protected habitat throughout both species' historical range. Additional populations will be found and protected to secure recovery. All threats to the species, the most important of which are horticultural collection from wild populations and ORV and livestock trampling, will be sufficiently abated to ensure a high probability of survival at least 100 years into the future.

C. INITIAL ACTION PLAN

The primary focus of the initial phase of recovery will be to maintain the known distribution of *P. despainii* and *P. winkleri* through protection of the extant populations and their habitat and protection from collection. Secondary actions include: surveys to locate additional populations; biological and ecological studies to determine the species demographic trends and life history to gain an understanding of both *P. despainii's* and *P. winkleri's* population declines; and adequately resolve taxonomic issues for the genus *Pediocactus*. These actions will be accomplished by using the full range of protection tools available and will be based on an understanding of the ecological requirements of the species and what is needed to fully protect its habitat. Heightened public awareness through education efforts may play a role in generating voluntary protection actions on State and private lands.

The recovery effort should build on ongoing conservation efforts. Specific actions that will be undertaken early in the process include the following:

- Provide and ensure implementation of effective conservation measures to minimize and mitigate the effects of human land use activities on populations and habitat of *P. despainii* and *P. winkleri*.
- Prevent the collection of *P. despainii* and *P. winkleri* plants from natural populations.
- Inventory suitable habitat for *P. despainii* and *P. winkleri* and determine the population size and distribution of each species.

- Identify sites in urgent need of habitat conservation and establish and implement formal land management designations which would provide for long-term protection on undisturbed habitat for each species.

- Determine the biological and ecological factors controlling the species distribution and abundance.

- Conduct modeling to clarify the factors affecting long-term population viability

- Determine phylogenetic relationship of *P. despainii* and *P. winkleri* to each other and to their congeneric species.

IV. PREPLANNING DECISIONS

A. PLANNING APPROACH

A multi-species recovery plan will be prepared for *P. despainii* and *P. winkleri* pursuant to section 4(f) of the ESA.

Plan preparation will be developed under the stewardship of Larry England, Region 6, lead botanist for *P. despainii* and *P. winkleri*. Other Federal agency personnel involved with the species will be integrally involved in the planning effort. The USFWS field office biologists will coordinate with the Regional endangered species office as planning proceeds. An active plant conservation team involving the BLM in the Price and Richfield Field Offices, Capitol Reef National Park, and the Fishlake National Forest is addressing the conservation of *P. despainii* and *P. winkleri*; therefore, these species do not, at the present time, warrant the appointment of a formal recovery team. Larry England will coordinate recovery efforts with an informal network of experts and involved parties. Periodically, meetings among these parties may be convened for the species with the purpose of sharing information and ideas about advancing *P. despainii* and *P. winkleri* recovery.

B. INFORMATION MANAGEMENT

- General:
  All information relevant to recovery of *P. despainii* and *P. winkler*i will be housed in administrative files found at USFWS Utah Ecological Services field office in West Valley City, Utah. Larry England will be responsible for maintaining a full administrative record for the recovery planning and implementation process for the species. Copies of new study findings, survey results, records of meetings, comments received, etc., should be forwarded to him.

- Reporting requirements:

Information needed for annual accomplishment reports, the Recovery Report to Congress, expenditures reports, and implementation tracking should be forwarded by all individuals and offices involved in the *P. despainii* and *P. winkleri* recovery effort to Larry England. Copies of the completed reports can then be disseminated to all contributors upon request.

C. RECOVERY PLAN PRODUCTION SCHEDULE

Internal review draft:	July 2008
Public review draft:	September 2008
Public comment period:	October – November 2008
Final plan:	September 2009

D. STAKEHOLDER INVOLVEMENT

- Key stakeholders:
  - Private and State landowners with *P. despainii* and *P. winkleri* populations on their lands
  - Public land managers with *P. despainii* and *P. winkleri* populations on their lands, in particular representatives of BLM, Price and Richfield Field Offices and Capitol Reef National Park
  - Town/county officials in Emery and Wayne Counties, Utah
  - Utah Natural Heritage Program
  - Conservation organizations such as The Nature Conservancy and the Center for Plant Conservation and cooperating institutions
  - Academic researchers

- Stakeholder involvement strategy:
  Strong, one-on-one working relationships with both experts and stakeholders will be developed over time. Early in the recovery planning process, a meeting of Federal and State endangered species experts and biologists working with *P. despainii* and *P. winkleri* will be held to exchange status information and identify recovery issues. The information emanating from this discussion will provide the initial platform for proceeding with recovery planning. State and local officials also will be asked to participate on an ongoing basis in the recovery effort, particularly with regard to monitoring and regulatory protection of the species.

  Landowners and land managers may be affected by the recovery of *P. despainii* and *P. winkleri*. Thus, stakeholders will also be invited to participate in the recovery planning process including involvement in developing the draft and final recovery plan. These stakeholders will also be involved in implementation of all necessary recovery actions. A mailing list will be maintained. The Utah Field Office will foster open and ongoing communications with all interested parties. Field biologists will develop strong one-on-one working relationships with interested individuals.

As needed, additional meetings and/or conference calls will be held to discuss particular issues. Stakeholders will be invited to participate as warranted by the purposes of the meeting. Advantage will be taken of all opportunities to interact with stakeholders in a productive and meaningful way.

All stakeholders will be afforded an opportunity to review and comment on a draft of the recovery plan in conformance with the ESA.

Approved:

Gary S. Mowad

U.S. Fish and Wildlife Service, Regional Director

Date: 12-6-07