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TITLE	NAME	DATE
AUTHOR	<i>Teresa Smith</i>	8/29/19
F/O DEPUTY PROJECT LEADER	<i>[Signature]</i>	8-29-19
F/O PROJECT LEADER	<i>[Signature]</i>	8/29/19

### 5-Year Review Short Form

**Species Reviewed:** Winkler cactus (*Pediocactus winkleri*) and San Rafael cactus (*Pediocactus despainii*).

**Federal Register Notice Announcing Initiation of this Review:** June 20, 2011. 5-Year Status Reviews of 12 Species in the Mountain-Prairie Region, 76 FR 35906.

**Lead Region:** Region 6, Marjorie Nelson, Chief, Division of Ecological Services, 303-236-4258.

**Current Classification:** Winkler cactus – Threatened  
San Rafael cactus – Endangered

**Current Recovery Priority Number:** Winkler cactus – 11C  
San Rafael cactus – 11

A ranking of 11 is based on a moderate degree of threat to the species' habitat over its range, a low potential for recovery in terms of habitat conservation, and the species' taxonomic standing as an individual species. In addition, the modifier "C" is added for Winkler cactus, based on the high potential for economic conflict with needed recovery actions throughout its range.

#### Methodology used to complete this review:

This review was completed by the Utah Ecological Services Field Office on August 29, 2019. All pertinent literature and documents on file at the Utah Ecological Services Office were used for this review. We placed specific emphasis on new information obtained since release of the 2016 draft revised recovery plan, which represents the most recent status review for these species. Although the draft recovery plan did not include a five-year review, it contained updated demographic information, a full threats analysis, and a determination of threat levels for each species. The 2016 draft recovery plan will be updated with new information and revised quantitative recovery criteria in fiscal year 2020, at which time it will be available for public review. We plan to finalize the recovery plan in fiscal year 2021.

#### Review Summary:

Winkler cactus and San Rafael cactus are small, sub-globose cactus that shrink underground in winter and during periods of drought. They are described as separate species in all taxonomic treatments involving those species in regional floras (eFloras 2019; Neese 1981; Welsh et al. 1987; Welsh et al. 2003) and in monographs of the genus (Heil et al. 1981). However, because they are difficult to distinguish by field characters alone, geographic location has often been used to delineate individual populations for each species (USFWS 2016). Preliminary results from a genetic study of both species indicates that their ranges may overlap, and that some populations identified as Winkler cactus may be San Rafael cactus and vice versa (Wang *et al.* 2018). For

the purposes of this review, we will continue to use the species designations from the 2016 draft recovery plan, as the Wang *et al.* genetics study has not been finalized.

Both species are endemic to south-central Utah in Emery, Sevier, and Wayne counties. Winkler cactus is generally found at elevations between 4,900 to 7,000 feet (1,500 to 2,130 meters) on rocky, alkaline hill tops and benches, and gentle slopes on barren, open sites in salt desert shrub communities in alkaline silty loam or clay loam soils (Clark 1998, 1999; Heil 1984; Neese 1987).

San Rafael cactus grows in fine textured, mildly alkaline soils that are rich in calcium and derived from limestone substrates or on shale barrens, and in soils characterized as mainly alluvium and colluvium. It most commonly occurs on benches, hill tops and gentle slopes, most abundantly on sites with a south exposure and elevations of 4,760 to 6,830 feet (1,450 to 2,080 meters). It is found in piñon-juniper woodland plant community at lower elevations and at the higher elevations in a galleta-three awn shrub-steppe community (Cronquist *et al.* 1972; Kuchler 1964).

Winkler cactus is found within Capitol Reef National Park (Park) and on Bureau of Land Management (BLM) lands adjacent to it. San Rafael cactus is found on BLM lands primarily in Emery County, as well as land administered by the State of Utah (USFWS 2016). Both species may have some distribution on private lands, but little to no data is available.

We originally listed Winkler cactus as threatened throughout its range on August 20, 1998 (50 FR 33734) and San Rafael cactus as endangered on September 16, 1987 (52 FR 34914) under the Endangered Species Act of 1973 (Act), as amended. At the time of listing, the primary threats to Winkler cactus included mining and energy development, recreation, and livestock grazing, and the primary threats to San Rafael cactus were collection by hobbyists and commercial collectors, energy and mineral development, and off-road vehicle use. A five-year review was never completed for either species. However, since the release of the draft recovery plan in 2016, we have received new information regarding the abundance, distribution, and threats to both species.

In 2016, we documented 5,700 individual Winkler cactus in 4 populations (USFWS 2016). Since that time, five new occurrences were documented within the Park, as well as additional individuals within existing occurrences. The total number of new individuals documented within the Park since 2016 is 244 (Borthwick 2017, pers. comm.). However, the Park and the BLM also documented declines in Winkler cactus at monitoring sites 2017 and 2018, but no mortality numbers are available (Borthwick and Livensperger 2019; Rooks 2019).

Also in 2016, we documented 8,553 individual San Rafael cactus in 21 populations. Since that time, additional occurrences were documented on BLM lands, although not all of these have been confirmed and thus they may or may not represent new populations (Truman 2018, pers. comm.; CUC 2019). No regular, rangewide monitoring of San Rafael cactus has occurred, and some previously identified populations have not been resurveyed in many years.

Additionally, at least one population of each species may have been misidentified (Wang *et al.* 2018). It should be noted that the cryptic nature of these species makes accurate survey counts

and monitoring difficult, as individuals can remain underground for more than an entire year, and even adult plants above ground can be easily missed if not blooming (USFWS 2016).

Due to the lack of population data on most new occurrences, the time elapsed since surveys in some locations, and the uncertainty regarding the species delineation due to preliminary genetic results, we cannot provide an accurate, updated count or population estimate for either species. We anticipate that some or all of these questions will be resolved before the recovery plan is finalized and we plan to provide a population estimate at that time.

In the 2016 recovery plan we re-evaluated the existing threats to Winkler and San Rafael cactus. For Winkler cactus we assessed the threat of livestock grazing as high; the threats of commercial and hobby collecting, the inadequacy of existing regulation, and climate change as moderate; and the threats of energy and mineral development, native ungulates, invasive species, insect and small mammal predation, road and utility corridor development, and off-road vehicle use as low (USFWS 2016).

For San Rafael cactus, we assessed the threats of livestock grazing, off-road vehicle use and recreation, energy and mineral development, and climate change as high; the threats of commercial and hobby collecting and the inadequacy of existing regulations as moderate; and the threats of native ungulates, wild horses, invasive species, paleontological exploration, insect and small mammal predation, and road and utility corridor development as low (USFWS 2016).

Since our 2016 evaluation, some threats to both species may have changed in intensity and scope. For Winkler cactus, in 2018 the Park removed all grazing from the Hartnet grazing allotment, where the majority of individuals within the Park occur (CRNP 2018). The removal of grazing from this allotment will likely decrease grazing impacts to the species because the allotment contained 94 percent of the individuals in the park and in 2017, 20 percent of those individuals had been disturbed by cattle (Borthwick 2017, pers. comm.).

Larval moth infestation and drought significantly impacted Winkler cactus in 2016 and 2017 and caused mortality. However, the past two years have seen little to no moth infestation and improvements in recruitment and plant condition (CUC 2019).

For San Rafael cactus, recreational use in occupied habitat has increased, and new legislation has resulted in changes to land status across the species' range including the designation of new recreation areas, new wilderness areas, and lands that will be exchanged with the State of Utah (CUC 2019; Pub. L. 116-9, "John D. Dingell, Jr. Conservation, Management, and Recreation Act"). Management plans for these lands are still in development and land exchanges have not been finalized, making evaluation of the long term changes in threat levels to this species impractical at this time.

Additional information should become available in the near future that will help clarify the status of Winkler cactus and San Rafael cactus. For Winkler cactus we anticipate monitoring results that will show the impact of removing grazing from a large portion of the population (CUC 2019), and results of a grazing impact study sponsored by the BLM on private land (Rooks 2019, pers. comm.). For San Rafael cactus, we anticipate the development and finalization of

management plans by the BLM, the clarification of land status and administration throughout the species' range, and results of newly installed recreational impact monitoring plots at the species' largest population (Truman 2018, pers. comm.; CUC 2019). An intensive analysis of all monitoring and survey data is in progress for both species, and we expect results of this work to clarify species' responses to threats and help develop data-driven, quantitative recovery criteria (Hornbeck 2019). In addition, the final results of the genetic study should delineate populations of the two species with greater accuracy (Wang *et al.* 2018), and the finalization of a U.S. Geological Survey habitat model will provide predictions of available habitat based on climate change projections (Kelly 2016; Kelly 2019, pers. comm.).

Winkler cactus and San Rafael cactus do not have a finalized recovery plan. The most recent draft recovery plan, released in 2016, identified the following delisting criteria (P indicates a population-based criterion and T indicates a threat-based criterion):

**P-1.** Based on analysis and modeling implemented under the recovery actions, trends for San Rafael cactus and Winkler cactus populations are shown to be stable or improving according to the following measures:

- a) Species presence is maintained at all known San Rafael and Winkler cactus populations; **and**
- b) Within at least three-quarters of the known populations that represent the majority of the total known individuals (and including the Wedge, Millsite/Clawson, and all of the McKay Flats populations) **and** represent the range of geographical, morphological, and genetic diversity of San Rafael cactus, plant density within occupied habitat is stable or improving over a 20-year period. These populations would be designated as Recovery Populations and this measurement would be based on a standardized, long term monitoring protocol developed by the Recovery Team and managing agencies. These criteria must be met for **all** known Winkler cactus populations due to the low number of known populations at this time. The four known populations are designated as Recovery Populations. If additional Winkler cactus populations are discovered in the future, it may be determined that delisting is appropriate even if some populations are not stable or increasing; **and**
- c) Predictive modeling using data from an additional 10-year period (30 years total), collected in accordance with a standardized monitoring protocol, provides an indication of long-term demographic stability as well as a projected survival probability of at least 95 percent over 100 years for each species.

**P-2.** Based on best available data, the available habitat base for each recovery population of each species is of sufficient quality and large enough to allow for natural population dynamics, population expansion where needed, and the continued presence of pollinators, with sufficient connectivity to allow for needed gene flow within and, where possible, among populations.

**P-3.** Population and habitat management is implemented for all populations of both species cactus in accordance with management plans developed under Recovery Action 1 (Section 3.4).

Each species-specific management plan will include a course of action that addresses the following needs: habitat protection and management, threats abatement, biological and threats monitoring, and reporting and evaluation.

**T-1.** Federal land protection through long-term management agreements or plans is achieved for all known San Rafael and Winkler cactus populations. Protection from grazing impacts, development, mining, oil and gas, and recreation must be included in the management agreements and the protected areas must include all occupied habitat at a minimum. As research is conducted on species requirements for long term viability, these areas should be expanded as needed to meet the size and connectivity parameters determined to be adequate to sustain those populations. These protections may include but are not limited to resource management plans, conservation easements, conservation agreements, recreation management plans, and travel management plans.

**T-2.** Management agreements or plans in place and being implemented for all Winkler and San Rafael cactus populations on all federal lands must include measures to address and curtail illegal collection activities. These plans should include criteria for appropriate law enforcement at correct times and places to prevent illegal collection and sales of plants or any plant parts.

**T-3.** Adverse population-level effects from herbivory, disease, or predation, if any, are identified, monitored and abated to the extent that all known Winkler cactus and at least three quarters of known San Rafael cactus population trends are stable or increasing. Impact and population trend monitoring should be supported by demographic monitoring results, Programs to control excessive herbivory or predation will be developed to adaptively manage each population per criterion P-3, and must take into consideration the degree which climate change may impact disease or herbivory levels in the future.

**T-4.** Land protection covering the habitat of all populations for each species and/or statutory and regulatory protections for plants are such that the protections of the ESA are no longer needed to compensate for regulatory inadequacies.

**T-5.** A long-term ex-situ conservation program is ongoing for all extant Winkler cactus and San Rafael cactus populations. This would include seed collection and storage, germination and viability trials, and development of a protocol for successful reproduction under greenhouse conditions as well as establishment and maintenance of live collections in botanical gardens for educational purposes This program would allow for population augmentation and establishment if needed to help avert the risk of extinction from stochastic events or environmental catastrophes.

**T-6.** In conjunction with recovery criterion P-2, the available habitat base for each of the populations designated under criterion P-1 is of sufficient quality and large enough to offset the threat of loss or restriction of the species' pollinators.

None of these criteria have been met for Winkler cactus or San Rafael cactus. However, we are in the process of developing revised recovery criteria with both species, which will be available for public review in fiscal year 2020.

**Recommendations on species status:**

After reviewing the best available scientific information and recovery criteria, we conclude that Winkler cactus should remain as a threatened species and San Rafael cactus should remain as an endangered species. Our review of new information compiled since 2016 does not change our overall evaluation of the species' status and the threats affecting the species under the factors in 4(a)(1) of the Act from our most recent review, although there have been some alterations to scope and intensity of the existing threats (see Review Summary; USFWS 2016).

Our previous evaluation that Winkler cactus remains likely to become in danger of extinction across its entire range, and thus continues to meet the definition of a threatened species under the Act is supported by: the lack of knowledge about long-term population trends and recruitment rates; the continued current and potential threats, including those associated impacts by large animals (cattle and native ungulates) over a large portion of the species range; removal by collectors; the projected impacts of climate change; and the small known population size. Grazing intensity and scope has decreased since that time but it still remains an active threat for greater than half the population, and it is too early to determine what the species response to the removal of grazing from the Park will be.

Our previous evaluation that San Rafael cactus remains likely to become extinct across its entire range, and thus continues to meet the definition of an endangered species under the Act is supported by: the lack of knowledge about long-term population trends and recruitment rates; the continued current and potential threats, including those associated with cattle, energy and mineral development, recreation, and removal by collectors; the projected impacts of climate change; and the small known population size. Impacts from recreation to San Rafael cactus have increased since that evaluation and are likely to continue to do so (CUC 2019). The BLM is in the process of developing travel and recreation plans that may impact management of the species, and upcoming land exchanges due to recent legislation may also have an impact on the species. Although a full analysis of the threats to the species is difficult due to the number of factors in flux at this time, we do not have reason to believe that the overall threats to the species have decreased since our last evaluation.

Therefore, we recommend no change in status to either species at this time.

**Recommended future actions:**

We recommend rangewide surveys of known populations for Winkler cactus and San Rafael cactus, and that survey results be used to compile a robust, updated population estimate. Additional research that provides a better understanding of current population demographics, population trends, and the impact of and response to the primary threats is vital to evaluating these species' status in the future and to developing updated and meaningful recovery criteria and actions. The designation and management of protected areas that reduce impacts from identified threats may be necessary to facilitate this species' recovery.

Additionally, we recommend updating and finalizing the draft recovery plan and specifically reevaluating the recovery goals and criteria based on new population numbers, habitat requirements, connectivity analysis, and recent and upcoming changes in management and conditions that may result in changes to threat intensity and scope.

Approve:  \_\_\_\_\_

Date: 8/29/2019

Larry Crist, USFWS Field Office Supervisor  
Utah Ecological Services Field Office

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