

**RECOVERY OUTLINE  
for the  
Colorado hookless cactus  
(*Sclerocactus glaucus*)**

**Colorado Ecological Services Field Office**

**April 2010**



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**I. INTRODUCTION**

This document provides an overview of the known information for Colorado hookless cactus (*Sclerocactus glaucus*) and serves to guide recovery efforts and inform consultation and permitting activities until a comprehensive recovery plan for the species is approved. While this species has been protected under the Endangered Species Act (Act) since 1979 (44 FR 58868, October 11, 1979), until recently it was considered a part of *S. glaucus* (Uinta Basin hookless cactus). On September 15, 2009 (74 FR 47112), we officially recognized the taxonomic split of this species into three distinct species: *S. brevispinus* (Pariette cactus), *S. glaucus* (Colorado hookless cactus), and *S. wetlandicus* (Uinta Basin hookless cactus). As a newly listed species under the Act, the recovery needs of each species are being considered separately. This document supersedes all prior recovery planning documents.<sup>1</sup>

• **LISTING AND CONTACT INFORMATION:**

Scientific Name:	<i>Sclerocactus glaucus</i>
Common Name:	Colorado hookless cactus
Listing Classification:	Threatened
Original Listing:	44 FR 58868, October 11, 1979
Revised Listing:	74 FR 47112, September 15, 2009
Lead Agency, Region:	U.S. Fish and Wildlife Service, Region 6
Lead Field Office:	Colorado Field Office
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<sup>1</sup> A recovery plan for Uinta Basin Hookless Cactus (*S. glaucus*) was completed in 1990, prior to taxonomic revision of this species complex into three distinct species: *S. glaucus*, *S. brevispinus*, and *S. wetlandicus* (74 FR 47112, September 15, 2009). This recovery plan is neither sufficient nor up-to-date enough to direct the current and future recovery of *S. brevispinus*.

## II. RECOVERY STATUS ASSESSMENT

### A. BIOLOGICAL ASSESSMENT

Taxonomy: The original listing rule for *S. glaucus* (44 FR 58868, October 11, 1979) included all hookless (straight central spines) *Sclerocactus* populations in western Colorado and northeastern Utah, and referred to them as *S. glaucus* per Benson (1966, pp. 50-57; 1982, pp. 728-729). This taxonomic classification is not supported by the results of more recent genetic and morphological research.

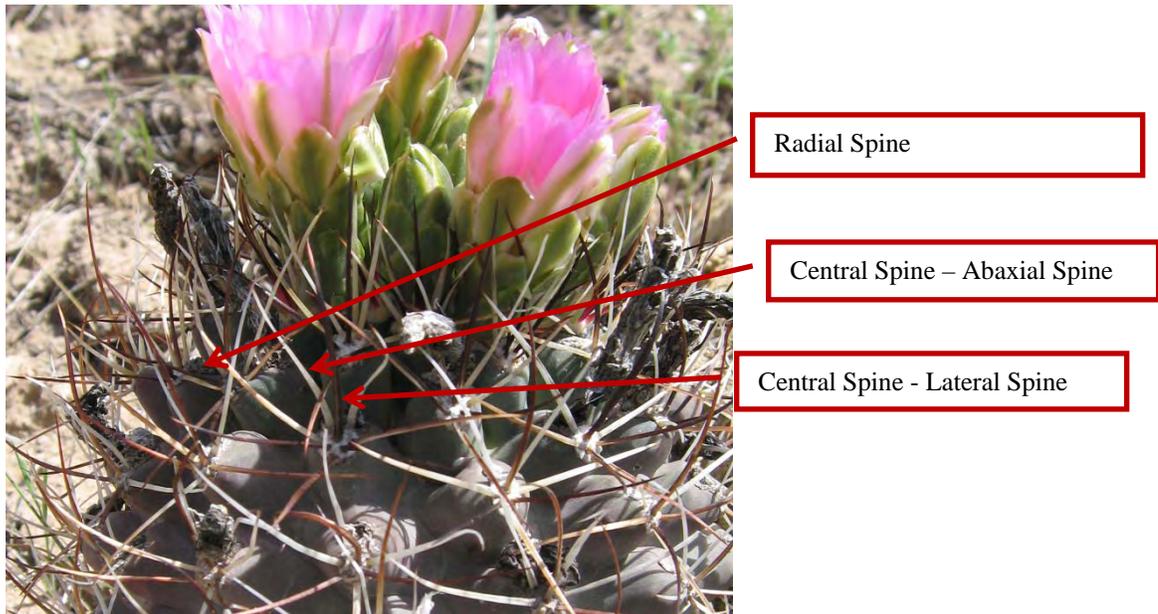
Genetic studies (Porter et al. 2000), common garden experiments (Hochstätter 1993; Welsh et al. 2003), and a reevaluation of the morphological characteristics of *S. glaucus* have led to separating this species into three distinct species: *S. brevispinus*, *S. glaucus*, and *S. wetlandicus* (Hochstätter 1993; Heil and Porter 2004). The *Flora of North America* recognizes 15 species in the genus *Sclerocactus*, including these 3 species (Heil and Porter 2004). Comparative DNA sequences (Porter et al. 2000) infer common ancestry between *S. brevispinus* and *S. wetlandicus*, but infer *S. glaucus* is more closely related to *S. parviflorus* (Devil's claw cactus) and *S. whipplei* (Whipple's fishhook cactus).

The common name for *S. glaucus* was changed to Colorado hookless cactus as the species is endemic to western Colorado. *S. wetlandicus* is now known as the Uinta Basin hookless cactus as this species occurs across Utah's Uinta Basin. *S. brevispinus* is now known as the Pariette cactus as it is limited to the Pariette Draw of the Central Uinta Basin.

Throughout the remainder of this document we will refer to the Colorado hookless cactus' common name to avoid confusion with a scientific name that, until recently, applied to all three species. The Uinta Basin hookless cactus complex will be used to refer to the combination of all three species previously listed as a single entity.

Description, Habitat, and Life History: The Colorado hookless cactus is a barrel-shaped cactus that ranges from 1.2 to 4.8 inches (in.) (3 to 12 centimeters (cm)) tall, with exceptional plants up to 12 in. (30 cm) tall. Stems range from 1.6 to 3.6 in. (4 to 9 cm) in diameter. The stems have 8 to 15 (typically 12 or 13) ribs that extend from the ground to the tip of the plant. Along the ribs are areoles (small, cushion-like areas) with hooked spines radiating out (Heil and Porter 2004). There are two types of spines, radial and central, defined by the size and position on the plant (see Figure 1) (74 FR 47112, September 15, 2009). The 2 to 12 radial spines are located around the margin of the areole, extending in a plane parallel to the body of the plant. The radial spines are white or gray to light brown. They are up to 0.67 in. (17 millimeters (mm)) long, and less than 0.04 in. (1 mm) in diameter. The one to five central spines (usually three) are 0.5 to 2.0 in. (12 to 50 mm) long, are generally longer than radial spines, and extend from the center of the areole. The central spines include abaxial and lateral forms. Abaxial spines are typically single, point toward the top of the plant, and are noticeably bent at the tip at an angle usually less than 90 degrees. Lateral spines are usually present in pairs on either side of the abaxial spine, but are more or less straight and diverge from the abaxial spine at an acute angle (usually 20 to 50 degrees).

FIGURE 1. *Sclerocactus glaucus* (Colorado hookless cactus) Spine Types



The flowers are usually funnel-shaped, but sometimes bell-shaped. They usually have pink to violet tepals (petal-like flower parts not differentiated into petals and sepals) with yellow stamens (the male reproductive organ of the flower), and are 1.2 to 2.4 in. (3 to 6 cm) long and 1.2 to 2 in. (3 to 5 cm) in diameter (74 FR 47112, September 15, 2009). The fruit is short, barrel-shaped 0.31 to 0.47 in. (8 to 12 mm) wide, and 0.35 to 1.2 in. (9 to 30 mm) long.

Populations of Colorado hookless cactus occur primarily on alluvial benches (soils deposited by water) along the Colorado and Gunnison Rivers and their tributaries. Colorado hookless cactus generally occurs on gravelly or rocky surfaces on river terrace deposits and lower mesa slopes. Exposures vary, but Colorado hookless cactus is more abundant on south-facing slopes (Colorado Natural Heritage Program (CNHP) 2010a). Soils are usually coarse, gravelly river alluvium above the river flood plains, usually consisting of Mancos shale with volcanic cobbles and pebbles on the surface. Elevations range from 3,900 to 6,000 feet (ft) (1,400 to 2,000 meters (m)) (Heil and Porter 2004).

Associated desert shrubland vegetation includes shadscale (*Atriplex confertifolia*), galleta grass (*Pleuraphis jamesii*), black-sage (*Artemisia nova*), and Indian rice grass (*Achnatherum hymenoides*) (U.S. Fish and Wildlife Service (Service) 1990). Populations also exist in big sagebrush (*Artemisia tridentata*) dominated sites and in the transition zone from sagebrush to pinyon-juniper (*Pinus edulis* and *Juniperus osteosperma*) communities (CNHP 2010b).

Relative size of individual plants within a population is considered to be primarily a function of the age of the plant and secondarily a function of relative site quality (Service 1990). Pollination is likely carried out by a broad assemblage of native bees and other insects, including ants and beetles (Service 1990).

Distribution, Abundance, and Trends: Colorado hookless cactus is an endemic plant found in Delta, Montrose, Mesa, and Garfield Counties, Colorado. There are two population centers of Colorado hookless cactus: (1) on alluvial river terraces of the Gunnison River from near Delta, Colorado, to southern Mesa County, Colorado; and (2) on alluvial river terraces of the Colorado River and in the Plateau and Roan Creek drainages in the vicinity of DeBeque, Colorado (Service 1990). These populations may be morphologically and genetically discrete from each other (Porter 2008). Introgression with *S. parviflorus* may play a role in these differences. This issue is being researched by the Denver Botanic Gardens (2009b).

The species has been documented at 98 element occurrences (EOs) totaling approximately 13,300 individuals (CNHP 2010b). Forty-two of the EOs have not been observed in over 20 years (see Table 1 below).

TABLE 1. Element Occurrence Ranks (CNHP 2010a; 2010b).

Rank	Viability	# of EOs	% of EOs	Comment
A	Excellent	2	2.0	500 or more plants, high quality site, little or no fragmentation
AB	Excellent or good	2	2.0	
B	Good	14	14.3	50 to 499 plants, may be somewhat fragmented but ecological processes intact
BC	Good or Fair	4	4.1	
C	Fair	10	10.2	10 to 49 plants, fragmented but ecological processes intact
CD	Fair or Poor	1	1.0	
D	Poor	5	5.1	Fewer than 10 plants, highly fragmented
E	Extant	4	4.1	Insufficient information to assign an EO rank
H	Historic	42	42.9	Have not been observed in over 20 years
U	Unrankable	13	13.3	Many were impacted by transplantation
X	Extirpated	1	1.0	No longer exists

Over 6,000 additional individuals were located recently in field surveys for a proposed electric transmission line and a proposed oil and gas wastewater evaporation facility north of Delta, Colorado (Bio-Logic 2008; 2009). These newly discovered individuals have not yet been incorporated into the CNHP database. Therefore, by combining the new survey data and the CNHP data, we estimate the total known population of Colorado hookless cactus at over 19,000 plants.

The species is found in an estimated area of 1,700 square miles (square mi) (4,400 square kilometers (square km)) (Service 2010b). Eighty occurrences exist fully or partially on Bureau of Land Management (BLM) land (CNHP 2010b). Forty-five occurrences exist fully or partially on private land (CNHP 2010b). Nine occurrences exist fully or partially on lands owned by the State of Colorado (CNHP 2010b). In addition, the recent discoveries north of Delta occur on BLM and private lands (Bio-Logic 2008, 2009).

Colorado hookless cactus individuals are extremely difficult to locate in the field. Surveys are most effective during flowering. Most surveys have been associated with ground disturbing projects proposed for BLM lands. There are large expanses of potential habitat within the known range that have not been surveyed.

We have limited rangewide long-term status or trend population data for Colorado hookless cactus. In the northeastern corner of the species' range, the BLM Colorado River Valley Field Office conducted periodic monitoring from 1985 to present. This data suggests a downward trend at several locations. The BLM attributes these trends to cheatgrass (*Bromus tectorum*) invasion (BLM 2009a).

In the southern portion of the species' range, the BLM Uncompahgre Field Office conducted periodic monitoring between 1983 and 1993. These surveys detected no significant changes in the overall numbers of individuals. The Uncompahgre Field Office has conducted numerous other surveys, mostly related to projects, but there is little associated trend data (BLM 2009b).

From 2007 to 2009, the Denver Botanic Gardens and the BLM Colorado State Office established a total of six permanent plots on BLM lands for long-term demographic monitoring of the species. Additional monitoring plots may be established in 2010. As these efforts remain in their early years, they have not yet demonstrated trends (Denver Botanic Garden 2009a).

## B. VULNERABILITY AND THREATS ASSESSMENT

At the time of the original listing of the Uinta Basin hookless cactus complex, ongoing and foreseeable threats included mineral and energy development, illegal collection, recreational off-road vehicle (ORV) use, and grazing. Since that time, additional threats have been realized for the Colorado hookless cactus, while some threats no longer apply to the species. The following briefly summarizes threats to Colorado hookless cactus as we now view them.

The total range of the Colorado hookless cactus comprises approximately 1,700 square mi (4,400 square km), within which possible habitat (between 3,900 and 6,600 ft (1,400 and 2,000 m) in elevation) covers approximately 758,000 acres (ac) (307,000 hectares (ha)) (CNHP 2010a; Service 2010b). Approximately 18 percent (139,000 ac/56,000 ha) of the possible habitat is covered by rivers, ponds, wetland vegetation, or has been converted to agricultural, residential and urban development. The remaining potential habitat comprises approximately 618,000 ac (250,000 ha). Twenty-seven percent of this

total is in private ownership (Service 2010b). Less than 1 percent of the potential habitat occurs on State or local government lands. Approximately 73 percent of potential habitat occurs on Federal (public) land (Service 2010b). Plants receive virtually no protections on private, State, or local government lands (Service 2010b). Destruction of plants and habitat is likely occurring in these areas and will likely continue. Plants and their habitat receive some protections on Federal lands.

Mineral and Energy Development: The 1990 Recovery Plan identified threats associated with mineral and energy development including: oil and gas, oil shale and tar sands, sand and gravel quarrying, gold dredging, and building stone collecting and quarrying.

Several of these issues are of minor or no concern to Colorado hookless cactus. Oil shale and tar sand mining and processing is a threat to *S. wetlandicus*, and *S. brevispinus*, but is not a threat to Colorado hookless cactus. We also have no information to indicate that building stone collecting is a threat to Colorado hookless cactus. A gravel mining project proposed near Whitewater, Colorado, poses a threat to several Colorado hookless cactus individuals (BLM 2010). The BLM recently closed an area where recreational gold panners were causing disturbance in close proximity to a Colorado hookless cactus occurrence (BLM 2009b). We have no other record of sand and gravel quarrying or gold dredging impacting Colorado hookless cactus.

Oil and gas development remains a meaningful factor in the long-term conservation of the Colorado hookless cactus. Thirty-six percent of the federally-owned potential habitat approximately 164,000 ac (66,000 ha) is leased for oil and gas development (Service 2010b). Increased surface disturbance from wells, roads and pipelines for oil and gas projects can result in the following impacts to *S.* and habitat:

- Oil and gas development fragments and destroys *S.* habitat (BLM 2005, 2008a). Each well disturbs approximately 1.5 ac (0.6 ha) of surface area (74 FR 47112, September 15, 2009). Roads, pipelines, and associated infrastructure can disturb individuals and habitat. Habitat loss and fragmentation modify plants' interactions with other individuals of the same species, exacerbating edge effects and potentially affecting the genetic composition of local populations (Debinski and Holt 2000).
- Increased erosion, soil compaction, and sedimentation can kill cacti (BLM 2005). Cactus seeds can be buried and lost due to erosion runoff from well-field facilities (BLM 2005).
- Increased surface disturbance increases airborne dust. Dust accumulation on cacti increases tissue temperature and reduces photosynthesis, thus decreasing plant growth, vigor, and water use efficiency (Farmer 1993; Sharifi et al. 1997). Dust effects can extend up to 300 m from roads (Everett 1980).
- Energy development requires the addition of access roads in previously undeveloped areas. In most cases, these access roads are open to the public. The ORV trail use increases erosion, fugitive dust, soil compaction, sedimentation, and can crush cactus (Service 1990; BLM 2008a).

- Human access can result in illegal collection and the direct loss of individual plants (Service 1990; BLM 2005). Collection is an ongoing threat to listed *Sclerocactus* species (see discussion below).
- Oil and gas development increases weed invasions because of the associated surface disturbance. Increased invasive weeds alter the ecological characteristics of cactus habitat, making it less suitable for the species (Service 1990; BLM 2008a).

From 2006 through 2009, 11 oil and gas related consultations took place due to potential impacts to Colorado hookless cactus (Service 2010). Conservation measures were designed so that these projects would not result in direct impacts to individual Colorado hookless cactus plants. Approximately 620 wells have been drilled within the potential habitat of Colorado hookless cactus. An additional 83 drilling permits have been approved in potential habitat (Service 2010). In 2009, the Service was informed of two new proposed oil and gas wastewater evaporation facilities within Colorado hookless cactus potential habitat. Preliminary survey information provided by the applicant suggests that one of these projects may result in the future destruction of over 400 Colorado hookless cactus individuals on private land (BioLogic 2009).

The BLM is monitoring or requiring project proponents to conduct post-project monitoring of Colorado hookless cactus, *S. wetlandicus* and *S. brevispinus* populations, including impacts associated with oil and gas development and utility corridors. Initial results show that there may be indirect impacts from oil and gas development (i.e., roads and well pads) on the survival and reproductive success of *S. brevispinus* (74 FR 47112, September 15, 2009). Similar effects could be expected for Colorado hookless cactus.

Utility Corridors: A BLM and Department of Energy designated Westwide Energy Corridor covers 70,142 ac (28,385 ha) of BLM land that is potential habitat for Colorado hookless cactus (Service 2010b; BLM 2008b). The BLM identified preferred corridors to limit the proliferation of additional rights-of-way across the landscape, but utilities are not limited to these corridors (BLM 2008b). Twenty-nine of the species' 98 occurrences are at least partially located within this energy corridor (Service 2010b; BLM 2008b). Specific pipeline and transmission line routes within the energy corridor are not yet identified. The TransColorado (TransCO) gas pipeline resides in this corridor. Many of the 29 aforementioned occurrences were discovered during surveys for this project. The TransCO project resulted in transplantation of approximately 1,200 Colorado hookless cactus individuals. Monitoring documented a 19-percent mortality rate for the 129 monitored individuals between 1999 and 2003 (Bio-Logic 2008).

Surveys for a new powerline north of Delta, Colorado (not in the designated energy corridor), located approximately 5,200 Colorado hookless cactus individuals (Bio-Logic 2008). Up to 100 individuals may be transplanted or destroyed during construction of this powerline in 2010 (Bio-Logic 2008).

Invasive Species: Invasive weeds, including *Bromus tectorum* (cheatgrass) and *Halogeton glomeratus* (halogeton), are prevalent on BLM and private lands within the range of Colorado hookless cactus (CNHP 2010b). Invasive weeds alter the ecological

characteristics of cactus habitat, making it less suitable for the species (Service 1990; BLM 2008a). In addition, invasive weeds are often able to out-compete native species under drought conditions (Everard et al. 2010). Several EO records include cheatgrass invasion as a threat, and BLM attributes downward trend at several locations to cheatgrass invasion (CNHP 2010b; BLM 2009a).

Off Road Vehicle Use: Despite ORV use being common within Colorado hookless cactus habitat, there have been few documented impacts to the plants. Observers documented ORV use as a threat to 3 of the 98 EOs (CNHP 2010b). Additionally, illegal off road driving damaged Colorado hookless cactus individuals during construction of the Collbran pipeline (WestWater Engineering 2009). The ORV use is expected to increase along with expected human population increases in the region in which Colorado hookless cactus is native and with increasing popularity and availability of improved ORVs. This is expected to result in an increase in damage to Colorado hookless cactus individuals and habitat (Service 1990).

Water Development: The 1990 Recovery Plan identified water development as a threat to the species. It is likely that reservoir and irrigation canal development have impacted Colorado hookless cactus occurrences in the past; however, we have no documentation of those impacts.

Two water reservoir projects known as Roan Creek and Sulphur Gulch have been proposed within potential and occupied habitat of Colorado hookless cactus. These potential reservoirs could permanently destroy plants and their habitat through project construction and inundation. After evaluation of numerous alternatives, the Roan Creek and Sulphur Gulch projects are no longer being considered (Bray and Drager pers. comm. 2008; Grand River Consulting Corporation 2009). Since the proposals have been withdrawn, these threats are not imminent.

Collection: The original listing of the Uinta Basin hookless cactus complex concluded that the cactus is prized among collectors and threatened by unregulated commercial trade (44 FR 58869, October 11, 1979). Collectors prefer larger, reproductive age individuals, leaving behind a younger, less reproductively fit population. We are not aware of illegal removal of *Sclerocactus* in Colorado prior to 2009. Three Colorado hookless cactus individuals were removed illegally in 2009 from sites proposed for a natural gas pipeline and a sewer pipeline in Mesa County, Colorado (Service 2010a; Glenne 2009). It did not appear that these plants were removed by collectors, but rather these were acts of vandalism. Additional damage to cacti occurred during project construction on the same natural gas pipeline (WestWater Engineering 2009). These incidents show that additional development increases risk to cacti of vandalism and removal by increasing human presence in areas previously rarely visited by humans.

Livestock Grazing and Trampling: Of the 450,000 ac (182,000 ha) of Colorado hookless cactus potential habitat on Federal lands, approximately 94 percent, 424,000 ac (172,000 ha) falls within grazing allotments. Moderate to heavy domestic livestock grazing has been observed to cause physical damage to *Sclerocactus* plants through

trampling, but we have no evidence to suggest that cattle browse on individual *Sclerocactus* plants (Service 1990). A study on another federally listed cactus, *S. wrightiae*, found that cacti density increased more rapidly in a fenced plot excluded from cattle grazing than in an unfenced plot with a reduced cattle stocking rate (Clark and Clark 2007). Overgrazing (the continued heavy grazing beyond the recovery capacity of forage plants) by domestic livestock can have a negative impact on North American xeric ecosystems (Jones 2000; Vallentine 1990). For example, overgrazing can facilitate the establishment of invasive species like *Bromus tectorum* (Masters and Sheley 2001), which are difficult to eradicate and tend to outcompete native vegetation, including cacti.

Predation: Another source of mortality is lagomorph and rodent browsing on Colorado hookless cactus. While there have been numerous observations of *S. glaucus* individuals being removed by desert cottontail rabbits (*Sylvilagus audubonii*) and unknown rodents (CNHP 2010b; BioLogic 2008; Clayton 2006), some of these plants have re-sprouted in subsequent years (Clayton 2010). Browsing likely goes unnoticed unless a marked individual is revisited within a 1- to 2-year period. We know very little about the magnitude of this threat.

Parasitism by the cactus-borer beetle (*Moneilema semipunctatum*) is a significant but localized source of mortality to all *Sclerocactus* species on the Colorado Plateau, especially in larger, mature, reproducing individuals (Service 1990; 74 FR 47112, September 15, 2009). Additional studies are needed to determine the long-term, population-level effects of the cactus-borer beetle to Colorado hookless cactus.

Herbicides and Pesticides: Colorado hookless cactus lives in or near areas that receive herbicide and pesticide treatments to remove undesirable species, such as cheatgrass and crop harming insects (Service 1990). Individual cacti are likely to be directly affected by herbicide use, and indirectly by effects of pesticides on pollinators (Service 1990). However, we cannot fully assess the magnitude of this threat, since the specific species that pollinate Colorado hookless cactus are currently unknown.

Hybridization: Extinction due to hybridization, both natural and human influenced, can be a major concern for rare and endangered species (Denver Botanic Gardens 2009b). Colorado hookless cactus may hybridize with *S. parviflorus* (Heil & Porter 1987; Woodruff 2009; CNHP 2010b). The extent to which hybridization is occurring is unknown. Genetic research investigating this issue is essential for planning management and recovery efforts. The Denver Botanic Gardens has begun collecting floral tissue to examine the population genetic structure within and among the two population centers of Colorado hookless cactus and investigate the potential threat of introgression with *S. parviflorus* (Denver Botanic Gardens 2009b).

Climate Change, Drought, and Impacts to the Vegetative Community: Climate change is likely to affect long-term survival of native species, including *Sclerocactus*, especially if longer or more frequent droughts occur. For the southwestern region of the United States, warming is occurring more rapidly than elsewhere in the country with an increase of 1.5°F (0.8°C) since 1979 (Karl et al. 2009). Under lower emission scenarios

temperature is expected to increase 5°F (2.8°C) and under higher emission scenarios temperature is expected to increase 10°F (5.6°C) by the end of the century, from the 1979 baseline (Karl et al. 2009). Other future projections for the southwest include more intense and longer-lasting heat waves, an increased probability of droughts that are worsened by higher temperatures, heavier downpours, increased flooding, and increased erosion (Karl et al. 2009, pp. 129-134). The levels of aridity of recent drought conditions and perhaps those of the 1950s drought years may become the new climatology for the southwestern United States (Seager et al. 2007).

Effects related to climate change (e.g., persistent or prolonged drought conditions, changes in community assemblages and the ability of nonnative species to succeed) may affect long-term persistence of Colorado hookless cactus. While the potential impacts of climate change could be significant, improved localized projections are needed to better understand this potential threat.

In addition, invasive weeds are often able to out-compete native species under drought conditions (Everard et al. 2010). Drought conditions could further hinder BLM's efforts to control invasive weeds and restore native vegetation, which is already difficult due to the extreme environment of the Colorado and Gunnison River basins (Service 1990; BLM 2005, 2008a).

Inadequacy of Existing Regulatory Mechanisms: We are not aware of any city, county or State laws, ordinances or zoning that provide for protection or conservation of Colorado hookless cactus or its habitat. Removal, damage or destruction of plants on private lands is not prohibited under the Act. Removal from Federal lands is prohibited without a permit, but can be allowed through consultation with the Service. The BLM sometimes authorizes adverse effects to Colorado hookless cactus, if it will not jeopardize the continued existence of the species. The BLM has instituted some protections for the plants through Resource Management Plan designations such as No Surface Occupancy; however, these designations often allow for exceptions and impacts, and do not apply to actions associated with preexisting mineral leases. Establishment of consistent guidance and Resource Management Plan designations that provide adequate regulatory mechanisms over the longer term is needed to protect large portions of the range of Colorado Hookless cactus.

### **III. PRELIMINARY RECOVERY STRATEGY**

#### **A. RECOVERY PRIORITY NUMBER WITH RATIONALE**

The Colorado hookless cactus is currently assigned a recovery priority of 14C. This ranking was assigned to the Uinta basin hookless cactus complex. We recommend changing the ranking of the Colorado hookless cactus to 8C. This ranking recognizes that:

- (1) The Colorado hookless cactus is a distinct species;
- (2) It faces a moderate degree of threat;
- (3) It has a high potential for recovery; and
- (4) It is in conflict with development activities or other forms of economic activities.

TABLE 2. Recovery Priorities

Degree of Threat	Recovery Potential	Taxonomy	Priority	Conflict
High	High	Monotypic Genus	1	1C
		Species	2	2C
		Subspecies/DPS	3	3C
	Low	Monotypic Genus	4	4C
		Species	5	5C
		Subspecies/DPS	6	6C
Moderate	High	Monotypic Genus	7	7C
		<b>Species</b>	8	<b>8C</b>
		Subspecies/DPS	9	9C
	Low	Monotypic Genus	10	10C
		Species	11	11C
		Subspecies/DPS	12	12C
Low	High	Monotypic Genus	13	13C
		Species	14	14C
		Subspecies/DPS	15	15C
	Low	Monotypic Genus	16	16C
		Species	17	17C
		Subspecies/DPS	18	18C

The change from 14 to 8C recognizes the change from a low degree of threat to the Uinta Basin hookless cactus complex to a moderate degree of threat to the more range-limited Colorado hookless cactus.

The moderate degree of threat is linked to its occurrence within a relatively limited range, the threat of habitat destruction through energy development and transmission corridors, and inadequacy of existing regulatory mechanisms. Recovery potential is high because of the potential for protection of known populations, and likelihood of discovery of new populations. Climate change also may be an issue in the species' recovery, but improved projections are needed to better understand this potential threat.

Further information from future studies, including genetics, reproductive/pollinator biology, rangewide surveys, and long-term demographic and monitoring studies, could influence the recovery priority number. Therefore, this recovery priority number will be reviewed during the upcoming recovery planning process by the Service and as new data are made available.

**B. RECOVERY VISION**

We envision recovery for the Colorado hookless cactus includes sizable, stable populations maintained on conserved suitable habitat, with acceptable levels of connectivity between subpopulations for pollinator movement, gene flow, and seed dispersal. Populations will be maintained to provide sufficient representation, resiliency,

and redundancy to ensure a high probability of survival for the foreseeable future. Meeting these goals will require that threats be sufficiently understood and abated. Range-wide monitoring will be necessary.

## C. INITIAL ACTION PLAN

Recovery needs for Colorado hookless cactus include: (1) survey to accurately document populations and suitable habitat; (2) protect and restore habitat including pollinator habitat and corridors to provide connectivity; and (3) protect individual plants and populations from direct and indirect threats. Specific actions include:

### **Surveys and Monitoring**

- Completion of a comprehensive survey throughout the species' range. This would include areas that are not likely to be disturbed. Survey results will provide an accurate population estimate and allow us to identify core population areas so we can more effectively protect the species. This will require evaluation of habitat components likely to support Colorado hookless cactus.
- Surveys also should more accurately delineate the Colorado hookless cactus range relative to other *Sclerocactus* species.
- Locate possible population connectivity corridors.
- Continue ongoing monitoring efforts and expand monitoring to include a larger and more representative sample of occupied sites. This data should improve our understanding of trends.

### **Threats Abatement**

- Identify sites in urgent need of habitat protection, set protection priorities, and implement protective measures. In the long run, land management agencies should establish formal land management designations to provide for long-term protection of important populations and habitat.
- Oil and gas leasing and other mineral extraction activities should avoid occupied sites and other important habitat.
- Develop and implement standard conservation measures to minimize future project and use impacts.
- Coordinate with land management agencies, project proponents, and other partners early in the planning process to limit direct and indirect impacts of planned activities.
- Prevent the collection of Colorado hookless cactus plants from natural populations.

### **Research**

- Resolve the taxonomic status of Colorado hookless cactus regarding the species relationship with *S. parviflorus*. Secondarily, this study would assess genetic differences between Colorado hookless cactus populations.
- Continue research into Colorado hookless cactus life history and ecology, including pollinators.

- Study population dynamics and conduct a population viability analysis.
- Encourage investigations that project *Sclerocactus* species' vulnerability and response to climate change.
- Improve our understanding of livestock and native (e.g., rodent) grazing impacts.
- Monitor cactus-borer beetle (*Moneilema semipunctatum*) infestations, and study the relationship of episodic infestations with drought and other environmental factors.
- Monitor changes in invasive species prevalence and impacts on Colorado hookless cactus. Additionally, continue to explore approaches to minimize the risk posed by invasives and associated remediation actions.

#### IV. PREPLANNING DECISIONS

##### A. PLANNING APPROACH

A recovery plan will be prepared for the Colorado hookless cactus pursuant to Section 4(f) of the Act. The recovery plan will include objective, measurable criteria which, when met, will result in a determination that the species be removed from the Federal List of Endangered and Threatened Plants. Recovery criteria will address all threats meaningfully impacting the species. The recovery plan also will estimate the time required and the cost to carry out those measures needed to achieve the goal for recovery and delisting. This plan will be a single species plan.

Plan preparation will be under the stewardship of the Western Colorado Ecological Services Field Office. At the present time, this species does not warrant the appointment of a recovery team. The Service will coordinate recovery efforts with an informal network of experts and involved parties (see Stakeholder Involvement below). A recovery team may be formally appointed, if deemed necessary. Periodically, meetings among these parties may be convened for the purpose of sharing information and ideas about advancing Colorado hookless cactus recovery.

##### B. INFORMATION MANAGEMENT

**General:** All information relevant to recovery of Colorado hookless cactus will be housed in administrative files in our Western Colorado Ecological Services Field Office in Grand Junction, Colorado. The lead botanist will be responsible for maintaining the official record for the recovery planning and implementation process. Copies of new

study findings, survey results, records of meetings, comments received, and other relevant information should be forwarded to this office (see Listing and Contact Information section above).

**Reporting Requirements:** Information needed for annual accomplishment reports, the Recovery Report to Congress, expenditures reports, and implementation tracking should be forwarded to this office (see Listing and Contact Information section above). Copies of the completed reports can then be disseminated to all contributors upon request.

C. RECOVERY PLAN PRODUCTION SCHEDULE

The following dates are dependent on personnel and funding being available to complete the recovery planning process:

- Internal review draft: December 2011
- Public review draft: April 2012
- Public comment period ends: July 2012
- Final plan: December 2012

D. STAKEHOLDER INVOLVEMENT IN THE RECOVERY PROCESS

**Possible Stakeholders:**

- Public land managers with Colorado hookless cactus occurrences on their lands, including representatives of BLM (Grand Junction, Uncompahgre, and Colorado River Valley Field Offices);
- Academic and Federal researchers including the Denver Botanic Gardens;
- Town/county officials for Mesa, Delta, Montrose, and Garfield Counties, Colorado;
- State agencies (Colorado Natural Heritage Program, Colorado Natural Areas Program);
- Energy organizations; and,
- Individuals with cattle grazing leases containing cactus habitat and affiliated cattle industry organizations.

**Stakeholder Involvement Strategy:** Early in the recovery planning process, we will hold a meeting of individuals with an interest in Colorado hookless cactus to exchange status information and identify recovery issues. The information emanating from this discussion will help shape the initial draft recovery plan. We will reach out to the above potential stakeholder groups to facilitate involvement of all interested parties. When needed, additional meetings and/or conference calls will be held to discuss particular issues. Targeted stakeholders will be invited to participate in these calls when relevant for the purposes of recovery planning. We will take advantage of all opportunities to interact with stakeholders in a productive and meaningful way. Stakeholders also may be asked to contribute directly in developing implementation strategies for planned recovery actions.

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

*Richard A. Coleman*  
Regional Director, Region 6

**Acting**

Date \_\_\_\_\_

*4/14/10*

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