

Recovery Plan

for the

Uinta Basin

Hookless Cactus

UINTA BASIN HOOKLESS CACTUS

SCLEROCACTUS GLAUCUS

RECOVERY PLAN

Prepared by

Region 6
U.S. Fish and Wildlife Service
Denver, Colorado

Approved:

Robert B. ...
Regional Director, U.S. Fish and Wildlife Service

Date:

SEPT. 27, 1990

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P.O. Box 6044
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EXECUTIVE SUMMARY

Current Status: The Uinta Basin hookless cactus (Sclerocactus glaucus) was listed as a threatened species on October 11, 1979 (44 FR 58870). It is currently known to exist in three population centers, two in Colorado and one in Utah. This species has a documented population of about 22,000 individuals. Much of this species' habitat is subject to the impacts of the development of energy and water resources.

Habitat Requirements and Limiting Factors: The species is primarily located on coarse gravelly river alluvium above the present flood plains of the upper Colorado and Green rivers and their major tributaries.

Recovery Objective: Delisting

Recovery Criteria: Document a total population of 30,000 S. glaucus individuals in six separate populations of at least 2,000 individuals each. These six populations must be demonstrated to be at minimum viable population levels. Preserve and protect four of these populations on lands with formal management designations which would provide long term, undisturbed habitat.

Actions Needed:

1. Inventory of suitable habitat for S. glaucus for additional populations.
2. Establish and conduct minimum viable population studies on at least six different populations.
3. Establish formal land management designations which would provide for long term, undisturbed habitat.
4. Conduct studies to determine the taxonomic status of morphologically distinct populations currently considered to be S. glaucus.

Costs

<u>Year</u>	<u>Need 1</u>	<u>Need 2</u>	<u>Need 3</u>	<u>Need 4</u>	<u>Total</u>
1991	10,000	6,000	unknown	5,000	21,000
1992	10,000	6,000	unknown	5,000	21,000
1993	5,000	6,000	unknown	1,000	12,000
1994	completed	6,000	unknown	1,000	7,000
1995	--	6,000	unknown	1,000	7,000
1996	--	6,000	unknown	1,000	7,000
1997	--	6,000	unknown	1,000	7,000
1998	--	6,000	unknown	1,000	7,000
1999	--	6,000	unknown	1,000	7,000
2000	--	6,000	unknown	1,000	7,000

Total Cost of Recovery 25,000 60,000 unknown 18,000 103,000

Date of Recovery: 2000

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I. INTRODUCTION

A. Taxonomy

Sclerocactus glaucus (K. Schum.) L. Benson (Uinta Basin hookless cactus) is a member of a small genus of 12 species as currently recognized in botanical literature (Benson 1966, 1982; Woodruff and Benson 1976; Castetter et al. 1976; Heil 1979; Heil and Porter 1987; also see Heil and Welsh 1986; Welsh and Thorne 1985; Welsh et al. 1987). Seven species of Sclerocactus are native to the Colorado plateau of Colorado, Utah, Arizona, and New Mexico. S. glaucus was listed as threatened on October 11, 1979 (44 FR 58870).

Sclerocactus glaucus, as described by Benson (1966), is one of the more distinctive members of its genus. Its unhooked large central spine differentiates it from other members of the genus which have either a hooked large central spine or none (the common name for the genus Sclerocactus is the "fish hook cactus"). In addition, S. glaucus has seeds which are noticeably smaller than those of other species of the genus.

Some populations of S. glaucus show characteristics more typical of S. parviflorus with some individuals possessing a hooked or partially hooked large central spine. This intergradation has been observed in both the upper Colorado River and Gunnison River valley populations in Colorado and the Uinta Basin population in Utah where the ranges of these species meet. The presence of these hybridized or intergraded populations of S. glaucus and S. parviflorus has brought the taxonomic validity of S. glaucus into question (Welsh 1984; Welsh et al. 1987).

Sclerocactus glaucus is apparently a member of a polymorphic species complex centered on S. parviflorus, with S. glaucus occupying the northern and eastern margins of the complex's range (Heil and Porter 1987). Heil and Porter have evaluated the taxonomic status of S. glaucus as it relates to S. parviflorus and as the Colorado and Utah populations relate to each other. In addition, small, atypical populations within the range of S. glaucus showing unusual characteristics of extremely shortened central spines having strongly recurved tips and occupying clay badland habitat were taxonomically evaluated (Heil and Porter 1987).

Sclerocactus glaucus has had an involved taxonomic history as evidenced by its synonyms. Schumann (1898) initially described the species as Echinocactus glaucus. Rydberg (1917) considered the Schumann publication to be illegitimate and published the name E. subglaucus. Purpus (1925) treated this taxon as a variety of the current S. whipplei under the name E. whipplei var. glaucus. Evans (1939) described this taxon as S. franklinii, now considered synonymous. Benson's (1966) monograph of Sclerocactus assigned six species to that genus and his taxonomic treatment is followed here. Arp (1972) placed all species of Sclerocactus in the genus Pediocactus, erecting the species Pediocactus glaucus. Heil, Armstrong, and Schleser (1981) restored Benson's concept of

Sclerocactus and reestablished S. glaucus in the taxonomic literature. Welsh (1984) reduced S. glaucus to varietal status as S. whipplei var. glaucus and later submerged the species in synonymy under S. whipplei var. roseus in "A Utah Flora" (Welsh et al. 1987).

B. Description

Sclerocactus glaucus is a leafless succulent plant in the cactus family (Cactaceae). This species commonly has solitary, ovoid to nearly globular stems, 1.5 to 7 inches tall and 1 to 4.5 inches in diameter with about 12 ribs with spine clusters born on short protuberances arising from the ribs. The spines are usually of two types. The 4 to 12 radial spines spread around the margin of the areole are usually white, much less than an inch in length, and are much finer and shorter than the darker central spines. The central spines number from one to four (sometimes absent) and are 1 to 1.5 inches long.

Flowers have numerous pinkish to lavender perianth parts (sepaloids and petaloids) and are 1 to 2 inches in diameter and 1 to 2 inches long. The outer parts (sepaloids) are about 1 inch long and 0.25 inch broad and are elliptic shaped. The inner parts (petaloids) are about 1.25 inches long and 0.25 inch broad and are lanceolate shaped. S. glaucus flowers have a pronounced ultra-violet reflectance which is unique in its genus and readily separates it from similar appearing populations of S. parviflorus. S. glaucus flower stamens are numerous with yellow anthers and green filaments. The ovary is located beneath the attachment of a floral tube which bears the stamens and the perianth. The ovary bears numerous ovules. A style arises from the top of the ovary and has about 12 stigma lobes which form the site of pollination of pollen grains from the anthers. The fruit is 0.3 to 0.5 inch long and about 0.3 inch in diameter and is barrel shaped. The seeds are small and black.

Modified from the above-mentioned taxonomic evaluation of Heil and Porter (1987), the U.S. Fish and Wildlife Service (Service) currently accepts the following technical morphological species description of S. glaucus (values in parentheses indicate values for morphologically distinct species from clay badlands):

Stems solitary or clustered, sometimes glaucous, cylindroidal or ovoid to nearly globular, (3.0)4.0-18.0 cm long, (2.7)4.0-8.5 cm in diameter; tubercles 6-15 mm long vertically, 7-20 mm broad; central spines 0-4, the upper central spine 0-1, white, 0.3-3.6 cm long, mostly 1 mm broad; lower central spine 0-1, light to dark brown, straight, curving and sometimes hooked (strongly hooked, tip reflexed almost to areole), (0.1)2.0-3.6 cm long, (0.5)0.7-1.0 mm broad; peripheral central spines 0-2, ascending, colored as the lower central spine, 1.5-3.8 cm long, 0.5-1.0 mm broad; radial spines mostly white, straight or nearly so, 4-13 per areole, the longer ones up to 2.0 cm long, mostly 0.5 mm broad; flower (1.5)2.0-4.0 cm in diameter, (2.0)3.0-4.5 cm long; perianth parts are strongly ultra-violet reflective; sepaloid perianth parts green with the midribs

lavender to lavender brown, lanceolate to oblanceolate, up to 2.2 cm long, up to 0.6 cm broad, marginally entire; petaloid perianth parts pink to purple, lanceolate to oblanceolate, up to 2.2 cm long, up to 0.7 cm broad, marginally entire; anthers yellow; filaments white; stigma lobes 5-12, up to 5 mm long; fruits green, drying brown at maturity, indehiscent, 0.4-1.2 cm long, 0.5-0.8 cm diameter, barrel-shaped; seed black, 2.0-3.5 mm long, 1.5-2.5 mm wide, 1 mm thick.

C. Distribution

The original description of S. glaucus was based on a Colorado plant probably from the Gunnison River population (Schumann 1898). The Colorado populations have been known since the species was first described in 1898 and have been visited intermittently by various botanists. Benson's (1966) description was based on herbarium specimens and live material seen by him from the Gunnison River population plus herbarium specimens collected by M.E. Jones along the Duchesne River and E.H. Graham from along the Green River, both in the Uinta Basin of Utah. Until rediscovered in 1978, S. glaucus had not been reported in Utah since the 1933 Graham collection and was thought to be extirpated from the State (Welsh et al. 1975). The majority of the populations of S. glaucus in Colorado and Utah are located on Federal lands managed by the Bureau of Land Management, with important populations on Service (Ouray National Wildlife Refuge), Indian (Ute Tribe, Uintah and Ouray Reservation), Department of Energy (Naval Oil Shale Reservoir #2), and private (primarily near DeBeque, Colorado) lands.

There is one major population center with three important population groups of S. glaucus in the Uinta Basin of northeastern Utah: (1) on alluvial river terraces near the confluence of the Green, White, and Duchesne rivers including Ouray National Wildlife Refuge and the town of Ouray, Utah, south along the Green River to the vicinity of Sand Wash including concentrations near the mouth of Pariette Draw; (2) along the base of the Badlands Cliffs in extreme southeastern Duchesne County; and (3) a small population of a morphologically distinct form growing on the clay badlands in the Pariette Draw drainage south of Myton, Utah, which gradates into the more typical S. glaucus near the mouth of Pariette Draw south of Ouray, Utah.

There are two population centers of S. glaucus in the upper Colorado and Gunnison River valleys of western Colorado: (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. These population groups contain at least three distinct populations in each of the two Colorado population centers, to as many as seven in Utah. Table 1 gives the general location and approximate documented and estimated population numbers for each of the major S. glaucus population groups. Figures 1 and 2 show the general distributions of S. glaucus in Colorado and Utah, respectively.

Table 1. Documented and estimated size of Sclerocactus glaucus populations.

<u>Population Name</u>	<u>Numbers of Individual Plants(a)</u>	
	<u>Documented Size</u>	<u>Estimated Size</u>
Gunnison River (Colorado)	8,000	15,000
Upper Colorado River (Colorado)	4,000	10,000
Uinta Basin (Utah)	10,000	25,000

(a) all numbers are approximate pending the continued review and analysis of existing status information from several different Federal, State, Indian, and private agencies and groups. The estimated population size is the anticipated ultimate population size after the completion of inventory of all potential habitat.

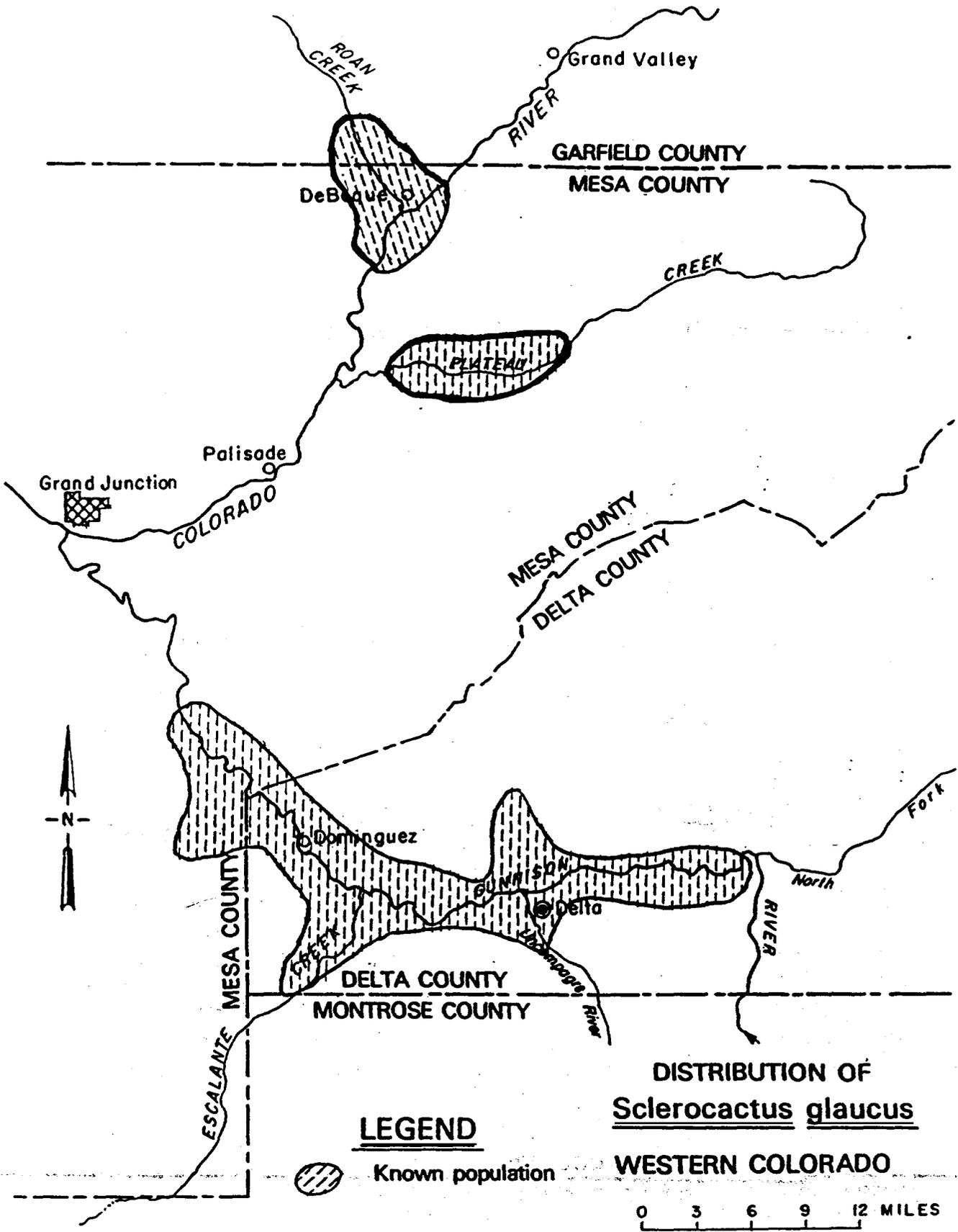


Figure 1. Distribution of Sclerocactus glaucus (Uinta Basin hookless cactus) in Colorado.

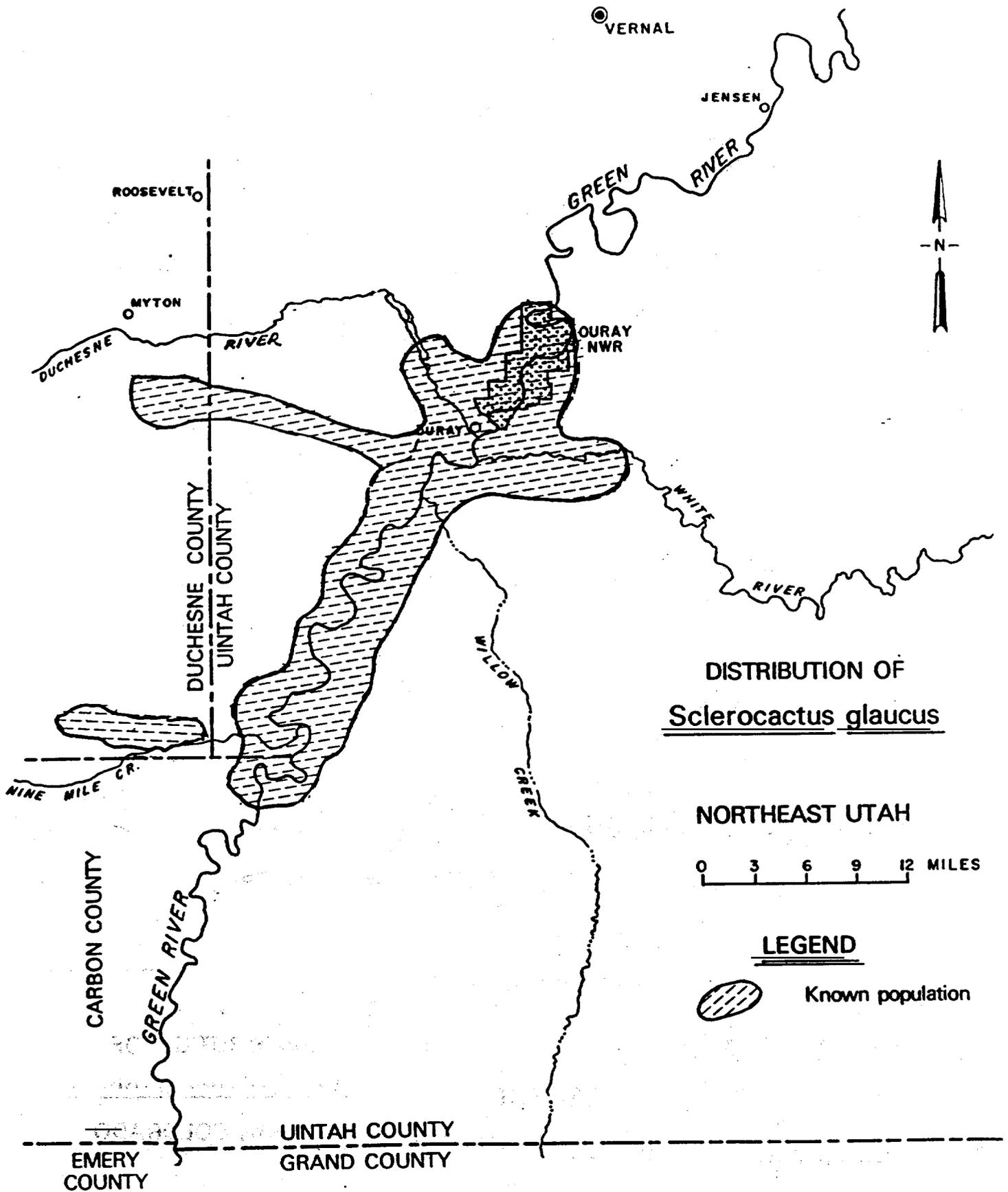


Figure 2. Distribution of Sclerocactus glaucus (Uinta Basin hookless cactus) in Utah.

D. Population Biology

Sclerocactus glaucus reproduction is sexual. Flowering occurs April to May and fruiting occurs May to June. Bees, flies, beetles, and ants have been observed visiting S. glaucus flowers. The effective pollination vectors are not specifically known. The seeds are released after the pericarp separates horizontally near its base, leaving a "cup of seeds." The seeds are small and dense with no surface structures which facilitate dispersal. Seeds are dispersed by gravity, water flow, or possibly by insects and/or birds. Seed dispersal is possibly a limiting factor in the distribution of S. glaucus. The factors which govern the distribution of S. glaucus are not known, nor are the long-term population dynamics. The relative size of individual plants within a population covering one habitat type is considered to be primarily a function of the age of the individual plant and only secondarily a function of relative site quality. This concept is useful in evaluating age class structure of individual S. glaucus populations.

E. Habitat

Sclerocactus glaucus generally occurs on cobbly, gravelly, or rocky surfaces on river terrace deposits and lower mesa slopes, with the exception of the morphologically distinct population in the clay badlands of Pariette Draw south of Myton, Utah. S. glaucus occurs on varying exposures, but is more abundant on south facing exposures, and on slopes to about 30 percent grade; it is most abundant at the point where terrace deposits break from level tops to steeper side slopes. The species is found at an elevational range of 4,500 to 5,900 feet. The vegetation type is desert scrub dominated by shadscale (Atriplex confertifolia), galleta (Hilaria jamesii), black-sage (Artemisia nova), and Indian rice grass (Stipa hymenoides). Other important species include two similar spherical or cylindrical cactus species, strawberry hedgehog cactus (Echinocereus triglochidiatus var. melanacanthus) and Simpson's pincushion cactus (Pediocactus simpsonii). Other important species in the plant community include the prickly pear cactus (Opuntia polyacantha), winterfat (Ceratoides lanata), yucca (Yucca harrimaniae), snakeweed (Gutierrezia sarothrae), low rabbitbrush (Chrysothamnus viscidiflorus), sand dropseed (Sporobolus cryptandrus), and Salina wildrye (Elymus salinus).

F. Limiting Factors

There is no direct evidence that the range of S. glaucus is any more restricted today than in the recent past. This is especially true given the scant information available regarding the species' range prior to rare plant inventories inspired by the Endangered Species Act. Circumstantial evidence indicates that the species present range is a result of natural rather than man-induced factors. It is possible that some population and range reduction has taken place as a consequence of agriculture and water development, especially along the upper Colorado and Gunnison rivers from the vicinity of Grand Junction to DeBeque and to Delta, respectively, in Colorado. In Utah,

range and population reductions from agricultural and water development may have occurred along the Green River from the vicinity of Ouray to Jensen, and along the Duchesne River from Ouray to Myton. Oil and gas development may have destroyed portions of both the Colorado and Utah populations.

As discussed in the previous section on habitat, S. glaucus prefers gravelly, cobblely, and/or rocky river terrace hills and mesa slopes above the flood plain of the upper Colorado River and its major tributaries. The plant rarely occupies fine textured deep river alluvium or shallow, or better developed upland desert soils. The scarcity of its habitat type is a strong limiting factor governing the distribution of S. glaucus.

Sclerocactus glaucus populations in the vicinity of the major rivers (most notably the Colorado, Green, Gunnison, and Duchesne rivers) are larger than populations found elsewhere. They appear to be viable, reproducing populations as exhibited by the variable size of individuals within the population and the resultant assumed age class distribution as discussed above. A few isolated populations have been found on relictual pockets of pleistocene and earlier alluvial terrace deposits removed some distance from major rivers. These old terrace deposits are well eroded and resident S. glaucus populations are, in every known instance, very small (rarely exceeding 10 individuals).

Habitat disturbance is variable. Those habitat areas near human population centers and agricultural lands have probably been significantly impacted. Areas removed from population centers have been impacted much less, but some have been affected by livestock grazing and trampling and recent mineral and energy exploration and development. The largest populations occur in remote areas far from any populated place, most notably near Sand Wash in the extreme southern portion of the Uinta Basin and in the Dominguez Canyon section of the Gunnison River between Grand Junction and Delta.

G. Threats

There is only circumstantial evidence to indicate that the range of S. glaucus has been reduced by man-induced factors. Realized and potential threats to S. glaucus stem primarily from mineral and energy development, water development, and collecting. A list and brief discussion of existing and potential threats follows (this list is not all inclusive):

1. Collecting
2. Mineral and energy development activities
 - a. Oil and gas exploration, drilling, and removal
 - b. Oil shale and tar sand mining and processing
 - c. Sand and gravel quarrying and gold dredging
 - d. Building stone collecting and quarrying
3. Off-road vehicle use and recreational impacts
4. Road building and maintenance
5. Water development
6. Pesticide use

7. Natural threats

- a. Disease
- b. Parasitism
- c. Predation
- d. Erosion
- e. Trampling
- f. Vegetative competition

1. Collecting - U.S. Fish and Wildlife Service (1979) states "Sclerocactus glaucus is prized for its beautiful purplish-red flowers and is sought by professional and amateur cactus growers. This cactus, being very rare and highly endemic, has been, and will continue to be, a particular prize among collectors and therefore is very threatened by unregulated commercial trade from specimens of wild origin." Commercial collection has occurred. The Colorado population has lost an estimated 200 to 300 individuals of its population to cactus collectors since 1977. Recent amendments to the Endangered Species Act explicitly forbid the destruction or removal of listed endangered plant species from areas under Federal jurisdiction. This protection may be extended to threatened plant species through regulation. The majority of the S. glaucus population is on Federal land under the management of the Bureau of Land Management.
2. Mineral and Energy Development Activities - Sclerocactus glaucus was listed as a threatened species, in part because of the potential of energy development and mining actions adversely impacting this species. U.S. Fish and Wildlife Service (1979) stated "The general region where the species occurs is potentially subject to future development of oil shale deposits or gold mining."
 - a. Oil and Gas Exploration, Drilling, and Removal - The rate of oil and gas development activities in the range of S. glaucus have been extremely variable, increasing dramatically initially after the species was listed, then decreasing just as dramatically to low levels of activity at the present. However, this activity has the potential of devastating local populations of S. glaucus through all the ground disturbing phases of oil and gas development.
 - b. Oil Shale and Tar Sand Mining and Processing - U.S. Fish and Wildlife Service (1979) stated that this activity has the potential to impact S. glaucus. Small-scale prospecting on private land near Sand Wash on the Green River in the immediate proximity of two of the largest populations of S. glaucus has occurred. The large Badland Cliffs population lies on land withdrawn from mineral entry because of its oil shale value. Large-scale oil shale development, however, is unlikely on S. glaucus habitat. The greatest potential threat to S. glaucus may come as a result of the construction of support facilities for oil shale and tar sand development.

- c. Sand and Gravel Quarrying and Gold Dredging - Interest and activity in gold mining by dredging in the Green River has varied considerably over time. The practice of scraping gravel in the bed and flood plain of the Green River and working out gold particles has destroyed much of the native vegetation along the river in the vicinity of Jensen, Utah. Although it has not been confirmed, some of these areas may have supported populations of S. glaucus prior to gold dredging disturbance. The pleistocene terrace deposits above the current flood plain of the Green River and its major tributaries are one of the most significant sources of sand and gravel in the Uinta Basin. The use of these deposits is destroying potential habitat of S. glaucus. The entire consumption of these deposits would destroy habitat occupied by S. glaucus.
 - d. Building Stone Collecting and Quarrying - Much of the habitat of S. glaucus is in or near areas that have natural stone suitable for use as decorative building stone. Building stone collecting and quarrying in the habitat of S. glaucus has the potential for devastating some of the more pristine populations of the species.
3. Off-road Vehicle Use and Recreational Impacts - At present, off-road vehicle use on the habitat of S. glaucus is minimal. However, with possible human population increases in the region in which S. glaucus is native and with increasing popularity and availability of improved off-road vehicles, this use is expected to increase. This is expected to result in an increase in damage to the habitat of S. glaucus. Bringing more people into contact with the species also will increase the potential for collection of the plant.
 4. Road Building and Maintenance - Most roads in the vicinity of known populations of S. glaucus are rough, narrow, unimproved trails. Improving these roads and building new ones may directly impact some populations of this species. Of greater concern is the potential for possible loss of habitat due to the quarrying of aggregates throughout the range of S. glaucus for road construction materials.
 5. Water development - Various existing and proposed water development projects have the potential for impacting directly or indirectly the habitat of S. glaucus. These projects would include such projects as irrigation and other water canals in the vicinity of Ouray and Myton, Utah, and Debeque and Delta, Colorado, and dams on the Green, Colorado, and Gunnison rivers within the habitat of the species.
 6. Pesticide use - Populations of S. glaucus are in or adjacent to areas which receive pesticide treatments to control undesirable species, especially weed and insect pests. S. glaucus may be vulnerable to various rangeland pesticides used in the control of those pests, either directly with herbicides or indirectly with an adverse affect on its pollinators

from insecticides. The Agricultural Research Service's Bee Biology Laboratory is currently investigating the pollination biology of S. glaucus under contract with the Animal and Plant Health Inspection Service which is responsible for the control of insect pests on Federal rangelands.

7. Natural Threats - Little is known concerning disease, parasitism, and predation on S. glaucus. No known diseases have been reported in this species. A termite and a beetle larvae have been observed to parasitize the roots and stems of S. glaucus, but the significance of this parasitism on the species overall survival is not known. Ants have been observed grazing on the flowers and immature fruits of S. glaucus, but again the significance to species survival is not known. The U.S. Fish and Wildlife Service (1979) states "Limited grazing of its habitat appears to be beneficial for this species. Greatly increased or decreased grazing could contribute to the decline of the species." It is doubtful that decreased domestic livestock grazing would adversely affect this species. Moderate to heavy domestic livestock grazing has been observed to cause physical damage to S. glaucus plants through trampling. Erosion and vegetative competition from exotic (and some native) species as a result of an over-grazing disclimax may adversely affect S. glaucus. Many dead individuals of S. glaucus were observed in Utah's Uinta Basin after the severe drought of 1976-1977. However, the Service does not currently consider the above-discussed natural threats to be of significant nature to warrant detailed studies.

II. RECOVERY

A. Objective and Criteria

The objective of this recovery plan is to preserve and protect the habitat of at least 30,000 individual Sclerocactus glaucus plants from the three known population groups (i.e., Green River in Utah, Gunnison River in Colorado, and upper Colorado River in Colorado). Recovery will be completed and delisting considered when the following recovery and conservation criteria are met:

1. A documented total population of at least 30,000 S. glaucus individuals.
2. S. glaucus populations and habitat are protected from environmental degradation, over collecting, and commercial exploitation.
3. Six separate populations, of at least 2,000 individuals each, must be demonstrated to be at minimum viable population levels. A minimum viable population is defined as a demographically stable population that is large enough to maintain genetic variation and to enable it to evolve and respond to natural environmental variation.
4. Four of the above six populations must be on lands with formal management designations which would provide long term, undisturbed habitat for S. glaucus. One of these four populations must be located in each of the three main population groups (it is expected that most, if not all, of these four formally protected populations will have population numbers of considerably more than 2,000 individuals).

It must be understood that the above objective and criteria are subject to change as more information becomes available. The estimated date for complete recovery is the year 2000.

B. Stepdown Outline

1. Inventory all suitable habitat for S. glaucus and determine with a reasonable degree of accuracy the number, extent, and distribution of S. glaucus populations.
2. All applicable laws and regulations will be enforced to protect this species and its habitat.
 - 2.1 Manage mineral development activities.
 - 2.11 Manage oil and gas exploration, drilling, and production.
 - 2.12 Manage oil shale and tar sands mining and siting of support facilities.

- 2.13 Manage sand and gravel quarrying and gold dredging.
- 2.14 Manage building stone collecting and quarrying.
- 2.2 Manage off-road vehicle use and recreational impacts.
- 2.3 Manage road building and maintenance.
- 2.4 Manage water development.
- 2.5 Manage pesticide use.
- 2.6 Prevent collecting and destruction of S. glaucus plants from wild populations.
 - 2.61 Enforce Federal laws and regulations controlling the unauthorized removal and destruction of plants from Federal lands.
 - 2.62 Protect S. glaucus from international trade and commercial exploitation.
 - 2.63 Prevent intra-State trade, collecting, and damage of S. glaucus on areas not under Federal jurisdiction.
 - 2.64 Promote commercial propagation of S. glaucus in gardens and greenhouses to meet the market demand for this species.
- 3. Establish and conduct at least six minimum viable population studies on at least six different populations of S. glaucus.
- 4. Protect four populations of S. glaucus, identified in Objective 3 above, on areas with formal land management designations which will provide long-term, undisturbed habitat.
- 5. Conduct morphological, biochemical, cytological, and common garden research.
- 6. Develop public awareness, appreciation, and support for the conservation of S. glaucus.

C. Narrative Outline

1. Inventory all suitable habitat for *S. glaucus* and determine with a reasonable degree of accuracy the number, extent, and distribution of *S. glaucus* populations.

These surveys will include age class distribution, documentation of losses, and population increase or reduction for each population. The impact of cactus collection, grazing, parasitism, vulnerability to pesticide use, etc., on the species will be quantified. Essential habitat and those populations which will best ensure the long-term survival of the species can then be identified.

2. All applicable laws and regulations will be enforced to protect this species and its habitat.

All affected Federal agencies will regulate activities under their control which affect individuals, populations, and the habitat of *S. glaucus* through Sections 7 and 9 of the Endangered Species Act and other relevant laws and regulations including: the Federal Land Policy and Management Act under which the Bureau of Land Management administers lands under their jurisdiction; the National Environmental Policy Act; and Bureau of Land Management, Bureau of Indian Affairs, Department of Energy, and Fish and Wildlife Service regulations and policies governing the surface management of Federal lands (particularly those regulations pertaining to surface management of Federal lands under the U.S. Mining Laws).

Section 7 of the Endangered Species Act provides the opportunity to exercise a degree of control over the impact of mineral and energy development on *S. glaucus* and its habitat.

2.1 Manage mineral development activities.

Most of the habitat of *S. glaucus* occurs on federally managed public land under the jurisdiction of the Bureau of Land Management with other significant habitat under the surface administration of Bureau of Indian Affairs, Fish and Wildlife Service, and Department of Energy. Mineral and energy development activities on this Federal land will require the necessary lease permits, etc., from Bureau of Land Management, Bureau of Indian Affairs, and possibly other Federal agencies before they can proceed.

2.11 Manage oil and gas exploration, drilling, and production.

Since the species was listed in 1979, the Vernal and Grand Junction Districts of the Bureau of Land Management have had proposals for several drilling projects which could have

adversely affected local populations of this species. The Bureau of Land Management and the Bureau of Indian Affairs, as part of their right-of-way and drilling permitting programs, have required an on-the-ground examination of all phases of oil and gas development which could impact S. glaucus and have required oil and gas development activities to avoid individual cactus plants. This policy must continue to ensure the protection of S. glaucus populations.

2.12 Manage oil shale and tar sands mining and siting of support facilities.

Oil shale and tar sands energy development projects within the range of S. glaucus will, in nearly all cases, require an environmental impact statement to meet the requirements of the National Environmental Policy Act of 1970. This will allow for the opportunity for the Service and other Federal agencies to analyze such projects as to their impact on this species. Those actions which will affect this species will necessitate the preparation of a biological assessment to determine the impact to S. glaucus and any other listed species affected by the project. Section 7 of the Endangered Species Act (Act) mandates that projects requiring Federal involvement will not jeopardize listed threatened and endangered species.

2.13 Manage sand and gravel quarrying and gold dredging.

Sand and gravel quarrying on Federal lands within the habitat of S. glaucus is regulated by the Bureau of Land Management. The Bureau of Land Management is required by Section 7 of the Act to make sure that any activity will not jeopardize a listed species. The Service and the Bureau of Indian Affairs will work with the Ute Indian Tribe to identify and conserve the habitat of S. glaucus on the Uintah and Ouray Reservation which may be threatened by this activity. At present, the Green River has been withdrawn from mineral location. Potential threats from gold mining will not be realized as long as the withdrawal is in effect. This recovery task will primarily be the responsibility of the Bureau of Land Management and other land managing agencies.

2.14 Manage building stone collecting and quarrying.

The sale of stone on Federal lands within the habitat of S. glaucus is regulated by the Bureau of Land Management. The Bureau of Land Management is required by Section 7 of the Act to make sure that any activity will not jeopardize a

listed species. The Service and the Bureau of Indian Affairs will work with the Ute Indian Tribe to identify and conserve the habitat of S. glaucus on the Uintah and Ouray Reservation which may be threatened by this activity. The Service also will work with private landowners, on whose property the cactus may occur, to identify and conserve the habitat of S. glaucus. At present, portions of the habitat of S. glaucus is closed to rock gathering, which protects some of the species' populations.

2.2 Manage off-road vehicle use and recreational impacts.

Off-road vehicle use on Federal lands within the habitat of S. glaucus is regulated by the Bureau of Land Management. The Bureau of Land Management is required by Section 7 of the Act to make sure that any activity will not jeopardize a listed species. Section 9 of the Act makes it unlawful to maliciously damage or destroy any listed endangered plant species from areas under Federal jurisdiction or to remove, cut, dig up, damage, or destroy any such species in knowing violation of any law or regulation of any State or in the course of any violation of a State criminal trespass law. This protection may be extended to threatened plant species through regulation. The Service and other Federal agencies are responsible for identifying S. glaucus habitat areas which may be affected by off-road vehicle damage and provide the necessary land use designations to ensure that off-road vehicle damage is controlled through effective monitoring, law enforcement, and the judicious application of Section 10 penalties of the Act. The Service and the Bureau of Indian Affairs will work with the Ute Indian Tribe to identify and conserve the habitat of S. glaucus on the Uintah and Ouray Reservation which may be threatened by this activity. The Service also will work with private landowners, on whose property the cactus may occur, to identify and conserve the habitat of S. glaucus. Special land use designations should control this threat with periodic monitoring by the Service, Bureau of Land Management, and local law enforcement agents.

2.3 Manage road building and maintenance.

Road construction and maintenance within most of the habitat of S. glaucus is regulated by the Bureau of Land Management and the Federal Highway Administration through State highway departments. These two agencies are required by Section 7 of the Act to ensure that this activity will not jeopardize this species. The Service and the Bureau of Indian Affairs will work with the Ute Indian Tribe to identify and conserve the habitat of S. glaucus on the Uintah and Ouray Reservation which may be threatened by this activity. The Service also will work with private landowners, on whose property the cactus may occur, to identify and conserve the habitat of S. glaucus.

2.4 Manage water development.

The Bureau of Reclamation, the U.S. Army Corps of Engineers, and the Bureau of Land Management are required by Section 7 of the Act to ensure that water development activity will not jeopardize this species. The Service, Bureau of Indian Affairs, and other Federal agencies will work with the Ute Indian Tribe to identify and conserve the habitat of S. glaucus on the Uintah and Ouray Reservation which may be threatened by this activity. The Service and other Federal agencies, as appropriate, will work with private landowners, on whose property the cactus may occur, to identify and conserve the habitat of S. glaucus which may be impacted by this activity.

2.5 Manage pesticide use.

The Environmental Protection Agency is responsible for the registration of all pesticides to ensure, in part, that they do not adversely affect federally listed endangered and threatened species. The Animal and Plant Health Inspection Service and the land managing agencies responsible for the habitat of S. glaucus are required by Section 7 of the Act to ensure that activities involving pesticide use will not jeopardize this species. The Service, Bureau of Indian Affairs, and other Federal agencies will work with the Ute Indian Tribe to identify and conserve the habitat of S. glaucus on the Uintah and Ouray Reservation which may be threatened by this activity. The Service and other Federal agencies, as appropriate, will work with private landowners, on whose property the cactus may occur, to identify and conserve the habitat of S. glaucus which may be impacted by this activity.

2.6 Prevent collecting and destruction of S. glaucus plants from wild populations.

Section 9 of the Act makes it unlawful to remove and reduce to possession, maliciously damage, or destroy any listed endangered plant species from areas under Federal jurisdiction or to remove, cut, dig up, damage, or destroy any such species in knowing violation of any law or regulation of any State or in the course of any violation of a State criminal trespass law. This legal protection may be extended to threatened plant species through regulation. The Service and other Federal agencies are responsible for ensuring that populations of S. glaucus on lands under Federal jurisdiction are not affected by unauthorized collection. Control of this threat will be accomplished with periodic monitoring of the species' populations by Service, Bureau of Land Management, and local law enforcement agents and taking appropriate action when necessary.

2.61 Enforce Federal laws and regulations controlling the unauthorized removal and destruction of plants from Federal lands.

Section 9 of the Act explicitly forbids the destruction or removal of listed endangered plant species from areas under Federal jurisdiction and from all other lands, if the act of theft or vandalism was committed in knowing violation of State statutes, including trespass laws. This protection may be extended to threatened plants through regulation. The majority of the total S. glaucus population is believed to be on Federal land under the management of the Bureau of Land Management, U.S. Fish and Wildlife Service, and the Department of Energy. Additional significant populations occur on Indian lands of the Ute Indian Tribe. These agencies will use their law enforcement authority resources to ensure that S. glaucus populations are not subject to damage and unauthorized collection.

2.62 Protect S. glaucus from international trade and commercial exploitation.

By maintaining the species on Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), it will make illegal the international export of S. glaucus plants, unless the proper permits are obtained from the Fish and Wildlife Service. No CITES permits should be issued for plants collected in the wild. The Service's Office of Management Authority and Law Enforcement Division will monitor trade of cactus species to ensure that this species is not illegally traded.

2.63 Prevent intra-State trade, collecting and damage of S. glaucus on areas not under Federal jurisdiction.

The Service will encourage the States of Colorado and Utah to enforce existing State statutes and regulations which pertain to the regulation and control of the sale of vegetative materials and destruction of vegetation by off-road vehicles.

2.64 Promote commercial propagation of S. glaucus in gardens and greenhouses to meet the market demand for this species.

The Service will work with legitimate, bona fide cactus horticulturists to provide a source of S. glaucus plants to satisfy the horticultural demand for this species. This will be accomplished by using plants currently in cultivation and, if necessary, with seed collected from wild populations under permit.

3. Establish and conduct at least six minimum viable population studies on at least six different populations of *S. glaucus*.

Minimum viable population studies will document demographic stability of the species population. A minimum viable population is defined as: a demographically stable population that is large enough to maintain genetic variation and to enable it to evolve and successfully respond to natural environmental variation (see Menges 1986). If, as a consequence of these studies, other factors, natural or man caused, are identified as possibly having a detrimental effect on the species' population that would preclude its eventual delisting, those factors will be addressed and the recovery plan revised accordingly. It is assumed that many, if not most, populations of *S. glaucus* are at population levels that will ensure long-term demographic and genetic viability.

4. Protect four populations of *S. glaucus*, identified in Objective 3 above, on areas with formal land management designations which will provide long-term, undisturbed habitat.

Such designations may include the following: research natural areas; areas of critical environmental concern; designated wildernesses; or private, Indian, and/or State natural preserves and parks. Special protected areas such as those mentioned above should ensure the long-term protection of enough populations of *S. glaucus* to ensure its survival as a vigorous reproducing species into the foreseeable future. The Service will work with the land managers/owners in identifying populations which should be protected and in developing the most appropriate land use designation to protect those populations.

5. Conduct morphological, biochemical, cytological, and common garden research.

This will be done to determine the taxonomic status of obvious morphologically distinct populations currently considered to be *S. glaucus*, with particular emphasis on the short spined phase from the Pariette Draw drainage in Utah. If appropriate, protection under the Act will be provided to those entities which are demonstrated to be separate taxa.

6. Develop public awareness, appreciation, and support for the conservation of *S. glaucus*.

Education is a vital part of the recovery process. The cooperation of the public is essential in the ultimate success of the above recovery measures. This can be started with educational programs such as pamphlets and audio-visual programs for use in schools and groups interested in conservation.

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III. IMPLEMENTATION SCHEDULE

The Implementation Schedule that follows outlines actions and costs for the recovery program. It is a guide for meeting the objective elaborated under the Recovery section of this Plan. This schedule indicates task priorities, task numbers, task description, duration of tasks ("ongoing" denotes a task that once begun should continue on an annual basis), responsible agencies, and estimated costs. These actions, when accomplished, should bring about the conservation of Sclerocactus glaucus and protect its habitat.

Priorities in column one of the following implementation schedule are assigned as follows:

1. Priority 1 - An action that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.
2. Priority 2 - An action that must be taken to prevent a significant decline in species population/habitat quality or some other significant negative impact short of extinction.
3. Priority 3 - All other actions necessary to meet the recovery objective.

Key to Acronyms used in Implementation schedule

APH - Animal and Plant Health Inspection Service
BIA - Bureau of Indian Affairs
BLM - Bureau of Land Management
BOR - Bureau of Reclamation
CO - State of Colorado, including the Colorado Natural Areas Program
CPC - Center for Plant Conservation
DOE - Department of Energy
EPA - Environmental Protection Agency
FHA - Federal Highway Administration
FWS - Fish and Wildlife Service
 FWE - Fish and Wildlife Enhancement
 LE - Law Enforcement
 WPO - Wildlife Permit Office
 RW - Refuges and Wildlife
UIT- Ute Indian Tribe
UT - State of Utah, including the Utah Natural Heritage Inventory

Sclerocactus glaucus (Uinta Basin Hookless Cactus) Recovery Implementation Schedule

Priority	Task	Task Description	Task Duration	Responsible Party			Cost Estimates			Comments
				FWS Region	Program	Other	FY-91	FY-92	FY-93	
2	2.11	Manage oil & gas activities	ongoing	6	FWE	BLM,BIA,DOE UIT	5,000	5,000	5,000	
2	2.12	Manage oil shale & tar sand activities	ongoing	6	FWE	BLM,BIA,DOE	included in task 2.11			
2	2.13	Manage sand, gravel & gold dredging activities	ongoing	6	FWE	BLM,BIA,DOE, UIT	included in task 2.11			
24	2.14	Manage building stone collecting	ongoing	6	FWE	BLM,BIA,UIT	included in task 2.11			
2	2.2	Manage ORV activity	ongoing	6	FWE,LE	BLM,BIA,CO, UT,UIT	2,000	2,000	2,000	
2	2.3	Manage road construction	ongoing	6	FWE	BLM,BIA,DOE, FHA,CO,UT, UIT	1,000	1,000	1,000	
2	2.4	Manage water development activities	ongoing	6	FWE	BLM,BIA,BOR, COE,CO,UT	1,000	1,000	1,000	
2	2.5	Manage pesticide	ongoing	6	FWE	EPA,APH,BLM, BIA,UT	1,000	1,000	1,000	
2	2.61	Protect from unauthorized removal & destruction	ongoing	6	LE,RW, FWE	BLM,BIA,UIT, DOE	1,000	1,000	1,000	

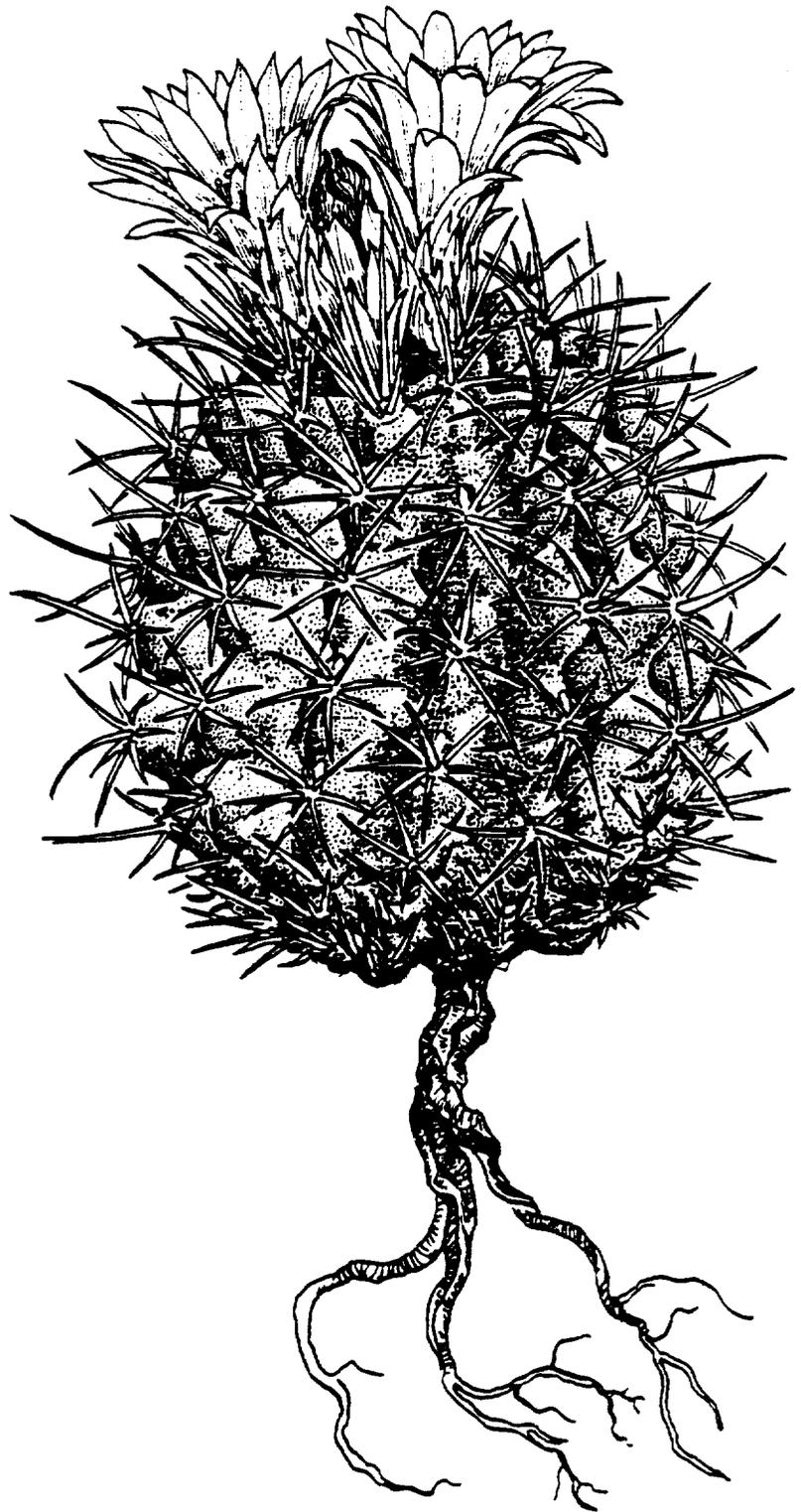
Sclerocactus glaucus (Uinta Basin Hookless Cactus) Recovery Implementation Schedule

Priority	Task	Task Description	Task Duration	Responsible Party			Cost Estimates			Comments
				FWS Region	Program	Other	FY-91	FY-92	FY-93	
2	2.62	Protect from international & commercial exploitation	ongoing	6,9	LE,WPO				included in task 2.61	
2	2.63	Protect from unauthorized renewal from State & private lands	ongoing	6	LE	CO,UT			included in task 2.61	
3	1.	Inventory suitable habitat	3 years	6	FWE,RW	BLM,BIA,CO,UT,UIT,DOE	10,000	10,000	5,000	
3	2.64	Promote nursery propagation	ongoing	6	FWE				included in task 2.61	
3	3.	Conduct MVP studies	10 years	6	FWE,RW	BLM,BIA,CO,UT,UIT	6,000	6,000	6,000	
3	4.	Document and/or establish land use designations	ongoing	6	FWE,RW	BLM,BIA,CO,UT,UIT,DOE	unk	unk	unk	
3	5.	Conduct taxonomic evaluation	10 years	6	FWE	CPC,BIA,BLM	5,000	5,000	1,000	
3	6.	Develop public education program	ongoing	6	FWE	BLM,BIA,	3,000	1,000	1,000	

This recovery plan was made available to the public for comment as required by the 1988 amendments to the Endangered Species Act of 1973, as amended. The public comment period was announced in the Federal Register on June 2, 1990, and closed on July 16, 1990. Two hundred and seventy press releases were sent to the media and public in Utah and Colorado.

Eleven comment letters were received. The comments provided in these letters have been considered and incorporated as appropriate. Comments addressing recovery tasks that are the responsibility of an agency other than the U.S. Fish and Wildlife Service have been sent to those agencies as required by the 1988 amendments to the Endangered Species Act.

Sclerocactus glaucus



Recovery Plan for the
Uinta Basin Hookless Cactus
Sclerocactus glaucus
Agency Review Draft

SCLEROCACTUS GLAUCUS (K. Schum.) L. Benson

RECOVERY PLAN

Prepared by

Sclerocactus glaucus Recovery Committee

Committee Members

Larry England, Committee Chairman U.S. Fish and Wildlife Service
James L. Miller, Sr. U.S. Fish and Wildlife Service
Jane C. Park U.S. Fish and Wildlife Service

APPROVED

Date _____

U.S. Fish and Wildlife Service _____
Director

GROUP: FLOWERING PLANTS

SPECIES NAME: *Sclerocactus wrightiae*
(Wright fishhook cactus)

WHEN LISTED: 10/11/79

WHEN DELISTED:

RECOVERY PLAN HISTORY:

FINAL PLAN: 12/24/85

PLAN NAME: Wright Fishhook Cactus
(*Sclerocactus*
wrightiae Benson)

REVISION 1:

PLAN NAME:

REVISION 2:

PLAN NAME:

REVISION 3:

PLAN NAME:

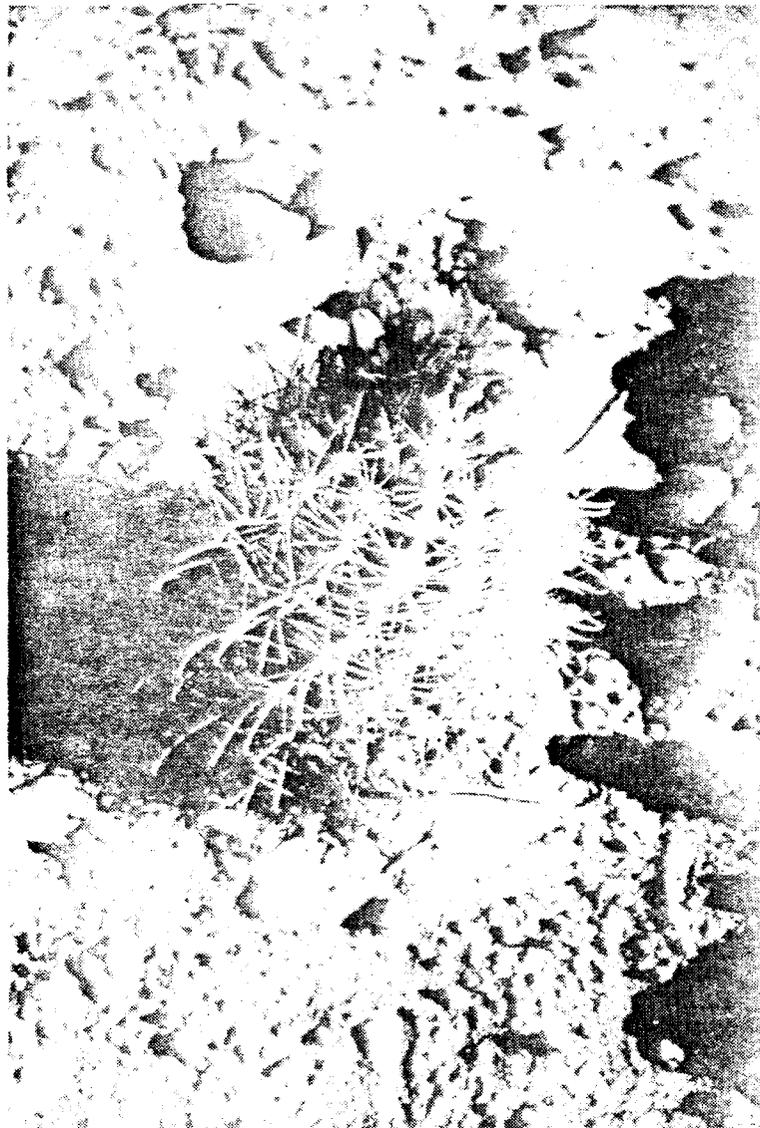
MULTISPECIES PLAN:

OTHER:

175

WRIGHT FISHHOOK CACTUS
(SCLEROCACTUS WRIGHTIAE BENSON)

RECOVERY PLAN



WRIGHT FISHHOOK CACTUS
SCLEROCACTUS WRIGHTIAE BENSON
RECOVERY PLAN

Prepared by the
Wright Fishhook Cactus Recovery Committee

For Region 6
U. S. Fish and Wildlife Service
Denver, Colorado

APPROVED

DATE: 12-24-85

U.S. Fish and Wildlife Service: *Robert B. Bantel*
Regional Director, Region 6

This is the completed Wright Fishhook Cactus Recovery Plan. It has been approved by the U.S. Fish and Wildlife Service. It does not necessarily represent official positions or approvals of cooperating agencies, and it does not necessarily represent the views of all individuals who played a key role in preparing this plan. This plan is subject to modification as dictated by new findings and changes in species status and completion of tasks described in the plan. Goals and objectives will be attained and funds expended contingent upon appropriations, priorities, and other budgetary constraints.

Acknowledgements should read as follows:

The Wright Fishhook Cactus Recovery Plan, dated December 24, 1985, prepared by the U.S. Fish and Wildlife Service in cooperation with the Wright Fishhook Cactus Recovery Committee.

Committee Members

Kathryn M. Mutz, Chairman	Kaysville, Utah
Elizabeth Neese	Brigham Young University
James L. Miller, Sr.	U.S. Fish and Wildlife Service
Gerald R. Jacob	Kaysville, Utah

Literature citation should read as follows:

U.S. Fish and Wildlife Service. 1985. Wright Fishhook Cactus Recovery Plan. Prepared in cooperation with the Wright Fishhook Cactus Recovery Committee. U.S. Fish and Wild. Serv., Denver, Colorado 27pp.

Additional copies may be obtained from:

Fish and Wildlife Reference Service
6011 Executive Boulevard
Rockville, Maryland 20852
301/770-3000 or
1-800-582-3421

The fee for plans varies depending on the number of pages.

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PART I

INTRODUCTION

The Wright fishhook cactus, Sclerocactus wrightiae L. Benson, was listed as threatened on October 11, 1979 (44 FR 58868). Two other members of this genus are listed as threatened: Sclerocactus glaucus (K. Schum.) L. Benson, and S. mesae-verdae (Boissevain ex Hill & Salisbury) L. Benson. In addition, three candidate species from this genus: S. whipplei (Engelm. and Bigelow) Britton and Rose var. heilii Castetter, Pierce, and Schwerin, S. polyancistrus (Engelm. and Bigelow) Britton and Rose, and S. spinosior (Engelm.) Woodruff and Benson are on the 1980 Notice of Review (45 FR 82480) and 1983 supplement (48 FR 53640). The small genus Sclerocactus consists of 8-10 species in the Navajoan, Great Basin, and Mohave deserts. The Wright fishhook cactus occurs in the low elevation desert trough around the south end of the San Rafael Swell. Its habitat can vary from saltbush clay flats to sandy desert grasslands. The entire range extends in an arc from the Emery area on the northeast to Hanksville on the south and the Goblin Valley area on the northeast. In addition to the threat of collecting, this cactus may be impacted by grazing and potential energy developments in the area.

History

Mrs. Dorde Wright Woodruff discovered a new small barrel-like cactus in 1961 "near San Rafael Ridge" in Emery County, Utah. It was collected again by Irving G. Reimann in 1964 in Wayne County a few miles away. Lyman Benson also collected it during this time (the type collection) and recognized that the new cactus formed a link between Sclerocactus whipplei and Coloradoa mesae-verdae. At that time the genus Sclerocactus Britton and Rose consisted of just two species: S. whipplei and S. polyancistrus. Benson (1966) expanded the genus Sclerocactus to six species, based on the manner of fruit dehiscence, by including some disparate species from other genera and the new cactus, naming it after Mrs. Wright. Additional field observations and documentation of the occurrence of the Wright fishhook cactus have been made by Welsh (1978 and 1980), Neese (1981), Welsh and Neese (1979), and Heil (pers. com.). Woodruff and Benson (1976) later recognized two more species, S. parviflorus and S. spinosior in the genus.

Description

The genus Sclerocactus is generally distinguished from Pediocactus by the method of fruit dehiscence and the coalescence (to a greater or lesser extent) of the tubercles of Sclerocactus into ribs. Arp (1972) combined Sclerocactus with Pediocactus, but Heil (1979) and Heil et al. (1981) concur with Benson in the segregation of Sclerocactus at the generic level. Sclerocactus wrightiae is separated from the other members of the genus by having four central spines with the lower principal one being hooked and less than 1.5 cm long. Flowers appear in April and May and vary in color from white to pink. The following brief description is taken from Benson (1982):

"... stems unbranched, globose (depressed-globose to obovoid), 5-5.5 (9) cm long, 5-7.5 cm diameter; ribs + or - 13; tubercles more prominent and on even the older stems about as high as the rib

beneath them, 12 mm long, 9 mm broad, protruding 6-9 mm; areoles 3-4 mm diameter, typically + or - 9 mm apart, the scar of the fruiting area ventral to areole vertically elongate (length 2-4 times breadth); spines not obscuring stem; central spines 4, the principal (lower) one hooked, pale on upper side, dark brown on lower, often stout, + or - 12(15) mm long, somewhat curved as well as hooked, in older plants + or - 0.5-1 mm broad, elliptic in cross section, the 2 lateral upper central spines slightly curving, dark to light brown, to 12 mm long, the uppermost (median) central pale straw or ashy, the longer centrals 1.2-2 cm long, basally 0.8-1.5 mm broad, somewhat flattened, thus relatively broad; radial spines white, 8-10 per areole, spreading almost perpendicularly to tubercle, nearly straight, the longer 6-12 mm long, basally 0.25-0.4 mm broad, subulate; flower 2-2.5(4) cm diameter and long, fragrant; sepals with light reddish-brown, reddish-green, or lavender middles and pale pink to white margins, the larger obovate-oblong, 5-12 mm long, 3-8(12) mm broad, rounded, entire to undulate or with irregular minute teeth; petals nearly white to pink, midribs brownish, largest lanceolate to oblong, 12-20 mm long, (3)4.5-6(10) mm broad, acute to rounded, often mucronulate, entire to undulate or irregularly minutely toothed; filaments pink, 6-12 mm long, slender; anthers yellow, narrowly elliptic-oblong, 0.7-1 mm long; style green, 12 mm long, 1 mm diameter; stigmas 5-8, 1.5-2 mm long, slender to broad, ovary in anthesis + or - 10 mm long, 5-6 mm diameter; fruit with 1 or 2 scales or none, 9-12 mm long and diameter, barrel-shaped; seeds 2 mm long, 3.5 mm broad, 1.5 mm thick."

Where Sclerocactus wrightiae grows in proximity to other Sclerocactus taxa, intergradation may occur affecting characters used in identification. In recent field observations by John Anderson, U.S. Fish and Wildlife Service, S. wrightiae and S. parviflorus were found to be growing together in the Emery area without apparent intergradation. While authors have disagreed on nomenclature and affinities of some of the Sclerocactus taxa, the specific status of S. wrightiae has not been seriously questioned. Recent field observations by Mutz and Neese (Recovery Committee Members) indicate that characters of size, spine characteristics, and flower color and shape are uniform and diagnostic throughout most of the known distribution. In particular, the narrowly opening, near-white flowers which are suffused or ribbed with pale pink serve to distinguish the Wright fishhook cactus from S. parviflorus (Woodruff and Benson 1976), with its more flat-opening and uniformly purplish-pink flowers. The identification of all Sclerocactus collected in an area of sympatry should be questioned unless the plants are collected in flower and notes made of flower color and shape. Stem shape may also be used to separate the two: globose in S. wrightiae and cylindrical in S. parviflorus (Anderson pers. obv.).

Past and Present Distribution

The Wright fishhook cactus occurs in the Canyonlands section of the intermountain region (Holmgren 1972), an area of relative geological stability and high plant endemism. Two factors which contribute to the high endemism are the rough broken topography formed by the canyons and mesas and the mosaic of soils resulting from the many sandstone, shale, and occasional limestone strata. The range of Sclerocactus wrightiae follows a low elevation trough

around the south end of the San Rafael Swell uplift between the Swell and the Wasatch Plateau, Thousand Lake Mountain, and the Henry Mountains (Figure 1). In contrast to most rare endemics of the Canyonlands Section which are edaphic specialists (whose habitat can be described by a geologic strata or soil type), within this physiographic area, Sclerocactus wrightiae occurs over a variety of soil types from clay flats with mat saltbush species to sandier soils of desert grasslands with galleta grass and three-awn and scattered pinyon-juniper woodlands with blue grama.

In the years following Benson's own collection and description of the species, it has been collected in several locations in Emery and Wayne Counties in Utah. When listed as endangered under the Endangered Species Act of 1973 on October 11, 1979 (44 FR 58866), the species was known from about five locations but was nowhere abundant. These areas are under jurisdiction of the Bureau of Land Management (BLM) and the State of Utah.

Recent inventories, general floral collections, and agency reports have expanded our knowledge of the species distribution. Collections at Brigham Young University, University of Utah, Pomona College, and San Juan College's herbaria document the cacti's existence over about 25 townships in Wayne and Emery Counties. Although new populations have been located, they are still characterized by a few scattered individuals (Anderson 1982; Mutz and Neese per. obs.). These populations of S. wrightiae are grouped into two general locations, the Emery area and the Caineville-Hanksville area. However, the most northern populations in the Emery area are thought to be S. wrightiae but may be better assigned to S. parviflorus (Welsh 1980). It may be that the ranges of the two are overlapping here and both cacti occur in the Emery area (Heil and Anderson pers. obs.). Further study of the Sclerocactus populations in the Emery area is indicated.

A thorough inventory and population count has not been conducted for the taxon, and a general estimate of the total number of individuals cannot be extrapolated based on incomplete data from individual sites. The number of individuals at each location appears to be small. At each site, their distribution is usually reported to be clustered within a few square meters, possibly due to poor seed dispersal, with many square meters or even hectares between the groups. However, where appropriate habitat exists, populations may be more or less continuous, though widely spaced, over relatively large areas with a dispersed distribution pattern. Because it has a wide edaphic tolerance, more information is needed on the factors accounting for its distribution. Since all habitat areas have not been intensively inventoried, the limits of each small site have not been defined. Much potential habitat adjacent to known sites has not been investigated.

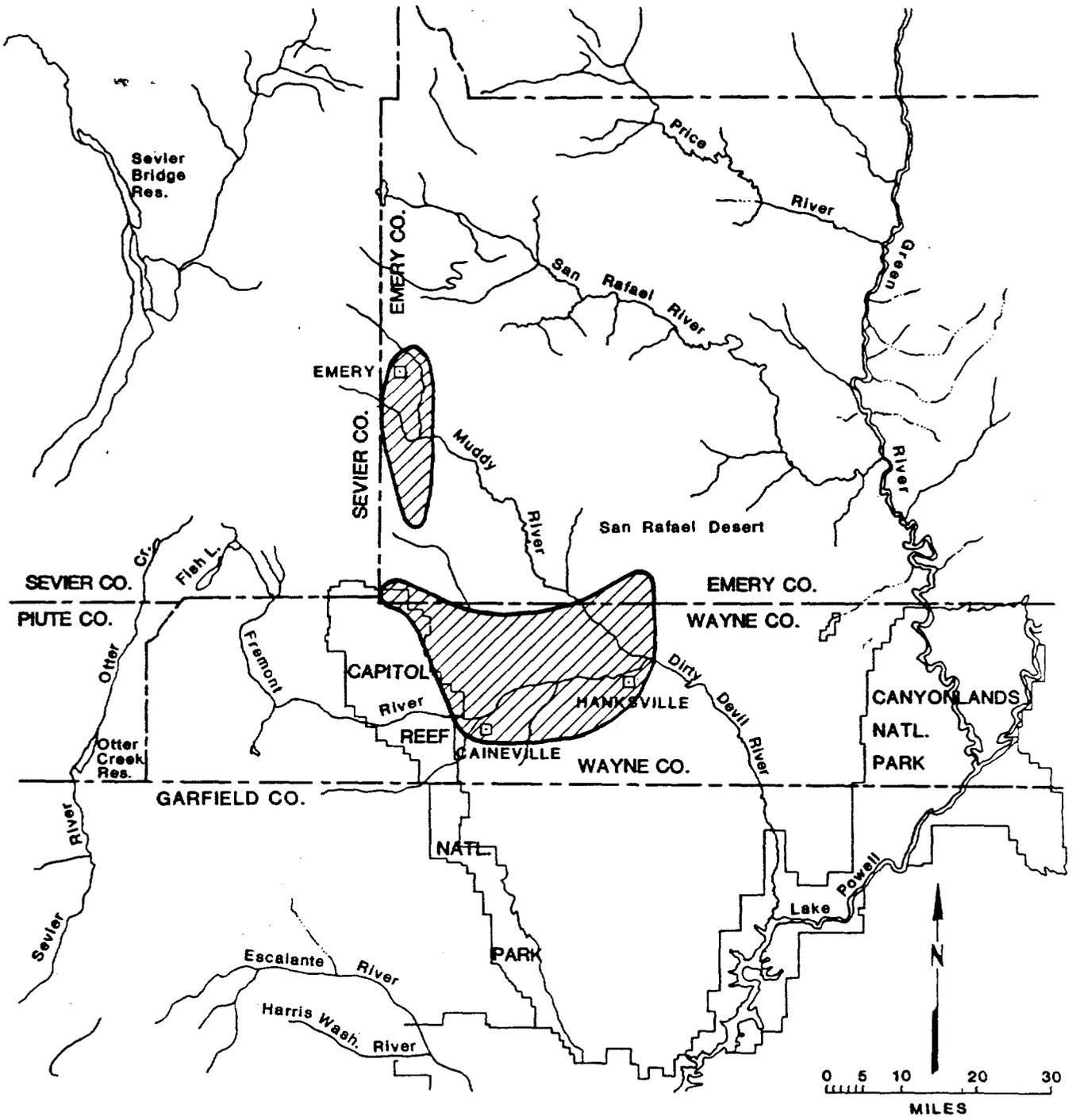


FIG.1 DISTRIBUTION OF THE WRIGHT FISHHOOK CACTUS

Habitat and Ecology

S. wrightiae is unlike many of Utah's endemics which are restricted to habitats with a narrow range of features, e.g., a single geologic formation or soil parent material. The locations illustrated in Figure 1 represent several geologic formations: Morrison, Carmel Entrada, Moenkopi, and Curtis Formations; and Tununk, Ferron, Blue Gate and Emery, all members of the Mancos Shale Formation. Soil types of these sites range from clays of the Blue Gate to sandy silts and fine sands of the Ferron Sandstone and the Entrada Formation. Populations are known from areas with well-developed gypsum layers (Cathedral Valley) and from areas with little or no gypsum (Welsh pers. comm). Soils at most of the sites possess a surface structure with at least some cryptogamic crust. Plants are rare or absent where the cryptogamic crust has been destroyed or is undeveloped. Sites usually are littered with sandstone or basalt gravels, cobbles and boulders. Both the surface and rock litter may aid in water infiltration and provide safe sites for germination and seedling establishment.

The biotic environment of most sites is arid, with widely spaced shrubs, perennial herbs, bunch grasses, or scattered pinyon and juniper providing very little surface coverage. Salt desert shrub and pinyon-juniper are the community types reported. Important species include Pinus edulis, Juniperus osteosperma, Atriplex cuneata, A. confertifolia, A. corrugata, and Hilaria jamesii. Cryptantha flava, Eriogonum bicolor, Oryzopsis hymenoides, and various Opuntia species are also frequent associates.

Reproduction of these small barrel-like cacti is primarily by seed. Plants begin to flower when they are quite small (observed at 5 cm diameter and 3 cm tall) and, presumably, young. Flowers form on the new growth of the current year. From one to several white to pale pink blossoms cluster at the top of each small barrel. Specific pollinators are not known, but a small beetle collected and awaiting identification was observed in closed flowers near Emery. Ants have been observed grazing on flowers (and perhaps aiding pollination) of the related Sclerocactus glaucus in the Uinta Basin (agency draft recovery plan for the Uinta Basin hookless cactus, Sclerocactus glaucus). Fruits mature in June, dehiscing along a circular horizontal line near or below the middle. Seeds generally are dispersed near the parent but may be transported by water or animals. Seedling plants often are collected inadvertently in organic detritus clinging to adult plants. Budding also contributes to the population. Small cacti form at the base of an adult especially when meristem damage has occurred. As the summer progresses and drought stress increases, the cacti shrink, becoming almost level with the ground surface. They are very difficult to locate in this condition.

Impacts and Threats

When S. wrightiae was listed as endangered in 1979, the principal threats to the species were:

- 1) amateur and commercial collecting,
- 2) consideration of the cactus's habitat as a potential site for the Intermountain Power Plant, and

- 3) potential for a natural or man-made disaster to eradicate the narrowly distributed population.

Collecting is likely to remain a threat to all the cacti of the Southwest. The dispersed distribution pattern of Sclerocactus wrightiae is, however, to its advantage. Commercial scale collecting would be more time consuming and probably less profitable for S. wrightiae than for a more densely grouped species like S. glaucus (agency draft recovery plan for the Uinta Basin hookless cactus, Sclerocactus glaucus), and collecting is unlikely to be as much of a threat to S. wrightiae as such other cacti except where recreational use is high (see Goblin Valley below), but enforcement over the wide areas of backcountry where the cactus occurs is difficult. Under the Endangered Species Act, it is unlawful to remove and reduce to possession (collect) any endangered plant on Federal land without appropriate permits.

The Intermountain Power Project eventually was built near Delta in Millard County, Utah, and is no longer a threat to the cactus. A new threat that has recently come up is the Dirty Devil Salinity Control Project. Both proposed project sites, Emery South Salt Wash and Hanksville, have been preliminarily surveyed and found to contain Sclerocactus wrightiae. Informal Section 7 consultation has been initiated.

Of the two general locations where populations of S. wrightiae are found, the Emery area and the Caineville-Hanksville area, each has its own mix of potential threats. At this time, populations in the Emery area are most likely to be threatened by the coal industry and supporting developments. These activities would require Section 7 consultation. Populations in the Caineville-Hanksville area face a more diverse set of threats including off-road vehicle (ORV) use and road upgrading. It is possible that populations in both areas are being impacted by grazing. S. wrightiae appears to be associated with the presence of a well-developed cryptogamic crust. The plant does not occur in more than small restricted numbers in those locations at which evidence of cattle trampling and a subsequent loss of cryptogamic crust has been noted (Neese pers. comm.). Their clustered distribution in these areas may reflect a restriction to undisturbed microhabitat.

Emery Area: The single largest threat to the species in this location is coal development. Three Federal coal lease tracts are found in the area. The tracts were originally put up for lease by BLM in February of 1982. No bids were received and the tracts were reoffered in 1984 and no bids received again.

The original Environmental Impact Statement (EIS) for these tracts made no mention of Sclerocactus wrightiae. The entire area lies within the Emery Known Recoverable Coal Resource Area (KRCRA). A development related to this increased coal production is the proposed Denver and Rio Grande-Western Railroad extension from Price to Emery. Called the Castle Valley Railroad, this new line will follow a route roughly parallel to US-89 with a loadout facility planned for this location approximately 4 miles southeast of Emery. The line itself is expected to be completed by 1990. Construction of additional connector lines also may create additional impacts on populations of cactus.

In the distant future, the Emery area also may see development of a coal gasification plant and a coal slurry terminal. The Mountain Fuel Company has proposed a coal-gas plant for Emery, with an accompanying increase in coal mining activity. Size of the plant and Federal funding is uncertain. In addition, the proposed Boeing Pacific Bulk Commodity Transportation System involves coal slurry terminals at Emery, Utah, and Oxnard, California. Little has been done on this project other than some preliminary engineering feasibility work.

Other more immediate threats to Emery area populations of S. wrightiae will accompany the continuing growth of the towns in Castle Valley which has been averaging an 8 percent per year growth rate (BLM 1981). A proportionately high percentage of town residents possess trail bikes and other ORV's which are used most often during the spring and the autumn hunting seasons. Rock hounding for gypsum crystals also may bring individuals into contact with the cactus. Irrigated cropland has been retired with coal and power plant developments. The intensity of cattle grazing in the area appears to be stable. Oil, gas, and mineral exploration activity, while relatively slow in 1982, may resume in the future. No large scale, nonenergy mineral development projects are known to be scheduled for the area (information provided by BLM, Price, Utah, Area Office).

Wilderness designation cannot offer protection for populations of S. wrightiae as proposals to designate wilderness study areas (WSA) in the Emery area were protested and subsequently dropped.

While the above discussion presents a general view of threats to Sclerocactus wrightiae found in the Emery area, some factors are more important than others to the survival of specific populations. Specific location data are presented below.

1. North Emery Locations

Location Source: BLM Records; may be S. parviflorus

Leases - Cactus sites in this location are adjacent to a Federal coal preference right lease application by R.J. Holberg and are within the Emery North Federal Coal Lease Tract. The Emery North Lease would involve both underground and surface mining. Expected impacts of mining on the tract include lowering of the water table and the possibility of up to 19 feet of subsidence. Consolidated Coal Company has a mine in the same township located within the Emery KRCRA.

Additional cactus sites in this location may be impacted by a right-of-way granted to the town of Emery and oil and gas leases (issued in 1976).

Grazing - Cattle trampling was noted in the area.

Railroad - Extension of the Castle Valley Railroad into the area is a consideration; at this time, its exact route is undetermined. The railroad is likely to involve a Federal-private lands exchange (which would require Section 7 consultation).

2. Central Emery Location A

Location Source: BLM Records; may be S. parviflorus

Leases - Cactus locations are part of the Emery KRCRA and are in the Emery Central Federal Coal Lease Tract, which is a strip coal deposit. Consolidated Coal Company, has a mine on an adjacent section. Slumping of escarpments is one predicted impact of coal mining on the tract.

Habitat sections contain a 10-year oil and gas lease issued in 1977 and were part of a State lands exchange application.

Grazing - Cattle trampling was noted in the area.

Roads - The eastern edge of the cactus site is easily accessible from a good gravel road which functions as a shortcut between Interstate 70 and Emery.

3. Central Emery Location B

Location Source: BLM Records; may be S. parviflorus

Leases - This cactus site is in the Emery Central Federal Coal Lease Tract, a strip coal deposit which is adjacent to existing Consolidation-Kemmerer Coal Company leases. In addition, a 19-year oil and gas lease was issued in 1976 for this location which is also part of State lands exchange application.

Grazing - Cattle trampling has been noted in the area.

4. Central Emery Location C

Location Source: BLM and Herbarium Records; site visit by Mutz and Jacob (Recovery Committee Members)

Leases - According to BLM plat maps, this cactus site is not included in the Emery KRCRA but most of the township is. The site is adjacent to the Emery Central Federal Coal Lease Tract.

The Utah Department of Transportation has a material site and right-of-way on adjacent sections. Ten-year oil and gas leases, including one issued to Cities Service of Tulsa (1979), cover this and adjacent sections. The central half of this section is non-Federal land.

Grazing - Cattle trampling has been noted in the area along with damage to flower buds which may be the result of insects.

Mining - Soldier Creek Coal Company has a Hidden Valley (Ivie Creek) Coal Mine under development on Section 18 of this same township. The J.B. King (Dog Valley) Coal Mine is located on Section 32 (State land). These mines eventually may involve connector links with the Castle Valley Railroad.

Roads - The location is easily accessible from Interstate 70 and is adjacent to a popular shortcut route between I-70 and Emery. The road can easily be travelled by two-wheel drive vehicles.

5. South Emery Locations A

Location Source: BLM Records

Leases - One cactus site at this location is within the Emery South Federal Coal Lease Tract. Coal on the tract will be mined using underground methods. Subsidence may be one impact from this mining. The J.B. King (Dog Valley) Coal Mine lies to the northwest on T23S, R6E, Section 32.

Sites are covered by 10-year oil and gas leases issued in 1976. The entire cactus location is not within a coal lease tract but is within the Emery KRCRA. Consolidation-Kemmerer Coal Company has Federal coal leases to the west.

Grazing - Some cattle trampling has been noted here.

6. South Emery Location B

Location Source: Herbarium Records; site visit by Neese and Mutz (Recovery Committee Members)

Leases - According to BLM plat maps, no leases were recorded at this cactus location as of July 1982. The site is near, but not within, the Emery KRCRA and the Emery South Federal Coal Lease Tract. However, it is a mile or less from existing Federal coal leases held by Consolidation-Kemmerer Coal Company. Slumping of escarpments, lowering of the water table, and subsidence are expected impacts on the Emery South tract. All tracts of coal will be mined with underground methods because Townsendia aprica, a listed threatened species, is found in the area.

Grazing - The Wright fishhook cactus was not observed in 1984 at a site of severe cattle trampling and grazing where it was seen to occur in 1882 (Mutz pers. obs.)

Caineville-Hanksville Area: Potential threats to the survival of Sclerocactus wrightiae in this area represent a more diverse mixture of human activities including intensive ORV activity and powerline-road corridor construction. At the present time, the area hosts little active energy or minerals development, although the area around Factory Butte contains a strip coal deposit. Potential uranium development areas are located to the west of Factory Butte and south of Notom. If pursued, these developments could introduce other threats to the cacti such as powerline corridor construction, increased ORV use, road upgrading, increased exploration activity, and water developments. Exploratory drilling for a proposed dam on the Fremont River is now occurring east of Caineville Mesa. The extent and nature of the development is yet to be determined. It is conceivable that this water would be used by coal

developments to the north in the Emery or Factory Butte coal fields (BLM 1982a and 1982b). The cactus is reported from Capitol Reef National Park (Meyer 1980, Heil and Anderson (pers. obs.)). It occurs within park boundaries near Cathedral Valley and the Hartnet. The principal threat to the taxon within the park is probably habitat disturbance due to grazing and possibly illegal collecting.

Specific threats are described in more detail for populations at the following locations:

1. Goblin Valley Locations

Location Source: Herbarium Records; site visit by Neese and Mutz (Recovery Committee Members)

Leases - Chevron USA, Inc., holds Federal and State oil and gas leases on these sites. Mineral leases on one site have been cancelled. Uranium exploration did occur in the 1970's but has been discontinued for the most part. Some seismic work has been done here.

Grazing - Wild horses may be found in the area. Cattle grazing tends to be dispersed and closer to the creeks.

ORVs - Recreation activity probably represents the most significant, immediate threat. Up to 14,000 people pass through Goblin Valley State Park on an Easter weekend and nearly all camp on BLM land. The cactus sites are traversed by the road to Muddy Creek, a route popular with trailbikes, campers, and other visitors.

Wilderness - A few areas within a mile of cactus locations are part of BLM Wilderness Study Area A-028.

2. Middle Desert-Salt Wash Locations

Location Source: Site visit by Neese and Mutz (Recovery Committee Members)

Leases - Cactus habitat in this area is covered by Federal and State oil and gas leases issued since 1976. Many adjacent sections also have oil and gas leases on them, many issued since 1980; however, no major company activity was noted. Mineral leases in the area have been cancelled and little development is occurring. However, most sites are in a potential uranium development area as identified by the BLM.

Grazing - Most livestock grazing occurs along wash bottoms and sides where significant trampling is sometimes evident.

ORVs - There is relatively little recreational vehicle activity. Most vehicle traffic is associated with visits to the north end of Capitol Reef National Park or local livestock operations.

Roads - Some road grading takes place because the road is easily rutted. Improvements may be tied to increasing use of Capitol Reef National Park.

3. North Caineville Mesa Locations

Location Source: Herbarium Records; site visit by Mutz and Jacob (Recovery Committee Members)

Leases - The locations are open to oil and gas leasing with certain stipulations. However, the main lease activity has been for a right-of-way filed by GarKane Power Association in 1980. A similar request may affect other sites in this area.

Grazing - There is a grazing allotment for the perimeter of the mesa. Livestock grazing in the area is dispersed.

ORVs - Trails on the mesa are closed to ORV use and the mesa itself has been designated an Area of Critical Environmental Concern (ACEC) by BLM. The area around the mesa was not declared an ACEC, although further study might reverse this decision in the future. (For further ORV activity east of the mesa, see Factory Butte.)

Roads - The road along the west side of the mesa is navigable by two-wheel drive vehicles but eventually degenerates into a jeep trail. It is one possible route into an area with uranium development potential.

4. Caineville Location

Location Source: Site visit by Mutz and Jacob (Recovery Committee Members)

Leases - An oil and gas lease was issued in 1976 covering the area. A right-of-way to a Utah Department of Transportation material site also was granted through the area in 1981.

Grazing - Some grazing does occur in the Red Desert area and on the perimeter of North Caineville Mesa. There is significant trampling of vegetation along the sides of washes.

ORVs - Most ORV use occurs to the east (see Factory Butte). This area did not receive ACEC protection.

Roads - The species is located on the road leading into the north end of Capitol Reef National Park, the Cathedral Valley area, the Red Desert, and North Caineville Mesa. A potential uranium development area also occurs near the Emery-Wayne County line. These locations are relatively accessible, being only 2 miles from a paved road.

Rockhounding - Rockhounding may occur in this and other areas along Caineville Wash.

5. Factory Butte Locations

Location Source: Herbarium record; field visit by Recovery Committee Members did not verify location

Leases - Chevron, USA, Inc., holds oil and gas leases on the area and many adjacent sections. Atlas Dirty Devil Mining Company also holds a coal lease in this area. The Henry Mountains Coal Study issued by the Richfield, Utah, BLM Office in 1982 did find strip coal deposits on the north and east sides of Factory Butte suitable for leasing. The Factory Butte Coal Mine, though indicated on U.S. Geological Survey maps, is inactive at this time. The cost of transporting coal out of this area is likely to keep it non-competitive with Emery area coal. However, this would change if a coal consuming industry were developed nearby.

ORVs - The area around Factory Butte is a site of intensive ORV use. A popular route winds up Neilson Wash, around to Coal Mine Wash, and back on the mine road. In an attempt to control ORV use in the area, the BLM has designated an ORV "playground" on the Mancos Shale at T28S, R9E, Sections 14 and 15. ORV impacts are visible from Highway 24.

Roads - The road, which crosses the cactus habitat, currently is used by ORVs and campers, and is the main route to the previously identified coal deposits. It also serves as a point of access into a potential uranium development area (west of Factory Butte) and the Muddy Creek-Goblin Valley road (see Goblin Valley locations).

6. Notom Location

Location Source: Site visit by Neese and Mutz (Recovery Committee Members)

Leases - This site is State land. A valid oil and gas lease is held for the section by a local company (issued 1980). Adjacent sections contain oil and gas leases issued in the last 2-3 years.

Grazing - Irrigated farmland as well as grazing operations occur in the Notom area, especially on private bottomlands.

ORVs - Some trailbike use takes place on Sandy Creek to the east of Notom. ORV use on the Notom road largely is associated with extended trips into the south Capitol Reef National Park along the Waterpocket Fold.

Roads - Wayne County is relocating the Notom road to bypass Notom on the east. Individual cacti have been observed on the margins of the partially constructed road that bisects the Notom population (Neese pers. obs.). The road is an unpaved primary route for entry into the south end of Capitol Reef National Park and eventually enters Glen Canyon National Recreation Area where it joins paved State road 276 near Bullfrog Marina. With development of the Henry Mountains coal field, this road would be the major route into the strip coal deposits found suitable for Federal leasing, approximately 6 miles to the south. The road also provides

access to a potential uranium development area. In either case, it would function as a utility corridor. However, neither development is likely in the near future considering coal and uranium market conditions. The road may be upgraded as warranted by visitation to Capitol Reef National Park.

Wilderness - This area is not being considered for wilderness designation. A WSA can be found to the east (WSA #238) in the Sweetwater Creek area.

7. Hanksville - Dry Valley Location

Location Source: Site visit by Neese and Mutz (Recovery Committee Members)

Leases - A 10-year oil and gas lease was issued to Questa Petroleum of Albuquerque in 1975. Hanksville Redi-Mix has a permit on the adjacent State section for a sand and gravel operation. The BLM is committed to providing a sand and gravel pit in the Hanksville area.

There has been some uranium exploration drilling in the area but little or none in the past 3 years. Some oil and gas permits have been issued for areas further south at Mt. Ellen.

Grazing - The area is covered by a grazing allotment.

ORVs - There is some local ORV use in the area but not the intensive activity found elsewhere.

Roads - The site is bisected by a road that provides access to the Mt. Ellen area. It also lies within a powerline corridor that follows State highways 95 and 276.

BLM was unaware that the cactus occurred in this area and assumed it was found only on Mancos Shale.

PART II

RECOVERY

OBJECTIVE

The objective of this plan is to remove the species from the U.S. Fish and Wildlife Service (Service) List of Endangered and Threatened Plants. The species will be considered eligible for down-listing to threatened when two self-sustaining populations of Sclerocactus wrightiae totaling not less than 10,000 individuals dispersed over two areas considered essential habitat are established and/or maintained in perpetuity. The species will be considered eligible for delisting when at least one new self-sustaining population (a third population of not less than 10,000 individuals) is maintained within its range. In addition, the populations must be secure from collecting pressures.

Known populations of S. wrightiae appear viable but are scattered, limited in number, and currently restricted to two general areas. A lack of thorough, extensive surveys has allowed only an estimate of current population numbers, status, and distribution. Because of the dispersed nature of its distribution, fewer populations with larger numbers are the objective rather than several smaller, concentrated populations. Additional studies are needed to determine what constitutes a viable, self-sustaining population. The specific goals outlined above may be revised as more information is obtained on the status and biology of the species.

STEP-DOWN OUTLINE

1. Delineate essential habitat for the species based on known distribution.
 - 1.1. Survey for populations in Wayne and Emery Counties.
 - 1.2. Delineate at least two widespread areas supporting the largest populations of the species as essential habitat.
 - 1.3. Revise essential habitat determinations as additional population, biological, and habitat data become available based on results of studies in No. 2. below.
2. Sustain healthy populations in their natural habitat at all existing sites.
 - 2.1. Study autecology of the cactus.
 - 2.1.1. Analyze soil requirements.
 - 2.1.2. Analyze effects of disturbance to cryptogamic crust.
 - 2.2. Determine pollination mechanisms.
 - 2.3. Determine seedling and germination requirements.
 - 2.4. Investigate effects of larval predators.

3. Protect known populations of the species.
 - 3.1. Inform Federal and State agencies of locations of known populations on their land.
 - 3.2. Review all agency activities in essential habitat areas to assure that they pose no threat to the species.
 - 3.3. Increase enforcement of existing regulations.
 - 3.4. Develop Fish and Wildlife Service law enforcement strategy.
 - 3.5. Conduct public information programs.
 - 3.6. Restrict land uses as necessary to protect populations.
 - 3.7. Develop a management plan to ensure continued survival/protection of the species.
4. Monitor populations and pursue down-listing/delisting or revise recovery goals as needed.
5. Develop techniques to artificially propagate and transplant the Wright fishhook cactus.
6. Develop a comprehensive trade management plan for all cacti.

NARRATIVE

The objective is to recover the species so that it can be removed from the List of Endangered and Threatened Plants. The species will be considered eligible for down-listing to threatened when two self-sustaining populations of Sclerocactus wrightiae totaling not less than 10,000 individuals dispersed over two areas considered essential habitat are established and/or maintained in perpetuity. The species will be considered eligible for delisting when at least one new self-sustaining population (a third population of not less than 10,000 individuals) is maintained within its range.

Known populations of S. wrightiae appear viable but are scattered, limited in number, and currently restricted to two general areas. A lack of thorough, extensive surveys has allowed only an estimate of current population numbers, status, and distribution. Additional studies are needed to determine what constitutes a viable, self-sustaining population. The specific goals outlined above will be revised as more information is obtained on the status and biology of the species. Current and potential threats to the cactus are diffuse and can change constantly as new development takes place or is proposed in the region. Threats currently include potential energy development, ORV use, construction or modification of facilities, livestock trampling, and collecting.

Vigilance and prompt action by Federal land management agencies can eliminate some threats to specific populations (Tasks 3.1. - 3.7.). Other threats to the species may be diminished but may not be completely eliminated. The maintenance or establishment of two populations totaling 10,000 in number and the possible establishment of a third population should minimize the impact of collecting and any natural phenomena that might decimate a single population. However, future delisting would depend on land use activities and other threats existing at that time. Decline of the total population could necessitate more active recovery efforts.

1. Delineate essential habitat for the species based on known distribution.

Since the species survival depends on adequate habitat of sufficient quantity and quality, essential habitat should be determined and delineated.

1.1. Survey for populations in Wayne and Emery Counties.

The area surveyed should include the low deserts from Goblin Valley to Hanksville on around to Notom and north up to Emery on the varied substrates on which it occurs.

1.2. Delineate at least two widespread areas supporting the largest populations of the species as essential habitat.

Essential habitat is considered to be the minimum undisturbed habitat required for the taxon's natural maintenance. Preservation of dispersed and varied habitat is the species' best defense against one or a combination of potential threats.

A committee representing the Fish and Wildlife Service, National Park Service (NPS), BLM, the State of Utah, and biologists knowledgeable regarding S. wrightiae should delineate the species' essential habitat based on information developed from this recovery plan. The committee should consider all available biological and distributional data including evolutionary aspects. They should also consider the ease and efficiency of protection given the accessibility of areas and current (proposed) land use and land ownership. Once the essential habitat has been outlined, recovery efforts should be focused in this area. All known locations should be maintained, and funds for inventories, review of management practices, and other recovery efforts should be applied to the essential habitat first.

1.3. Revise essential habitat determinations as additional population, biological, and habitat data become available based on results of studies in No. 2. below.

Since the species is not well known biologically or distributionally, essential habitat and population estimates should be reviewed at least annually as more data becomes available (see Task 2). Discoveries of large new populations or extensions of the species' range could reduce its rarity and lead to down-listing or delisting.

2. Sustain healthy populations in their natural habitat at all existing sites.

This will provide understanding of limiting factors contributing to the species' rareness and survivability.

2.1. Study autecology of the cactus.

This will contribute to a knowledge of the species' environmental requirements.

2.1.1. Analyze soil requirements.

Since the cactus grows on a number of different substrates, each should be tested for the major soil characters to determine commonalities or any unusual and significant requirements. This knowledge can be used to predict potential habitat and survey areas.

2.1.2. Analyze effects of disturbance to cryptogamic crust.

Compare cactus numbers in pristine and impacted cryptogamic habitats of the cactus to determine whether there is a significant difference in cactus numbers between the two. (Is undisturbed cryptogamic crust needed for the cactus's survival?)

2.2. Determine pollination mechanisms.

Specific pollinators and any potentially detrimental impacts need to be studied. Also, in light of the plants' dispersed distribution pattern, density dependence of pollination (outcrossing) needs to be determined.

Compare cactus numbers in pristine and impacted cryptogamic habitats of the cactus to determine whether there is a significant difference in cactus numbers between the two.

2.3. Determine seedling and germination requirements.

Since many more seeds are produced than germinate and reach maturity, this is a potentially weak link in the species life cycle that needs to be investigated through studies of different substrates, aspects, moisture regimes, etc., both in the wild and in greenhouses.

2.4. Investigate effects of larval predators.

Although the cactus's spines provide protection against traditional herbivores, the cactus is still vulnerable to be eaten from the inside out by insect larva. The degree of such predation should be determined for the Wright fishhook cactus.

3. Protect known populations of the species.

Implementation of existing laws and regulations and public education is necessary to prevent population decline.

3.1. Inform Federal and State agencies of locations of known populations on their land.

Land management agencies cannot protect populations without accurate information on their location. The Service will provide the BLM District and Area Offices, NPS, the State of Utah, and The Nature Conservancy with current data and up-to-date status information as available.

3.2. Review all agency activities in essential habitat areas to assure that they pose no threat to the species.

In Section 7 consultation with the Service, the BLM, and NPS should review all activities that may affect the species. These and other Federal agencies involved in activities on State or Federal lands should also consult with the Service if Federal monies, permits, etc. are involved. The principal activities of concern in the habitat either destroy all vegetation (e.g., exploration and mining, energy production and transport) or severely damage the fragile cryptogamic crust (e.g., off-road vehicles, recreation, and grazing). Agency actions must be undertaken in consonance with the Endangered Species Act as amended so as not to pose a threat to the species.

3.3. Increase enforcement of existing regulations.

The State of Utah currently has no statutes that protect Federal- or State-listed endangered or threatened plant species. However, interstate and foreign commerce as well as import and export of endangered species is prohibited by the Endangered Species Act, the Lacey Act, and Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Under the Endangered Species Act as amended, it is unlawful for any person to remove and reduce to possession (collect) any endangered plant from areas under Federal jurisdiction. At the present time, enforcement of taking on Federal lands is not adequate. An enforcement plan should be developed by BLM. Funding for increased surveillance should be considered if collecting is evident as a significant threat. Control efforts could be concentrated in the spring when plants are flowering and collecting is most likely to occur. Trade should be monitored, perhaps through TRAFFIC (USA).

3.4. Develop Fish and Wildlife Service law enforcement strategy.

The Service's Endangered Species Office, in conjunction with Law Enforcement, need to develop strategies, as necessary, to discourage collecting.

3.5. Conduct public information programs.

The Service and BLM should supply information to cactus clubs, growers, and other interested groups concerning the stipulations of the Endangered Species Act, as amended, the Lacey Act, and CITES. BLM should publicize any regulations prohibiting collecting of flora on its lands. This activity could be accomplished with the aid of the American Association of Botanic Gardens and Arboreta and would help to develop a better understanding of endangered species and the value of maintaining natural populations.

3.6. Restrict land uses as necessary to protect populations.

If data indicate that disturbance or destruction of the cryptogamic crust adversely impacts the species and limits its distribution, land managing agencies should develop use restrictions for these population areas that would avoid these impacts. Discreet enclosure facilities should be established around S. wrightiae for monitoring the results of these activities.

3.7. Develop a management plan to ensure continued survival/protection of the species.

Current and potential threats to the cactus are diffuse and can constantly change as new development occurs or is proposed. While vigilance and prompt action by land management agencies can eliminate some threats, other threats may only be diminished. Development of a management plan will provide further guidance for land managers and assure some protection even after the species is delisted.

4. Monitor populations and pursue down-listing/delisting or revise recovery goals as needed.

Populations should be monitored annually to determine trends. Recovery goals may require revision as more information becomes available.

5. Develop techniques to artificially propagate and transplant the Wright fishhook cactus.

Search the literature and contact commercial cactus nurseries to learn techniques for propagating and transplanting the Wright fishhook cactus. New populations will only be initiated through artificial propagation if conditions indicate that this measure will be necessary for survival of the species.

6. Develop a comprehensive trade management plan for all cacti.

To determine the extent of the commercial market for cacti, studies are needed to determine what species are in trade, the overall trend of trade in listed cacti, the feasibility of reducing the collecting pressure on wild populations by promoting a commercial artificial propagation program, and strategies for effective implementation of Law Enforcement responsibilities under Endangered Species Act, CITES, Lacey Act, and State laws. These studies should be national in scope and address all cacti. The results of these studies will be used in development of Service policy on cactus trade problems and will allow for the drafting of a Comprehensive Trade Management Plan.

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PART III
IMPLEMENTATION SCHEDULE

Definition of Priorities

- Priority 1: All actions that are absolutely essential to prevent extinction of the species.
- Priority 2: All actions necessary to maintain the species' current population status.
- Priority 3: All actions necessary to provide for full recovery of the species.

Abbreviations Used in Implementation Schedule

BLM	Bureau of Land Management.
FWS	U.S. Fish and Wildlife Service.
LE	FWS, Law Enforcement.
NPS	National Park Service.
OES	FWS, Office of Endangered Species, Washington, D.C.
PAO	FWS, Public Affairs Office.
SE	FWS, Endangered Species.
UT	State of Utah.

Other Definitions

Biennial	Task which must be complemented on a 2-year cycle.
Continuous	Task which will be required over a very long or undetermined period of time.

GENERAL CATEGORIES FOR IMPLEMENTATION SCHEDULES

Information Gathering - I or R (research)

1. Population status
2. Habitat status
3. Habitat requirements
4. Management techniques
5. Taxonomic studies
6. Demographic studies
7. Propagation
8. Migration
9. Predation
10. Competition
11. Disease
12. Environmental contaminant
13. Reintroduction
14. Other information

Management - M

1. Propagation
2. Reintroduction
3. Habitat maintenance and manipulation
4. Predator and competitor control
5. Depredation control
6. Disease control
7. Other management

Acquisition - A

1. Lease
2. Easement
3. Management agreement
4. Exchange
5. Withdrawal
6. Fee title
7. Other

Other - O

1. Information and education
2. Law enforcement
3. Regulations
4. Administration

Implementation Schedule *Sclerocactus wrightiae*
(Wright fishhook cactus)

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GENERAL CATEGORY	PLAN TASK	TASK #	PRIORITY #	TASK DURATION	RESPONSIBLE AGENCY			FISCAL YEAR COSTS (EST.)			COMMENTS/NOTES	
					FWS	OTHER		FY-01	FY-02	FY-03		
					REGION	PROGRAM						
(1)	(2)	(3)	(4)	(5)	(6)	(6a)	(7)	(8)		(9)		
I1	Survey for population in Wayne & Emery Co's	1.1	2	3 years	6	SE			5,000	5,000	5,000	
I2	Delineate at least two widespread areas supporting the largest population as essential habitat	1.2	2	biennial	6	SE			3,000		3,000	Cost apportioned between agencies
I2	Revise essential habitat determinations as additional population, biological and habitat data becomes available	1.3	2	continuous	6	SE			500	500	500	reviewed at least biennially
I3	Analyze soil requirements	2.11	2	1 year	6	SE			2,000			duration & cost per inventory (to be conducted as needed)
									1,000			
R3	Analyze effects of disturbance of cryptogamic crust	2.12	2	continuous	6	SE			500	500		
									2,000	2,000		
									500	500		
									500	500		
I1	Determine pollination mechanisms	2.2	3	3 years	6	SE			2,000	2,000	2,000	
									3,000	3,000	3,000	
I6	Determine seedling and germination requirements	2.3	3	3 years	6	SE			1,000	1,000	1,000	
									1,000	1,000		
									500	1,000		
									500	1,000		

Implementation Schedule *Sclerocactus wrightiae*
(Wright fishhook cactus)

GENERAL CATEGORY	PLAN TASK	TASK #	PRIORITY #	TASK DURATION	RESPONSIBLE AGENCY			FISCAL YEAR COSTS (EST.) ₅			COMMENTS/NOTES	
					FWS		OTHER	FY-01	FY-02	FY-03		
					REGION	PROGRAM						
(1)	(2)	(3)	(4)	(5)	(6)	(6a)	(7)	(8)	(8)	(8)	(9)	
	I9	Investigate effects of larval predators	2.4	2	3 years	6	SE		500	500	500	
	01	Inform agencies (Federal & State) of plant locations on their lands	3.1	1	continuous	6	SE		2,000	2,000	2,000	
	04	Review agency activities in essential habitat	3.2	2	continuous	6	SE	BLM NPS others	1,000 250 250	1,000 250 250	1,000 250 250	SE costs will be covered by salaries of Section 7 personnel.
25	02	Enforcement of existing regulations	3.3	1	continuous	6	SE	BLM NPS	1,000 1,500 500	1,000 1,500 500	1,000 1,500 500	
	02	Develop law enforcement strategy	3.4	2	continuous	6	SE,LE		1,000	1,000	1,000	
	01	Conduct public information	3.5	3	continuous	6	PAO, LE	BLM	500 500	500 500	500 500	
	M3	Restrict land use to protect populations	3.6	1	continuous	6	SE	BLM			5,000	Costs should decrease once land use restrictions are identified & put into practice.
	M7	Develop a management plan	3.7	3	1 year	6	SE	BLM NPS UT			5,000	Cost apportioned between agencies

Implementation Schedule Sclerocactus wrightiae
(Wright fishhook cactus)

GENERAL CATEGORY	PLAN TASK	TASK #	PRIORITY #	TASK DURATION	RESPONSIBLE AGENCY			FISCAL YEAR COSTS (EST.)			COMMENTS/NOTES
					FWS		OTHER	FY-01	FY-02	FY-03	
					REGION	PROGRAM					
(1)	(2)	(3)	(4)	(5)	(6)	(6a)	(7)	(8)	(8)	(9)	
I1/ I2	Monitor populations & pursue down-listing, delisting, or revise recovery goals as needed	4	3	continuous	6	SE				1,500 2,000 1,000	
R7	Develop techniques to artificially propagate and transplant the Wright fishhook cactus	5	2	2 years	6	SE		5,000	5,000		
R14	Develop a comprehensive trade management plan for all cacti	6	2	1 year	9	OES		20,000			

PART IV

APPENDIX

COMMENTATORS ON THE TECHNICAL
AND AGENCY DRAFTS OF THE
WRIGHT FISHHOOK CACTUS RECOVERY PLAN

Director, U.S. Fish and Wildlife Service, Washington, D.C.

Field Supervisor, Salt Lake City Field Office, Endangered Species,
U.S. Fish & Wildlife Service, Salt Lake City, Utah

State Director, Utah State Office, Bureau of Land Management,
Salt Lake City, Utah

State of Utah, Natural Resources and Energy: Division of Wildlife
Resources;

State of Utah, Natural Resources: Division of Oil, Gas & Mining

W. Richard Hildreth, Director of the State Arboretum of Utah, University of
Utah, Salt Lake City, Utah

J. Scott Peterson, Colorado Heritage Inventory

Robert W. Lichvar, Wyoming Heritage Program

Kathryn M. Mutz, Kaysville, Utah