Recovery Plan

for the

Uinta Basin

Hookless Cactus

UINTA BASIN HOOKLESS CACTUS

SCLEROCACTUS GLAUCUS

RECOVERY PLAN

Prepared by

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Date: SEPT. 27, 1990

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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 course 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

Year	Need 1	Need 2	Need 3	Need 4	Total
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.

Population Name	Numbers of Individual Plants[a]	
	Documented Size	Estimated Size
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.

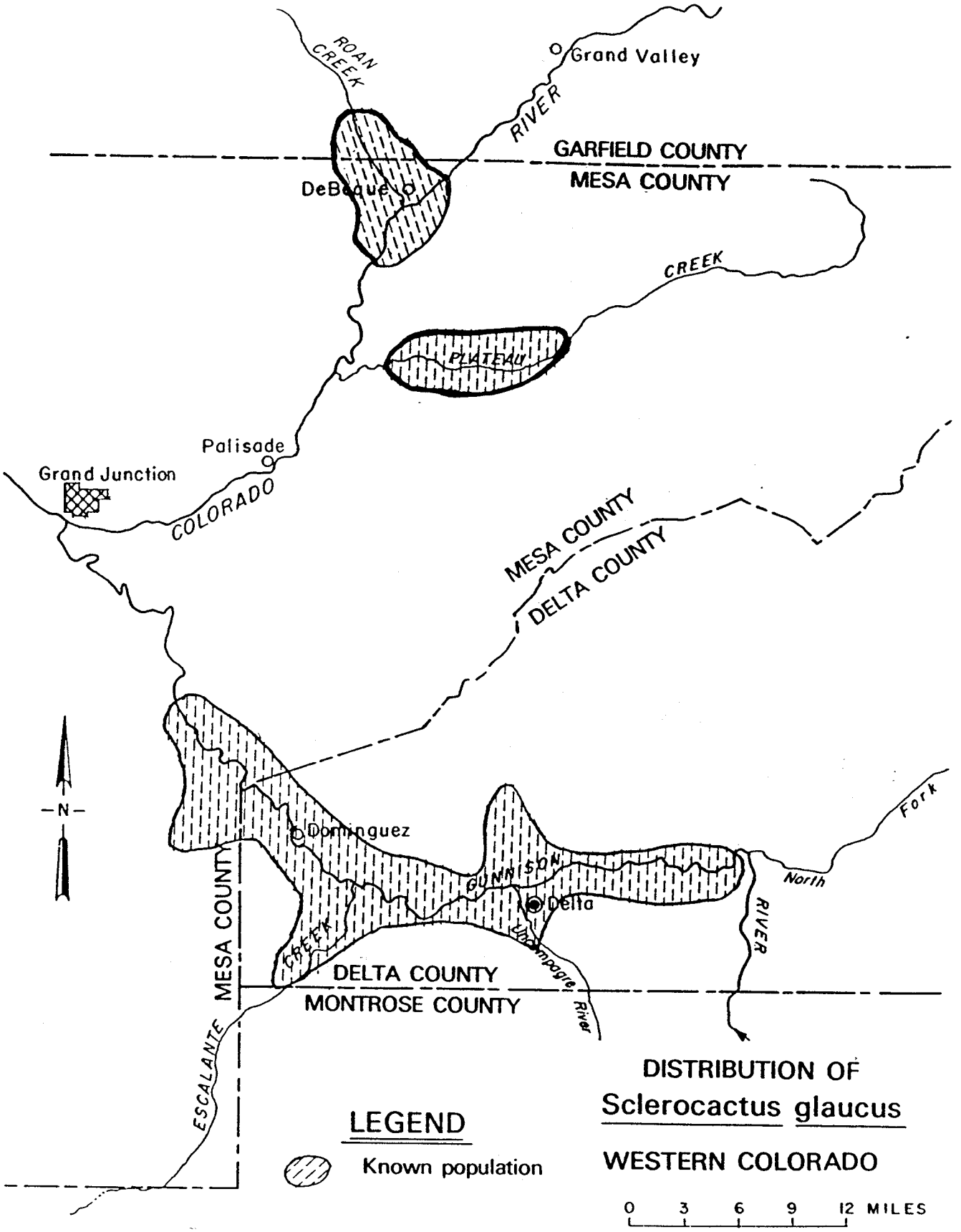

Figure 1. Distribution of Sclerocactus glaucus (Uinta Basin hookless cactus) in Colorado.

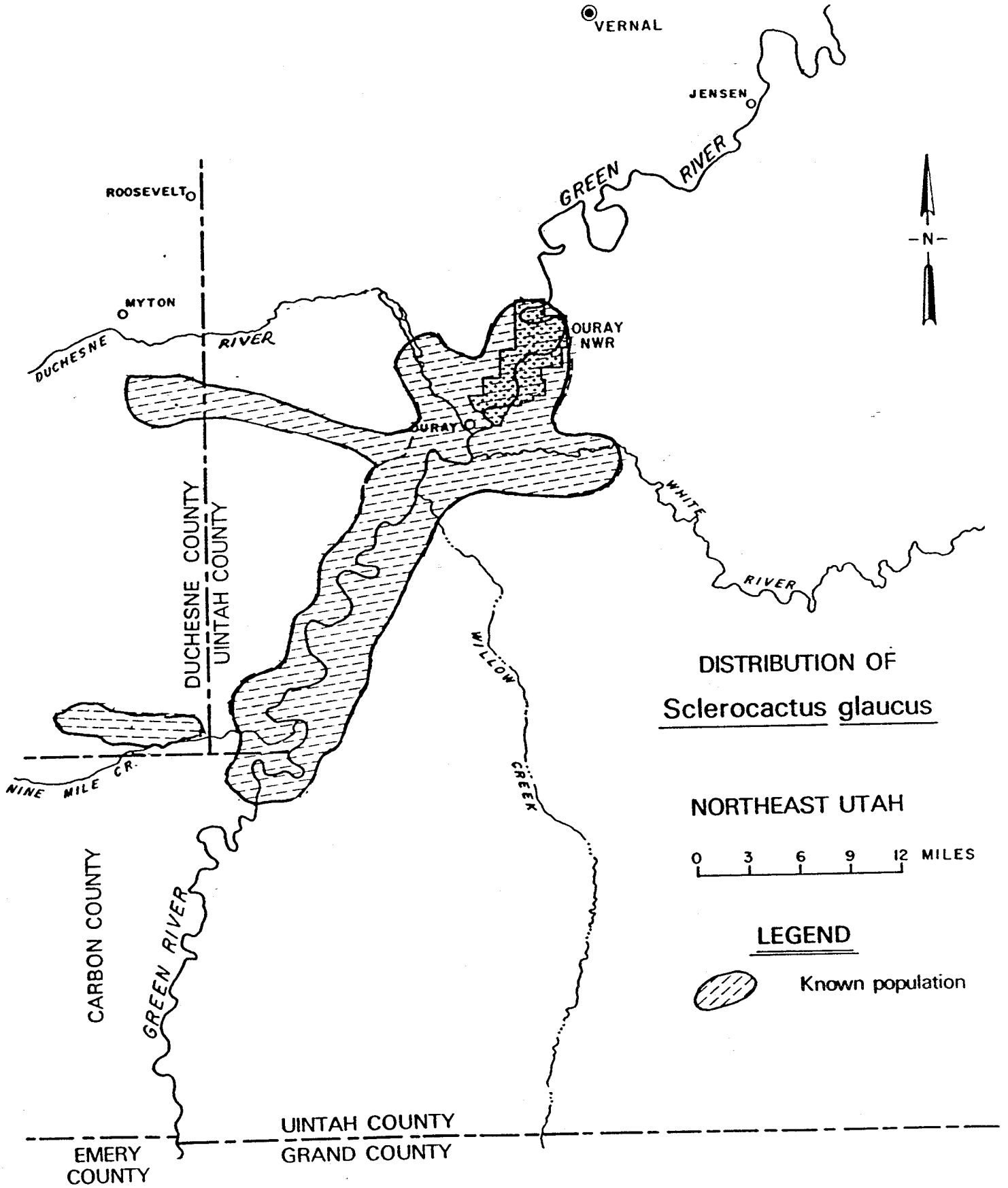

Figure 2. Distribution of Sclerocactus glaucus (Uinta Basin hookless cactus) in Utah.

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 cobblely, 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 were 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 overgrazing 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 courses 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 statues, 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: FWS Region	Responsible Party: FWS Program	Responsible Party: Other	Cost Estimates FY-91	Cost Estimates FY-92	Cost Estimates FY-93	Comments
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			
2	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 un-authorized 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: FWS Region	Responsible Party: FWS Program	Responsible Party: Other	Cost Estimates FY-91	Cost Estimates FY-92	Cost Estimates FY-93	Comments
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.