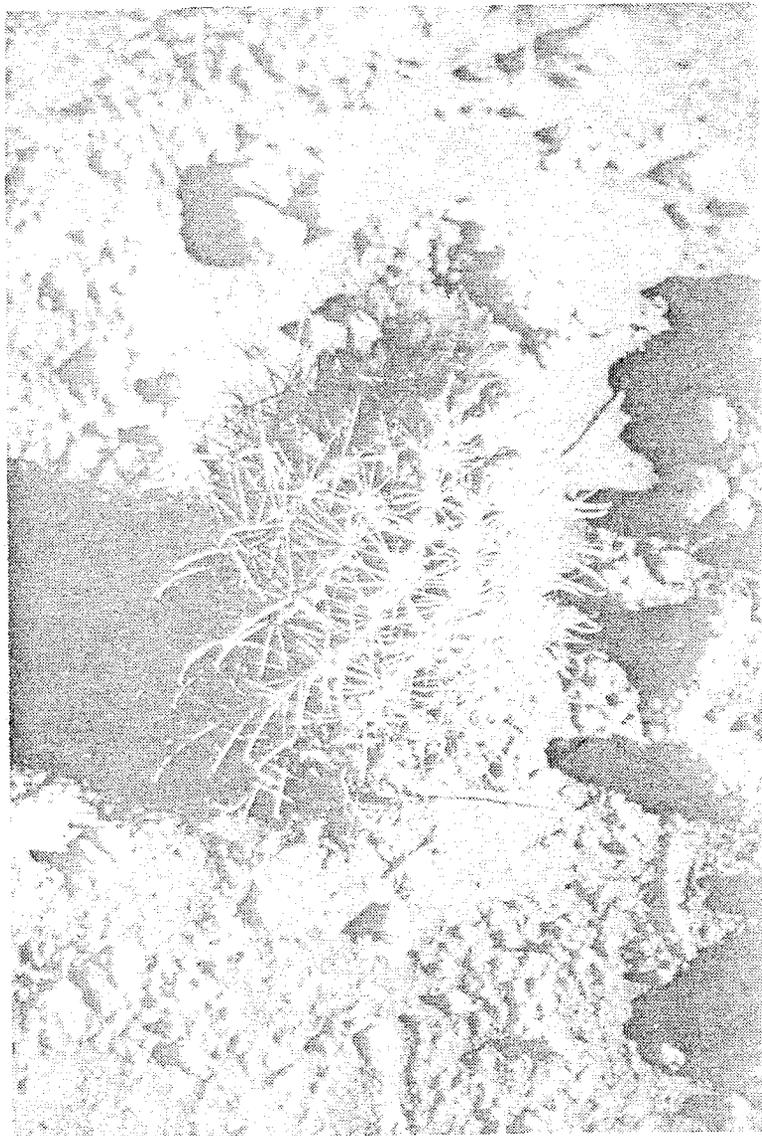
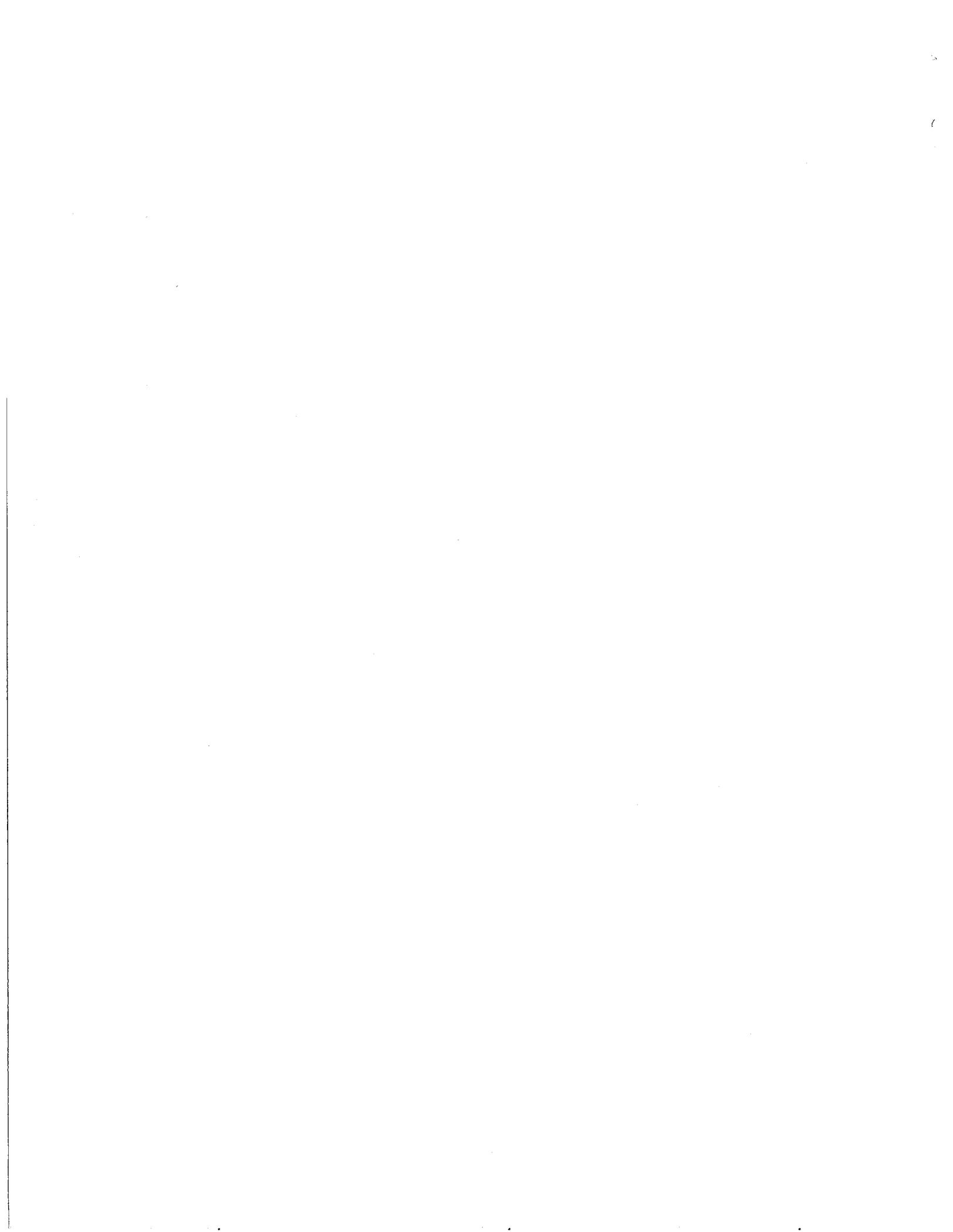


WRIGHT FISHHOOK CACTUS
(SCLEROCACTUS WRIGHTIAE BENSON)

RECOVERY PLAN





WRIGHT FISHHOOK CACTUS
SCLEROCACTUS WRIGHTIAE BENSON
RECOVERY PLAN

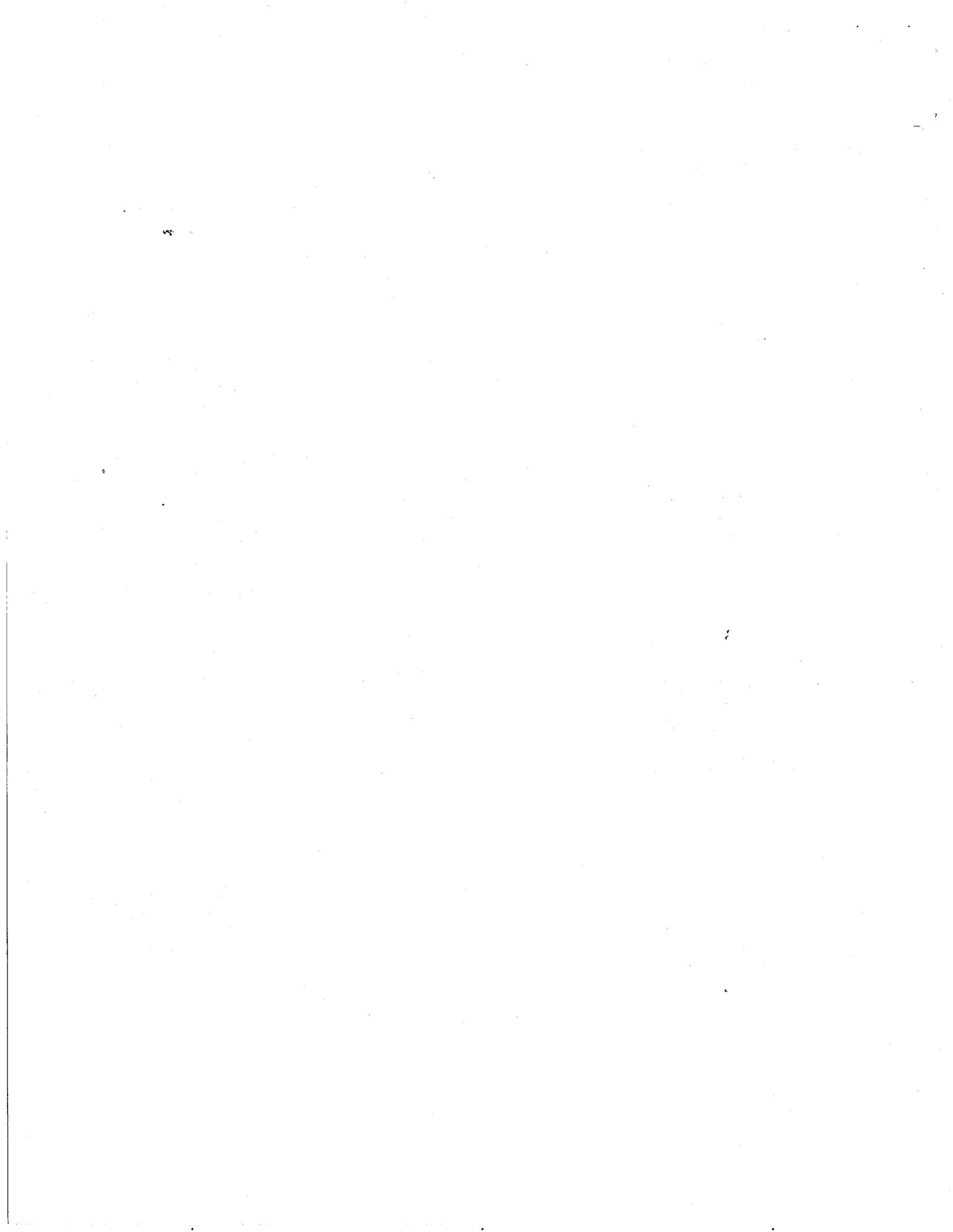
Prepared by the
Wright Fishhook Cactus Recovery Committee

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

APPROVED

DATE: 12-24-85

U.S. Fish and Wildlife Service: *Nolan B. Stelapf*
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.

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Literature citation should read as follows:

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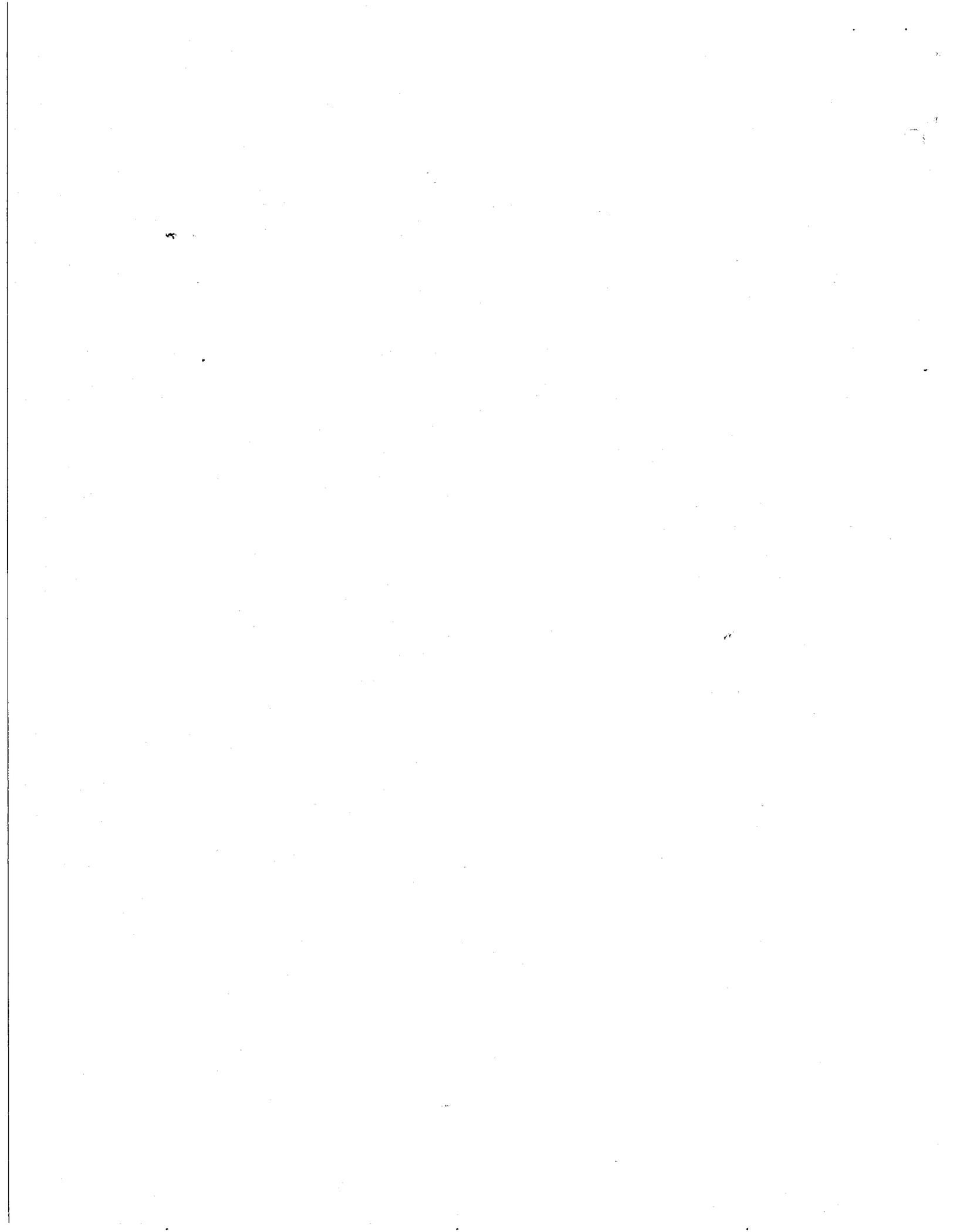
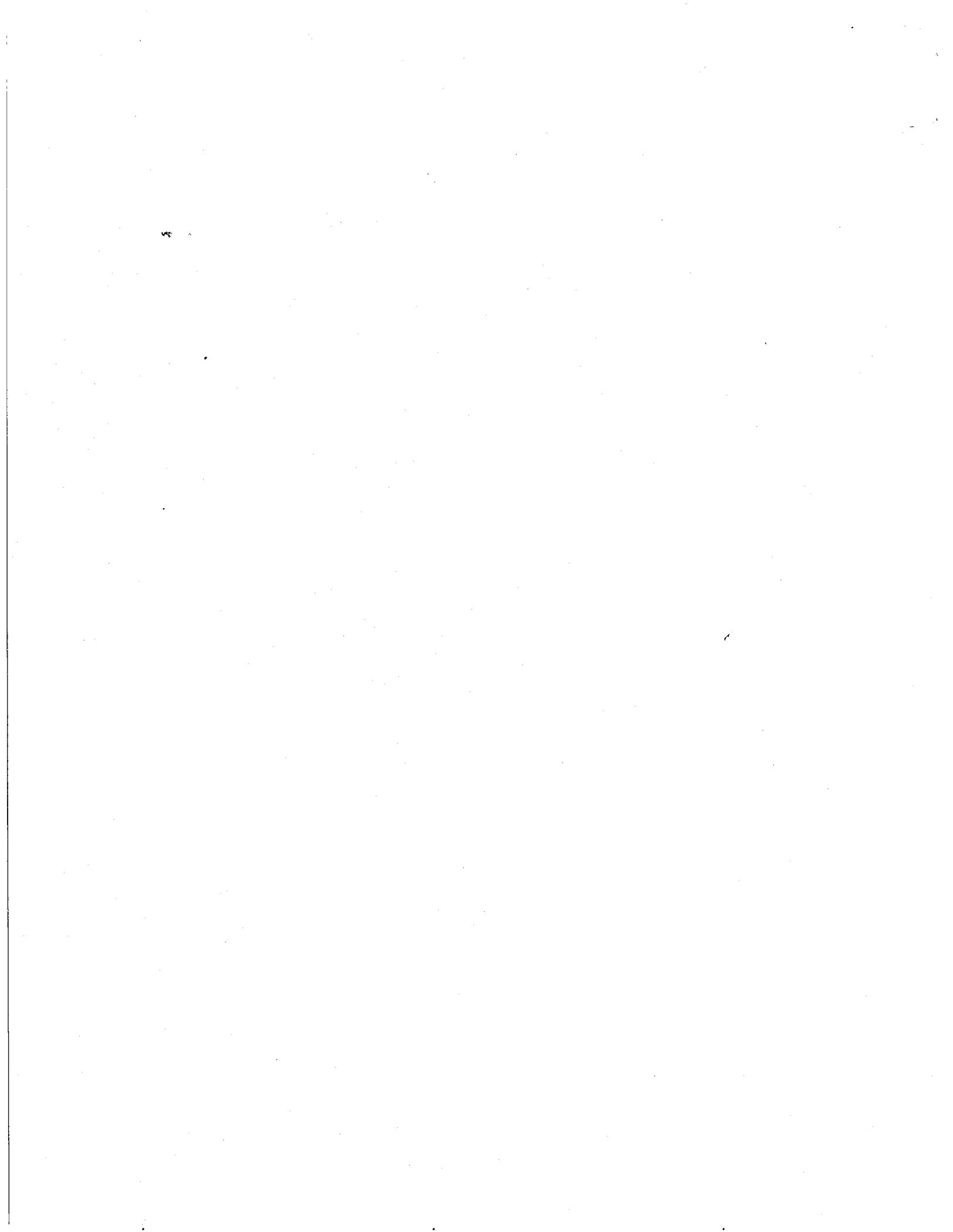


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PART I

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; sepaloids with light reddish-brown, reddish-green, or lavender middles and pale pink to white margins, the larger obovate-oblongate, 5-12 mm long, 3-8(12) mm broad, rounded, entire to undulate or with irregular minute teeth; petaloids nearly white to pink, midribs brownish, largest lanceolate to oblongate, 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.

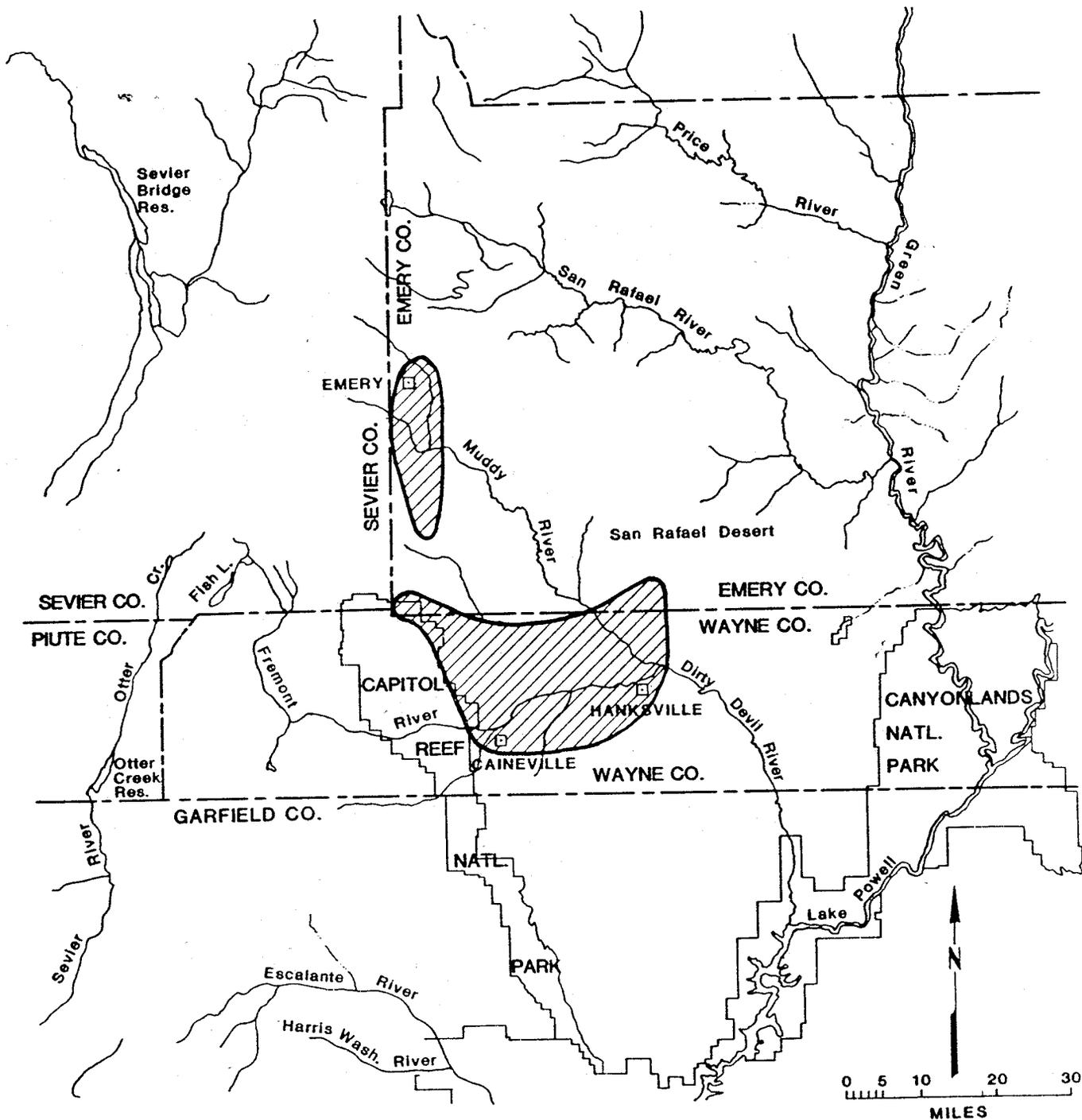


FIG.1 DISTRIBUTION OF THE WRIGHT FISHHOOK CACTUS

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.

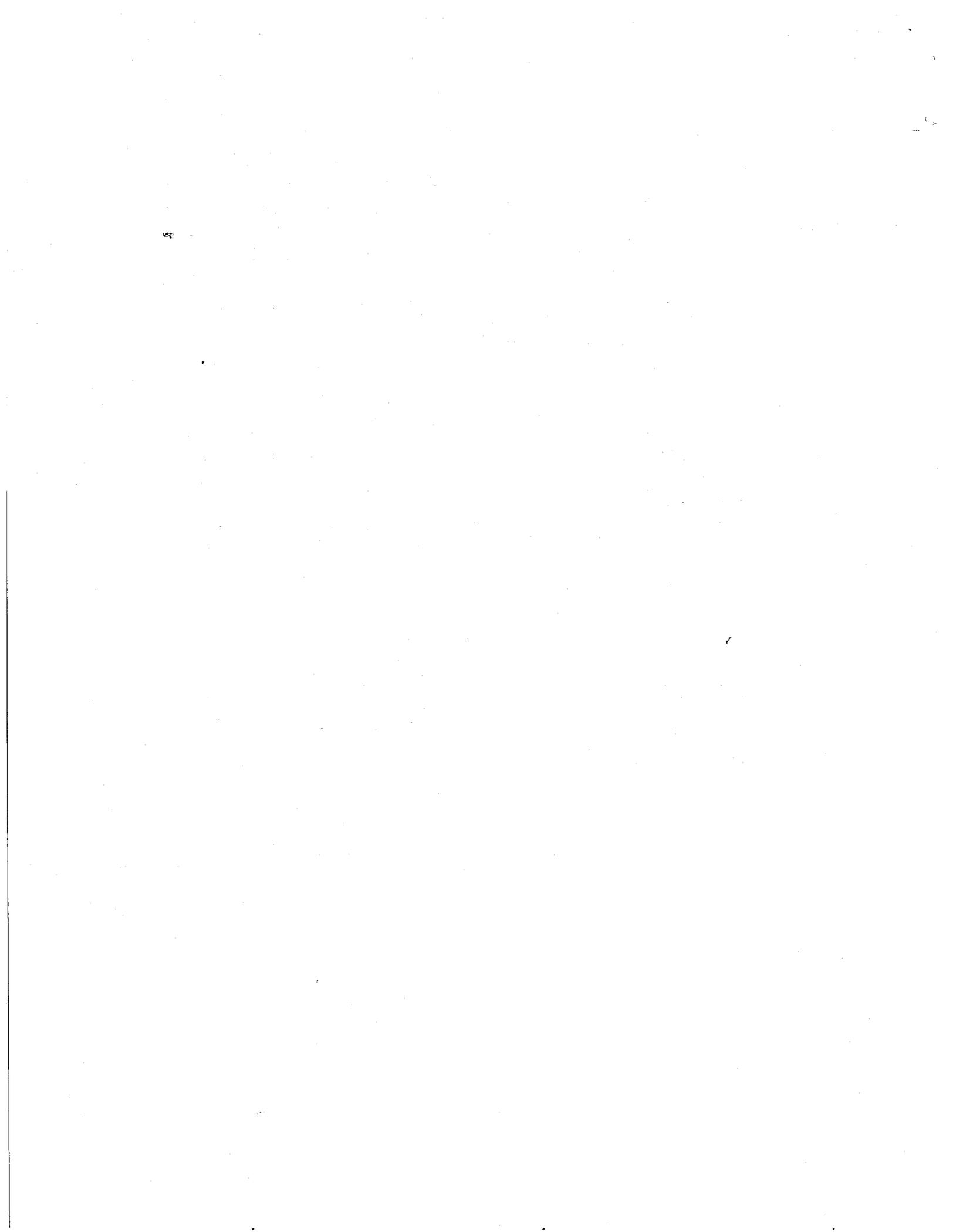
There has been some uranium exploration drilling in the area but little or none in the past 3 years. Some oil and gas permits have been issued for areas further south at Mt. Ellen.

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)

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
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	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	1,000	1,000	duration & cost per inventory (to be conducted as needed)
R3	Analyze effects of disturbance of cryptogamic crust	2.12	2	continuous	6	SE		500	2,000	500	
I1	Determine pollination mechanisms	2.2	3	3 years	6	SE		2,000	2,000	2,000	
I6	Determine seedling and germination requirements	2.3	3	3 years	6	SE		3,000	3,000	3,000	

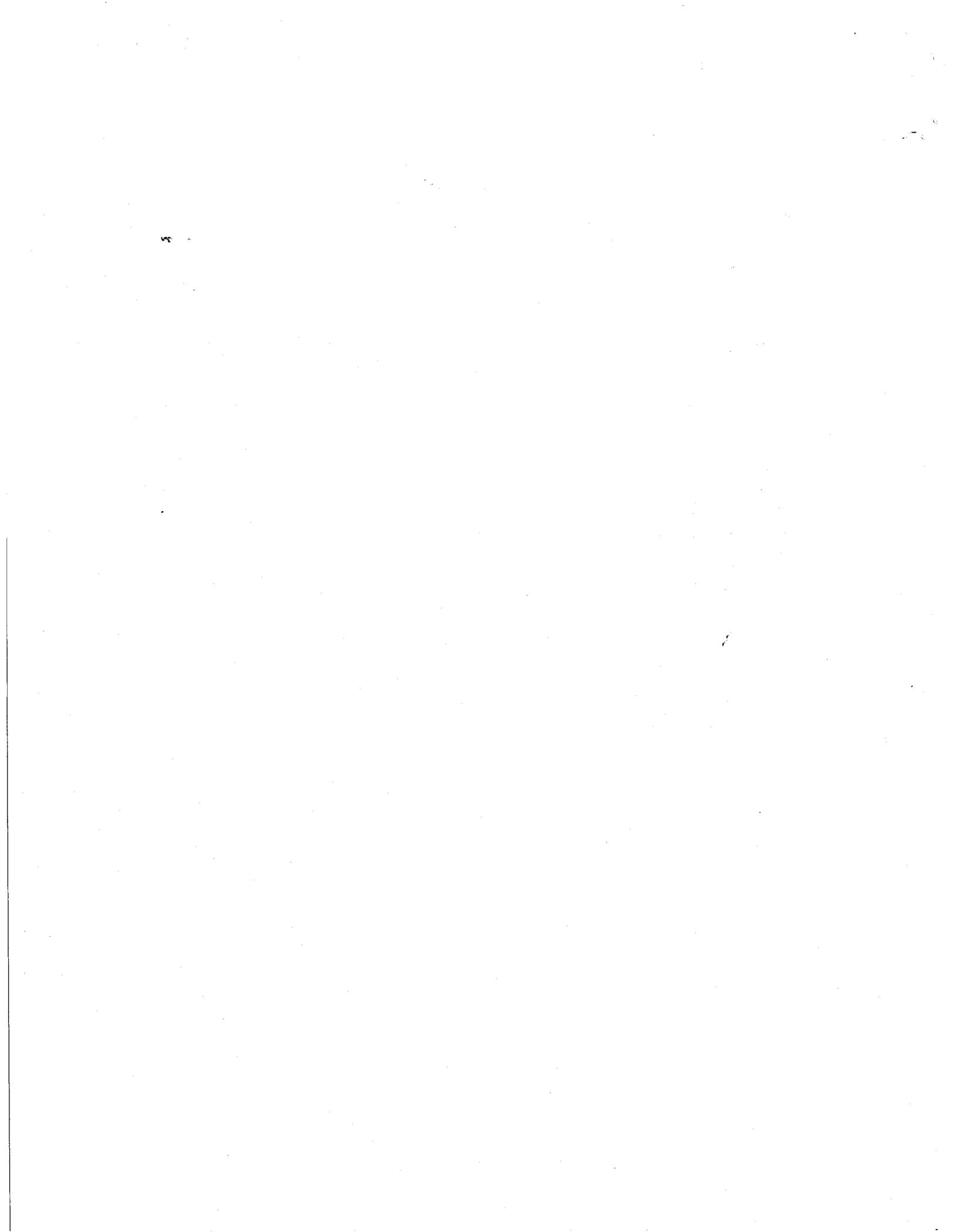
Implementation Schedule *Sclerocactus wrightiae*
(Wright fishhook cactus)

GENERAL CATEGORY	PLAN TASK	TASK #	PRIORITY #	TASK DURATION	RESPONSIBLE AGENCY		FISCAL YEAR COSTS (EST.)			COMMENTS/NOTES	
					FWS REGION	PROGRAM	FY-01	FY-02	FY-03		
(1)	(2)	(3)	(4)	(5)	(6)	(6a)	(7)	(8)	(9)		
19	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.
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)

4

GENERAL CATEGORY	PLAN TASK	TASK #	PRIORITY #	TASK DURATION	RESPONSIBLE AGENCY		FISCAL YEAR COSTS (EST.)	COMMENTS/NOTES	
					FWS REGION	OTHER PROGRAM			
(1)	(2)	(3)	(4)	(5)	(6)	(6a)	(7)	(8)	(9)
I1/ I2	Monitor populations & pursue down-listing, delisting, or revise recovery goals as needed	4	3	continuous	6	SE	BUM NPS	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
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J. Scott Peterson, Colorado Heritage Inventory

Robert W. Lichvar, Wyoming Heritage Program

Kathryn M. Mutz, Kaysville, Utah

