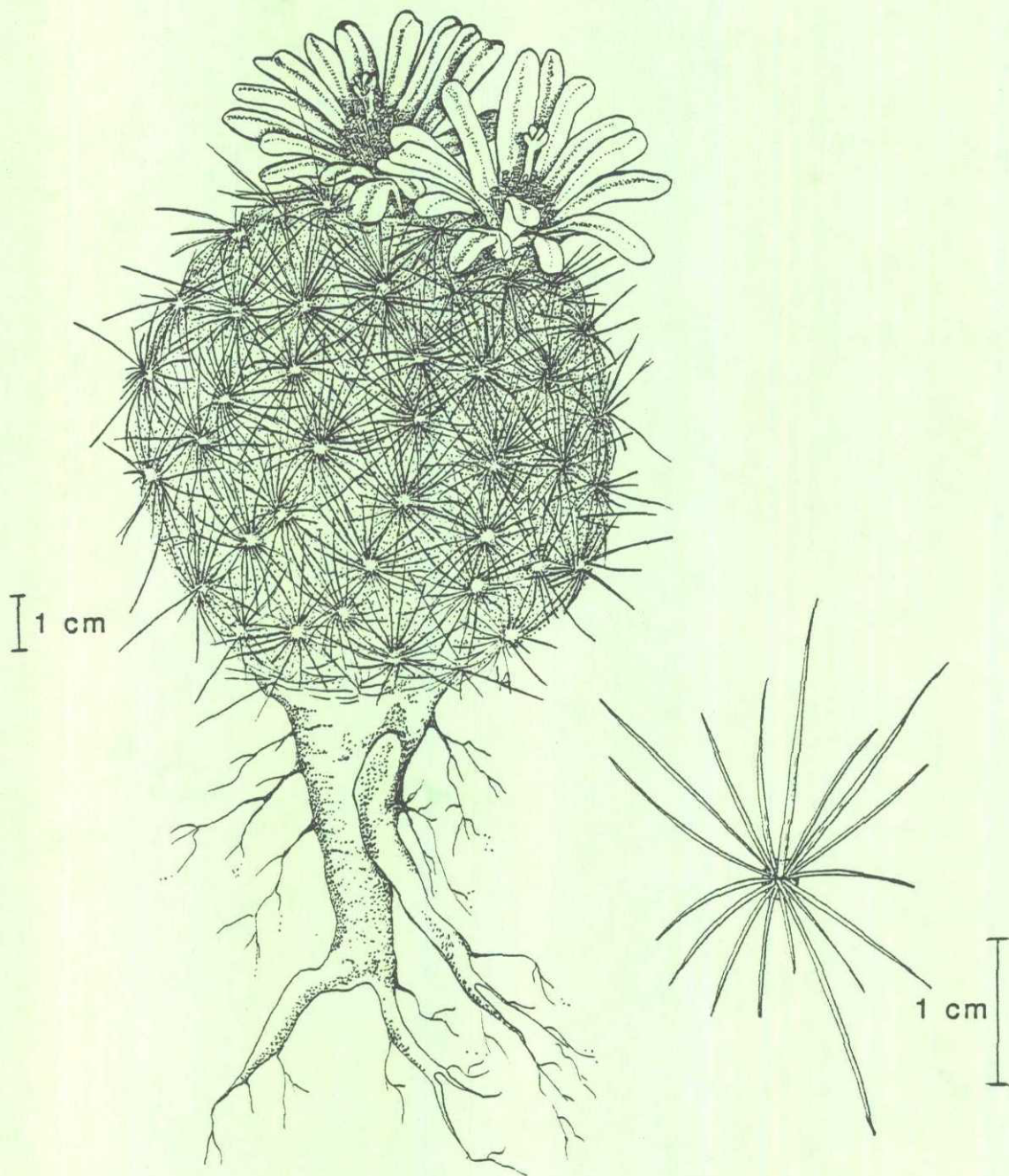


# LLOYD'S MARIPOSA CACTUS

*(Neolloydia mariposensis)*

## RECOVERY PLAN



LLOYD'S MARIPOSA CACTUS

(Neolloydia mariposensis)

RECOVERY PLAN

1989

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#### DISCLAIMER

This is the completed Lloyd's Mariposa 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 does not necessarily represent the views of all individuals who played a role in preparing this plan. This plan is subject to modification as dictated by new findings, 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 constraints.

Literature Citations should read as follows:

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## SUMMARY

- Goal:** To remove the Lloyd's Mariposa cactus from the Federal list of endangered and threatened species by managing the species in a way that will ensure the continued existence of natural self-sustaining populations.
- Recovery Criteria:** The criteria for delisting the Lloyd's Mariposa cactus will be to identify at least three sites where the species can be protected and then carry out protective management measures. One site should be on private land in northeastern Brewster County, one site should be in Big Bend National Park, and one site should be in Mexico. Each site should initially contain at least 1,000 plants, and should have enough available habitat to permit population expansion and growth. The species can be delisted when monitoring and habitat surveys indicate that a total of at least 20,000 plants is being sustained at the protected and managed sites.
- Actions Needed:** The major steps needed to meet the recovery criteria include: protecting populations on public land through law enforcement and protective management, protecting populations on private land through landowner cooperation and protective management, protecting populations in Mexico through cooperation with the Mexican government or Mexican conservation groups, monitoring populations to determine population and habitat changes, gathering biological information that can be used in management, conducting inventories to accurately determine range and abundance of plants, and developing public support for preservation of the Lloyd's Mariposa cactus.

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## PART I

### INTRODUCTION

#### Brief Overview

The Lloyd's Mariposa cactus, Neolloydia mariposensis (Hester) L. Benson, was listed as a threatened species under the Endangered Species Act on November 6, 1979 (USFWS 1979). It is also listed as threatened by the state of Texas. This species is known from the Big Bend Region of southwestern Texas and from adjacent Coahuila, Mexico. No other members of this genus are currently listed as threatened or endangered; however, three members of the genus are under review for possible listing (USFWS 1985).

The objective of this plan is to outline steps for recovery of the Lloyd's Mariposa cactus by achieving long-term stability of its populations in the wild, and by removing and preventing threats to the species and its habitat. Attainment of these goals will lead to the ultimate objective of removal of the Lloyd's Mariposa cactus from the list of threatened and endangered species.

This plan begins with background information on the Lloyd's Mariposa cactus that includes taxonomy, morphology, habitat and associated species, distribution, population biology and phenology, land ownership, threats, and conservation efforts. This information

is followed by a step-down outline and narrative that provide information on recovery measures. The final section of this plan contains an implementation schedule that lists the recovery measures, priorities for their accomplishment, agencies involved, and estimated costs.

### Taxonomy

The Lloyd's Mariposa cactus was first collected by Mr. J. Pinckney Hester at the Mariposa Mine in southwestern Texas and was described by him as Eschinomastus mariposensis (Hester 1945). In 1969, Dr. Lyman Benson described several new cactus species and made many nomenclatural combinations. At that time, Benson placed the Lloyd's Mariposa cactus into the genus Neolloydia (Benson 1969). Many cactus experts feel that the original name, Echinomastus mariposensis, best reflects the correct taxonomic placement of this species (Glass and Foster 1975; Edward Anderson, Whitman College, Walla Walla, Washington, pers. comm., 1984; Zimmerman 1985). In his book Cacti of the Southwest, Weniger (1970) uses the name Echinocactus mariposensis; however, this nomenclatural combination should not be used because the rules of botanical nomenclature were not followed in its publication.

### Morphology

The stems of Neolloydia mariposensis are ovoid-cylindroid, up to 10 cm (3.9 inches) tall, and 4 to 6 cm (1.6 to 2.4 inches)



in diameter. The 4 to 7 central spines per areole are white, gray, or pale yellow toward the base with light brown or bluish-gray tips. The upper 3 to 6 central spines spread upward and are often somewhat appressed against the upper radial spines. The upper central spines are 1.3 to 2.0 cm (0.5 to 0.8 inch) long; the lower central spine is porrect (directed outward and forward) or curves downward and is 0.5 to 1.3 cm (0.2 to 0.5 inch) long. The 25 to 36 radial spines per areole are white to gray, sometimes tipped with light brown, and 0.5 to 1.1 cm (0.2 to 0.4 inch) long. The flowers are white, or pinkish fading to white with age, up to 3 cm (1.2 inches) long and of about equal diameter. Fruits are yellowish-green, globose or oblong, and up to 1 cm (0.4 inch) long. Seeds are black, ovate, and slightly over 1.5 mm (0.6 inch) long (Weniger 1970).

Benson's description of the species is similar to Weniger's but differs by stating that there are 2 to 4 central spines per areole and that the flowers are about 2.5 cm (1 inch) long and 4 cm (1.6 inches) in diameter (Benson 1982).

#### Habitat and Associated Species

Lloyd's Mariposa cactus is found on hills and the lower slopes of mesas at elevations between 750 and 1,050 meters (2,500-3,500 feet). The geologic formations are various Quaternary deposits, the Tertiary aged Chisos Formation, and various Cretaceous aged formations composed primarily of lime-

stone. The Cretaceous formations include the Santa Elena, Sue Peaks, Del Carmen, Telephone Canyon, Boquillas, Glen Rose, Del Rio Clay, Aguja, and Pen. The soils are alkaline and very rocky, composed primarily of crumbling limestone gravel. The specific soil series are the Chamberino, Lajitas, Lozier, Mariscal, Pantera, Solis, Tornillo, and Upton-Nickel. Plants occur in full sun in patches of limestone chips, and the reflection from the whitish rocks raises the heat and light radiation to extremes. The regional mean annual temperature is about 64° F and the mean annual total precipitation varies from 10 inches (25 cm) on the western edge of the species' range to 14 inches (35 cm) on the eastern edge (USFWS 1986).

Lloyd's Mariposa cactus occurs in the Chihuahuan desertscrub biotic community (Brown and Lowe 1980). The habitat is very open with a few shrubs and a great diversity of small perennial xerophytes. In at least two sites, Lloyd's Mariposa cactus grows with the bunched cory cactus (Coryphantha ramillosa), which is also a threatened species (USFWS 1986). Other plants typically associated with Lloyd's Mariposa cactus include:

Acacia constricta

Jatropha dioica

Agave lecheguilla

Krameria glandulosa

Asclepias oenotheroides

Larrea tridentata

Bouteloua breviseta

Leucophyllum candidum

Buddleja marrubiifolia

Macrosiphonia hypoleuca

Calliandra conferta

Microrhamnus ericoides

|                                  |                            |
|----------------------------------|----------------------------|
| <u>Castilleja</u> sp.            | <u>Prosopis glandulosa</u> |
| <u>Dasyllirion leiophyllum</u>   | <u>Selaginella</u> sp.     |
| <u>Hechtia scariosa</u>          | <u>Tiquilia gossypina</u>  |
| <u>Euphorbia antisyphilitica</u> | <u>T. greggii</u>          |
| <u>Fouquieria splendens</u>      | <u>Yucca torreyi</u>       |

Typically associated cacti include:

|  |  |
|--|--|
| <u>Ariocarpus fissuratus</u>                                 | <u>Ferocactus hamatacanthus</u>              |
| <u>Coryphantha albicolumnaria</u>                            | <u>Mammillaria lasiacantha</u>               |
| <u>C. duncanii</u>   | <u>M. pottsii</u>                            |
| <u>C. echinus</u>  | <u>Opuntia engelmannii</u>                   |
| <u>Echinocactus</u><br><u>horizontalis</u>                   | <u>O. leptocaulis</u>                        |
| <u>Echinocereus enneacanthus</u><br>var. <u>enneacanthus</u> | <u>O. phaeacantha</u> var.<br><u>brunnea</u> |
| <u>E. pectinatus</u> var.<br><u>neomexicanus</u>             | <u>O. phaeacantha</u> var.<br><u>major</u>   |
| <u>E. stramineus</u>   | <u>O. rufida</u>                             |
| <u>Echinomastus warnockii</u>                                | <u>O. schottii</u>                           |
| <u>Epithelantha bokei</u>                                    |  |

#### Distribution

The Lloyd's Mariposa cactus occurs as scattered individuals or occasionally as dense concentrations on hills and ridges in three parts of the Big Bend Region of Texas (Figure 1). One area occupies the southeastern corner of Brewster County, another

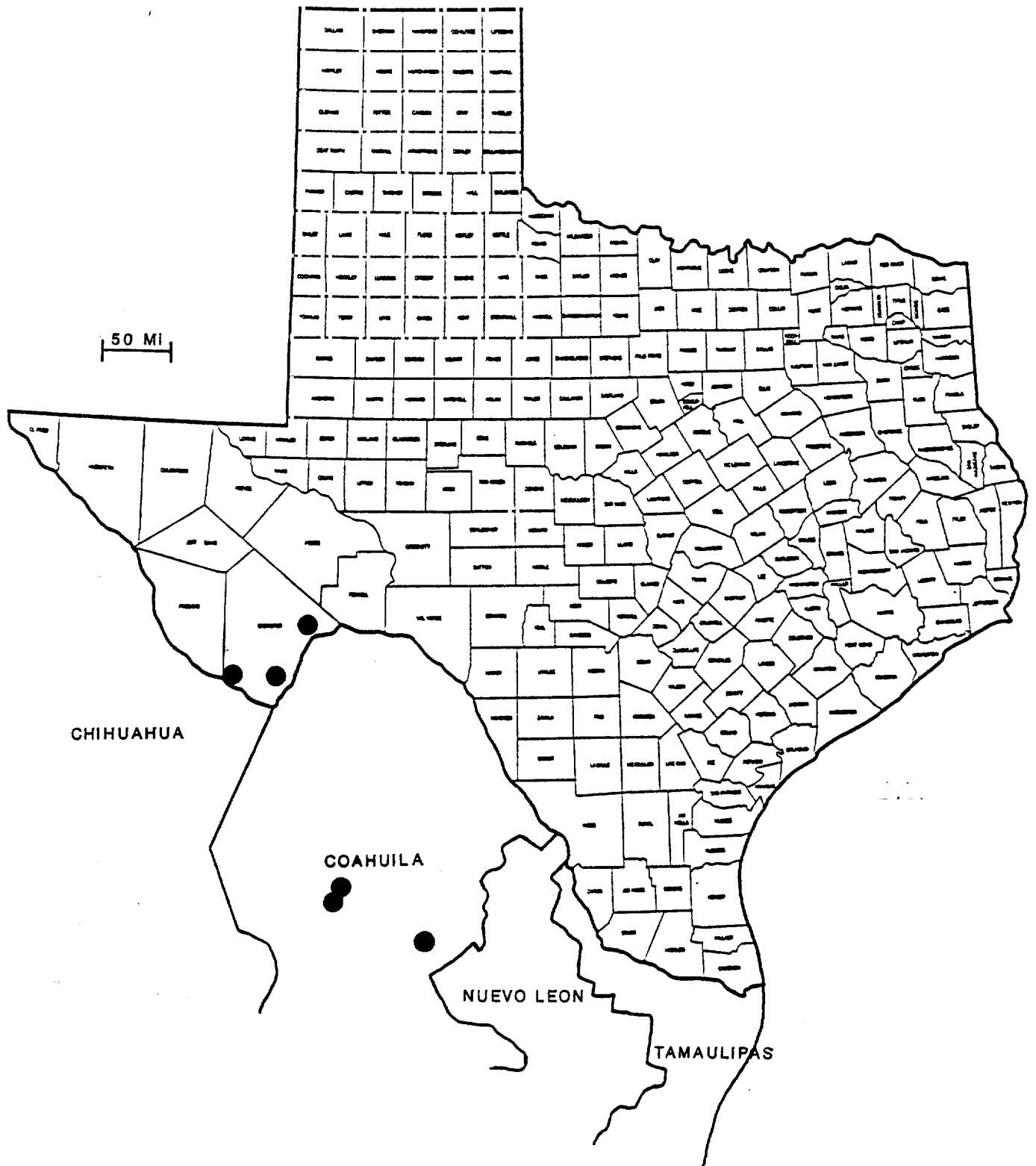


Figure 1. General location of Neolloydia marinosensis.

area occupies the northeastern portion of Big Bend National Park, and a third area occupies the eastern portion of Brewster County north of Black Gap Wildlife Management Area (USFWS 1986).

Herbarium specimens document three occurrences of Lloyd's Mariposa cactus in Coahuila, Mexico. One specimen is from near Monclova, and two are from near Cuatrociénegas (USFWS 1986).

#### Population Biology and Phenology

The Lloyd's Mariposa cactus has a patchy distribution. Within its three areas of occurrence in the United States, it is found as scattered individuals or occasionally as dense colonies on the tops of small hills or on rocky flats below hills. This type of distribution makes it difficult to determine the number of individuals within populations or to make any realistic estimates about the total number of plants over the species' entire range. Information on microhabitat requirements and demography of populations is also lacking. Seedlings have been observed in many populations, but the seedling establishment rate has not been determined. In the past, the cactus has been heavily collected in southwestern Brewster County (Weniger 1970). Collecting in this area must have had a large impact because older plants are exceedingly rare. The populations in Big Bend National Park, however, have many large specimens, which indicates that little collecting occurs in the park.

Lloyd's Mariposa cactus blooms from February to early March. Flowers open in the mid-afternoon during the warmest part of the day and last 3-4 days. Fruits form in April. If cross pollinated, nearly all of the flowers produce fruits. Ripe fruits split open on one side, releasing the seeds that are believed to be dispersed by water, wind, and ants. The average number of seeds per fruit is 22. Safe sites for seeds are generally under rocks or deep in the cracks of rocks where the seeds are protected from dessication and predation.

#### Land Ownership

Neolloydia mariposensis is found on Federal land in Big Bend National Park and on private land. Much of the private land in southwestern Brewster County is owned by the Lajitas Museum and Desert Garden under the auspices of the Lajitas Foundation. The private land north of Black Gap Wildlife Management Area is owned by ranchers. The type locality of the Lloyd's Mariposa cactus is on land owned by Villa de la Mina, a guest ranch in the Lajitas-Terlingua area.

#### Impacts and Threats

At the turn of the century, quicksilver mining (mercury) at the Terlingua and Mariposa mines was a major threat to Neolloydia mariposensis. Significant disturbance to the Neolloydia populations probably took place as a result of these

mines. Mining continued until 1946, and mercury is still present in the Boquillas Formation. Because coal and petroleum are also found there (Maxwell 1979), mining and drilling activities remain potential threats.

Habitat disturbance by off-road vehicles is a problem in the Lajitas-Terlingua region. As the population of Lajitas continues to grow owing to its promotion as a recreation and retirement community, off-road vehicle use and other problems associated with development will likely increase.

Grazing is a threat in the northern part of the species' range, mainly through the effects of livestock trampling. The ranch land around Reagan Canyon appears to be heavily grazed.

Collecting has had the largest impact on Neolloydia mariposensis and remains the greatest threat. Most of the past collecting was done by professional cactus-digging crews. Many of the plants were sold in curio stores, nurseries, supermarkets, dime stores, etc. Caches of cacti were occasionally abandoned by professional collectors; these plants sunburned and died in a short time (Weniger 1970).

Because no monitoring data are available, it is difficult to determine the present impact of collecting on Neolloydia mariposensis. Apparently, many collectors know of the Villa de la Mina site, because very few adult and only scattered juvenile

plants are found. The Lloyd's Mariposa cactus populations in Big Bend National Park are difficult to reach and it appears that very little, if any, collecting has occurred there. Collecting is illegal within the park. Because of the species' limited distribution, it remains highly vulnerable to collecting. Monitoring studies would help determine the present collecting threat.

#### Conservation and Research Efforts

Lloyd's Mariposa cactus was listed as a threatened species under the Endangered Species Act in 1979. Little additional work occurred on the species until recently (1983-1985), when the National Park Service issued a contract to study sensitive and rare cacti in Big Bend National Park. This study (Heil et al. 1985) has extended the known distribution of Lloyd's Mariposa cactus. More, however, needs to be learned about the species' demography, edaphic requirements, and natural or human-influenced population changes.

On July 29, 1983, Neolloydia mariposensis was placed on Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which requires permits from both the importing and exporting countries before shipment of field-collected plants may occur. Only scientific trade benefiting the species' survival is allowed.



The Endangered Species Act of 1973, as amended in 1982, prohibits the removal (from Federal lands) and reduction to possession of plants listed under the Act. It also prohibits interstate or foreign commerce in listed plant species. Under certain circumstances, permits can be obtained to carry out otherwise prohibited activities. Section 7 of the Act requires all Federal agencies to consult with the Fish and Wildlife Service if any activities they authorize, permit, or fund might affect a threatened or endangered species. If the activities are found to jeopardize the continued existence of a species, the activities cannot proceed unless modifications are made that will remove the jeopardy situation. This provision of the Endangered Species Act most often applies to activities on lands under Federal management but it also applies to activities on private lands if a Federal agency is involved.

The Lacey Act, as amended in 1981, also provides some protection for the Lloyd's Mariposa cactus. Under this act, it is prohibited to import, export, sell, receive, acquire, purchase, or engage in the interstate or foreign commerce of any plant taken, possessed, or sold in violation of any law, treaty, or regulation of the United States, any Indian tribal law, or any law or regulation of any State.

Neolloydia mariposensis is on the Texas State protected plant list. Under Texas law, a scientific collecting permit is required for plant collection on State lands; permits are issued

only for scientific or educational activities that benefit the species. Collection from private lands for commercial purposes requires written permission from the landowner and a State commercial collecting permit. Each field collected plant must be tagged and the tag must stay attached until the plant reaches its ultimate destination.

## PART II

### RECOVERY

#### Primary Objective

This plan outlines a program that when implemented should remove threats to the Lloyd's Mariposa cactus and ensure that healthy natural populations can be sustained. The primary actions for meeting these objectives are:

1. Develop and implement management measures that will ensure the continued protection of at least three sites where populations occur. The three sites should represent the full geographic range of the species with one site in northeastern Brewster County on private land, one site in Big Bend National Park, and one site in Mexico. Each site should initially contain at least 1,000 plants, and should have adequate suitable habitat to permit population expansion and growth.
2. Develop and implement cooperative law enforcement strategies to provide protection against illegal collecting both on public and on private lands.

3. Search potential habitat and accurately determine population locations, area occupied, and number of plants.
4. Establish permanent monitoring plots to determine population changes. The plots should be censused at least annually.

Actions necessary for delisting include:

1. Identifying at least three sites (using the criteria on the previous page) where the species will be protected.
2. Carrying out management measures that are determined to be necessary for continued protection of the three sites and for the general protection of the species and its habitat.
3. Demonstrating long-term stability or increase in population levels and habitat through monitoring and habitat surveys. A total of 20,000 plants at protected and managed sites must be sustained. This figure is higher than might otherwise be needed because of the degree of collecting threat to this species.

These criteria will be evaluated for adequacy upon attainment and prior to delisting.

Step-down Outline

1. Remove threats to Neolloydia mariposensis by enforcement of existing regulations and management for protection.
  11. Protect the populations on Federal land.
    111. Enforce existing Federal and State laws.
    112. Conduct consultations under Section 7 of the Endangered Species Act.
    113. Develop and implement management measures.
    114. Identify areas for protection.
    115. Seek National Park Service cooperation.
    116. Monitor the populations and habitat.
  12. Protect populations on private lands.
    121. Enforce existing trade laws.
    122. Conduct consultations under Section 7 of the Endangered Species Act.
    123. Develop cooperation with private landowners.
    124. Develop and implement species management plans.
    125. Monitor the populations and habitat.
  13. Protect populations in Mexico.
2. Gather information for use in management.
  21. Inventory a sufficient proportion of suitable habitat to enable an accurate estimate of range, occupied habitat, and number of plants.
  22. Study the population biology and ecology of the Lloyd's Mariposa cactus.

221. Study soil needs.
  222. Study water needs.
  223. Determine the role of animals in seed dispersal.
  224. Determine the microhabitat factors involved in seedling establishment.
  225. Determine pollinators.
  226. Monitor population numbers to determine which trends result from natural cycles and which result from human impacts.
23. Apply the results of studies done under task 22.
    231. Determine environmental parameters defining and restricting the species' habitat.
    232. Update management measures.
3. Develop a comprehensive trade management plan for all cacti.
  4. Refine propagation techniques to provide nursery stocks and seeds, thereby reducing collecting pressure.
    41. Investigate various methods of propagation.
    42. Publish propagation techniques in cactus journals.
  5. Establish populations at the botanical gardens of research institutions.
  6. Develop public awareness, appreciation, and support for preservation of the Lloyd's Mariposa cactus.
    61. Use pamphlets, talks, and slide shows to increase the public's knowledge of the Lloyd's Mariposa cactus.

62. Enlist the support of public interest groups for protection and preservation of the Lloyd's Mariposa cactus.

Narrative

1. Remove threats to Neolloydia mariposensis by enforcement of existing regulations and management for protection.

Because of the rarity of the Lloyd's Mariposa cactus, the populations must be protected by the enforcement of existing Federal and State regulations and by management to remove threats to the species.

11. Protect the populations on Federal land.

Active protection and management by Federal agencies is needed to ensure the continued existence of the species on Federal land.

111. Enforce existing Federal and State laws.

Regulations under the Endangered Species Act, CITES, Lacey Act, or State native plant laws should be enforced to the maximum extent possible.

112. Conduct required consultations under Section 7 of the Endangered Species Act.

The National Park Service must conduct biological

assessments and then formally consult with the Fish and Wildlife Service on any Big Bend National Park projects that the Park Service determines may affect the Lloyd's Mariposa cactus.

113. Develop and implement management measures.

Specific management measures should be included in appropriate National Park Service planning documents. These planning documents should contain procedures for preventing loss of plants and habitat due to trail building, road development or improvement, campground development, etc., and should also outline measures for protecting the populations from collecting and other park visitor activities. Implementation of management measures is a required step for delisting the Lloyd's Mariposa cactus.

114. Identify areas for protection.

The National Park Service should identify portions of Big Bend National Park where Lloyd's Mariposa cactus will be protected. Protected areas do not need to be restricted to use solely as endangered species "sanctuaries", but activities that could jeopardize populations must be avoided.



115. Seek National Park Service Cooperation.

It may be desirable for the U.S. Fish and Wildlife Service and the National Park Service to develop a memorandum of understanding or cooperative agreement to facilitate the management and protection of Neolloydia mariposensis. This agreement should outline long-term objectives and the general management activities that will be carried out by each agency.

116. Monitor the populations and habitat.

Monitoring plots should be established in Big Bend National Park, and these plots should be inventoried at least annually. Monitoring is needed to determine long-term population and habitat stability and is a requirement for delisting.

12. Protect populations on private lands.

The populations on Lajitas Museum land and private ranch lands lack full Federal protection. The Lajitas Museum has expressed interest in protecting the Lloyd's mariposa cactus. Ranchers should be contacted and their support solicited.

121. Enforce existing trade laws.

Federal and State laws do not specifically prohibit collecting on private lands; however, the laws do regulate commercial trade, and these provisions can still be enforced. Under Texas law, a permit is required for commercial collecting on private land. The State permit requirement applies to interstate as well as intrastate commerce.

122. Conduct consultations under Section 7 of the Endangered Species Act.

Federal agencies that authorize, permit, or fund actions on private lands must formally consult with the Fish and Wildlife Service if a biological assessment determines that the actions may affect the Lloyd's Mariposa cactus.

123. Develop cooperation with private landowners.

In order to maintain the species on private lands, it will be necessary to obtain the cooperation and goodwill of private landowners. Written agreements that describe specific measures that can be accomplished through landowner and Fish and Wildlife Service cooperation should be developed with landowners.

124. Develop and implement species management plans.

The Service should develop management plans with cooperating landowners for populations on private lands (Lajitas Museum and private ranches).

Implementation of management plans is an essential step for delisting the Lloyd's Mariposa cactus.

125. Monitor the populations and habitat.

Monitored plots should be established on private lands and inventoried at least annually. Monitoring is necessary for determining long-term population and habitat stability and is a requirement for delisting.

13. Protect populations in Mexico.

Cooperation should be sought with the Mexican government or with private Mexican conservation groups to protect and manage populations in Mexico.

2. Gather information for use in management.

A thorough understanding of the population biology and ecology of Lloyd's Mariposa cactus is needed to help manage healthy natural populations.

21. Inventory a sufficient proportion of suitable habitat to enable an accurate estimate of range, occupied habitat, and number of plants.

Inventories are needed to map the exact range of the cactus. Geologic formations similar to those known to support the cactus should be checked to be sure that populations have not been overlooked.

22. Study the population biology and ecology of the Lloyd's Mariposa cactus.

Generalized studies will provide information about the habitat of Neolloydia mariposensis. Growth requirements and limiting factors should be studied in detail.

221. Study soil needs.

Soil factors such as chemical composition, texture, structure, aeration, temperature, and relation to parent material need to be assessed.

222. Study water needs.

The hydrologic characteristics of the soil on which the Lloyd's Mariposa cactus occurs need to be determined. The timing, amount, and duration of rains need to be studied. Runoff of rainwater is apparently an important mechanism for seed dispersal and should also be studied.

223. Determine the role of animals in seed dispersal.  
Study is needed to determine whether insects and/or rodents play a role in seed dispersal of the Lloyd's Mariposa cactus.
224. Determine the microhabitat factors involved in seedling establishment.  
Most of the Lloyd's Mariposa cactus seeds germinate in the cracks of limestone or under rocks where the seeds are well protected. A thorough study of the edaphic factors that influence seedling ecology is needed.
225. Determine pollinators.  
The major pollinator of Lloyd's Mariposa cactus is thought to be a green sweat bee in the family Halictidae. Although no other pollinators have been observed, investigations should be conducted to determine if other insects or other organisms are involved in the pollination of this cactus.
226. Monitor population numbers to determine which trends result from natural cycles and which result from human impacts.  
Natural population numbers are often cyclic. Overlying this natural variation there may be effects from human-caused environmental

disturbances. Long-term monitoring is needed to determine the causes of population changes.

23. Apply the results of studies done under task 22.

Studies of population biology and ecology can provide information essential for understanding the species' distribution and for successful management.

231. Determine environmental parameters defining and restricting the species' habitat.

Information is needed to explain why the Lloyd's Mariposa cactus does not occur on all of the apparently suitable habitat in the area. Once these parameters are understood, the potential habitat for the species can be identified.

232. Update management measures.

As more data are obtained on the population biology and ecology of the Lloyd's Mariposa cactus, management measures should be revised to incorporate this new information.

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

Studies are needed to determine which species are in trade, the overall trend of trade in listed cacti, and the feasibility of reducing collecting pressure on wild populations by promoting a commercial program for artificial propagation.

Strategies for effective law enforcement under the Endangered Species Act, CITES, Lacey Act, and State laws need to be developed. The trade study should be national in scope and address all cacti.

4. Refine propagation techniques to provide nursery stocks and seeds, thereby reducing collecting pressure.

The collecting pressure on natural populations could possibly be reduced by making plants commercially available through commercial propagation techniques. This task will be undertaken only if findings from the trade management plan indicate that increased commercial propagation is an advisable means of reducing collecting pressure on natural populations.

41. Investigate various methods of propagation.

Methods of mass production of nursery-grown plants and seeds should be developed to meet field collecting demands for the Lloyd's Mariposa cactus.

42. Publish propagation techniques in cactus journals.

Successful propagation techniques should be compiled and published in appropriate journals.

5. Establish populations at the botanical gardens of research institutions.

Even though plants in botanical gardens cannot substitute for healthy populations in natural habitats, a living collection

could still contribute significantly to the overall recovery effort. Much information on ecological requirements and reproductive potential could be obtained most easily from a living collection. In addition, a permanent, well documented, and accessible living collection, together with appropriate seed banking, could provide an important source of material for non-destructive research, maintenance of wild populations, and public awareness. An adequate living collection would remove the necessity of repeatedly returning to wild populations to collect plants for various recovery projects.

6. Develop public awareness, appreciation, and support for preservation of the Lloyd's Mariposa cactus.

Public education is a vital part of the recovery process. The cooperation of the public is essential for the ultimate success of many recovery measures.

61. Use pamphlets, talks, and slide shows to increase the public's knowledge of the Lloyd's Mariposa cactus.

An appreciation of the Lloyd's Mariposa cactus and of its role in the environment needs to be developed. This appreciation can be started with educational pamphlets, talks, and slide shows.



62. Enlist the support of public interest groups for protection and preservation of the Lloyd's Mariposa cactus.

Public interest groups, especially local ones such as native plant societies, Lion's Clubs, or Rotary Clubs need to be involved in recovery efforts.

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## PART III

### IMPLEMENTATION SCHEDULE

The following Implementation Schedule outlines actions and costs for the Lloyd's Mariposa cactus recovery program. It is a guide to meeting the objectives elaborated in Part II of this plan. The schedule indicates the general category for implementation, recovery plan tasks, corresponding outline numbers, task priorities, duration of tasks ("on-going" denotes a task that once begun should continue on an annual basis), the agencies responsible for performing these tasks, and lastly, estimated costs for Fish and Wildlife Service tasks. These actions, when accomplished, should bring about the recovery of the Lloyd's Mariposa cactus and protect its habitat. It should be noted that monetary needs for agencies other than Fish and Wildlife Service are not identified and therefore, Part III may not reflect the total financial requirements for the recovery of this cactus.

General Categories for Implementation Schedule

## 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 contamination
13. Reintroduction
14. Other information

## Acquisition - A

1. Lease
  2. Easement
  3. Management agreement
  4. Exchange
  5. Withdrawal
  6. Fee title
  7. Other
- Other - 0
1. Information and education
  2. Law enforcement
  3. Regulations
  4. Administration

## 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

Recovery Action Priorities

- 1 = an action that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.
- 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 = all other actions necessary to provide for full recovery of the species.

Abbreviations Used

- FWS - USDI Fish and Wildlife Service  
 SE - Office of Endangered Species  
 LE - Law Enforcement  
 RE - Realty  
 ES - Ecological Services  
 NPS - USDI National Park Service  
 TPWD - Texas Parks and Wildlife Department

PART III IMPLEMENTATION SCHEDULE

| GENERAL<br>CATEGORY | PLAN TASK   | TASK # | PRIORITY | # TASK<br>DURATION | RESPONSIBLE AGENCY |                  | FISCAL YEAR COSTS<br>(EST)* |       |       | COMMENT |  |
|---------------------|---|--------|----------|--------------------|--------------------|------------------|-----------------------------|-------|-------|---------|--|
|                     |   |        |          |                    | FWS<br>REGION      | OTHER<br>PROGRAM | FY1                         | FY2   | FY3   |         |  |
| O2                  | Enforce<br>Federal and<br>State laws  | 111    | 2        | ongoing            | 2                  | SE<br>LE         | NPS<br>TPWD                 | 1,000 | 1,000 | 1,000   |  |
| O3                  | Conduct<br>Section 7<br>consultations   | 112    | 2        | ongoing            | 2                  | ES               |                             | 1,000 | 1,000 | 1,000   |  |
| M3                  | Develop and<br>implement<br>management<br>measures for<br>plants on<br>public lands | 113    | 2        | 2 years            | 2                  | SE               | NPS                         | 2,000 | 2,000 |         |  |
| M7                  | Identify<br>protected<br>areas on<br>public land                                    | 114    | 2        | 2 years            | 2                  | SE               | NPS                         | 300   | 300   |         |  |
| O4                  | Seek co-<br>operation of<br>land manag-<br>ing agencies                             | 115    | 2        | 1 year             | 2                  | SE               | NPS                         | 250   |       |         |  |
| I6                  | Monitor pop-<br>ulations on<br>public land  | 116    | 2        | ongoing            | 2                  | SE               | NPS                         | 4,000 | 4,000 | 4,000   |  |

PART III - IMPLEMENTATION SCHEDULE

| GENERAL<br>CATEGORY | PLAN TASK   | TASK # | PRIORITY # | TASK<br>DURATION | RESPONSIBLE AGENCY |                  | FISCAL YEAR COSTS<br>(EST.)* |        |        | COMMENTS |  |
|---------------------|---|--------|------------|------------------|--------------------|------------------|------------------------------|--------|--------|----------|--|
|                     |   |        |            |                  | FWS<br>REGION      | OTHER<br>PROGRAM | FY1                          | FY2    | FY3    |          |  |
| 02                  | Enforce laws<br>for plants on<br>private lands                                    | 121    | 2          | ongoing          | 2                  | SE<br>LE         | TPWD                         | 1,000  | 1,000  | 1,000    |  |
| 03                  | Conduct<br>Section 7<br>consultations   | 122    | 2          | ongoing          | 2                  | ES               |                              | 1,000  | 1,000  | 1,000    |  |
| A3                  | Develop co-<br>operation<br>with private<br>landowners                            | 123    | 2          | 3 years          | 2                  | SE<br>RE         |                              | 2,500  | 2,500  | 2,500    |  |
| M3                  | Develop and<br>implement<br>management<br>plans for<br>plants on<br>private lands | 124    | 2          | 2 years          | 2                  | SE               |                              | 1,500  | 1,500  |          |  |
| I6                  | Monitor<br>populations<br>on private<br>lands                                     | 125    | 2          | ongoing          | 2                  | SE               |                              | 5,000  | 5,000  | 5,000    |  |
| 04                  | Protect<br>plants in<br>Mexico  | 13     | 2          | 3 years          | 2                  | SE               |                              | 10,000 | 10,000 | 10,000   |  |
| I14                 | Inventory<br>and make pop-<br>ulation size<br>estimates                           | 21     | 2          | 3 years          | 2                  | SE               |                              | 6,000  | 6,000  | 6,000    |  |

PART III - IMPLEMENTATION SCHEDULE

| GENERAL<br>CATEGORY | PLAN TASK   | TASK # | PRIORITY | # | TASK<br>DURATION | RESPONSIBLE AGENCY   |                         | FISCAL YEAR COSTS |       |       | COMMENT |
|---------------------|---|--------|----------|---|------------------|----------------------|-------------------------|-------------------|-------|-------|---------|
|                     |   |        |          |   |                  | <u>FWS</u><br>REGION | <u>OTHER</u><br>PROGRAM | (EST)*<br>FY1     | FY2   | FY3   |         |
| R3                  | Study soil<br>needs                               | 221    | 3        |   | 3 years          | 2                    | SE                      | 2,000             | 2,000 | 2,000 |         |
| R3                  | Study water<br>needs                              | 222    | 3        |   | 3 years          | 2                    | SE                      | 6,000             | 6,000 | 6,000 |         |
| R8                  | Study seed<br>dispersal                           | 223    | 3        |   | 3 years          | 2                    | SE                      | 5,000             | 5,000 | 5,000 |         |
| R7                  | Study<br>seedling<br>establishment                | 224    | 3        |   | 3 years          | 2                    | SE                      | 3,000             | 3,000 | 3,000 | 34      |
| R14                 | Determine<br>pollinators                          | 225    | 3        |   | 3 years          | 2                    | SE                      | 1,500             | 1,500 | 1,500 |         |
| R14                 | Determine<br>reasons for<br>population<br>changes | 226    | 2        |   | ongoing          | 2                    | SE NPS                  | 5,000             | 5,000 | 5,000 |         |
| R3                  | Determine<br>habitat<br>parameters                | 231    | 2        |   | 3 years          | 2                    | SE                      | 6,000             | 6,000 | 6,000 |         |
| 04                  | Update<br>management<br>measures                  | 232    | 2        |   | ongoing          | 2                    | SE NPS                  | 500               | 500   | 500   |         |
| R14                 | Develop a<br>trade<br>management<br>plan          | 3      | 2        |   | 1 year           | 2                    | SE                      | 20,000            |       |       |         |



PART III - IMPLEMENTATION SCHEDULE

| GENERAL<br>CATEGORY | PLAN TASK   | TASK # | PRIORITY # | TASK<br>DURATION | RESPONSIBLE AGENCY |                  | FISCAL YEAR COSTS<br>(EST)* |       |       | COMMENT |  |
|---------------------|---|--------|------------|------------------|--------------------|------------------|-----------------------------|-------|-------|---------|--|
|                     |   |        |            |                  | FWS<br>REGION      | OTHER<br>PROGRAM | FY1                         | FY2   | FY3   |         |  |
| R7                  | Investigate<br>propagation<br>methods               | 41     | 3          | 3 years          | 2                  | SE               |                             | 4,000 | 4,000 | 4,000   |  |
| 01                  | Publish<br>propagation<br>techniques                | 42     | 3          | 1 year           | 2                  | SE               |                             | 250   |       |         |  |
| M7                  | Establish<br>populations<br>at botanical<br>gardens | 5      | 2          | 2 years          | 2                  | SE               |                             | 7,500 | 7,500 |         |  |
| 01                  | Increase<br>public<br>awareness                     | 61     | 2          | ongoing          | 2                  | SE               | NPS<br>TPWD                 | 3,000 | 3,000 | 3,000   |  |
| 01                  | Seek support<br>of public<br>interest<br>groups     | 62     | 2          | ongoing          | 2                  | SE               | NPS<br>TPWD                 | 500   | 500   | 500     |  |

35

\*Costs refer to USFWS expenditures only.

## APPENDIX

List of Reviewers

An agency review draft of this plan was sent to the following on November 21, 1986:

Desert Botanical Garden, Phoenix, Arizona

Executive Director, Texas Parks and Wildlife Department,  
Austin, Texas

Director, Texas Natural Heritage Program, Austin, Texas

Regional Director, National Park Service, Santa Fe, New  
Mexico

Regional Supervisor, Realty, USFWS, Region 2

Special Agent in Charge, Law Enforcement, USFWS, Region 2

Field Supervisor, Ecological Services, Fort Worth Field  
Office, USFWS, Region 2

Director (AFA/OES), Office of Endangered Species, USFWS,  
Washington, D.C.

Comments Received

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Comment letters are reproduced in this section followed by the Service's response to each comment. Some reviewers submitted comments marked directly on the draft plan or submitted comments by phone. These comments have not be reproduced.

The public notice of review for Neolloydia mariposensis was published in the Alpine Avalanche on april 27, 1989 in accordance with the 1988 Amendments to the Endangered Species Act. This notified the public of the 30 day comment period and the availability of the draft recovery plan for public review. No comments were received.

The Federal Register Notice of Review for Neolloydia mariposensis was published on August 10, 1989 in accordance with the 1988 Amendments to the Endangered Species Act. No comments were received.




~~H. Part III, Implementation Schedule: Most of the estimated costs appear quite low.~~ A-8

2. Draft Recovery Plan for Coryphantha ramillosa:

- A. Page 14, #2: Add "on private land" (see comment A on preceding page).
- B. Page 14-15: Combine 11 and 12 (see comment B on preceding page).
- C. Page 16-20: Combine 11 and 12.
- D. Page 17-18: There is no #113.
- E. Page 17, #112: Not necessarily desirable to delineate areas of specific management for individual species.
- F. Page 18, #114: See comment E on preceding page.
- G. Page 23, #23: See comment F on preceding page.
- H. Page 25, #5: See comment G on preceding page.
- I. Part III, Implementation Schedule: See comment H on preceding page.

We appreciate the opportunity to comment on the Draft Recovery Plan.



James W. Carrico

TEXAS NATURAL HERITAGE PROGRAM  
GENERAL LAND OFFICE  
STEPHEN F. AUSTIN BUILDING  
1700 NORTH CONGRESS AVENUE  
ROOM 619  
AUSTIN, TEXAS 78701  
(512) 463-5299  
1-800-252-RARE

---

January 6, 1987

Dr. Charlie McDonald  
U.S. Fish Wildlife Service  
Endangered Species Office  
P.O. Box 1306  
Albuquerque, New Mexico 87103

Dear Charlie,

Thank you for allowing me the opportunity to comment on the recovery plan for Neolloydia mariposensis.

Two typographical errors occur on p. 4. The metric precipitation figures should be 25 cm and 35 cm. On p. 15, numbers 113, 114, 115 have been left out of the step-down outline. B-1

On p. 20, number 121 of the Narrative, only intrastate commerce is mentioned with regard to Texas State law. This implies that the Texas State law deals only with intrastate commerce. This should be changed to reflect the fact that the Texas State law applies to both intrastate and interstate commerce. Texas State law requires a commercial collecting permit for state-listed threatened or endangered plants taken for sale from private land, regardless if the plants will be sold within the borders of the state or not. Violation of this law results in a fine. B-2

Sincerely,



Jackie M. Poole  
Botanist, Texas Natural Heritage Program

JMP:mt



TEXAS  
PARKS AND WILDLIFE DEPARTMENT  
4200 Smith School Road Austin, Texas 78744

COMMISSIONERS

EDWIN L. COX, JR.  
Chairman, Athens  
WILLIAM M. WHELESS, III  
Vice-Chairman, Houston

February 5, 1987

|              |
|--------------|
| End. Sp. R-2 |
| JOHNSON      |
| BLANCOWSKI   |
| Dorton       |
| Byles        |
| Corley       |
| Edwards      |
| Lovely       |
| Lueras       |
| SANCHEZ      |
| FILE         |

CHARLES D. TRAVIS  
Executive Director

BOB ARMSTRONG  
Austin

GEORGE R. BOLIN  
Houston

WM. O. BRAECKLEIN  
Dallas

WM. L. GRAHAM  
Amarillo

RICHARD R. MORRISON, III  
Clear Lake City

A.R. (TONY) SANCHEZ, JR.  
Laredo

DR. RAY E. SANTOS  
Lubbock

Dr. Charles McDonald  
U.S. Fish & Wildlife Service  
Endangered Species Office  
P.O. Box 1306  
Albuquerque, New Mexico 87103

RE: Region 2: SE  
Draft Recovery Plan for Lloyd's Mariposa Cactus

Dear Dr. McDonald:

The U.S. Fish & Wildlife Service draft recovery plan for Lloyd's Mariposa cactus (Neolloydia mariposensis) has been reviewed by Texas Parks & Wildlife Department staff.

Population monitoring for this species is urgently needed. In the Habitat and Associated Species section of the plan, specific information should be added on soil types and geological substrates to provide a better habitat description. In the Population Biology and Phenology section, information on microhabitat requirements is needed. The species' range requires sampling to determine species distribution and population size.

On page 20, number 121, interstate, as well as intrastate, commerce should be mentioned with regard to Texas law. Texas law requires a commercial collecting permit for state-listed threatened or endangered plants taken for sale from private land, regardless of whether or not the plants will be sold within the borders of the state. Violation of this law results in a fine. The last paragraph on page 12 should reflect this permit requirement and distinguish between scientific and commercial collecting permits. The second sentence should read, "Under Texas law, a scientific collecting permit . . ." The third sentence should end with ". . . and a commercial collecting permit." The commercial collecting permit is required in addition to the plant tags already mentioned. The tags may not be removed until the plant has been transplanted to its ultimate site for landscaping or other purposes. Only the ultimate owner or a department employee may remove the tag. The end of the last sentence should be modified to read "FWS REG 2 its ultimate destination."

C-1  
C-2  
C-3  
C-4  
C-5  
C-6

FWS REG 2  
RECEIVED

FEB 9 '87

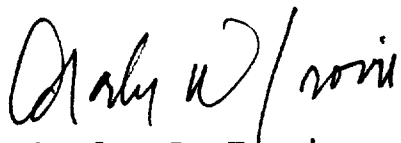
SE



Dr. Charles McDonald  
Page 2

Thank you for the opportunity to comment on this draft recovery plan.

Sincerely,

A handwritten signature in black ink, appearing to read "Charles D. Travis". The signature is written in a cursive style with a large initial "C" and "T".

Charles D. Travis  
Executive Director

CDT/DLR/dr





# United States Department of the Interior

FISH AND WILDLIFE SERVICE  
WASHINGTON, D.C. 20240

ADDRESS ONLY THE DIRECTOR,  
FISH AND WILDLIFE SERVICE

In Reply Refer To:  
FWS/OES

MAY - 8 1987

|                      |
|----------------------|
| End. Sp. R-2         |
| JOHNSON              |
| <del>LANGOWSKI</del> |
| Burton               |
| Byles                |
| Carley               |
| Hoffman              |
| <del>...</del>       |
| <del>...</del>       |
| Edwards              |
| Lovsto               |
| Lucas                |
| SANCHEZ              |
| FILE                 |

## Memorandum

To: Regional Director, Region 2

From: Assistant Director - Fish and Wildlife Enhancement

Subject: Review of Six Texas Draft Plant Recovery Plans

We have reviewed the technical/agency drafts of the Texas snowbells, slender rush-pea, ashy dogweed, Johnston's frankenia, Lloyd's Mariposa cactus, and bunched cory cactus recovery plans. Editorial comments for each of the plans are provided as marginalia on the attached plans. In addition, the following comments are provided:

1. Some of these plans give detailed site locations, e.g., ashy dogweed and slender rush-pea. On page 10 of the ashy dogweed, it states that "...publication of its one location could lead to vandalism or imprudent taking." However, on page 8 of the same plan, it gives details on land ownership plus additional information that a gas pipeline crosses the site. With this degree of detail, it would be relatively easy to locate the subject plants. Please consider if you wish to be this specific. D-1
2. The Implementation Schedule of some of the plans have tasks which are assigned Priorities of 1. A Priority 1 task is an action that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future (emphasis added). Some of the Priority 1 tasks are questionable. For example, Lloyd's Mariposa cactus is a threatened species found on National Park Service land and on private land. Much of the private land is owned by the Lafitas Museum and Desert Garden. It seems inappropriate to have task 122, "Establish safe sites on private lands" and task 123, "Develop and implement species management plans" as Priority 1 tasks. Also, note that tasks 111-115 are missing from the Implementation Schedule for this plan. D-2

Similar concerns exist for the Priority 1 tasks listed for the threatened bunched cory cactus. This cactus is also found on National Park land, State land, and private land. It seems inappropriate to have tasks 112 and 113 dealing with protection on private lands assigned a level 1 priority. D-3

FWS REG 2  
RECEIVED

MAY 18 '87

SE

3. The recovery objectives for the threatened bunched cory cactus and Lloyd's Mariposa cactus have interim goals of 10,000 individuals and 20,000 individuals, respectively. Why is the interim goal for the Lloyd's cactus double that of the bunched cory cactus? D-4
4. All maps and drawings should include a scale to better depict size and distance. D-5
5. Most of the plans do not quantify the primary objective. This should be done if at all possible. D-6

I hope these comments are useful as you prepare the final draft of these recovery plans for the Regional Director's approval. Upon his approval, notify the Office of Endangered Species, 500 Broyhill Building, and provide them with 30 copies of the printed plan when it is available.

*Ronald E. Lamberton*

Attachments



Responses to Comments

- A-1 The second (it has been moved to the first position in the final plan) required action for delisting the Lloyd's Mariposa cactus has been modified to read, "Identify at least three sites where the species will be protected." This type of identification should not restrict park activities or complicate in-park policies to any greater extent than is necessary to protect the species.
- A-2 The task to develop specific management plans for the species has been modified and now reads, "Specific management measures should be included in appropriate agency planning documents. It is felt that having each land managing agency develop their own management measures is preferable to having a single all-encompassing management plan.
- A-3 The tasks, 11, "Protect populations on public lands," and 12, "Protect populations on private lands," have not been combined because, although the overall goals for both tasks are the same, the needed steps and responsible agencies are slightly different.
- A-4 See response A-1. Also, the task, "Establish safe sites," has been changed to read, "Identify areas for protection." Areas identified for protection do not have to be designated as areas managed specifically for the Lloyd's Mariposa cactus, but any land use conflicts must be resolved in ways that assure the species' continued existence.
- A-5 Memoranda of understanding and cooperative agreements are standard documents for formalizing interagency cooperation. Although the National Park Service may not feel that species by species agreements are presently needed, the task is being retained because circumstances could make such agreements useful in the future.
- A-6 The numerical sequence of the recovery tasks does not necessarily represent the order in which the tasks will be accomplished. Never-the-less, it does seem sensible to have searches for additional populations come earlier in the outline than biological and ecological studies, so this change in outline order has been made.
- A-7 When botanical garden populations are established, care will be taken to ensure that previous efforts are not being duplicated.
- A-8 Costs in the implementation schedule have been reviewed and some costs have been revised upward.

- B-1 These errors have been corrected.
- B-2 The Narrative section has been reworded to incorporate these comments.
- C-1 Comment noted.
- C-2 Information on geologic formations and soil types has been added to the Habitat and Associated Species section.
- C-3 Specific microhabitat requirements are not known for this species. Recovery tasks are included to acquire this information.
- C-4 Comment noted.
- C-5 The recovery task has been reworded to incorporate these comments.
- C-6 These changes have been made.
- D-1 The locality information in this plan has been revised to make it more general.
- D-2 Priorities have been reviewed and several tasks formerly given Priority 1 have been reassigned to Priority 2.
- D-3 This error has been corrected.
- D-4 The different figures reflect different estimates of present plant abundance. In addition, Lloyd's Mariposa cactus occurs in areas more vulnerable to collecting than does bunched cory cactus and it, therefore, may need a larger number of plants to ensure its safety.
- D-5 A scale has been added to the distribution map.
- D-6 This plan has a quantified primary objective.
- E-1 This task has been revised with a new goal of developing cooperation with private landowners. The extent to which this cooperation is formalized through written agreements or the level of involvement by Fish and Wildlife, Realty Division cannot be specified at this time.