RECOVERY PLAN

Leptocereus Grantianus

U.S. Fish and Wildlife Service
Southeast Region
Atlanta, Georgia

LEPTOCEREUS GRANTIANUS RECOVERY PLAN

prepared by

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U.S. Department of the Interior
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Recovery plans delineate reasonable actions which are believed to be required to recover and/or protect listed species. Plans are published by the U.S. Fish and Wildlife Service, sometimes prepared with the assistance of recovery teams, contractors, State (Commonwealth) agencies, and others. Objectives will be attained and any necessary funds made available subject to budgetary and other constraints affecting the parties involved, as well as the need to address other priorities. Recovery plans do not necessarily represent the views nor the official positions or approval of any individuals or agencies involved in the plan formulation, other than the U.S. Fish and Wildlife Service. They represent the official position of the U.S. Fish and Wildlife Service only after they have been signed by the Regional Director or Director as approved. Approved recovery plans are subject to modification as dictated by new findings, changes in species status, and the completion of recovery tasks.

Literature Citations should read as follows:

U.S. Fish and Wildlife Service. 1994. *Leptocereus grantianus* Recovery Plan. U.S. Fish and Wildlife Service, Atlanta, Georgia. 18 pp.

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EXECUTIVE SUMMARY OF THE RECOVERY PLAN FOR *LEPTOCEREUS GRANTIANUS*

Current Status: *Leptocereus grantianus* is a spineless cactus endemic to Culebra, an island off the northeast coast of Puerto Rico. It is currently designated as endangered, as it is known from only one population consisting of about 50 individuals.

Habitat Requirements and Limiting Factors: The one known population occurs in dry thickets along a rocky shoreline on the southwestern part of Culebra. The population is located only 8 to 10 meters from high tide and is threatened by agricultural, residential, and tourist development on adjacent uplands, as well as by damage from heavy storm surges. It may have been cut in the past for use as livestock feed. Because it is an attractive and almost spineless cactus, it may be subject to collection for use as an ornamental.

Recovery Objective: Downlisting.

Recovery Criteria: *Leptocereus grantianus* may be considered for downlisting when (1) an agreement among the Fish and Wildlife Service, the municipality of Culebra, and the Puerto Rico Department of Natural and Environmental Resources (DNER) has been prepared and implemented for the protection of the species, and (2) new populations (the number of which should be determined following the appropriate studies) capable of self perpetuation have been established within units of the Culebra National Wildlife Refuge.

Actions Needed:

1. Protect the existing population and its habitat through an agreement with private landowners, the municipality of Culebra, and the Department of Natural and Environmental Resources.
2. Develop a management plan for the species in cooperation with these entities.
3. Monitor known populations.
4. Enforce existing Commonwealth and Federal endangered species regulations.
5. Educate the public on conservation values and regulations.
6. Conduct research on the life history of the species and evaluate propagation techniques.
7. Conduct propagation and enhance existing populations or establish new ones on lands within the Culebra National Wildlife Refuge.

Date of Recovery: Downlisting should be initiated in 2015, if recovery criteria are met.

Recovery Costs: Recovery costs for *Leptocereus grantianus* have been estimated at $62,000 for the first 3 years. Costs for land acquisition have not been estimated, since alternative mechanisms will be utilized to protect the species. Subsequent expenditures will depend upon the results of these preliminary studies, and therefore, cannot be estimated at this time.

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Reproductive Status

Little is known about the reproductive biology of *Leptocereus grantianus*. Repeated flowering has been observed while in cultivation, but no observations have been made on plants in their natural environment. While in cultivation, flowers open at about 10 p.m. and close at 10 a.m. the following morning (Britton 1933).

Habitat Description

Culebra and the surrounding small islands comprise an area of only 3,116 hectares (7,700 acres). Topography is irregular and the highest elevation is that of Monte Resaca (200 meters; 650 feet). Culebra and the cays adjacent to it are underlain by volcanic and intrusive rocks which are upper Cretaceous in age. Andesitic lava underlies most of the island, and the north coast is underlain by andesitic tuff. In north central Culebra this tuff and lava have been intruded by diorite. The diorite has weathered to round boulders which may reach more than a meter in diameter. Slopes in these areas are often greater than 60 percent.

The mean minimum annual temperature is approximately 23.5 Celsius and mean maximum 34 Celsius. The mean annual precipitation is 975 millimeters (44 inches). About 50 percent of the precipitation is received between August and November (Department of Natural Resources 1976).

The island of Culebra falls within the subtropical dry forest life zone (Ewel and Whitmore 1973), the driest life zone in Puerto Rico. The vegetation in this zone forms a complete ground cover and is deciduous on most soils. Leaves are small and succulent or coriaceous, and species with spines and thorns are common. Tree heights usually do not exceed 15 meters and the crowns are typically broad, spreading, and flattened. Fire is common on many soils, and occurs frequently on the lands adjacent to the location of the known population. Successional vegetation includes grasses, and the accumulated organic debris serves as fuel for the frequent dry season fires.

On Culebra *Leptocereus grantianus* grows on rocky, steep slopes adjacent to the narrow beach. Associated species on this rocky slope are almácigo (*Busera simaruba*), úcar (*Bucida buceras*), sea grape (*Coccoloba uvifera*), sebucán (*Pilosocereus royenii*), and mesquite (*Prosopis pallida*). Adjacent uplands have been mostly deforested, historically for agricultural use and grazing, and more recently for proposed residential/tourist development.

Reasons For Listing

It appears from Britton (1933) that *Leptocereus grantianus* was historically more common that it is today. Coastal areas on Culebra have been deforested for agricultural activities, as well as for rural and tourist development, and continue to be subject to intense

PART I. INTRODUCTION

Leptocereus grantianus (no common name) is a sprawling, nearly spineless cactus endemic to Culebra, an island located just off the northeastern corner of Puerto Rico. Only one population, which consists of approximately 50 individuals, is known to exist. It is threatened by intense pressure for rural, urban, and tourist development, as well as by its location on a rocky, unstable shoreline approximately 8 to 10 meters from high tide.

Leptocereus grantianus was determined to be an endangered species on February 26, 1993, pursuant to the Endangered Species Act of 1973, as amended (U.S. Fish and Wildlife Service 1993). Critical habitat has not been designated for this species because of the risks of vandalism as well as its potential for overcollection for use as an ornamental.

Description

Leptocereus grantianus (Cactaceae) was discovered on the island of Culebra in 1932 by Major Chapman Grant, whose collected specimen was later described by Nathaniel Britton (Britton 1933).

Leptocereus grantianus is a sprawling, suberect, nearly spineless cactus which may reach up to 2 meters in height and 3 to 5 centimeters in diameter. The elongated stems have 3 to 5 prominent ribs with broadly scalloped edges. Ribs of young joints are thin, and the small areoles may bear one to three minute, nearly black spines (less than 1 millimeter long) which disappear as the joints grow older and the ribs become thicker.

The flowers are solitary at the terminal areoles, 3 to 6 centimeters long, and nocturnal. The ovary and flower tube bear distinct areoles. The outer perianth segments are linear, green, and tipped by an areole like those of the tube and ovary. The inner perianth segments are numerous, cream-colored, oblong-ovate, obtuse and about 8 millimeters long. Stamens are many and have yellow anthers. The stigma lobes are several and short. The fruit is subglobose to ellipsoid and about 4 centimeters in diameter (Britton 1933, Proctor 1991).

Leptocereus grantianus is similar to another endemic species, *L. quadricostatus*, known from southern and southwestern Puerto Rico. These species differ primarily in flower morphology and in the characteristic areoles.

Distribution/Population Status

Leptocereus grantianus is known only from one location on Culebra, an island off the northeastern coast of Puerto Rico. The one known population, which consists of approximately 50 individuals, occurs in dry thickets along a rocky shore near Punta Melones, on the southwestern part of the island (Figure 1, page 3).

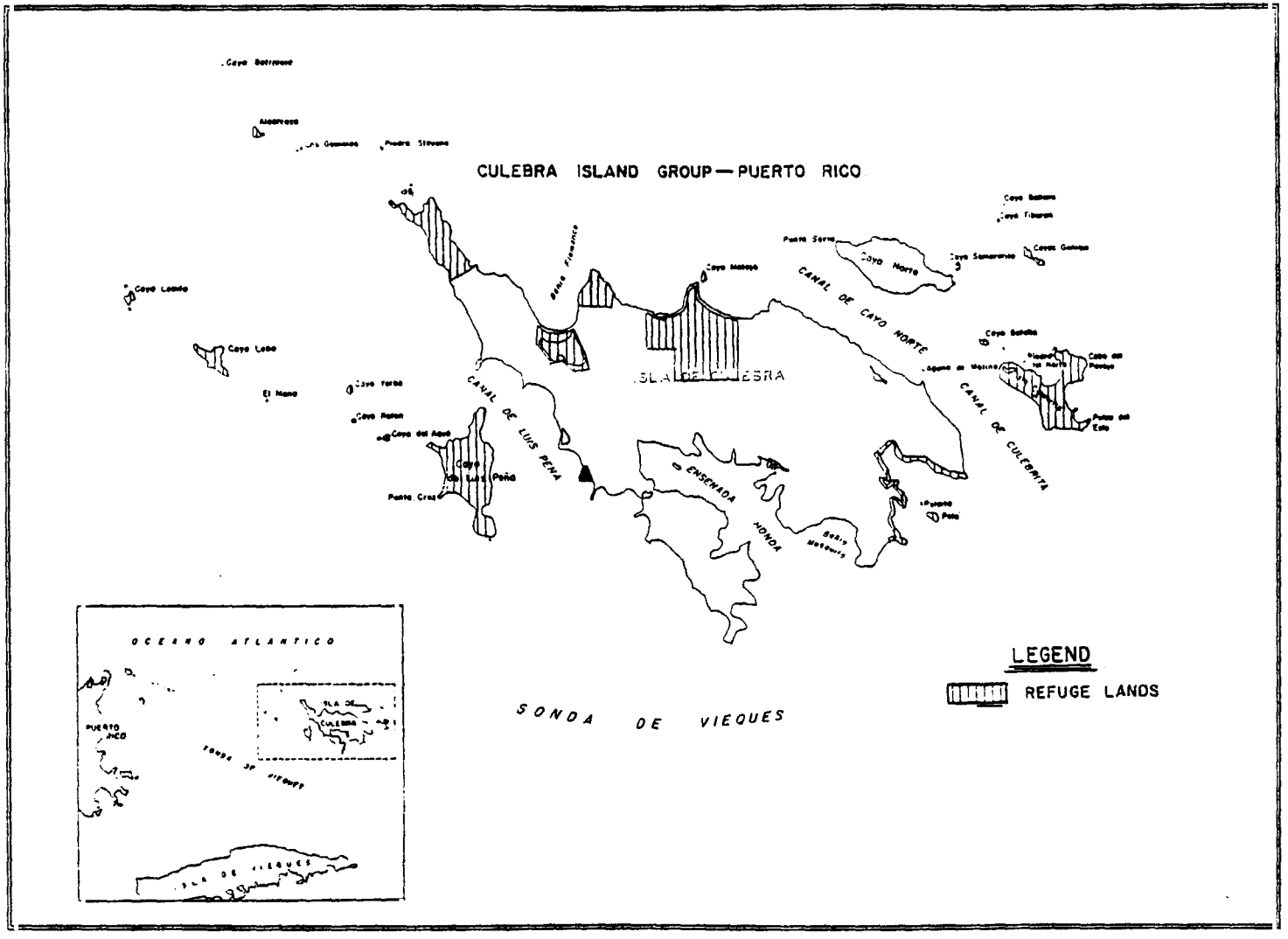

Figure 1. Location of *Leptocereus grantianus* (▲) on the island of Culebra.

developmental pressure. The area adjacent to the known population has been cleared recently by the owner, and the land is to be subdivided into small lots for a residential/tourist development. In addition, the municipality of Culebra has proposed the construction of a coastal road adjacent to the location of the L. grantianus population.

Leptocereus grantianus is located on a rocky, unstable slope adjacent to the shoreline. Although the recent passage of Hurricane Hugo (1989) apparently did not adversely affect the cactus, plants are located approximately 8 to 10 meters from high tide level and therefore may be subject to damage from heavy storm surges. Available information indicates that, due to the spineless character of the plant, it may have been cut for use as livestock feed (G. Proctor, Department of Natural and Environmental Resources, pers. comm.). In addition, it is an attractive cactus, increasing its potential for use as an ornamental; therefore, collection may become a problem in the future.

Conservation Measures

The developer of the adjacent uplands is aware of the presence of the species; however, a 14-meter strip of land between the lots and the rocky shore apparently has been ceded to the municipality of Culebra, which has expressed an interest in the construction of a coastal road through the area. No additional information is available on this preliminary proposal at this time. The maritime zone, in which portions of the population occur, falls under the jurisdiction of the Department of Natural and Environmental Resources (DNER).

The cactus was collected and propagated successfully by Major Chapman Grant and others to whom he distributed the species. Nevertheless, it has died out in cultivation (Proctor 1991).

Summary of Comments Received

A copy of the Technical/Agency Draft Recovery Plan for Leptocereus grantianus was sent to 13 reviewers, including three peer reviewers, for review and comments. A notice of availability of the Technical/Agency Draft was published in the Federal Register on September 2, 1994. Two letters of comment were received.

Dr. Robert Ross, of the University of Puerto Rico at Cayey, offered additional information on the status of the species and assistance in the implementation of the recovery plan. The Puerto Rico Planning Board supported the document and its outlined activities. Comments which offered supplemental data have been incorporated into this plan.

PART II. RECOVERY

A. Recovery Objective

The objective of this recovery plan is to provide direction for reversing the decline of *Leptocereus grantianus* and for restoring the species to a self-sustaining status, thereby permitting it to be removed from the Federal Endangered Species List.

Leptocereus grantianus could be considered for downlisting when (1) an agreement among the Fish and Wildlife Service (Service), the municipality of Culebra, and the Puerto Rico Department of Natural and Environmental Resources (DNER) has been prepared and implemented for the protection of the known population; and, (2) new populations (the number of which should be determined following the appropriate studies) capable of self perpetuation have been established within protected areas, such as off-shore cays near Culebra owned and managed as National Wildlife Refuges by the Service (Cayo Luis Peña and Cayo Culebrita). These are minimum requirements, and could be expanded upon if the regenerative or propagative potential of natural and ex situ populations proves to be insufficient. Alternatively, if new populations of the species are discovered, it may be preferable to place greater emphasis of protection rather than on propagation in order to achieve the minimum number of plants necessary for recovery.

B. Outline Narrative

1. Prevent further habitat loss and population decline.
Protection of habitat and individual plants at the known population site should be initiated by appropriate public agencies (Fish and Wildlife Service, DNER, municipality of Culebra).

11. Protect habitat.
The protection of the existing population should be given the highest priority.

111. Obtain protective status for the known population site.
An agreement among the Fish and Wildlife Service, DNER and the municipality of Culebra, must be established and implemented for the protection of the species

112. Develop a management plan, which provides for the protection of *Leptocereus grantianus*, in cooperation with DNER and the municipality of Culebra.
A management plan should be developed which includes measures to protect known individuals and their habitat and provides for long-term monitoring of their growth and reproduction.

12. Protect plants.
Individual plants and the recruitment of new individuals must be monitored on a long-term basis.

121. Monitor known population.
Individual plants should be measured and marked. Basic field observations which will contribute to the information available on population behavior (including phenology, seed production, seed dispersal, recruitment success, site changes, and growth), should be made at regular intervals.

122. Enforce existing Commonwealth and Federal endangered species regulations.
The Commonwealth Department of Natural Resources' Regulation to Govern the Management of Threatened and Endangered Species of 1985 provides for criminal penalties for the illegal take of listed plant species on public land. In addition, development projects which occur in these

areas are often funded through local or Federal agencies or require local permits. The Regulation's Section 10 provides for consultations on endangered species which may be affected by a particular project similar to Section 7 of the Endangered Species Act. Section 7 of the Endangered Species Act would apply where Federal lands or federally funded or permitted projects are involved.

123. Educate the public on plant conservation values and regulations.
Leptocereus grantianus should be included in the illustrated brochure and slide presentation (in both English and Spanish) on endangered plants and plant communities that is presented to local school groups, organizations, and agencies. Permitting and funding agencies (those potentially involved in Section 7 consultations) should be made aware of endangered plants, the pertinent laws, and their responsibilities.

2. Continue to gather information on the distribution and abundance of *Leptocereus grantianus* on Culebra and the adjacent cays.
Future management decisions and the establishment of recovery priorities depends on obtaining additional information concerning the distribution and abundance of this species.

21. Search for new populations.
Searches for new individuals and populations should be conducted on Culebra as well as adjacent cays.

211. Identify and inventory potential sites.
Based on a characterization of known habitat types, potential population sites should be identified and searched. The species' known habitat is limited in extent, therefore facilitating searches. Agencies and organizations that should be involved in these efforts include the Fish and Wildlife Service, the Department of Natural and Environmental Resources, local universities, and private conservation organizations.

212. Characterize sites to determine their suitability as future recovery sites.
If new populations are discovered, this information should be added to the database of the various agencies and organizations

involved. In addition, newly discovered sites should be evaluated for the availability of propagative material and the potential for protection.

3. Conduct research.
Little biological information is available on *Leptocereus grantianus*. Studies should focus on those aspects of life history that may be critical to the recovery of the species.

31. Define habitat requirements.
Information available from existing studies should be evaluated to more clearly define habitat requirements.

32. Study reproductive biology and ecology of *Leptocereus grantianus*.
Effective management and recovery of this cactus depends upon obtaining this information.

321. Assess periodicity of flowering.
Studies are needed to determine the frequency, timing, and abundance of flowering; pollination mechanisms, and the physical and biological factors controlling these events.

322. Assess seed production and dispersal.
Agents of seed predation and/or dispersal should be identified.

323. Evaluate seed viability and germination requirements.
Information on the environmental conditions required for germination should be obtained through field and laboratory studies.

324. Evaluate requirements for establishment and growth.
Field and laboratory experiments should focus on this critical stage to determine the factors that affect establishment and survival.

33. Evaluate techniques for artificial propagation and develop propagation program.
Propagation techniques should be evaluated so that a propagation program with local nurseries may be developed.

331. Assess methods of propagation.
Based on the availability of propagative material, economic and logistical considerations, and results from the above research, determine the most feasible method of propagation and transplantation to existing or new sites. Sexual vs. asexual reproduction should be evaluated as alternatives.

332. Develop artificial propagation program.
This species should be included in the ongoing artificial propagation program at local nurseries (e.g., the Department of Natural and Environmental Resources).

4. Establish new populations.
Areas for the establishment of new populations of *Leptocereus grantianus* should be selected and new populations established.

41. Select appropriate sites for population introduction or enhancement using artificially propagated material.
Habitat requirements must be considered in order to assure the success and relevance of transplanting propagated material.

411. Select sites and assess habitat suitability.
Using information from Task 31 above, inventory potential sites for the introduction and establishment of new populations of *Leptocereus grantianus*. Serious consideration should be given to the introduction of *L. grantianus* on the offshore cays near Culebra which form part of the National Wildlife Refuge system.

412. Assure site protection.
If proposed sites are not already on protected land, steps must be taken to provide for their protection. Management plans for these new sites should be developed or modified to include considerations for this species.

413. Introduce and monitor plants.
Success of plantings should be carefully monitored.

5. Refine recovery goals.
As additional information on the biology, ecology, propagation, and management of *Leptocereus grantianus* is accumulated, it will be necessary to better define, and possibly modify, recovery goals.

51. Determine number of individuals and populations necessary to ensure species stability and self-perpetuation.
Environmental and reproductive studies, together with the relative success of population protection measures, will allow more precise and realistic recovery goals to be established.

52. Determine what additional actions, if any, are necessary to achieve recovery goals.
If there are any actions not included in this recovery plan which, during the recovery process become recognized species needs, they should be incorporated into the plan.

C. Literature Cited and References

Britton, N. 1933. An undescribed cactus of Culebra Island, Puerto Rico. Cactus and Succ. Soc. Amer. 5:469.

Department of Natural Resources. 1976. The Culebra Segment of the Puerto Rico Coastal Zone Management Program. Commonwealth of Puerto Rico.

Ewel, J.S. and J.L. Whitmore. 1973. Ecological life zones of Puerto Rico and the U.S. Virgin Islands. USDA - Forest Serv. Res. Paper ITF-18. 72 pp.

Proctor, G. R. 1991. Status report on *Leptocereus grantianus* Britton. Unpublished status report submitted to the U.S. Fish and Wildlife Service, Boquerón, Puerto Rico. 8 pp.

U.S. Fish and Wildlife Service. 1993. Endangered and threatened wildlife and plants; determination of endangered status for the plant *Leptocereus grantianus*. Federal Register Vol. 58:11550.

PART III. IMPLEMENTATION SCHEDULE

Priorities in Column 4 of the following Implementation Schedule are assigned as follows:

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

List of Abbreviations

DNER - Puerto Rico Department of Natural and Environmental Resources
TE - Fish and Wildlife Service, Endangered Species Division
LE - Fish and Wildlife Service, Law Enforcement Division
CNWR - Fish and Wildlife Service, Culebra National Wildlife Refuge
BotGar - Botanical Gardens
Univ. - Universities
Culebra - Municipality of Culebra

RECOVERY PLAN IMPLEMENTATION SCHEDULE

PRIO-RITY #	TASK #	TASK DESCRIPTION	TASK DURA-TION (YRS)	RESPONSIBLE PARTY			COST ESTIMATES ($K)			COMMENTS
				FWS REGION	FWS DIVISION	OTHER	FY1	FY2	FY3	
1	111	Obtain protective status for the known population site.	2	4	TE	DNER Culebra	No cost anticipated.			
1	112	Develop a management plan, which provides for the protection of the species, with DNER and the municipality of Culebra.	2	4	TE	DNER Culebra	No cost anticipated.			
1	121	Monitor known population.	Cont.	4	TE	DNER Univ.	1	1	1	
1	122	Enforce existing Commonwealth and Federal endangered species regulations.	Cont.	4	TE LE	DNER	3	3	3	25 percent of DNER ranger
2	123	Educate the public on plant conservation values and regulations.	Cont.	4	TE	DNER	1	1	1	
2	211	Identify and inventory potential sites.	2-4	4	TE	DNER	3	3		

RECOVERY PLAN IMPLEMENTATION SCHEDULE

PRIO-RITY #	TASK #	TASK DESCRIPTION	TASK DURA-TION (YRS)	RESPONSIBLE PARTY			COST ESTIMATES ($K)			COMMENTS
				FWS REGION	FWS DIVISION	OTHER	FY1	FY2	FY3	
2	212	Characterize sites to determine their suitability as future recovery sites.	2-4	4	TE	DNER Univ.				
2	31	Define habitat requirements.	2-4	4	TE	DNER Univ.	3	3	3	
2	321	Assess periodicity of flowering.	2-4	4	TE	DNER Univ.	6	6	6	6K/yr includes 321,322,323, and 324.
2	322	Assess seed production and dispersal.	2-4	4	TE	DNER Univ.				
2	323	Evaluate seed viability and germination requirements.	2-4	4	TE	DNER Univ.				
2	324	Evaluate requirements for establishment and growth.	2-4	4	TE	DNER Univ.				
2	331	Assess methods of propagation.	2-4	4	TE	DNER Univ. BotGar	2	2	2	

RECOVERY PLAN IMPLEMENTATION SCHEDULE

PRIO-RITY #	TASK #	TASK DESCRIPTION	TASK DURA-TION (YRS)	RESPONSIBLE PARTY			COST ESTIMATES ($K)			COMMENTS
				FWS REGION	FWS DIVISION	OTHER	FY1	FY2	FY3	
2	332	Develop artificial propagation program.	Cont.	4	TE	DNER Univ. BotGar	2	2	2	This species should be incorporated into ongoing efforts
2	411	Select sites and assess habitat suitability.	2-4	4	TE CNWR	DNER Univ.		2		
2	412	Assure site protection.	2-4	4	TE CNWR	DNER				
2	413	Introduction of plants.	2-4	4	TE CNWR	DNER				
3	51	Determine number of individuals and populations to ensure stability and self-perpetuation.	Cont.	4	TE	DNER				
3	52	Determine what additional actions are needed to achieve recovery objectives.	Cont.	4	TE	DNER				

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