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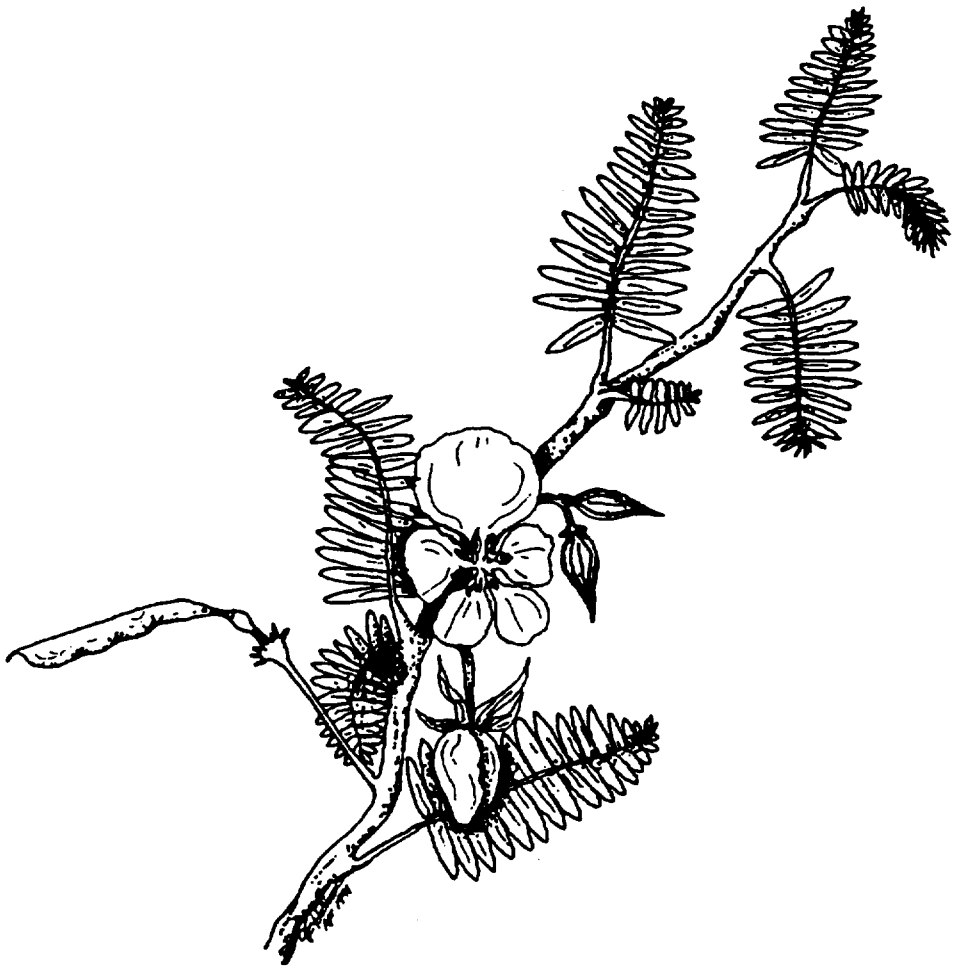
RECOVERY PLAN

(*Chamaecrista glandulosa* var. *mirabilis*)



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

CHAMAECRISTA GLANDULOSA VAR. *MIRABILIS* RECOVERY PLAN

prepared by

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for the

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Southeast Region
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Approved: _____
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Date: May 12, 1994

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.

Acknowledgement

The cover sketch of *Chamaecrista glandulosa* var. *mirabilis* was done by Jorge E. Saliva, a biologist with the Fish and Wildlife Service's Caribbean Field Office.

Literature Citations should read as follows:

U.S. Fish and Wildlife Service. 1994. *Chamaecrista glandulosa* var. *mirabilis* Recovery Plan. U.S. Fish and Wildlife Service, Atlanta, Georgia. 18 pp.

Additional copies may be purchased from:

Fish and Wildlife Reference Service
5430 Grosvenor Lane, Suite 110
Bethesda, Maryland 20814

Telephone: 301/492-6403
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Fees for recovery plans vary, depending upon the number of pages.

EXECUTIVE SUMMARY

Current Status: *Chamaecrista glandulosa* var. *mirabilis* is listed as endangered.

Habitat Requirements and Limiting Factors: *Chamaecrista glandulosa* var. *mirabilis* is a small shrub endemic to the white silica sands of the northern coast of Puerto Rico at elevations near sea level. It is scattered along the southern shore of the Tortuguero Lagoon and is also found at one location in Dorado and one in Vega Alta. The species is threatened by sand extraction and deforestation for urban and industrial expansion.

Recovery Objective: Delisting

Recovery Criteria: Existing populations and their habitats should be protected and at least three self-sustaining populations must be established in protected areas.

Actions Needed:

1. Monitor existing populations.
2. Provide protection, through acquisition or conservation easements, for existing populations.
3. Conduct research on aspects of the life history of the species and evaluate propagation techniques.
4. Conduct propagation and enhance existing populations or establish new ones.

Date of Recovery: Delisting should be initiated in 2025, if recovery criteria are met.

Recovery Costs: Recovery costs for *Chamaecrista glandulosa* var. *mirabilis* have been estimated at $114,500 for the first 3 years. Costs for land acquisition have not been estimated, since some land is public land and may be transferred to governmental agencies involved in conservation efforts. Subsequent expenditures will depend on the results of these preliminary studies, and therefore, cannot be estimated at this time.

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PART I. INTRODUCTION

Chamaecrista glandulosa var. *mirabilis* (no common name) is a small shrub endemic to the white silica sands of the northern coast of Puerto Rico. Data from herbarium collections indicate that this species was once common throughout this area of the north coast. Today, urban, industrial, and agricultural expansion have resulted in the restriction of the species to only one area in Dorado, one in Vega Alta, and scattered populations along the southern shore of the Tortuguero Lagoon.

Chamaecrista glandulosa var. *mirabilis* was determined to be an endangered species on April 5, 1990, pursuant to the Endangered Species Act of 1973, as amended (U.S. Fish and Wildlife Service 1990). Critical habitat has not been designated for this species because of the risks of overcollecting or vandalism.

Description

Chamaecrista glandulosa var. *mirabilis*, a member of the Fabaceae family, was first collected by Dr. Agustin Stahl in the mid-nineteenth century. In 1899, Mr. Edward Heller collected the species in Vega Baja. *Chamaecrista glandulosa* var. *mirabilis* has been placed by various authors in the genus *Cassia* as a species (*Cassia mirabilis*) and in the genus *Chamaecrista* both as a species and a variety (*Chamaecrista glandulosa* var. *mirabilis*). Liogier (1988), in the "Descriptive Flora of Puerto Rico and Adjacent Islands," place the taxon as a variety in the genus *Chamaecrista*.

C. glandulosa var. *mirabilis* is a prostrate, ascending, or erect shrub which may reach up to 1 meter in height. The branches are slender, straight, and wire-like. Leaves are alternate, evenly one-pinnate, 1 to 3 centimeters long, 0.5 to 1 centimeter wide, with some scattered whitish hairs. The stipules are persistent, striate, and about 2 millimeters long. The leaflets are membranaceous, usually in 18 pairs, 3 to 6 millimeters long and 0.5 to 1.5 millimeters wide. The petioles have one to two stipitate glands.

The flowers are solitary, with a pedicel about as long as the leaves. The corolla is yellow, about 2 centimeters in diameter, with one petal much larger than the others. Mature fruits (legumes) are glabrous, linear, 2.5 to 4 centimeters long, 3 to 4 millimeters wide, flat, elastically dehiscent, and 12 to 15 seeded (Vivaldi and Woodbury 1980).

Distribution/Population Status

Today *Chamaecrista glandulosa* var. *mirabilis* is known from only scattered locations along the southern shore of the Tortuguero Lagoon and one area in Dorado (Figure 1).

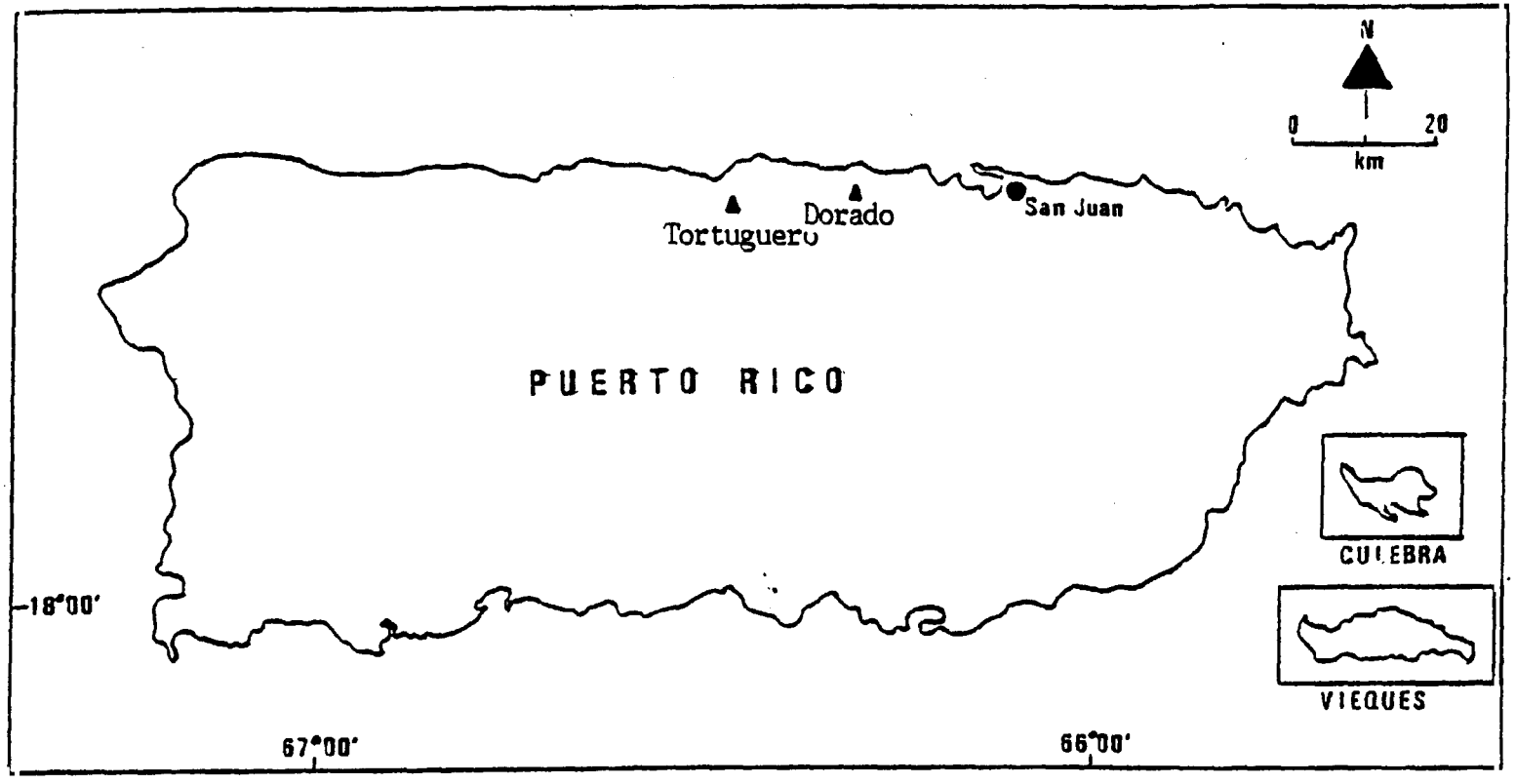

Figure 1. Distribution of *Chamaecrista glandulosa* var. *mirabilis* in Puerto Rico (▲).

Urban, industrial, and agricultural expansion, as well as sand extraction, may have eliminated other known populations. Although few areas of silica sands have not been explored, it is possible that other small populations may remain. The known sites can be described as follows:

1. Tortuguero Lagoon, Manatí and Vega Baja municipalities, Puerto Rico. Small populations are found scattered along the southern shore of the Lagoon. Although the Tortuguero Lagoon area has been designated by the Puerto Rico Planning Board as a Natural Reserve, the majority remains in private ownership or in public ownership by agencies such as the Puerto Rico Land Administration, not an agency that is responsible for the protection of natural resources. These populations have been estimated at 100 individual plants.

2. Dorado, Dorado municipality, Puerto Rico. Located just to the east of the Dorado airport, from 20 to 50 individual plants have been observed on this privately owned land.

Reproductive Status

Chamaecrista glandulosa var. *mirabilis* has been observed in flower and fruit during most of the year. It is not known whether a peak in these activities occurs. Seedlings were not observed during status surveys (Vivaldi and Woodbury, 1980) nor have they been observed during recent visits to the sites (V. Quevedo, Puerto Rico Department of Natural Resources, pers. comm.).

Habitat Description

C. glandulosa var. *mirabilis* is known only from the silica sands of the north coast of Puerto Rico. These sands occur between Vega Baja and Manatí, at elevations near sea level. Outcrops of granodiorite in the karst area of northwestern Puerto Rico have weathered to form these almost pure silica sands. They have been identified as belonging to the Algarrobo-Corozo-Arecibo soil association. These soils are deep, excessively drained, fine sands. Permeability is extremely rapid in the upper part and slow in the lower portion, an impermeable hardpan frequently being located at about 30 to 40 centimeters below the surface. They are extremely acidic and low in nutrients, poorly suited for crops, but supporting for these reasons a unique plant community (Soil Conservation Service, 1982).

The Tortuguero Lagoon is one of the most important freshwater lagoons in Puerto Rico. The open water area of the main lagoon encompasses approximately 746 acres. Small, open

water areas are found to the south of the main lagoon, including the Rica Lagoon approximately 18 acres in size. The Tortuguero Lagoon system has been identified by the Puerto Rico Department of Natural Resources as a Critical Coastal Wildlife Area, important for both resident and migratory birds. Locally endangered and candidate avifauna species include the least grebe (*Tachybaptus dominicus*); ruddy duck (*Oxyura jamaicensis*); purple gallinule (*Porphyrula martinica*); sora rail (*Porzana carolina*); and the white-crowned pigeon (*Columba leucocephala*) (Department of Natural Resources 1985).

The vegetation in the area surrounding the Tortuguero Lagoon has been described as a dry evergreen or littoral forest. The area lies within the subtropical moist forest life zone (Ewel and Whitmore 1973). Common trees in the area include *Ficus citrifolia* (jagüey); *F. sintenisii* (jagüey negro); *Coccoloba diversifolia* (uvilla); *Citharexylum fruticosum* (péndula); *Chrysobalanus icaco* (icaco); *Ocotea coriacea* (avispillo); *Andira inermis* (moca); *Bursera simaruba* (almacigo); *Acrocomia media* (palma de corozo); and *Guarea guidonia* (guaraguao). Common in the understory is *Zamia debilis* (marunguey). A total of 713 species of vascular plants has been reported from the Tortuguero Lagoon area. Of these, 128 species are considered rare (Department of Natural Resources 1985; Silander *et al.* 1986). These include *Schoepfia arenaria*, federally listed as threatened, and the candidate species *Panicum stevensianum* and *Scleria doradoensis*. *Chamaecrista glandulosa* var. *mirabilis* is usually found growing on almost pure sands, not covered by an organic layer, and frequently in open areas. Those populations not found within the Tortuguero Natural Reserve are also on silica sand areas with similar vegetation.

Long-term precipitation records indicate that mean annual rainfall ranges between 157 and 170 centimeters, with the drier season occurring between February and April. Mean monthly temperature is 25.5° Celsius, with a minimum monthly average of 23.7° Celsius and a maximum monthly average of 26.8° Celsius (Department of Natural Resources 1985).

Reasons For Listing

The distribution of *Chamaecrista glandulosa* var. *mirabilis* has been affected primarily by the extraction of silica sand for the production of glass and, in addition, the deforestation for agriculture, grazing, production of charcoal, and the cutting of wood to provide construction materials. More recent disturbances such as urban and industrial expansion and the accompanying increase in roads and service facilities have provided additional threats to the populations. Fires, both accidental and deliberately set, have been a serious problem,

particularly in the area to the south of the Tortuguero Lagoon. Fire often permits the invasion of exotic, dominant grass species such as *Panicum maximum*, thereby excluding native vegetation.

Conservation Measures

Conservation and recovery measures for *Chamaecrista glandulosa* var. *mirabilis* are ongoing. Following the listing of the species as endangered by the Fish and Wildlife Service, the Puerto Rico Department of Natural Resources also protected the species through its Regulation which Governs the Management of Vulnerable and Endangered Species. The Department, as well as the Service, have considered the species in recent proposals for residential, touristic and industrial development projects. Some of the known individuals and populations fall within the Tortuguero Natural Reserve managed by the Department of Natural Resources; however, approximately 41 percent of the land continues to be privately owned. Much of the remainder is owned by public agencies such as the Puerto Rico Land Administration and the Puerto Rico Land Authority. These agencies are currently selling this land, primarily for development purposes. The Puerto Rico Department of Natural Resources has acquired, through purchase and/or donation, a small portion to the south and northeast of the lagoon. Transplantation has been undertaken; however, the success of such efforts has not been determined. Propagation of the species has not been attempted.

PART II. RECOVERY

A. Recovery Objective

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

Chamaecrista glandulosa var. *mirabilis* could be considered for delisting when (1) the known populations are placed under protective status, and (2) at least three new populations capable of self perpetuation have been established within protected areas. These should be minimum requirements, and could be expanded upon if the regenerative or propagative potential of natural and ex situ populations proves to be insufficient. On the other hand, if new populations of the species are discovered, it may be preferable to place greater emphasis on protection, rather than on propagation, in order to achieve a minimum number of plants.

B. Outline Narrative

1. Prevent further habitat loss and population decline.
Protection of the habitat and the individual plants at the known population sites should be initiated by appropriate public agencies and private organizations. Although some known individuals and/or populations fall within the boundaries of the Tortuguero Natural Reserve, much of this land remains in private ownership. Some lands belong to public agencies such as the Land Administration and the Land Authority. These agencies are presently selling off land to private interests for development purposes.

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

111. Obtain protective status for the privately owned population sites.
Privately owned sites should be protected through land acquisition or through the establishment of conservation easements by either public or private agencies.

112. Develop or revise a management plan for the Tortuguero Lagoon Natural Reserve which provides for the protection of endangered plants, such as *Chamaecrista glandulosa* var. *mirabilis*, and their habitat.
A management plan should be devloped which includes measures to protect the species' habitat and the known individuals and populations.

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

121. Monitor known populations.
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. Plots should be established and monitored on a long-term

basis. Transplanted individuals should be monitored on a long-term basis in order to determine the success of such efforts.

122. Enforce existing Commonwealth 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 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.

123. Educate the public on plant conservation values and regulations.
Both Federal and Commonwealth agencies should become involved in the education of the public on general conservation values, as well as on the importance of protecting endangered plants and of adhering to Federal and local regulations. *Chamaecrista glandulosa* var. *mirabilis* should be included in the illustrated brochure and slide presentation on endangered plants and plant communities which is presented to local school groups and 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 *Chamaecrista glandulosa* var. *mirabilis* in northern Puerto Rico.
Future management decisions and the establishment of recovery priorities depends on the obtaining of additional information concerning distribution and abundance of the species.

21. Search for new populations.
Searches for new individuals and populations should be conducted in the silica sand area of northern Puerto Rico.

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 involved in these efforts should include the U.S. Fish and Wildlife Service, the Department of Natural Resources (Forest Service, Reserves and Sanctuaries Area and the Natural Heritage Program), 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, sites should be evaluated for the availability of propagative material and the potential for protection.

3. Conduct research.
Little biological information is available on *Chamaecrista glandulosa* var. *mirabilis*. Preliminary studies indicate that although fruit is produced, few seedlings are observed. Studies should focus on aspects of life stages which may be critical to the recovery of the species.

31. Define habitat requirements.
Information available from existing studies of the Tortuguero Lagoon area should be evaluated in order to more clearly define habitat requirements. Additional studies may be necessary in order to evaluate microhabitat requirements.

32. Study reproductive biology and ecology of *Chamaecrista glandulosa* var. *mirabilis*.
Preliminary information indicates that very few seedlings are observed. Effective management and recovery of *Chamaecrista glandulosa* var. *mirabilis* depends upon obtaining this information.

321. Assess periodicity of flowering and pollination mechanisms.
Vivaldi and Woodbury (1981) indicate that the species flowers and produces fruit, but that seedlings were rarely observed. Further study is needed to determine the frequency, timing, and abundance of flowering, and the physical and biological factors controlling them.

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 environmental conditions required for germination should be obtained through field and laboratory studies.

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

33. Evaluate feasibility of artificial propagation and develop propagation program.
Propagation techniques should be evaluated and, utilizing this information, a propagation program with local nurseries may be developed.

331. Assess feasibility of propagation.
Based on the availability of propagative material, economic and logistical considerations, and results from above research, determine the most feasible method of propagation and transplantation to existing or new sites.

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 Resources).

4. Establishment of new populations.
Areas for the establishment of new populations of *Chamaecrista glandulosa* var. *mirabilis* 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. Inventory potential sites for the introduction and establishment of new populations of *Chamaecrista glandulosa* var. *mirabilis*.

412. Ensure site protection.
If proposed sites are not already on protected land, steps must be taken to alter the status of such land in order provide protection for new populations. Management plans for these new sites should be developed or modified, if existing, to include considerations for these species.

413. Introduction of plants.
Seedlings should be planted in those areas selected for establishment of new populations. Success should be carefully monitored.

5. Refine recovery goals.
As additional information on the biology, ecology, propagation, and management of *Chamaecrista glandulosa* var. *mirabilis* 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 must be incorporated into the plan.

D. Literature Cited and References

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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.

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 privately owned sites.	4	4	TE	PRDNER	Cost cannot be determined at this time due to possibility of transfer of land from one public agency to another.			
2	112	Develop or revise management plan for the Tortuguero Lagoon Natural Reserve.	2	4	TE	PRDNER				No cost anticipated.
1	121	Monitor known populations.	Cont.	4	TE	PRDNER	2.5	2.5	2.5	
1	122	Enforce existing Commonwealth endangered species regulations.	Cont.	4	TE	PRDNER LE	9	9	9	One DNER ranger half-time.
1	123	Educate public on plant conservation values and regulations.	Cont.	4	TE	PRDNER	3	3	3	
2	211	Identify and in-ventory potential sites.	2-4	4	TE	PRDNER Univ.	3	3	3	

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 suit-ability as future recovery sites.	2-4	4	TE	PRDNER Univ.				
2	31	Define habitat requirements.	2-4	4	TE	PRDNER Univ.	3	3	3	
2	321	Assess periodicity of flowering and pollination mechanisms.	2-4	4	TE	PRDNER Univ.	12	12	12	12K/yr includes 321,322,323 and 324.
2	322	Assess seed produc-tion and dispersal.	2-4	4	TE	PRDNER Univ.				
2	323	Evaluate seed viability and germination requirements.	2-4	4	TE	PRDNER Univ.				
2	324	Evaluate require-ments for seedling establishment and growth.	2-4	4	TE	PRDNER Univ.				
2	331	Assess feasibility of propagation.	2-4	4	TE	PRDNER Univ. BotGar	2	2	2	

IMPLEMENTATION SCHEDULE

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

IMPLEMENTATION SCHEDULE

PRIORITY #	TASK #	TASK DESCRIPTION	TASK DURATION (YRS)	RESPONSIBLE PARTY			COST ESTIMATES ($K)			COMMENTS
				FWS REGION	FWS DIVISION	OTHER	FY1	FY2	FY3	
LIST OF ABBREVIATIONS PRDNER - Puerto Rico Department of Natural and Environmental Resources TE - Fish and Wildlife Service, Endangered Species Division LE - Fish and Wildlife Service, Law Enforcement Univ. - Universities BotGar - Botanical Gardens										

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