



Recovery Plan

for

Relict Trillium

(Trillium reliquum Freeman)

G. L. Moore

RECOVERY PLAN

for

Relict Trillium (Trillium reliquum Freeman)

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for

Southeast Region
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Recovery plans delineate reasonable actions that are believed to be required to recover and/or protect the species. Plans are prepared by the U.S. Fish and Wildlife Service, sometimes with the assistance of recovery teams, contractors, State agencies, and others. Objectives will only be attained and funds expended contingent upon appropriations, priorities, and other budgetary constraints. Recovery plans do not necessarily represent the views nor the official positions or approvals of any individuals or agencies, other than the U.S. Fish and Wildlife Service, involved in the plan formulation. 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. 1990. Relict Trillium Recovery Plan. Atlanta, Georgia. 29 pp.

Additional copies of this plan may be purchased from:

Fish and Wildlife Reference Service
5430 Grosvenor Lane, Suite 110
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EXECUTIVE SUMMARY

CURRENT STATUS: Relict trillium is listed as an endangered species. It is known from 21 populations-4 in Alabama, 14 in Georgia, and 3 in South Carolina.

HABITAT REQUIREMENTS AND LIMITING FACTORS: The species is typically found in mature undisturbed hardwood stands. The most significant threats to the species are loss of habitat to development, conversion of habitat to agricultural use, and timber harvest.

RECOVERY OBJECTIVES: To delist the species.

RECOVERY CRITERIA: The species will be considered for delisting when there are 12 self-sustaining populations (2 in Alabama, 7 in Georgia, and 3 in South Carolina) that are protected to the degree that the species no longer qualifies for being on the Federal list. Although this is less than the total number of populations currently in existence it is believed that it will provide the number of populations needed to insure the continued existence of the species. It should also be noted that at least 10 of the extant populations contain fewer than 200 individuals each. Upon completion of the biological studies required by the plan the recovery criteria will be reevaluated and changed if necessary.

ACTIONS NEEDED:

1. Provide interim protection (Tasks 1.1 through 1.4).
2. Study species (Tasks 2.1 through 2.5).
3. Conduct required management activities (Task 2.6).
4. Maintain cultivated plants and store seeds (Task 3).
5. Reestablish populations (Task 2.7).
6. Increase public awareness of species (Tasks 5.1 and 5.2).
7. Enforce laws (Task 4).
8. Assess recovery (Task 6).

TOTAL ESTIMATED COST: \$121,000 (funds below in 1,000's).

1.	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	<u>2000</u>
1.	5.0	5.0	0	0	0	0	0	0	0	0
2.	24.0	22.0	19.0	0	0	0	0	0	0	0
3.	0	0	0	1.5	1.5	1.5	1.5	1.5	1.5	1.5
4.	0	2.0	.5	.5	.5	.5	.5	.5	.5	.5
5.	0	0	0	0	0	0	0	3.0	3.0	3.0
6.	0	0	0	0	0	0	0	0	0	0
7.	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
8.	.5	.5	.5	.5	.5	.5	.5	.5	6.0	.5
	30.5	30.5	21.0	3.5	3.5	3.5	3.5	6.5	12.0	6.5

DATE OF RECOVERY: Relict trillium will be recovered by the year 2001 provided that funds are expended as scheduled and that the recovery actions outlined are adequate and complete.

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PART I

INTRODUCTION

Relict trillium (Trillium reliquum Freeman) occurs primarily in undisturbed moist hardwood forests in limited portions of Alabama, Georgia, and South Carolina. This rare spring-flowering species is known from only 21 locations and was determined to be an endangered species in 1988 (U.S. Department of the Interior, Fish and Wildlife Service [Service], 1988). In Alabama the species receives no formal protection but is informally listed as an endangered species by Freeman et al. (1979) and Freeman (1979). Relict trillium is not included in Georgia's Protected Plants (McCollum and Ettman 1977) but does receive State protection as a federally endangered species. This list has only been revised once since it was originally published, and it is expected that relict trillium will be added to the Georgia list as an endangered plant in a future revision of the Protected Plant List (Thomas Patrick, Georgia Department of Natural Resources, personal communication, 1990). South Carolina includes Trillium reliquum as an endangered species on its informal list of rare native vascular plants (Rayner et al. 1984). Although South Carolina does not have an official plant protection program, the State is pursuing protection of this rare species through its natural areas acquisition program.

Distribution

There are currently 21 known extant populations and 1 extirpated population of Trillium reliquum. Alabama has 4 extant populations, Georgia has 14 extant populations and 1 extirpated population, and South Carolina has 3 populations. Historic distribution of this species is unknown; however, it is reasonable to assume that the currently known populations were originally much larger and that there were additional populations that have been lost to development. The following discussion of the status of each the known extant populations is primarily extracted from a status report on the species prepared by Freeman (1985) and Allison (1988). This information is supplemented by appropriate additional information noted below.

Population 1

- a. Location: Henry County, Alabama.
- b. Ownership: U.S. Army Corps of Engineers.
- c. Approximate size: 150 plants on 0.3 acre.
- d. Land use: Land managed as a recreation area.
- e. Threats: Road construction, as well as an existing power transmission line, have altered the area and may have destroyed habitat occupied by relict trillium. The

remaining plants are now potentially threatened by illegal trash and refuse dumping, and digging for fish bait.

Population 2

- a. Location: Lee County, Alabama.
- b. Ownership: Private.
- c. Approximate size: Several thousand plants over a 120-acre area.
- d. Land use: Undisturbed woodland.
- e. Threats: This population is located near an expanding urban population center. The most significant threat at this time is the expansion of an adjacent residential subdivision. The site is currently for sale and could, in the near future, be lost to intensive residential development.

Population 3

- a. Location: Bullock County, Alabama.
- b. Ownership: Private.
- c. Approximate size: About 1,000 plants on 0.25 acre.
- d. Land use: Undisturbed woodland.
- e. Threats: Logging.

Population 4

- a. Location: Bullock County, Alabama.
- b. Ownership: Private.
- c. Approximate size: Several thousand plants over a 0.25-acre area.
- d. Land use: Partially logged woodland.
- e. Threats: Logging.

Population 5

- a. Location: Clay County, Georgia.
- b. Ownership: Private.
- c. Approximate size: At least 200 plants in groups scattered over a 3-acre area.

- d. Land use: Minimally disturbed woodlands.
- e. Threats: This rich woodland site contains numerous mature hardwoods, and logging is a significant threat to the site. The imported noxious weeds, Japanese honeysuckle (Lonicera japonica) and kudzu (Pueraria lobata), are encroaching on the site and may displace the relict trillium population if unchecked.

Population 6

- a. Location: Clay County, Georgia.
- b. Ownership: Private.
- c. Approximate size: At least 94 plants on less than an acre.
- d. Land use: Undisturbed woodland remnant.
- e. Threats: Logging and conversion of the site to agricultural use.

Population 7

- a. Location: Clay County, Georgia.
- b. Ownership: Private.
- c. Approximate size: At least 300 plants in groups scattered over a 5-acre area.
- d. Land use: Undisturbed woodland.
- e. Threats: Logging and encroachment of noxious weeds.

Population 8

- a. Location: Clay County, Georgia.
- b. Ownership: Private.
- c. Approximate size: At least 90 plants over a 2-acre site.
- d. Land use: Disturbed woodland.
- e. Threats: Logging and encroachment of noxious weeds.

Population 9

- a. Location: Clay County, Georgia.
- b. Ownership: Private.

- c. Approximate size: At least 92 plants occupying less than 1 acre.
- d. Land use: Undisturbed woodland.
- e. Threats: Logging.

Population 10

- a. Location: Clay County, Georgia.
- b. Ownership: Private.
- c. Approximate size: More than 1,000 plants on a 4-acre site.
- d. Land use: Undisturbed woodland.
- e. Threats: Logging and development of lands adjacent to the site.

Population 11

- a. Location: Lee County, Georgia.
- b. Ownership: Private.
- c. Approximate size: At least 100 plants on approximately 1 acre.
- d. Land use: Undisturbed woodland.
- e. Threats: Logging and development of site.

Population 12

- a. Location: Macon County, Georgia.
- b. Ownership: Private.
- c. Approximate size: More than 100 plants scattered along the steep slopes above a 0.5-mile length of river.
- d. Land use: Disturbed woodland.
- e. Threats: Logging and encroachment by kudzu.

Population 13

- a. Location: Macon County, Georgia.
- b. Ownership: Private.

- c. Approximate size: This population, which consists of at least 75 plants, occurs along less than 0.5 mile of steep slopes above a river. It is located about 0.5 mile from Population 10 and may, from a biological standpoint, be considered a part of it rather than a separate population.
- d. Land use: Undisturbed woodland.
- e. Threats: Logging and encroachment by noxious weeds.

Population 14

- a. Location: Early County, Georgia.
- b. Ownership: Private.
- c. Approximate size: Approximately 30 plants on less than an acre.
- d. Land use: Highly disturbed woodland. This area was struck by a tornado in 1985.
- e. Threats: Continued encroachment of greenbrier, blackberry, and grapevines that invaded the area after the tornado.

Population 15

- a. Location: Talbot County, Georgia.
- b. Ownership: Georgia Department of Natural Resources.
- c. Approximate size: 20 plants on less than 1 acre.
- d. Land use: Timber and wildlife management.
- e. Threats: The area was logged prior to the discovery of this population of relict trillium. The management agency for the site will ensure that future activities do not adversely affect the plants remaining in this small population (Tom Patrick, Georgia Natural Heritage Inventory, personal communication, 1987).

Population 16

- a. Location: Lee County, Georgia.
- b. Ownership: Private.
- c. Approximate size: Several hundred plants scattered in small groups over 2 to 3 acres.
- d. Land use: Undisturbed mixed hardwood/pine woodlands.

- e. Threats: Logging and conversion to agricultural use.

Population 17

- a. Location: Columbia County, Georgia.
- b. Ownership: Private.
- c. Approximate size: Several thousand plants on approximately 15 acres.
- d. Land use: Undisturbed woodland.
- e. Threats: Historically, part of this population was destroyed by a quarrying operation. Current threats include residential development and timber harvesting.

Population 18

- a. Location: Columbia County, Georgia.
- b. Ownership: Private.
- c. Approximate size: Less than 50 plants on approximately 0.5 acre.
- d. Land use: Disturbed woodland.
- e. Threats: Residential development and logging.

Population 19

- a. Location: Aiken and Edgefield Counties, South Carolina.
- b. Ownership: Private, State, and municipal.
- c. Approximate size: This is the largest known population of relict trillium and supports 50,000 to 100,000 plants along several miles of the Savannah River and the lower reaches of several tributaries. This population consists of about 12 sub-populations or colonies containing from a few hundred to several thousand plants. Historically, relict trillium was probably continuously distributed over this area. However, extensive habitat alteration associated with urban development has resulted in the current pattern of irregularly distributed colonies.
- d. Land use: In this population, relict trillium is found in undisturbed and disturbed woodland, the undeveloped portion of a city park, and in an undisturbed State natural area.

- e. Threats: Although this is the largest population, only about 500 plants are currently protected. These occur on a State natural area managed by the South Carolina Wildlife and Marine Resources Department. Residential and commercial development, sewer line construction, road expansion and new road construction, logging, cattle grazing, and conversion of land to intensive agricultural use all threaten this population. Parts of this population are also threatened by Japanese honeysuckle and kudzu encroachment.

Population 20

- a. Location: Aiken County, South Carolina.
- b. Ownership: Private.
- c. Approximate size: Several thousand plants in groups scattered over about 10 acres.
- d. Land use: Undisturbed woodland.
- e. Threats: Livestock grazing, logging, and residential and commercial development.

Population 21

- a. Location: Edgefield County, South Carolina.
- b. Ownership: Private.
- c. Approximate size: 20,000 plants in groups scattered over about 50 acres.
- d. Land use: Undisturbed woodland interspersed with agricultural lands.
- e. Threats: Logging, conversion to agricultural use, and residential development.

Description and Habitat Requirements

Trillium reliquum, an herbaceous member of the lily family, was recognized as a distinct species by Freeman (1975) after his extensive study of this complex, taxonomically difficult group. During his research, Freeman examined more than 10,000 Trillium specimens from more than 80 herbaria and extensively collected and observed members of this taxon in the field. This rare trillium is distinguished from other sessile-flowered members of the genus by its decumbent or S-curved stems, distinctively shaped anthers, and the color and shape of its leaves. The flowers appear in early spring and are greenish to brownish purple or occasionally pure yellow in color. The fruit is an oval-shaped, berry-like capsule that matures

in early summer. Trillium reliquum is a tuberous rhizomed perennial; like other members of the genus, it dies back to this rhizome after the fruit matures (Freeman 1975, 1985).

Trillium reliquum is found primarily in moist hardwood forests that have had little or no disturbance in the recent past. The soils on which it grows vary from rocky clays to alluvial sands, but all exhibit a high organic matter content in the upper soil layer. Most sites appear to be free from the influence of fire, both in the recent and distant past. Timber harvesting at the known sites has been limited to selective cutting (Freeman 1985). Relict trillium does occur on less than optimum sites, such as power and sewer line rights-of-way, and can apparently become reestablished after intensive disturbance to the habitat, such as agricultural activity. Reestablishment within power line and sewer line rights-of-way would be expected, provided that maintenance activities do not include broad spectrum herbicides or other intensive disturbances. Reestablishment of the species after intensive agricultural activities would be expected, provided that there is a nearby source of seeds for the plants and the original soil, moisture, and vegetational associates are reestablished on the disturbed site.

Threats

All of the known Trillium reliquum populations are currently threatened by one or more human activities (Freeman 1985, Rayner *in litt.*). The most significant threat is the loss or alteration of habitat resulting from residential development. Most populations are adjacent to rapidly expanding urban areas, and the direct impacts of construction activities associated with an expanding population are significant. In addition, activities such as road construction; power transmission line construction; and gas, water and sewer line installation all may have indirect or direct impacts if not planned in a way to protect this rare species. Logging of areas occupied by the species constitutes a significant threat, as does conversion or use of the sites for pine monoculture, pastures, or row crop agriculture. Historically, stone quarrying has adversely affected one population; and stone, sand, and clay quarrying remains a potential threat to at least some of the known populations. Fires, whether caused by arson, accident, or for timber management, threaten all populations (Freeman 1985). Taking for commercial trade is not currently a significant threat to the species. However, collecting for personal use in home gardens by wildflower enthusiasts is a potential threat.

The remaining populations appear to be threatened by an additional human-related factor that is adversely affecting the native flora throughout the Southeast. Two introduced vines, Lonicera japonica (Japanese honeysuckle) and Pueraria lobata (kudzu), are aggressively replacing the native flora in some areas. Freeman (1985) and Allison (1988) note that these weedy vines may represent a serious threat to Trillium reliquum. In recognition of this threat, the South Carolina

Wildlife and Marine Resources Department initiated a honeysuckle control program on the preserve supporting the species (Rayner in litt.).

Conservation Efforts

The Natural Heritage Programs in Alabama, Georgia, and South Carolina; the Service; or The Nature Conservancy have contacted most of the owners of the relict trillium populations. This has resulted in an informal nonbinding agreement to protect the species by the municipal government that owns part of Population 18 and a private landowner who owns another portion of the same population. A natural area purchased by the South Carolina Wildlife and Marine Resources Department within Population 18 protects about 500 plants from most human-related threats. Although populations 1 and 14 are small and occur on disturbed sites, they are protected by the government agencies owning them.

Searches for new populations are being conducted by the appropriate State conservation agencies and the Service. These searches will ensure that future conservation efforts will be concentrated on the most significant and biologically important relict trillium populations.

PART II

RECOVERY

A. Recovery Objectives

Relict trillium (Trillium reliquum) will be considered for delisting when there are at least 12 self-sustaining populations of the species (2 in Alabama, 7 in Georgia, and 3 in South Carolina) that are protected to such a degree that the species no longer qualifies for protection under the Endangered Species Act (see criteria below). A self-sustaining population is a reproducing population that is large enough to maintain sufficient genetic variation to enable it to survive and respond to natural habitat changes. It must also occur within a sufficiently large area to ensure that, to the extent possible, natural processes within its habitat can continue without adversely affecting the population and that active management required to maintain suitable habitat is minimal. The number of individuals necessary and the quantity and quality of habitat needed to meet these criteria will be determined as one of the recovery tasks.

These recovery objectives are considered an interim goal. Because of the lack of specific data on genetic diversity, biology, and management requirements of the species, the recovery objectives may be changed as additional information is acquired. This information may permit refinement of the estimate of the number of populations required to ensure the continued survival of relict trillium. This objective will be reassessed at least annually in light of any new information that becomes available.

The first step toward recovery will be protection and management of all extant populations of relict trillium to ensure their continued survival. Little is known about the biological requirements of this species. Therefore, it will be necessary to conduct detailed genetic, demographic, and ecological research for the purpose of gaining the knowledge needed to develop appropriate protection and management strategies. The ultimate effects of various kinds of habitat disruption must be determined and prevented. If necessary, active management required to ensure continued survival and vigor must be carried out. Therefore, relict trillium shall be considered for removal from the Federal list when the following criteria are met:

1. It has been documented that at least 12 populations (2 in Alabama, 7 in Georgia, and 3 in South Carolina) are self-sustaining and occur on sufficiently large tracts to ensure their perpetuation with a minimal amount of active management.

2. All of the above populations and their habitat are protected from present and foreseeable human-related and natural threats that may interfere with the survival of any of the populations.

B. Narrative Outline

1. Protect existing populations and essential habitat. Only 21 populations of relict trillium are currently known to exist. Until more is known about the species' biology, genetic diversity, specific habitat requirements, and management needs, all existing populations should be protected. The long-term survival of 12 populations in three States is believed to be essential to the recovery of the species.
 - 1.1 Develop interim research and management plans and develop cooperative management agreements with landowners. Relict trillium is typically found growing in mature hardwood forests that have received minimal human-related disturbance. Apparently the best locations are free from fire, grazing, and intensive timber management. Therefore, immediate emphasis will be on protection (prevention of site alterations that are known to be detrimental), in cooperation with the landowners, until appropriate management procedures have been developed through research. Pre- and post-management demographic studies should provide important insights into the management needs of relict trillium.
 - 1.2 Search for additional populations and characterize all known populations. Several intensive searches have been conducted for relict trillium. However, a thorough systematic effort to locate additional populations and to carefully describe the nature of the habitat occupied by the species is needed. Searches should be preceded by an examination of soil and topographic maps and aerial photographs to determine potential habitat and to develop a priority list of sites to survey.
 - 1.3 Determine habitat protection priorities and develop landowner agreements. Because of the small number of existing populations and the pervasive threats to the habitat, it is essential to protect as many populations as possible. However, efforts should be concentrated first on the largest and most vigorous populations, secondly on sites where current private landowners are cooperative, and then on sites that occur on currently protected land.
 - 1.4 Evaluate habitat protection alternatives. The greatest possible protection should be obtained for those existing populations that are considered critical to the recovery of the species. Fee simple acquisition or conservation easements provide the greatest degree of protection. However, it is unknown as yet how much

buffer land around each population is necessary to protect the integrity of occupied sites. Protection through management agreements or short-term leases may provide adequate short-term protection but should only be considered as intermediate steps in the process of ultimately providing for permanent protection. Short-term protection strategies may be necessary if private landowners are not agreeable to, or monies are not available for, acquisition of conservation easements or fee simple title. Conservation agreements with adjacent landowners or owners of rights-of-way (power companies, highway departments, etc.) should be developed to prevent inadvertent adverse alterations of the habitat.

2. Determine and implement management necessary for long-term reproduction, establishment, maintenance, and vigor.

Protection of the species' habitat is the obvious first step in ensuring its long-term survival, but this alone will not be sufficient. Habitat management may be necessary to allow the species to perpetuate its life cycle over the long term. However, since very little is known about this species, information on its genetic diversity, population biology, and ecology is necessary before effective management guidelines can be formulated and implemented.

2.1 Determine population size and stage-class distribution for all populations. Population size and stage-class distribution data are essential to predicting what factors may be necessary for populations to become self-sustaining (Menges 1987). Such data are needed for the existing populations and for any newly discovered populations.

2.2 Study abiotic and biotic features of the species' habitat. An understanding of the nature of the habitat occupied by the species is essential to the long-term survival and recovery of relict trillium. Monitoring studies should include populations within a wide range of habitats, both altered and undisturbed. Permanent plots should be selected and established to determine the relationship between abiotic factors (such as soil depth and type, soil moisture content, and light intensity) and biotic factors (such as reproduction, germination, and degree of competition and predation). This information is necessary to determine appropriate timing and type of management for ensuring the continued vigor of existing populations and to accurately select good potential sites for reintroduction if necessary.

The vectors of seed dispersal must be determined and their effectiveness under different ecological and

spatial conditions assessed. At least some seed dispersal is by ants; however, little else is known, including how far seeds can be dispersed by this vector and others and what conditions are optimal for dispersal. Major pollinators and pollination mechanisms of this species need to be determined.

Relationships with competing species must be investigated. The long-term significance of the current invasion of several sites by Japanese honeysuckle and kudzu should receive primary focus, but potential competition from the species normally associated with relict trillium should also be examined.

- 2.3 Conduct long-term demographic studies and determine genetic variability between populations. Long-term demographic studies should be conducted in permanent plots located within each study site established for habitat analysis. Plots should be visited annually, for at least 4 consecutive years, after seed set has occurred. The locations of individual plants of all stage-classes should be mapped; data collected should include overall plant, leaf, flower, and fruit size and the size and number of seeds. Larger plots, surrounding each of the smaller, more intensively measured and mapped plots, should be monitored for seed germination and seedling establishment. Seedlings should be mapped and measured. Any changes in the habitat within each plot (soil disturbance, increases or decreases in light intensity, moisture, etc.) should be noted at each visit. Through isozyme analysis, the degree of genetic variability between populations should be determined. This information will be essential to the determination of the location, distribution, and number of populations that need to be protected to ensure the long-term survival of the species.
- 2.4 Determine the effects of past and ongoing habitat disturbance. Establishment and long-term monitoring of permanent plots may be the most effective means of assessing the effects of disturbance. Appropriate methodology for this must be determined but will likely include measurement of many of the parameters specified in Tasks 2.2 and 2.3. The potential for herbicides applied to adjacent lands (agricultural fields, rights-of-way, etc.) to affect the species should be determined as a part of this task.
- 2.5 Define criteria for self-sustaining populations and determine the size of the area needed to protect each population. There is currently insufficient data to determine what this species requires in order for

populations to be self-sustaining and how large an area is needed to allow natural processes to continue without adversely affecting the size and health of the relict trillium population as a whole. Research, as described under Tasks 2.2 through 2.4, should provide the information needed to protect and, if necessary, manage occupied habitat so that the continued survival of healthy populations is assured.

- 2.6 Implement appropriate management techniques as they are developed from previous tasks.
- 2.7 Develop techniques and reestablish populations in suitable habitat within the species' historic range, if necessary, to recover the species. Techniques for seed collection, germination, propagation, and transplantation of this species should be developed. If necessary, reintroduction efforts will have to be conducted in cooperation with knowledgeable personnel at private nurseries, botanical gardens, and the Center For Plant Conservation. If established, transplant sites in suitable habitat must be closely monitored to determine success and to adjust methods of reestablishment.
3. Maintain a cultivated source of plants and provide for long-term seed storage. Techniques for seed storage, germination, and maintenance of cultivated specimens should be developed by private nurseries, botanical gardens, and the Center for Plant Conservation. At the present time, Woodlander's Incorporated of Aiken, South Carolina, is the only known private nursery that has the species under cultivation. This source of cultivated material should ease the threat of taking from wild populations.
4. Enforce laws protecting the species and/or its habitat. Trilliums are collected from the wild and sold as ornamentals. Relict trillium is not currently known to be a significant part of this trade, but this could become a threat in the future. The Endangered Species Act prohibits taking of relict trillium from Federal lands without a permit and regulates trade. Section 7 of the Act provides additional protection of the habitat from impacts related to federally funded or authorized projects. In addition, for listed plants, the 1988 amendments to the Act prohibit (1) their malicious damage or destruction on Federal lands and (2) their removal, cutting, digging, damaging, or destroying in knowing violation of any State law or regulation, including State criminal trespass law. The State of South Carolina offers no legal protection for listed plants in general. However, the approximately 500 relict trillium plants that occur on the State's natural area within Population 17 are protected from taking. No protection for

relict trillium is currently provided by the States of Georgia and Alabama.

5. Develop materials to inform the public about the status of the species and the recovery plan objectives. Public support for the conservation of the relict trillium could play an important part in encouraging landowner assistance and conservation efforts. This is especially true for the populations that occur in areas being adversely affected by development associated with expanding urban areas. Information materials should not identify the plant's locations so as not to increase the threat of taking.
 - 5.1 Prepare and distribute news releases and informational brochures. News releases concerning the status and significance of the species and recovery efforts should be prepared and distributed to major newspapers in the range of the species, as well as to smaller newspapers in the vicinity of the species' habitat.
 - 5.2 Prepare articles for popular and scientific publications. The need to protect the species in its native habitat and cooperation among local, State, and Federal organizations and individuals should be stressed. Scientific publications should emphasize additional research that is needed and solicit research assistance from colleges and universities that have conducted studies on this or closely related species.
6. Annually assess success of recovery efforts for the species. Review of new information, evaluation of ongoing actions, and redirection, if necessary, is essential for assuring that full recovery is achieved as quickly and efficiently as possible.

C. Literature Cited

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PART III
IMPLEMENTATION SCHEDULE

Priorities in column one of the following implementation schedule are assigned as follows:

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

Key to Acronyms Used in This Implementation Schedule:

ANHP	- Alabama Natural Heritage Program
CPC	- Center for Plant Conservation
FWE	- Fish and Wildlife Enhancement, U.S. Fish and Wildlife Service
FWS	- U.S. Fish and Wildlife Service
GNHI	- Georgia Natural Heritage Inventory
LE	- Law Enforcement, FWS
PA	- Public Affairs Office, FWS
SC	- South Carolina Wildlife and Marine Resources Department
TNC	- The Nature Conservancy

IMPLEMENTATION SCHEDULE

PRIOR- ITY #	TASK #	TASK DESCRIPTION	TASK DURATION (Years)	RESPONSIBLE PARTY			COST ESTIMATES (\$000'S)			COMMENTS
				FWS		Other	FY 1991	FY 1992	FY 1993	
				Region	Division					
1	1.1	Develop interim management plans	2	4	FWE	ANHP GNHI SC TNC	2.0	5.0	0	
1	1.3	Determine habitat protection priorities	1	4	FWE	ANHP GNHI SC	1.0	0	0	
1	1.4	Evaluate protection alternatives	1	4	FWE	ANHP GNHI SC	1.0	0	0	
1	2.1	Determine population size for all populations	2	4	FWE	ANHP GNHI SC	4.0	4.0	0	
1	2.2	Study species' habitat	3	4	FWE	ANHP GNHI SC	5.0	5.0	5.0	
1	2.3	Conduct demographic studies and determine genetic variability	3	4	FWE	ANHP GNHI SC	10.0	10.0	10.0	

IMPLEMENTATION SCHEDULE

PRIOR- ITY #	TASK #	TASK DESCRIPTION	TASK DURATION (Years)	RESPONSIBLE PARTY			COST ESTIMATES (\$000'S)			COMMENTS
				FWS		Other	FY 1991	FY 1992	FY 1993	
				Region	Division					
1	2.4	Determine effects of disturbance	3	4	FWE	ANHP GNHI SC	3.0	3.0	3.0	Should be combined with Tasks 2.2 and 2.3.
1	2.5	Define self-sustaining protection area needed	1	4	FWE	ANHP GNHI SC	0	0	1.0	
1	2.6	Implement needed management	Ongoing	4	FWE	ANHP GNHI SC TNC	1.5	1.5	1.5	
1	4	Enforce laws	Ongoing	4	FWE LE	GNHI	1.0	1.0	1.0	
1	6	Assess recovery success	Ongoing	4	FWE	ANHP GNHI SC	.5	.5	.5	
2	1.2	Characterize populations and search for new populations	1			ANHP GNHI SC	5.0	0	0	

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IMPLEMENTATION SCHEDULE

PRIOR- ITY #	TASK #	TASK DESCRIPTION	TASK DURATION (Years)	RESPONSIBLE PARTY			COST ESTIMATES (\$000'S)			COMMENTS
				FWS		Other	FY 1991	FY 1992	FY 1993	
				Region	Division					
2	3	Maintain cultiva- ted plants and store seeds	Ongoing	4	FWE	ANHP GNHI SC CPC	0	2.0	.5	
3	2.7	Reestablish populations	3	4	FWE	ANHP GNHI SC CPC	0	0	0	Conduct in FY 97-2000 (3K/year).
3	5.1	Prepare news releases and informational brochures	Ongoing	4	FWE PA	ANHP GNHI SC	0	0	0	Incorporate into regular public information program.
3	5.2	Prepare articles	Ongoing	4	FWE PA	ANHP GNHI SC	0	0	0	Incorporate into regular public information program.

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