

# Decurrent False Aster

*Boltonia Decurrens*

## Recovery Plan



DECURRENT FALSE ASTER (*Boltonia decurrens*)

RECOVERY PLAN

BY

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Date:

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## DISCLAIMER PAGE

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Literature Citations should read as follows:

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**EXECUTIVE SUMMARY OF THE RECOVERY PLAN FOR THE DECURRENT FALSE ASTER**

Current Status: The decurrent false aster (*Boltonia decurrens*), a Federally threatened species, currently consists of 18 known populations in Illinois and 2 known populations in Missouri. Not all of these populations are considered self-sustaining.

Habitat Requirements and Limiting Factors: Analysis of 19th century habitat data indicates that *B. decurrens*' natural habitat was the shores of lakes and banks of streams including the Illinois River. It currently is most common in lowland areas where it appears to be dependent on disturbance for survival. The reasons for the decline in this species seem to be related to habitat destruction and modification.

Recovery Objective: Delisting

Recovery Criteria: Three criteria must be satisfied to ensure that the species no longer needs the protection of the Endangered Species Act. 1. A basic research program to determine the requirements of a naturally reproducing population must be completed. 2. Twelve geographically distinct self-sustaining natural or established populations of the species must be protected through purchase in fee, easement or by cooperative management agreements. 3. Populations must be monitored for a period of 5 years to determine if they are self-sustaining. Self-sustaining is defined, for recovery purposes, as a population which is found to be stable or expanding during the 5-year monitoring period.

Actions Needed:

1. Survey suitable habitat for additional populations.
2. Protect existing and established populations.
3. Establish new populations.
4. Conduct research on the biology of the species.
5. Monitor natural and established populations.
6. Develop and maintain public support (brochure/display).

Costs (000's):

<u>Year</u>	<u>Need 1</u>	<u>Need 2</u>	<u>Need 3</u>	<u>Need 4</u>	<u>Need 5</u>	<u>Need 6</u>	<u>Total</u>
1991	2.5	25.2	0.0	10.0	1.0	2.0	40.7
1992	0.0	0.0	5.0	6.0	1.0	0.0	12.0
1993	0.0	0.4	0.0	0.0	1.0	0.0	1.4
1994	0.0	0.0	0.0	0.0	1.0	0.0	1.0
1995	0.0	0.0	0.0	0.0	1.0	0.0	1.0
1996	0.0	0.0	0.0	0.0	1.0	0.0	1.0
1997	0.0	0.0	0.0	0.0	1.0	0.0	1.0
Total	2.5	25.6	5.0	16.0	7.0	2.0	58.1

Date of Recovery: Provided recovery criteria are met, delisting should be initiated in 1997.

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## PART I. INTRODUCTION

### SYSTEMATICS AND IDENTIFICATION

Boltonia decurrens (Torr. & Gray) Wood is a perennial plant of open wetland habitats. A member of the Aster family, it was recognized as a species distinct from B. asteroides by Schwegman and Nyboer (1985). Boltonia decurrens is separated from B. asteroides var. recognita by its decurrent leaves and absence of rhizomes. It also has a strong tendency to have larger flowers that more frequently have violet colored rays (Schwegman and Nyboer 1985).

Boltonia decurrens reproduces both vegetatively, by producing basal shoots, and sexually. It grows to a height of 1.5 m, sometimes reaching heights of more than 2 m. It is characterized by conspicuous decurrent leaves that are linear to lanceolate, about 5-15 cm long and 5-20 mm wide. Lower leaves are generally somewhat larger. The inflorescence varies from a compact to a widely spreading panicle. Its branches are somewhat leafy with numerous aster-like heads with yellow disks 7-14 mm wide. Rays are white to pale violet and 1-1.8 cm long. Aster-like flower heads are 20-25 mm in diameter and appear on the tall bushy plants from August to October.

In a final rule making published in the Federal Register on November 14, 1988, the Fish and Wildlife Service determined that

Boltonia decurrens is a nationally threatened species under the authority of the Endangered Species Act of 1973, as amended.

#### REPRODUCTIVE STATUS

Boltonia decurrens reproduces both vegetatively and by seed. Under nursery conditions, naturally stratified, fall planted seed produced mature flowering plants and a single leafy basal rosette the first year. Some first year flowering plants exceeded 2 m in height. Basal rosettes that were monitored in the wild produced flowering plants the following year. Single stemmed flowering plants that possessed sessile basal shoots in the fall, produced rings of disconnected flowering plants the following growing season. These ramets in turn produced leafy shoots that will presumably carry them into a third or fourth generation of vegetatively produced plants. As many as 11 plants have been observed to grow from a single stem of the previous year, giving a 2-year-old wild population a definite clumped appearance. Production of basal shoots is typical for flowering plants of this species. The plants are prolific seed producers (Schwegman and Nyboer 1985).

The Illinois Department of Conservation monitored four Illinois populations and found that B. decurrens did not reproduce sexually in dense weedy areas even in full sunlight and that vegetative regeneration ceased after 4 or 5 years in these stands (Schwegman, personal communication). Fire effects are unknown as

is the significance of the soil seed bank and light requirements.

#### **HABITAT, DISTRIBUTION AND POPULATION STATUS**

Analysis of 19th century habitat data taken from herbarium sheets indicates that B. decurrens' natural habitat was the shores of lakes and the banks of streams including the Illinois River. It appears to require abundant light. It presently grows in such habitats but is more common in disturbed lowland areas where it appears to be dependent on human activity for survival.

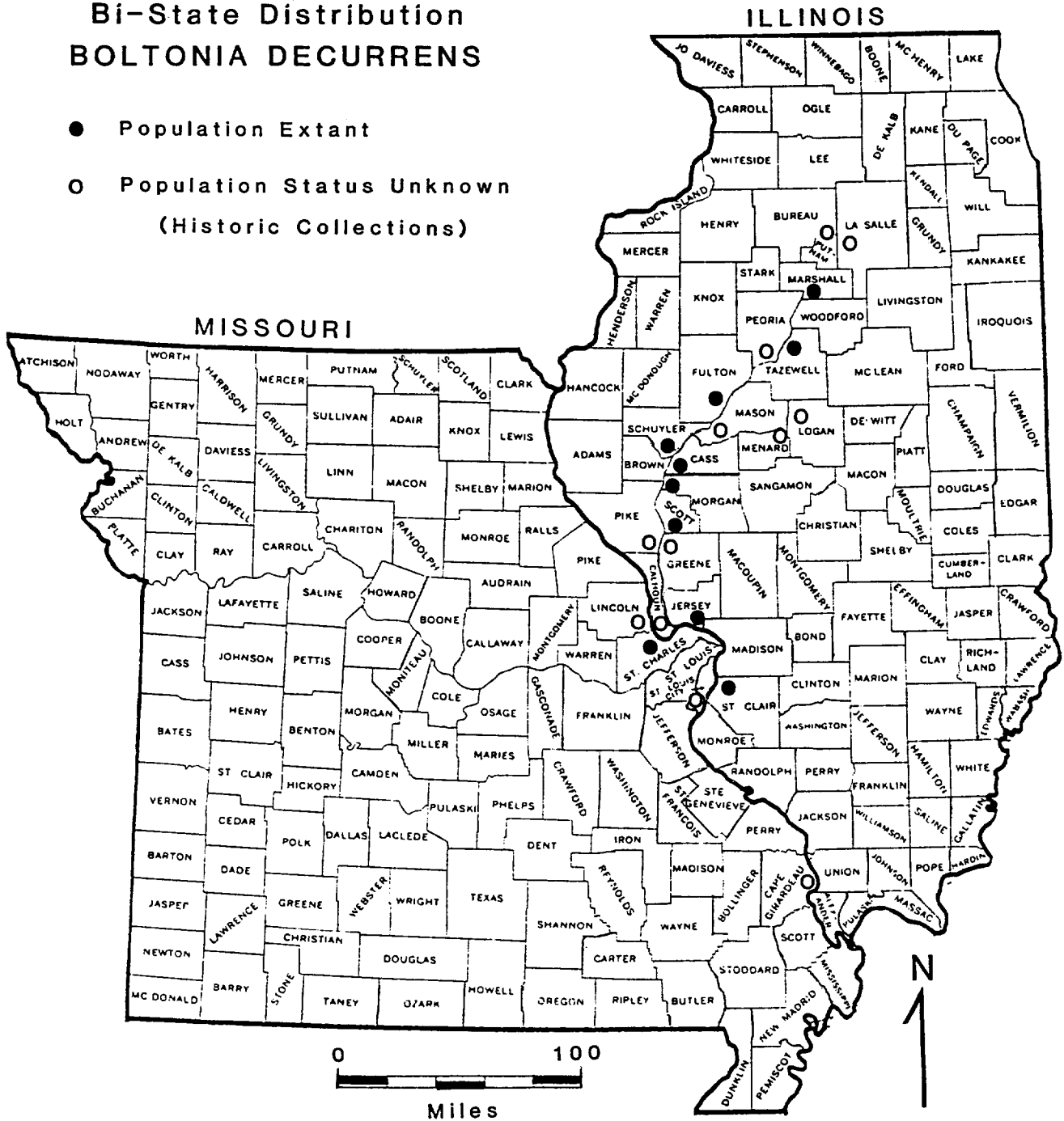
Historical collection records reveal that B. decurrens formerly ranged along a 400 km stretch between LaSalle, Illinois and St. Louis, Missouri within the Illinois and Mississippi River flood plains (FIGURE 1). A disjunct population, reported in 1976 but not found since, is known from Cape Girardeau, Missouri about 195 km down the Mississippi River from St. Louis (Schwegman and Nyboer 1985) (FIGURE 1).

Extensive surveys in Illinois for the species were conducted from 1980 to 1985 by Schwegman and Nyboer (1985). These surveys located a total of 13 populations in Illinois. In 1989, Schwegman (personal communication) reported a total of 18 populations in Illinois; 5 previously known populations had disappeared, but 6 new populations were discovered (TABLE 1). These 18 Illinois populations are located along the Illinois River in Jersey, Scott, Cass, Morgan, Schuyler, Fulton, Tazewell, and Marshall counties, and along the Mississippi River in St. Clair County. Five of the



**Bi-State Distribution  
BOLTONIA DECURRENS**

- Population Extant
- Population Status Unknown  
(Historic Collections)



**FIGURE 1.** Historic and extant populations of *Boltonia decurrens* in Illinois and Missouri (modified from Morgan (1980) and Kurz (1981)).

TABLE 1. 1989 Boltonia decurrens Population Estimates\*

ILLINOIS

<u>COUNTY</u>	<u>AREA</u>	<u>NUMBER OF PLANTS</u>
St. Clair	Fairmount City	3
Jersey	Gilbert Lake	59
Scott	Smith Lake	50
Morgan/Cass	Meredosia Lake	>2,000
Morgan	Meredosia Lake	20
Cass	Illinois River	2
Schuyler	Frederick	>2,000
Schuyler	Browning	53
Schuyler	Sanganois	50
Schuyler	Long Lake	36
Fulton	Anderson Lake	30
Fulton	Rice Lake	>4,000
Fulton	Rice Lake	61
Tazewell	Cooper Park N	10
Marshall	Brown' Run	4
Marshall	Billsbach Lake	6
Marshall	Sparland Conservation Area	2
Marshall	Apple Knob	36

MISSOURI

<u>COUNTY</u>	<u>AREA</u>	<u>NUMBER OF PLANTS</u>
St. Charles	Spatterdock Bottoms #1	>50
St. Charles	Spatterdock Bottoms #2	<50
St. Charles	Spatterdock Bottoms #3	>50
St. Charles	Spatterdock Bottoms #4	<50
St. Charles	Spatterdock Bottoms #5	200
St. Charles	Spatterdock Bottoms #6	100
St. Charles	Spatterdock Bottoms #7	<50
St. Charles	Columbia Bottoms #1	<1,000
St. Charles	Columbia Bottoms #3	500
St. Charles	Columbia Bottoms #4	>50

\*In Illinois, actual counts were made for populations containing <100 plants, while populations with >100 plants were estimated. The counts for Tazewell and Marshall County sites are probably higher than recorded due to high water conditions during the count period. Missouri counts are estimates made in the field.

18 are on State of Illinois property, 3 are on National Wildlife Refuges, and the remaining 10 sites are on private property. Naturally regenerating lake shore populations in Illinois increased markedly during the drought conditions in 1988 and 1989.

In a 1988 survey, Hickey (1988) searched 4 Missouri counties along the Mississippi River, 3 of which contained historical sites for the species. A total of 227 sites was searched in St. Louis, St. Charles, Lincoln and Pike counties. Prior to this survey only three extant populations of B. decurrens were known from Missouri. Although Hickey was unable to find any plants at one of these locations, she discovered 10 new sites for B. decurrens in St. Charles County. It was not found in St. Louis, Lincoln or Pike counties.

All new locations occur in the vicinity of the two previously known B. decurrens sites. Seven of the new locations are considered to be part of the Spatterdock Bottoms population and the remaining 3 new locations are part of the existing Columbia Bottoms population.

Of the 8 Spatterdock Bottom sites, 3 are privately owned, and 5 are under the jurisdiction of the St. Louis District, U.S. Army Corps of Engineers.

#### **LIMITING FACTORS**

Schwegman and Nyboer (1985) believed that habitat destruction and modification were the main reasons for the decline in this

species. Wet prairies and natural marshes have been eliminated within the species' range. Many natural lakes have been drained and converted to cropland as well. Shore habitats have been modified by heavy siltation and altered flooding regimes. Extensive row crop agriculture in the watershed and the numerous levee systems on the flood plain are responsible for these problems.

Prolonged flooding during the growing season appears to be a limiting factor. A flood in 1981 inundated most of the unleveed flood plain of the Illinois River with turbid flood water for an extended period during the summer. Shrubs such as Cephalanthus occidentalis were killed by the prolonged total inundation in some areas, and herbs were buried under heavy deposits of silt. Despite intensive searches, no B. decurrens was found for 2 subsequent seasons along the Illinois River. Such conditions severely limit natural reproduction and survival by B. decurrens.

Boltonia decurrens populations may also be vulnerable to destruction by discing and herbicide use in low-lying marginal lands for crop weed control. Nearly all stands are in habitats kept open by occasional cropping. Future weed control efforts may destroy many of these plants or they may disappear due to habitat succession if cropping is stopped.

#### **PRESENT PROTECTION STATUS AND MONITORING EFFORTS**

In addition to the protection afforded by the Endangered

Species act of 1973, as amended, B. decurrens is currently listed as endangered in Missouri (Wilson 1984) and threatened in Illinois (Illinois Endangered Species Protection Board 1989). Illinois law protects endangered and threatened plants found on state nature preserves, prohibits taking of endangered plants without written permission of the landowner and prohibits sale of endangered plants. Missouri statutes prohibit taking of endangered plants without written permission of the landowner and also prohibits sale of endangered plants.

The Illinois Department of Conservation began an annual B. decurrens population monitoring program for Illinois in 1984. A similar program was begun in Missouri by the Missouri Department of Conservation in 1987.

In 1986 the decurrent false aster was discovered in a borrow pit which was excavated for fill material for the access road to the Melvin Price Locks and Dam construction site in St. Charles County, Missouri. When the pool was raised behind the new locks and dam structure this borrow pit filled with water. In an effort to mitigate the loss of this population, a number of plants were successfully transplanted by the Missouri Department of Conservation to other Corps lands. Subsequent to this effort the St. Louis District, Corps of Engineers successfully transplanted additional plants to a second site on Corps lands.

The St. Louis District has begun a contract study of the basic life history characteristics of this species to provide information necessary for management of the species on District lands. The

U.S. Fish and Wildlife Service has initiated additional life history studies.

## PART II. RECOVERY

### A. RECOVERY OBJECTIVES

The primary objectives of the recovery plan for the decurrent false aster are: 1) to determine the requirements of a naturally reproducing population through research, 2) to locate and protect as many existing populations as practical, 3) to enhance existing populations through management practices where appropriate, and 4) to establish additional populations in suitable protected habitat. Once the specified research has been conducted, delisting may be considered when 12 geographically distinct, self-sustaining natural or established populations of the species are protected through purchase in fee, easement or by cooperative management agreements. Twelve populations were considered adequate by the Recovery Team because a number of existing populations occur on Federal or state refuges or management areas and are currently protected or actively managed.

Priority for protecting B. decurrens populations will be as follows. First priority will be given to providing protection through purchase in fee, easement, or management of natural self-sustaining populations. Second priority will be given to protection and management of existing and established populations on Federal and state lands. Third priority will be given to protection of naturally occurring or established populations on private and local government controlled lands. Populations will

be monitored for a period of 5 years to evaluate their population status. If, after 5 years of monitoring a population, it is found to be stable or expanding, that population will be considered a self-sustaining population for recovery purposes. Seed will be placed in long term storage at the U.S. Department of Agriculture's seed storage facility to provide a reintroduction source should some natural disaster occur that would again threaten the species with extinction following delisting.

#### **B. NARRATIVE OUTLINE FOR RECOVERY ACTIONS ADDRESSING THREATS**

The narrative outline lists tasks that need to be undertaken in order to meet the recovery objectives.

1. Inventory to locate additional populations. Surveys conducted by the Illinois Department of Conservation during 1989 located 6 new populations in the Illinois River Valley. The majority of populations located to date have been readily accessible by road. The potential for finding additional populations in remote areas is considered high, especially during drought years. As such, special emphasis should be placed on surveying flood plain habitat that is relatively inaccessible.

1.1 Identify and search potential new sites. Special attention should be given to the flood plain of the Illinois River Valley.



2. Secure some level of habitat protection for known, natural self-sustaining populations on privately-owned lands. The habitat of known, privately-owned, natural self-sustaining populations must be protected either by purchase in fee, easement or through cooperative management agreements. These populations are critical to species recovery because they have a greater potential for retaining the characteristics necessary for survival in the wild than do cultivated or actively managed populations. Two populations on private lands (Meredosia Lake and Smith Lake) should be protected by purchase, easement, or signed cooperative management agreement. Acquisitions of private lands or interests in private lands shall be by the U.S. Fish and Wildlife Service but management responsibility may be vested in the Illinois Department of Conservation. The following populations should be protected:

2.1 Meredosia Lake (East shore) Population, Morgan/Cass County, IL.

2.2 Smith Lake Population, Scott County, IL.

3. Obtain cooperative agreements to develop management plans for the protection and management of natural populations on U.S. Fish and Wildlife Service National Wildlife Refuges. Natural populations of disturbance origin on refuge lands shall be protected and managed by the U.S. Fish and Wildlife Service. Protected lands should be managed, if necessary, to maintain their suitability for the species through application of techniques to create limited disturbance, such as prescribed burning, mowing or

discing. Populations will be monitored on an annual basis to determine if the population should be managed or manipulated in a given year. The following populations should be protected:

- 3.1 Gilbert Lake Population, Jersey County, IL.
- 3.2 Meredosia Lake Population, Morgan County, IL.

4. Obtain cooperative agreements with the U.S. Army Corps of Engineers, St. Louis District to develop management plans for the protection and management of natural and transplanted populations on Corps lands in Missouri. Natural populations of disturbance origin and transplanted populations on Corp of Engineers lands shall be protected and managed by cooperative management agreement between the Twin Cities Endangered Species Office of the U.S. Fish and Wildlife Service and the Corps of Engineers. Protected lands should be managed, if necessary, to maintain their suitability for the decurrent false aster through application of techniques to create limited disturbance, such as prescribed burning, mowing or discing. Natural populations of disturbance origin and transplanted populations will be monitored annually, as part of a signed cooperative management agreement, to determine if the populations should be managed or manipulated in a given year. The following Missouri populations should be protected:

- 4.1 Spatterdock Bottom Populations, St. Charles County, MO.
- 4.2 Columbia Bottoms Populations, St. Charles County, MO.

5. Obtain cooperative agreements to develop management plans for

the protection and management of natural populations on State land in Illinois. Natural populations (Goose Lake) and natural populations of disturbance origin on State land shall be protected and managed by cooperative management agreement between the Twin Cities Endangered Species Office of the U.S. Fish and Wildlife Service and the appropriate State agencies. Protected lands should be managed, if necessary, to maintain their suitability for the decurrent false aster through application of techniques to create limited disturbance, such as prescribed burning, mowing or discing. Populations will be monitored annually, as part of the signed cooperative management agreements, to determine if the population should be managed or manipulated in a given year. The following Illinois populations should be protected:

- 5.1 Sanganois Population, Schuyler County, IL.
- 5.2 Anderson Lake Population, Fulton County, IL.
- 5.3 Rice Lake Population, Fulton County, IL.
- 5.4 Sparland Conservation Area Population (West shore of Goose Lake), Marshall County, IL.

6. Obtain cooperative agreements to protect natural populations on private property or land owned by local governments. The landowner will be notified that a Federally threatened plant occurs on their property and will be informed of the importance of the population to recovery efforts. A cooperative agreement, in the form of a signed letter from the property owner, will be obtained by the U.S. Fish and Wildlife Service stating that the property

owner will not knowingly take actions which may destroy the population. The following privately or municipally owned populations should be protected:

- 6.1 Frederick Borrow Pit Populations, Schuyler County, IL.
- 6.2 Browning River Road and Parking Lot Populations, Schuyler County, IL.
- 6.3 Spatterdock Bottom Populations, St. Charles County, MO.
- 6.4 Columbia Bottoms Populations, St. Charles County, MO.

7. Establish new populations in suitable habitat. In order to reach delisting criteria for protecting a total of 12 self-sustaining populations, new populations need to be established. It appears that one mechanism of long distance dispersal of B. decurrens seeds is by flood waters. There appears to be suitable habitat for the species in many areas on the flood plain of the Illinois River; however, dispersal has been prevented by the extensive levee system that has been constructed to reduce flood damage to agricultural fields. This problem can be resolved through the following measures.

- a) Identify suitable habitat on land owned or managed by the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, the Illinois Department of Conservation and the Missouri Department of Conservation. Sites within the existing range of the species will be identified based on soil/habitat characteristics.
- b) Transplant/Seed New Populations. Boltonia decurrens is

easily propagated by both cuttings and by seed, and transplanting has also been successful. Transplants and/or seeding will be done on appropriate suitable habitat using the following guidelines.

1. Seeds exhibit conditional dormancy (Baskin and Baskin 1988; Baskin, personal communication). Germination will occur if seeds are planted immediately upon collection in the fall. Seed may be sown in October, or kept in cold storage, stratified for 6 to 10 weeks and then sown in the spring. Boltonia decurrens seeds will not germinate in darkness and so should be scattered on the soil surface.

2. Transplanting may be conducted at any time. The St. Louis District, Corps of Engineers transplanted 60 clumps of plants in July with a 90% survival rate. However, higher survival rates would be anticipated if transplanting occurred during the fall or spring. Priority should be given to transplanting from sites threatened with destruction. Otherwise seeding is preferred.

- 7.1 As first priority for establishment of new populations, identify suitable habitat on land owned or managed by the U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, Illinois Department of Conservation, and

Missouri Department of Conservation.

7.2 As a second priority for establishment of new populations, identify suitable habitat on privately owned or local government controlled lands on which the land owner has agreed to protect the population.

7.3 Transplant or seed identified suitable habitat.

7.4 Obtain cooperative agreements with appropriate Federal and state agencies to develop management plans for the protection and management of established populations.

7.5 Obtain cooperative agreements with private landowners for the protection of established populations.

8. Monitor Populations. Natural, self-sustaining populations and populations established by transplanting or seeding will be monitored (censused) in September for at least 5 years to determine if the population is stable or expanding. If after 5 years the population is found to be stable or expanding, that population will be considered to be recovered. After 12 populations have been protected by purchase, easement, or cooperative management agreement and have been determined to be stable or expanding for a period of 5 years, the species will be considered recovered and thus eligible for delisting.

8.1 Monitor natural and established populations for 5 years to determine their status.

9. Conduct basic research. Basic research into the life history

of B. decurrens would be extremely useful in defining habitat requirements for establishing new populations and would provide information to better manage and ensure long term survival of the species.

Decurrent false aster populations are known to fluctuate greatly. Natural populations completely disappear and then reappear on a cycle apparently related to flood and drought. Populations started in weedy man-disturbed habitats also disappear over time, possibly related to floods and siltation, succession to shading woody vegetation and competition from later successional herbs. The causes of these declines and the mode of recovery need to be determined. It is also important to learn the role of soil seed banks, if any, in the recovery process. Boltonia decurrens is a prolific seed producer, and may have a large soil seed bank that requires natural or human induced disturbance for seed germination. This information may have implications concerning the classification of this species as threatened. Research is obviously needed to understand the population fluctuations which occur in this species. The effects of fire and other natural and human induced disturbances (i.e. mowing, discing) on this species need to be determined to establish management practices.

The restricted range of this species, primarily to areas of Wisconsinan glacial outwash deposits in the Illinois River and adjacent Mississippi River valleys, implies that it has specific habitat requirements. The limited occurrence of B. decurrens on natural lake shores in the Illinois River Valley is probably

related to soil conditions, slope and other site characteristics. Research on soil texture, pH, and slope is necessary to understand the natural restriction to B. decurrens' spread outside of its native range, to evaluate the long term survival potential of naturally regenerating populations, and to select appropriate sites for the establishment of new populations.

- 9.1 Conduct competition and reproduction studies to determine the ability of B. decurrens to compete successfully with other species.
- 9.2 Determine soil texture, pH and slope characteristics at all known B. decurrens sites.
- 9.3 Determine the role of a soil seed bank in the life history of the species.
- 9.4 Evaluate the role of disturbance (i.e. fire, mowing, discing) for population management.

10. Place seeds in long term seed storage. To provide for future propagation efforts, seeds should be deposited with the U.S. Department of Agriculture National Plant Germ Plasm System facility in Fort Collins, Colorado. Five seed heads from 50 plants at each of 10 populations across the range of the species will be collected and transferred to the seed storage facility. The seeds will be segregated by population. Seeds will be placed in long term storage to provide a buffer of protection to the species should some natural disaster occur that would threaten the species with extinction after it has been delisted.



10.1 Collect seeds from a minimum of 10 populations across the range of the species.

10.2 Transfer seeds to a long term storage facility.

11. Develop and maintain public support for protection of *B. decurrens* and enhancement of its habitat. *Boltonia decurrens* grows in close proximity to several public recreation facilities. This provides an opportunity for education at the local level. A small planting accompanied by an interpretive display and brochures should be placed at the following areas: Rice Lake, Forest Park Nature Center, and Pere Marquette State Park in Illinois, and the visitors center at Melvin Price Locks and Dam, Marais Temps Clair Wildlife Area and the Missouri Botanical Garden in Missouri. The brochure and interpretive display could be co-produced by the Illinois Department of Conservation, Missouri Department of Conservation, U.S. Army Corps of Engineers and U.S. Fish and Wildlife Service. Benefits from such a program could include: giving the general public a better understanding of the goals of the Endangered Species Act, stimulating a sense of stewardship in landowners with decurrent false aster populations on their land, and encouraging amateur and professional naturalists to recognize the species and search for new populations.

11.1 Prepare endangered species/*B. decurrens* brochure.

11.2 Prepare interpretive display.

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### PART III. IMPLEMENTATION SCHEDULE

The Implementation Schedule that follows outlines actions and estimated costs for the recovery program. It is a guide for meeting the objective discussed in Part II of this Plan. This schedule identifies task priorities, task numbers, task descriptions, duration of tasks, the responsible agencies and estimated costs. These actions, when accomplished, should bring about the recovery of the species and protect its habitat. The estimated recovery costs for the seven-year program is \$58,100.

Priorities in the 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 meet the recovery objectives.

RECOVERY PLAN IMPLEMENTATION SCHEDULE

PRIOR- ITY #	TASK #	TASK DESCRIPTION	TASK DURA- TION (YRS)	RESPONSIBLE PARTY	COST ESTIMATES (\$000)							COMMENTS	
					FY 1991	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997		
2	1.1	Locate Additional Populations	1	FWS	2.5								
2	2.1	Protect Meredosia Lake Population	Ongoing	FWS	12.0								Tasks 2.1 and 2.2: Purchase, easement or cooperative management agreement would occur during FY91, management would be ongoing. Costs reflect purchase of land.  Tasks 3.1, 3.2, 4.1, 4.2, 5.1-5.4: Management Agreements would be secured during FY91. Management of populations would be ongoing. The costs for management of the species on Corps and IDOC lands will be borne by the agencies as part of their on-going land management programs.
2	2.2	Protect Smith Lake Population	Ongoing	FWS	12.0								
2	3.1	Management Plan at Gilbert Lake	Ongoing	FWS	0.1								
2	3.2	Management Plan at Meredosia Lake	Ongoing	FWS	0.1								
2	4.1	Management Plan for Spatterdock Bottom Populations	Ongoing	FWS Corps	0.1								
2	4.2	Management Plan for Columbia Bottoms Population	Ongoing	FWS Corps	0.1								
2	5.1	Management Plan for Sanganois Population	Ongoing	FWS IDOC	0.1								
2	5.2	Management Plan for Anderson Lake Population	Ongoing	FWS IDOC	0.1								
2	5.3	Management Plan for Rice Lake Population	Ongoing	FWS IDOC	0.1								

RECOVERY PLAN IMPLEMENTATION SCHEDULE (Continued)

PRIORITY #	TASK #	TASK DESCRIPTION	TASK DURATION (YRS)	RESPONSIBLE PARTY	COST ESTIMATES (\$000)							COMMENTS	
					FY 1991	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997		
2	5.4	Management Plan for Sparland Conservation Area	Ongoing	FWS	0.1								
2	7.1	Identify Suitable Habitat for Establishment of New Populations - Federal and State	1 year	FWS		1.5							
2	7.2	Identify Suitable Habitat for Establishment of New Populations - Private and Local	1 year	FWS		1.5							
2	7.3	Establish New Populations	1 year	FWS		2.0							
2	7.4	Management Plans: Federal and State Lands	Ongoing	FWS			0.2						
2	7.5	Cooperative Agreements: Private and Local Owners	Ongoing	FWS			0.2						
2	8.1	Monitor Natural and Established Populations	7 years	FWS	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
2	9.1	Competition, Reproduction Studies	2 years	FWS	2.0	2.0							
2	9.2	Determine Soil Requirements	2 years	FWS	4.0								

RECOVERY PLAN IMPLEMENTATION SCHEDULE (Continued)

PRIOR- ITY #	TASK #	TASK DESCRIPTION	TASK DURA- TION (YRS)	RESPONSIBLE PARTY	COST ESTIMATES (\$000)							COMMENTS	
					FY 1991	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997		
2	9.3	Study Soil Seed Bank	2 years	FWS	2.0	2.0							
2	9.4	Study Disturbance for Population Management	2 years	FWS	2.0	2.0							
2	10.1	Collect Seeds	(1 wk)	Corps IDOC									Tasks 10.1 & 10.2: The Corps and IDOC have volunteered to collect seeds for long-term storage.
2	10.2	Place Seeds in Long-Term Storage	(1 wk)	FWS									
3	6.1	Protect Frederick Borrow Pit Population	Ongoing	FWS Local Govern- ment	0.1								Tasks 6.1-6.4: Agreements to protect popula- tions on private or local government lands would be made during FY91. Protection would be ongoing.
3	6.2	Protect Browning River Road and Parking Lot Popula- tions	Ongoing	FWS Local Govern- ment	0.1								
3	6.3	Protect Spatterdock Bottom Populations	Ongoing	FWS Private Land Owners	0.1								
3	6.4	Protect Columbia Bottoms Populations	Ongoing	FWS Private Landowners	0.1								
3	11.1	Prepare Brochure	1 year	FWS	1.0								The Corps, IDOC, and MDOC have expressed an interest in cooperating on Tasks 11.1 and 11.2
3	11.2	Prepare Interpre- tive Display	1 year	FWS	1.0								