

Decurrent False Aster
(Boltonia decurrens)

5-Year Review:
Summary and Evaluation
2012

U.S. Fish and Wildlife Service
Midwest Region
Rock Island Ecological Services Field Office
Moline, Illinois

5-YEAR REVIEW
Decurrent False Aster/*Boltonia decurrens*

1.0 GENERAL INFORMATION

1.1 Reviewers (*list primary reviewers of species information below*)

Lead Regional or Headquarters Office

Jessica Hogrefe, Recovery Coordinator, Midwest Region (612-713-5346)

Lead Field Office

Amber Andress, Rock Island Ecological Services Field Office (309-757-5800)

1.2 Methodology used to complete the review:

The U.S. Fish and Wildlife Service (Service) solicited information from the public through a Federal Register notice (76 FR 44564-44566) requesting new information on the decurrent false aster (*Boltonia decurrens*) that may have a bearing on its classification as threatened. No comments were received during the public comment period or since the open period.

The review of new information and this evaluation was completed by Amber Andress, biologist at the Rock Island Ecological Services Field Office. The information in this document was obtained from scientific journal articles; unpublished field observations by Service and State of Illinois biologists; unpublished survey reports; and notes and communications from other qualified biologists and individuals familiar with the species. We also relied heavily on the previous 5-year review for the species (USFWS 2010). Acknowledgement is given to Trisha Crabill of the Colombia Missouri Ecological Services Field Office for her review and comments on the draft document. No reclassification or significant change in threats or recovery criteria have been proposed and therefore formal peer review of this document was not solicited.

1.3 Background:

1.3.1 FR Notice citation announcing initiation of this review:

Federal Register, Volume 76, Number 143, Tuesday, July 26, 2011, pages 44564 to 44566.

1.3.2 Listing history

Original Listing

FR notice: 53 FR 45858

Date listed: November 14, 1988

Entity listed: Species – Decurrent False Aster (*Boltonia decurrens*)

Classification: Threatened

1.3.3 Associated rulemakings:

None

1.3.4 Review History

Decurrent false aster was included in a cursory five-year review of all species listed before January 1, 1991 (56 FR 56882). The five-year review resulted in no change to decurrent false aster's listing classification of threatened. A five-year review was initiated on March 30, 2006 (71 FR 16176-16177). This review was completed in 2010 (USFWS 2010) and resulted in no change to the species' listing classification of threatened.

1.3.5 Species' Recovery Priority Number at start of 5-year review:

The species has a recovery priority number of 8, reflecting a moderate degree of threat and a high potential for recovery.

1.3.6 Recovery Plan or Outline

Name of plan or outline: Decurrent False Aster, *Boltonia decurrens*, Recovery Plan

Date issued: September 28, 1990

Dates of previous revisions, if applicable: N/A

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate?

No.

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?

Yes.

2.2.2 Adequacy of recovery criteria.

2.2.2.1 Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?

The recovery criteria generally reflect the current understanding of the biology of the species, but there are aspects and assumptions in the recovery criteria that are in need of clarification and definition.

As noted in the 2010 five-year review, the term “population” used in the recovery plan refers to a group of individuals within a distinct geographic location. However, based on research conducted since the publishing of the recovery plan, the recovery team has observed that a population of *Boltonia decurrens* (*B. decurrens*) may cover a larger geographic area (USFWS 1990). More specifically, genetic research (DeWoody 2004) indicates that *B. decurrens* may best be described as a metapopulation in which *B. decurrens* colonizes and disappears from available habitat patches.

Additionally, a review of population monitoring data has indicated that plant abundance fluctuates widely, a presumed response to annual changing site conditions and dynamic Illinois River hydrology (Smith et.al. 2005). The *B. decurrens* recovery workgroup has held discussions regarding the efficacy of a period of five years to determine if a particular population is self-sustaining. The workgroup has also discussed how best to define self-sustaining. At this time, a consensus has not been reached on either point.

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)?

Yes. Listing factor A is addressed. Listing factors B,C, D, and E are not relevant to this species.

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information.

Criterion 1: *A basic research program to determine the requirements of a naturally reproducing population must be completed.*

This criterion has been met.

A summary of research that has been conducted to fulfill this criterion can be found in the 2010 Boltonia 5-year Review and at <http://www.siue.edu/~msmith/research.htm>.

Criterion 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.*

This criterion has not yet been met.

This criterion addresses listing factor (A), the present or threatened destruction, modification, or curtailment of habitat or range. Surveys indicate that more than twelve geographically distinct populations exist on lands already owned and permanently protected by the Illinois Department of Natural Resources (ILDNR) and the Service (USFWS, unpublished data). However, not all of these populations are managed specifically to promote the growth and expansion of *B. decurrens*. A draft cooperative management agreement to facilitate the protection and specific management of *B. decurrens* populations on ILDNR and National Wildlife Refuge lands has been written. This document will articulate a commitment by land managers to promote habitat conditions that facilitate *B. decurrens* growth and expansion. It is anticipated that the document will be signed in 2012. Depending on the final number of sites included in the cooperative management agreement, this criterion may be met on signing of the document.

Criterion 3: *Populations must be monitored for a period of five 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 five-year monitoring period.*

This criterion has not yet been met.

Forty-three populations of *B. decurrens* have been monitored intermittently for more than 20 years, and population numbers have appeared to increase and decrease according to environmental conditions (Smith et.al. 2005). Floodplain conditions and late-season high water precluded monitoring on many long-term monitoring sites for three of the last five years, and sites that were checked did not contain *B. decurrens*. Surveys in 2011 at 19 of the 43 historical sites show that *B. decurrens* has recolonized previously vacant areas, and total population numbers approach the peak numbers observed in the early 2000's. A graph of population trends on the Illinois River (in Illinois) over time constructed with available data can be found in Appendix A. Given the difficulty in monitoring the species over the past five years, there is insufficient information to determine with certainty if this criterion has been met at this time.

2.3 Updated Information and Current Species Status

Boltonia decurrens is a fugitive species endemic to the Illinois River corridor that colonizes periodically disturbed riverine moist soil habitats (Smith et.al. 2005). It is considered a perennial plant but also exhibits annual and biennial lifecycles. Aster-like inflorescences appearing in late summer and fall produce achenes that float and are often

dispersed by flowing water (Baskin and Baskin 2002). The plant is also capable of vegetative reproduction via shoots from a basal rosette (Smith and Keevin 1998). Research since the publication of the recovery plan has indicated that the population dynamics of the species may be more accurately modeled as a large metapopulation throughout its range (DeWoody et. al. 2004). In this model, *B. decurrens* sub-populations are maintained and new sub-populations are established under a flood pulse regime characterized by spring floods and midsummer periods of low water. Flood pulses provide necessary disturbance and reduce competition, facilitating the colonization of habitats by *B. decurrens*. Impoundment of the Illinois River and periodic prolonged high water events during the growing season reduce available habitat and have contributed to the decline of the species (Smith et.al. 2005).

2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology and life history:

Research relevant to the life history and biology of the species is referenced in the 2010 review, and a list of relevant literature published after the issuance of the recovery plan can be found on the website of Dr. Marian Smith of Southern Illinois University at (<http://www.siu.edu/~msmith/DrMarianSmith.htm#publications>). Since the last five-year review, no new research on *B. decurrens* life history or biology has been performed.

2.3.1.2 Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

B. decurrens continues to respond directly to the influence of Illinois River water levels and the duration of standing water on *B. decurrens* sites. Late season high water precluded most surveys from 2007-2010, and sites that were surveyed contained no plants. Surveys conducted in the fall of 2011 by Drs. Smith and Mettler-Cherry, confirmed the presence of flowering plants on 10 of 19 historical sites visited (USFWS and Smith 2011, unpublished data). The species appears to be rebounding from the 2007-2010 prolonged flooding, but cannot be said to have been stable over the past five years.

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

Since the publication of the 2010 5-year review, preliminary research has been conducted on the potential hybridization of *B. decurrens* and *B. asteroides*. DeWoody et.al. (2011) tested for hybridization in sympatric populations using allozyme genetic marker data. The results revealed a very low rate of hybridization and introgression, indicating that cross-pollination and hybridization may not pose an immediate threat to the species. However, higher resolution genetic testing has yet to be performed. Drs. Michael Romano and Susan

Romano of Western Illinois University have received funding from the Rock Island Field Office to research and develop species-specific microsatellite primers to facilitate the distinction between pure species and hybrids.

2.3.1.4 Taxonomic classification or changes in nomenclature:

None.

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.):

No changes have been observed since the 2010 5-year review.

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

Water levels on the Illinois River continue to influence *B. decurrens* habitat availability as described in Smith et al. (2005). Late season flooding in 2007, 2008, and 2009 limited population growth and precluded most surveys for the species on most historically occupied sites. Population surveys in 2011 indicated that *B. decurrens* populations had reestablished on 10 of 19 surveyed sites (USFWS and Smith 2011, unpublished data).

Construction has recently begun on a Habitat Rehabilitation and Enhancement Project at Rice Lake State Fish and Wildlife Area (SFWA) in Fulton County, Illinois. This project is sponsored by the U.S. Army Corps of Engineers (Corps) in partnership with the Illinois Department of Natural Resources and will involve the refurbishment of the Rice Lake levee system and the installation of a water control structure and pumping facility (USACE 2012). These improvements will enable managers to create and maintain moist soil habitat, which should facilitate the expansion of an existing population of *B. decurrens* at Rice Lake SFWA.

2.3.1.7 Other:

None

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:

No new information has become available since the 2010 five-year review. The primary limiting factors of *B. decurrens* continue to be impoundment and atypical flood pulse patterns on the Illinois River which result in attenuated growing

seasons and limited suitable habitat for the plant.

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:

None known.

2.3.2.3 Disease or predation:

None known.

2.3.2.4 Inadequacy of existing regulatory mechanisms:

In the absence of the Endangered Species Act, protection of this species and its habitat could be accomplished in part through the Clean Water Act, which extends protection to wetlands and water resources on which the species is dependent.

2.3.2.5 Other natural or manmade factors affecting its continued existence:

Preliminary allozyme research has been conducted on the potential hybridization of *B. decurrens* and a related species in the genus, *B. asteroides*. Hybridization could pose a threat to the species through decreased fertility, genetic swamping, and ecological competition from hybrid individuals (DeWoody 2011). DeWoody et.al. (2011) tested for hybridization in sympatric populations using allozyme genetic marker data. The results revealed a very low rate of hybridization and introgression, indicating that cross-pollination and hybridization may not pose an immediate threat to the species. However, higher resolution genetic testing has yet to be performed, and therefore the level of threat posed by hybridization is currently indeterminable.

2.4 Synthesis

B. decurrens is a fugitive species endemic to the Illinois River System that relies on flood pulses to maintain populations and suitable habitat. Impoundment of the Illinois River and prolonged high water events during the growing season reduce available habitat and have led to the decline of the species. It was listed as a federally threatened species in 1988 and a recovery plan was approved in 1990 (USFWS 1990).

The recovery plan identifies three recovery criteria (USFWS 1990): the completion of a basic research program to determine the requirements of a naturally reproducing population, the permanent protection of twelve geographically distinct self-sustaining populations, and the monitoring of those populations for a period of five years to determine if they are self-sustaining and stable or expanding. The first criterion has been met. A cooperative agreement to promote species-specific management of several sites to fulfill part of Recovery Criterion 2 has been drafted, but not yet signed. Insufficient information is currently available for the past five years to determine if the third criterion has been met.

At the time of the recovery plan issuance, *B. decurrens* was found in 20 known locations (USFWS 1990). Approximately 43 populations, including the original 20 populations on distinct sites have been discovered and monitored intermittently from 1984 to present, but high water on the Illinois River have prevented most recent monitoring efforts. 2011 surveys indicate that *B. decurrens* populations have recolonized 10 of 19 surveyed sites in numbers that approach peak recorded population numbers (See Appendix A). However, populations cannot be said to have been stable over the past five years.

Extreme variability in individual population sizes has been observed in the monitoring history of the species. Due to the intermittent nature of the available data, long-term trends are not readily apparent but appear to include a periodical expansion and contraction of populations (See Appendices A and B for charts of available long-term monitoring data). However, in spite of intermittent data collection, fluctuations in population sizes do not appear to indicate a substantial increase or decrease in the overall population. Therefore, it appears that the overall population has remained stable. Given this, we do not recommend a change in classification at this time.

Additional research is needed to refine the metapopulation model for the species and define what constitutes stability for this fugitive species. Finally, a cooperative management agreement to facilitate long-term protection and management for populations on federal and state lands remains to be completed.

3.0 RESULTS

3.1 Recommended Classification:

No change to the status of the species is needed at this time.

3.2 New Recovery Priority Number

No change is needed.

3.3 Listing and Reclassification Priority Number N/A

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

1. Continue to monitor known *B. decurrens* sites and search for new populations annually, collecting GPS location and census data. Include survey efforts for *B. decurrens* in suitable habitat at the confluence of the Illinois River and Mississippi River to determine the extent of the species' southern range.
2. Finalize the draft cooperative management agreement between the ILDNR and the Service.

3. Establish a consensus among the workgroup regarding the core sub-populations that are important for the survival of the species during times of adverse hydrologic conditions. Also, normal, expected patterns of expansion and contraction of populations over time should be identified to facilitate the definition of population stability in the context of recovery.
4. Based on the results of the genetic primer research by Drs. Romano, explore genetic relationships between sub-populations and refine the metapopulation model for the species. Specifically, dispersal patterns and important source populations could be identified through microsatellite research in combination with spatial analysis.
5. Explore the phenomenon of hybridization between *B. decurrens* and *B. asteroides* using microsatellite genetic markers. Research should include a confirmation of hybridization between the two species and an analysis of the extent of hybridization in the population.

5.0 REFERENCES

Population survey information from 2011 provided by:
Dr. Marian Smith, Southern Illinois University Edwardsville
Department of Biological Sciences
Box 1651
Edwardsville, IL 62026

Information regarding genetic primer research provided by:
Dr. Susan Romano and Dr. Michael Romano, Western Illinois University
Department of Biological Sciences
1 University Circle
Macomb, Illinois 61455

Baskin, C.C. and J.M Baskin. 2002. Achene germination ecology of the federally threatened floodplain endemic *Boltonia decurrens* (Asteraceae). *American Midland Naturalist* 147: 16-24.

DeWoody, J., J. D. Nason, and M. Smith. 2004. Inferring demographic processes from the genetic structure of a metapopulation of *Boltonia decurrens* (Asteraceae). *Conservation Genetics* 5: 603-617.

DeWoody, J., J. D. Nason, and M. Smith. 2011. Hybridization between the threatened herb *Boltonia decurrens* (Asteraceae) and its widespread congener, *B. asteroides*. *Botany* 89: 191-201.

Smith, M., H. Caswell, and P. Mettler-Cherry. 2005. Stochastic flood and precipitation regimes and the dynamics of a threatened floodplain plant. *Ecological Applications* 15(3): 1036-

1052.

Smith, M.H. and T. Keevin. 1998. Achene morphology, production, and germination, and potential for water dispersal in *Boltonia decurrens* (decurrent false aster), a threatened floodplain species. *Rhodora* 100:69-81

USACE. 2012. Rice Lake Habitat Rehabilitation and Enhancement Project.
<http://www.mvr.usace.army.mil/emp/hrep/ricelake.htm>. Accessed 18 Jan 2012.

USFWS. 1990. Recovery Plan for the Decurrent False Aster (*Boltonia decurrens*). 26p.

USFWS. 2010. U.S. Fish and Wildlife Service 5-Year Review for the Decurrent False Aster (*Boltonia decurrens*). 20 Apr 2010.

APPENDIX A

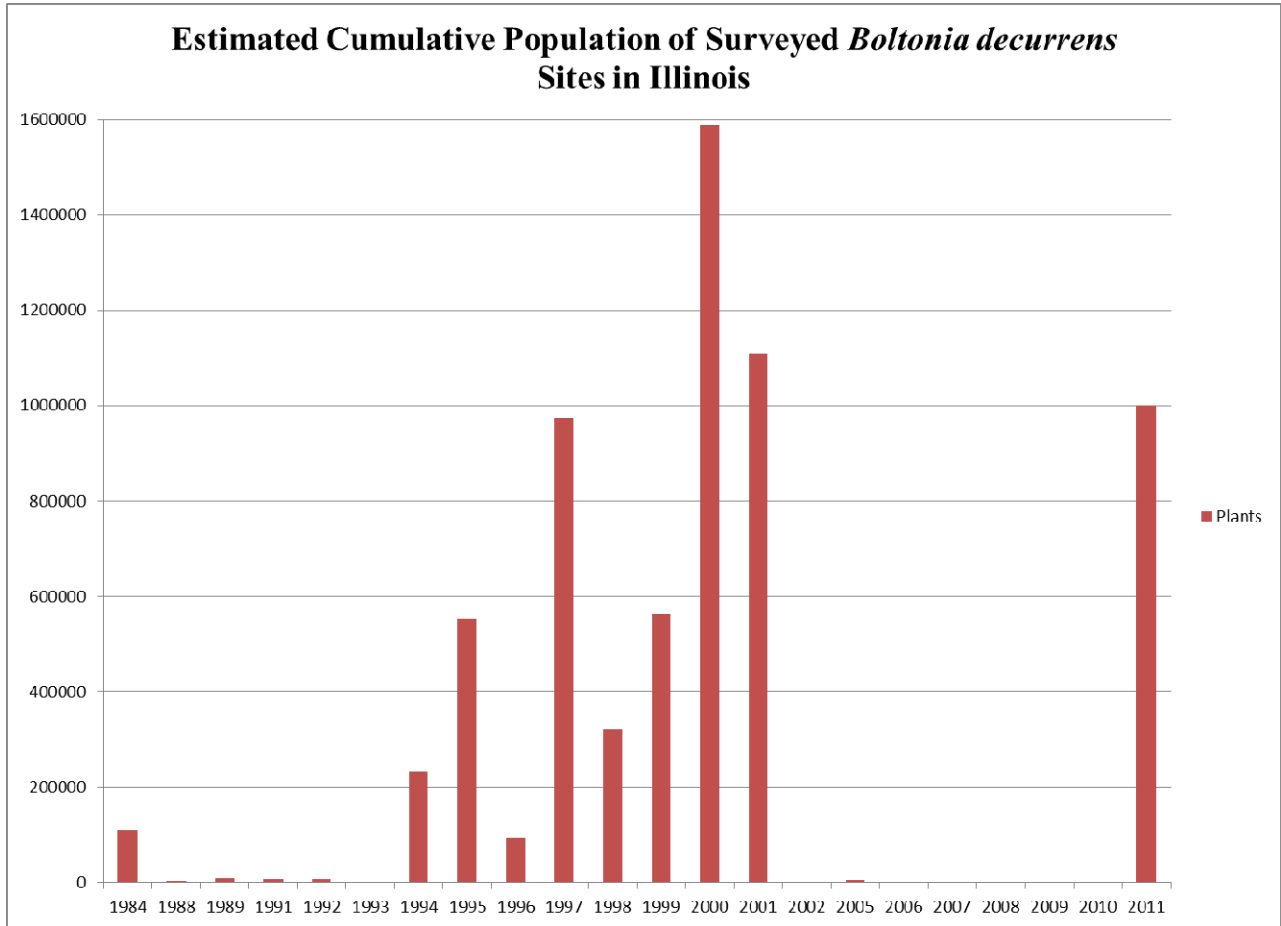


Figure 1: Chart illustrates the cumulative estimated individual plants across all surveyed sites in Illinois. (Monitoring data was unavailable for Missouri sites at the time of this review.)

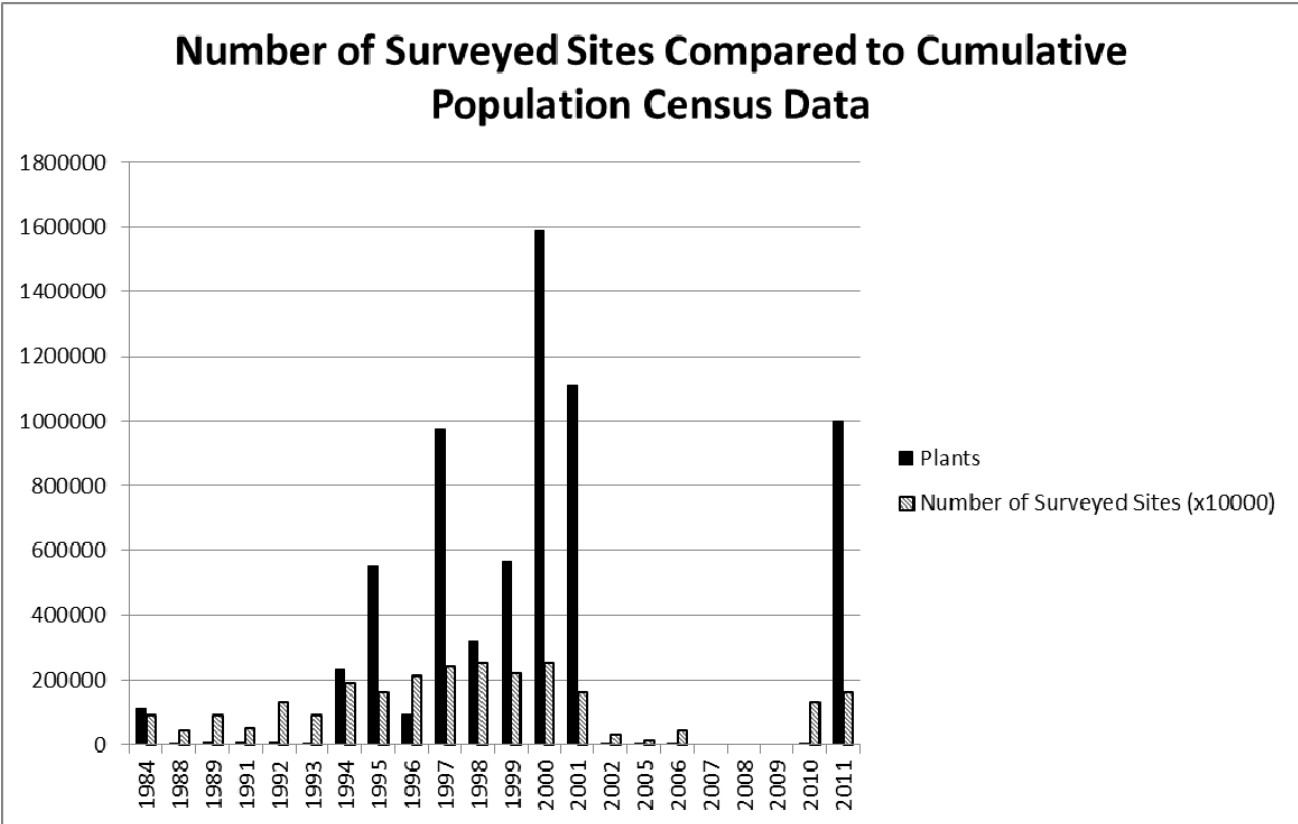


Figure 1: Chart illustrates total *B. decurrens* census data compared to number of sites surveyed. Surveyed sites data have been multiplied by a factor of 10,000 for visibility on the chart.

Appendix B

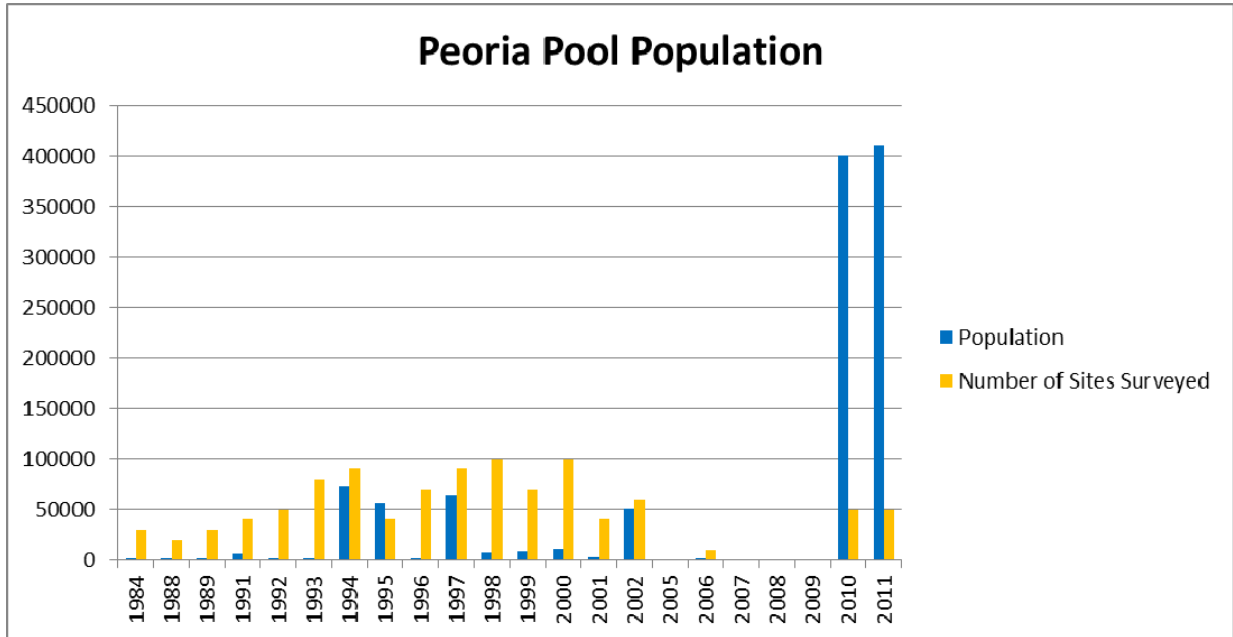


Figure 1: Chart illustrates *B. decurrens* census data in the Peoria Pool compared to the number of sites surveyed. Surveyed sites data have been multiplied by a factor of 10,000 for visibility on the chart.

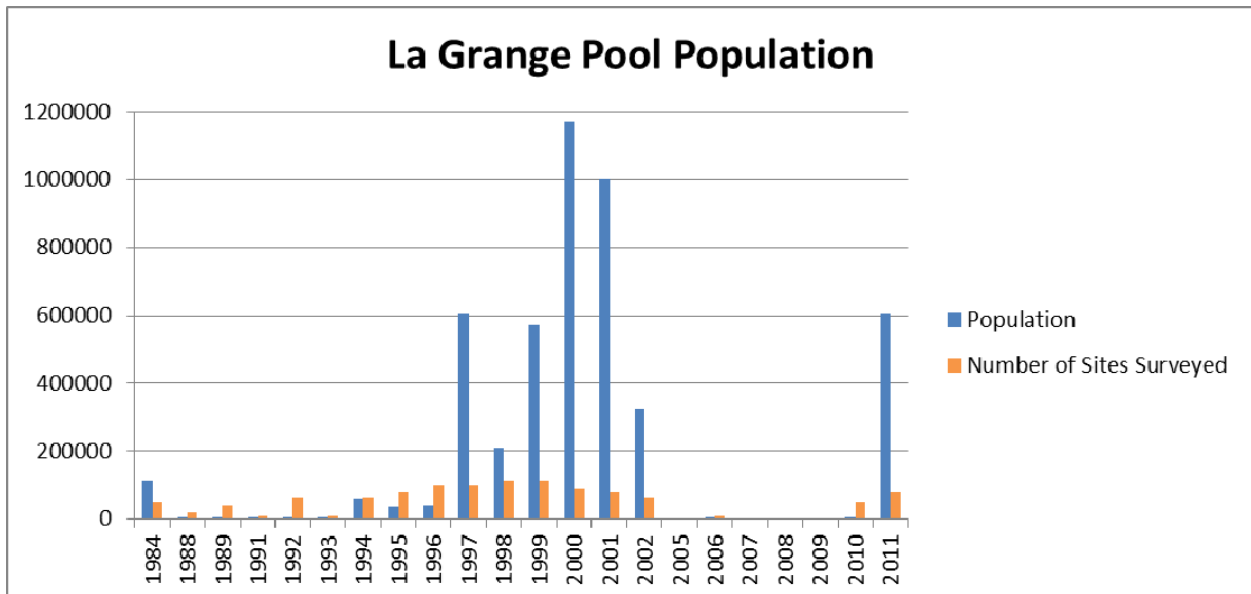


Figure 2: Chart illustrates *B. decurrens* census data in the LaGrange Pool compared to the number of sites surveyed in that pool. Surveyed sites data have been multiplied by a factor of 10,000 for visibility on the chart.

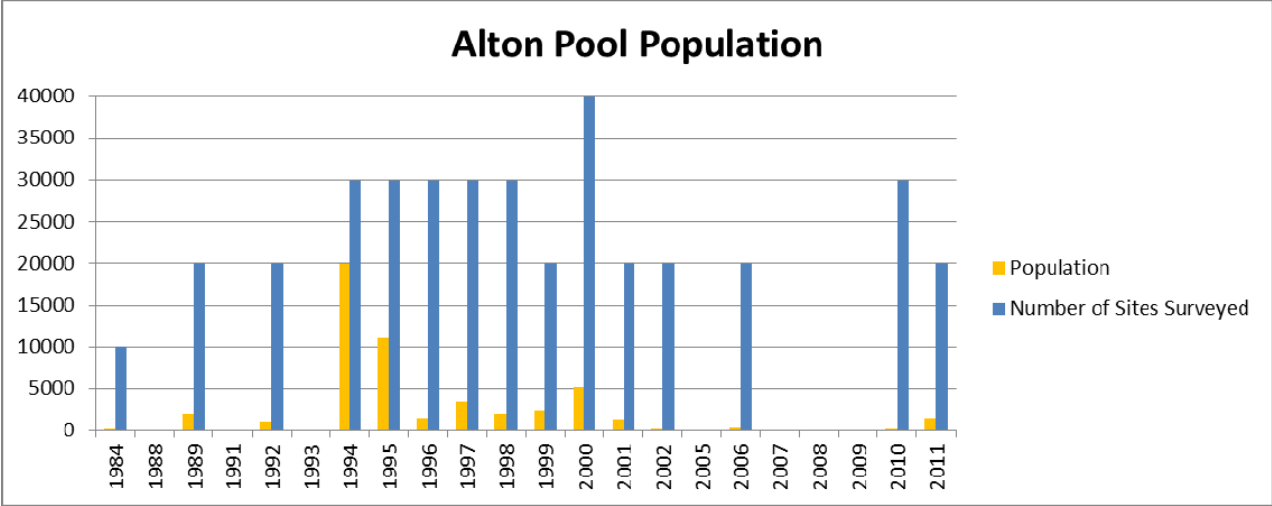


Figure 3: Chart illustrates *B. decurrens* census data in the Alton Pool compared to the number of sites surveyed in that pool. Surveyed sites data have been multiplied by a factor of 10,000 for visibility on the chart.

**U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Boltonia decurrens***

Current Classification:

Recommendation resulting from the 5-Year Review:

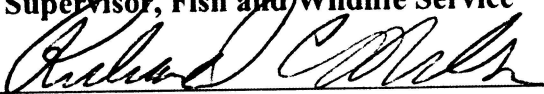
- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change needed

Appropriate Listing/Reclassification Priority Number, if applicable: N/A

Review Conducted By: Amber Andress, Rock Island Ecological Services Field Office

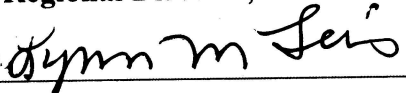
FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve  Date 1/30/12

REGIONAL OFFICE APPROVAL:

Assistant Regional Director, Fish and Wildlife Service, Midwest Region

Approve  Date 2/31/12