3.0 Decurrent false aster *(Boltonia decurrens)*

3.1 Status of the Species

This section presents the biological and ecological information relevant to formulating the biological opinion. Appropriate information on the species' life history, its habitat and distribution, and other data on factors necessary to its survival, is included to provide background for analysis in later sections. This analysis documents the effects of all past human and natural activities or events that have led to the current status of the species. Portions of this information are also presented in listing documents, the recovery plan (USFWS 1990), the Final Biological Opinion for the Operation and Maintenance of the 9-Foot Navigation Channel on the Upper Mississippi River System (USFWS 2000) (O&M BO), and the Biological Assessment of the Upper Mississippi River-Illinois Waterway System Navigation Study (USACE 2004).

3.1.1 Species/critical habitat description

Boltonia decurrens is an early successional species that requires either natural or human disturbance to create and maintain suitable habitat. Its natural habitat is wet prairies, shallow marshes, and shores of open rivers, creeks, and lakes (Schwegman and Nyboer 1985). In the past, the annual flood/drought cycle of the Illinois River provided the natural disturbance required by this species. Annual spring flooding created open, well-lit habitat and reduced competition by killing other less flood-tolerant, early successional species. Field observations indicate that in "weedy" areas without disturbance, the species is eliminated by competition within 3 to 5 years (USFWS 1990). No critical habitat has been designated for the decurrent false aster at this time, although the Recovery Plan identified ten Illinois populations and two Missouri populations that should be protected.

3.1.2 Life history

Boltonia decurrens is a perennial plant of open wetland habitats. It reproduces vegetatively and sexually. Vegetative production of one or more basal rosettes occurs during the fall. Rosettes bolt the following spring; plants flower and set seed (achenes) from late August to early October. Smith *et al.* (1998) found that populations of *B. decurrens* increased in size at three sites studied on the Illinois River following the flood of 1993, with the greatest increase occurring at the two sites which had the most severe flooding. These results suggest that the removal of competing species by flood waters may be an important factor in maintaining populations of *B. decurrens* in the floodplain. *B. decurrens* has high light requirements for growth and achene germination (Smith *et al.* 1993, Smith *et al.* 1995), and shading from other vegetation is thought to contribute to its decline in undisturbed areas.

Boltonia decurrens exhibits a number of morphological adaptations for life on the floodplain. Stoecker et *al.* (1995) found *B. decurrens* to be extremely tolerant when maintained under conditions of root -zone saturation. All plants in the flood treatment replicate survived to the end of the study at 56 days. The formation of aerenchyma, a common plant adaptation to flooding which allows diffusion of oxygen from aerial shoots to maintain root metabolism, was extensive, increasing in adventitious roots from 26% of root cross-section area in non-flooded plants to 49% in flooded plants (Stoecker *et al.* 1995). Achenes of *B. decurrens* are morphologically

structured for flotation and therefore presumably are adapted for dispersal on river currents. Smith and Keevin (1998) found that germination was not significantly reduced in achenes floated for 4 weeks, and 20% of achenes floated under conditions of simulated wave action were still floating after 4 weeks. These data indicate that achenes have the potential for long distance dispersal on water.

Smith and Keevin (1998) found that achenes of *B. decurrens* will not germinate in the dark. Achenes, which were covered with as little as 0.2 in. of sediment, did not germinate; therefore, if achenes are deposited by flood water and subsequently covered by a shallow layer of sediment, it is unlikely they will germinate. Natural or human disturbance of the soil, exposing the achenes to light, would be required for germination. Sediment type may also be an important factor in achene germination and long-term survival of populations. *B. decurrens* has been observed growing on a variety of soil types (Schwegman and Nyboer 1985, Smith 1991); however, laboratory studies (Smith *et al.* 1995) comparing achene germination and growth on two soil types, silty clay (6.7% sand, 53.3% silt, and 40% clay) and loamy sand (80% sand, 16.7% silt and 3.3% clay) indicate that germination and seedling growth were significantly greater on sand than on clay. These laboratory results suggest that the silt and clay sediment being deposited by flood events on the Illinois River (Lee and Stall 1976) is not ideal for germination and growth. Soil type may thus be important in determining the distribution pattern of this species.

Field monitoring by Schwegman and Nyboer (1985) suggested prolific achene production. *B. decurrens* produces about 50,000 achenes per individual, and, based on achene viability, an average plant is capable of producing about 40,000 seedlings under optimal conditions for germination (Smith and Keevin 1998). Fall seedlings overwinter and bolt and flower the following spring and summer. Spring seedlings, however, may either bolt and flower the same year or overwinter as small rosettes which bolt and flower the following year (Smith 1991). In areas where seedling production is low or nonexistent, *B. decurrens* populations can be maintained by basal rosette production. In fact, few seedlings are found in established populations (Moss 1997, Smith 1991). Seedling establishment is expected to be low due to the small achene size, the high light and temperature requirements for germination, and specific soil texture and microtopography requirements for germination and seedling growth (Baskin and Baskin 1988, Smith *et al.* 1995).

3.1.3 Population dynamics

During the consultation for the O&M BO, the species was considered to be stable ((Dr. Marian Smith, Southern Illinois University - Edwardsville. *in litt*. to Gerry Bade December 4, 1999). The Recovery Plan states that the species will be considered recovered after 12 stable populations have been protected by purchase, easement or cooperative management agreement. Following recent surveys, the number of populations had increased from 14 to 26 in 2002, but the number of individuals had decreased from over one million to an estimated 378,887 plants (Smith 2002). Given the fecundity of the species noted above and the long-term viability of achenes (Baskin and Baskin 2002) it is likely that wide variation will be the norm in the interannual numbers of individual plants within each known population. In the absence of other information, it is likely that the overall rangewide population of the species is stable within the species' natural range of variability, under current river management conditions.

3.1.4 Status and distribution

The status of the species is described above under Population dynamics.

Reasons for Decline and Listing

Habitat destruction and modification have been identified as the primary factors in the decline of the species, particularly of natural marshes, wet prairies, and shoreline habitats. Wetlands have been drained and converted to other uses, heavy siltation has buried suitable habitats, and construction of levee systems has altered the flooding regimes necessary for reduction of competition and prevented the dispersal of seeds to potential habitat. (USFWS 1990, Schwegman and Nyboer 1985, Smith et *al.* 1993, Stoecker *et al.* 1995, Smith *et al.* 1998, Smith and Keevin 1998). The decurrent false aster was listed as a threatened species by the Service on November 14, 1988 (53 FR 45861). It is a floodplain species that occurs along a 250 miles section of the lower Illinois River and nearby parts of the UMR (Schwegman and Nyboer 1985, USFWS 1990). Analysis of 19th century habitat data taken from herbarium sheets indicates that *B. decurrens*' natural habitat was the shores of lakes and streams in the Illinois River floodplain and the Mississippi River floodplain in the vicinity of its confluence with the Illinois River. It ranged along a 250 mile stretch between LaSalle, Illinois, and St. Louis, Missouri. A disjunct population at Cape Girardeau, Missouri, was reported in 1976, 120 miles downstream of St. Louis (Schwegman and Nyboer 1985), but it has not been found since.

Range-wide Status

The action area encompasses the entire range of *B. decurrens*. The present distribution of the aster is essentially unchanged. Determining the status of an early successional species such as the decurrent false aster is difficult. Such species typically display a "boom and bust" phenomenon as colonies invade newly suitable sites, become dominant, and then decline as succession overcomes them. Determining a total population for the species is difficult because individual populations may change dramatically from year to year; some increasing, some decreasing, new ones appearing and old ones disappearing depending on site conditions. Several notable populations include Riverlands Environmental Demonstration Area, Spatterdock Bottoms and Columbia Bottoms in St. Charles County, Missouri; and Rice Lake in Fulton County, and Worley Lake in Tazewell County, Illinois (Dr. Marian Smith, Southern Illinois University - Edwardsville. *in litt*. to Gerry Bade December 4, 1999; *ibid*. January 28, 2000.). No new threats to the species since preparation of the Recovery Plan are known at this time.

3.2 Environmental Baseline

This section is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat, and ecosystem within the action area. The purpose is to analyze the effects on the species at the action level. Factors affecting the species include habitat destruction and degradation due to water level regulation, impoundment, channel maintenance, and wetland and shoreline development.

3.2.1 Status of the decurrent false aster in the action area

The action area encompasses the entire range of *B decurrens*, therefore its status within the action area is as described above.

3.2.2 Factors affecting the decurrent false aster environment within the action area

Habitat destruction and modification have been noted as the main reasons for the decline of the species (Schwegman and Nyboer, 1985). Shore habitats have been modified by heavy siltation and altered flood regimes. Prolonged flooding during the growing season appears to be a limiting factor (USFWS 1990). Figure 3-1 illustrates the shift in seasonal river stages over the historic period. We are unaware of any research that has been specifically done to discern the relative contribution of natural factors such as climate and precipitation versus human factors such as upland and urban development, stormwater runoff, wetland drainage, and field tiling to this change in the hydrograph.

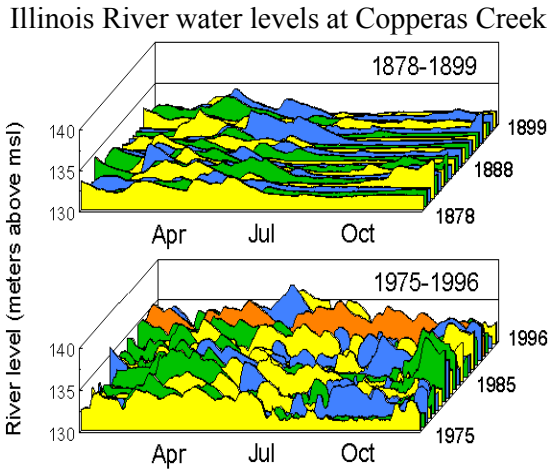

Figure 3-1. River stage records at the Copperas Creek gauge (Sparks et al. 1998).

While flooding benefits *B. decurrens* through seed dispersal and reduction of competition (Smith et al. 1998), summer flooding of recently germinated plants can be lethal depending on the depth and duration of the event. Mature plants are capable of withstanding saturated soils and display morphologic adaptions to maintain root metabolism under such conditions (Stoecker et al. 1995).

The 2000 O&M BO noted factors attributable to the 9-Foot Navigation Project that also affect the species: impoundment and water level regulation, dredged material disposal, channel regulating structures and bank revetment, fleeting, recreation, cabin leases, and General Plan Land management. These are summarized as follows:

Impoundment - The initial impoundment of the Illinois River by navigation dams Locks and Dam 26 on the UMR; La Grange Lock and Dam, Peoria Lock and Dam, Starved Rock Lock and Dam and Marseilles Lock and Dam on the Illinois River) within the historic range of the aster created a series of pools. The pooling of the Illinois River resulted in the inundation of shoreline

habitat. Historic collections indicate that shoreline habitat was utilized by *B. decurrens* (USFWS 1990). The acreage of shoreline habitat lost during the initial inundation by the navigation pools has not been quantified. It should be noted, however, that "new" shoreline would have been created or shifted to a higher elevation when the river was impounded.

Maintenance of navigation pools on the Illinois River has resulted in stable water levels during low-flow periods while locks and dams have had little effect on water stages during high water events. During low-flow periods prior to lock and dam construction, especially during drought years, the river would have receded, providing additional shoreline habitat for *B. decurrens.* The magnitude of impact would depend on many factors including the timing and duration of shoreline dewatering and availability of a seed bank.

Dredging and Disposal - Dredged material is usually removed from the navigation channel in the impounded reaches of the UMRS by a government or contractor-owned hydraulic cutterhead dredge and is discharged to placement sites by floating pipeline. In the Open River, it has been more common to use a hydraulic dustpan dredge that is sidecast, or discharged directly to adjacent channel border habitats. The government also uses its own mechanical dredging capability and contractors to perform smaller operations. Material is usually mechanically dredged by a clamshell bucket and placed on a deck barge for transport to a disposal site.

In the impounded or pooled reaches of the river system, dredged material was usually placed along the shoreline or occasionally in landward sites located in close proximity to the dredging site. Depending upon location, hydraulically or mechanically dredged material is placed 1) linearly along the shoreline for bankline stabilization or to rejuvenate recreational beaches that have eroded, or 2) placed in open water in channel border habitats, or 3) on sites landward of the shore to improve site suitability for planting or regeneration of desirable tree species, or 4) on land or behind levees for beneficial use stockpiles. Previous shoreline and upland placement may have destroyed populations of *B. decurrens* or rendered the habitat unsuitable for recolonization. However, the magnitude of impact cannot be quantified due to a lack of historical data.

Channel Structure/Revetment - Past activities related to the construction of channel training structures and revetment have likely affected *B. decurrens* or its habitat. Such modification included bankline grading and placement of stone (covering habitat) for bank revetment, wingdams, and closure structures. Maintenance of existing structures where shoreline modification has occurred may also have affected the species. The magnitude of these impacts cannot be quantified due to a lack of historical data. Other effects of channel regulating structures, such as redistribution of flows and sediment, may have changed overbank flooding and seed dispersal patterns at specific locations.

Fleeting - Development of existing fleeting areas required various levels of habitat modification, including placement of on-shore deadmen. Operation of heavy equipment and soil disturbance may have affected B. *decurrens* to an unknown degree. Other unregulated fleeting or casual mooring areas involving the use of shoreline trees for mooring has resulted in girdling, killing and toppling of trees which would provide marginal opportunity for achene exposure and germination. However, such effects would be expected to be short-lived and overcome by consequent shoreline erosion and/or succession at the forest edge.

Recreation - Development of existing recreation-related facilities required various levels of habitat modification including grading of shoreline areas, construction of boat ramps and docks, placement or riprap and bank revetment, and dredging access channels and harbors. The level of impact to *B. decurrens* or its habitat is unknown due to a lack of historical data.

General Plan Land Management - Corps of Engineers' General Plan (GP) Lands in the St. Louis District include Riverlands Environmental Demonstration Area (EDA) managed by the Corps, Dresser Island/Spatterdock Bottoms managed by the Corps, Horseshoe Lake managed in part by the Corps and the State of Illinois) and Batchtown, Calhoun and Gilbert Lake Divisions and the Portage Island Group of the Mark Twain National Wildlife Refuge managed by the Service. *B. decurrens* occurs in the Gilbert Lake Division, Horseshoe Lake, the EDA and Dresser Island/Spatterdock Bottoms. In the past, certain maintenance activities such as grading and filling, bank stabilization, mowing and drainage ditch clean-out may have impacted the aster on these areas. The magnitude of these impacts is unknown due to a lack of historical data. No previous Section 7 consultation has ever been conducted for these activities.

3.3 Effects of the Action

This section includes an analysis of the direct and indirect effects of the proposed action on the species and its interrelated and interdependent activities. Factors to be considered include proximity of the action distribution timing nature of the effect duration disturbance frequency disturbance intensity and disturbance severity. The action is the recommended plan and its components described in Section 1, preceding.

The Upper Mississippi River-Illinois Waterway System Navigation Study proposes to implement both navigation improvement and ecosystem restoration actions. The navigation improvement program also contains a mitigation component for unavoidable adverse impacts to natural resources of the UMRS.

This Tier I biological opinion for the decurrent false aster evaluates the effects of these actions from a programmatic scale. Site-specific impacts will be evaluated during the Tier II planning process for specific projects and Tier II biological opinions provided to the U.S. Army Corps of Engineers for those projects that are likely to adversely affect the decurrent false aster. As the range of the species is limited to the Illinois River and counties below its confluence with the Mississippi, site-specific actions on the UMR above Mississippi river mile 221 are not likely to affect the species.

The action area includes the entire known range of *B. decurrens*; therefore, implementation of the recommended plan and its construction components is expected to kill individual plants by clearing, crushing, or burial (USACE 2004), and is likely to affect individuals and colonies of both known and unknown populations as a result of both navigation improvements and floodplain restoration. Due to the distribution of actions within the action area, the majority of populations exist in managed and monitored locations that will remain unaffected by navigation improvement or ecosystem restoration, although they are found within part of the action area defined in the Feasibility Study. The timing of actions such as drawdown, water level management, and other floodplain restoration or management actions is commonly directed at enhancing the establishment and survival of moist soil species, and would be expected to benefit *B. decurrens*. The nature of adverse effect is noted above and is likely to involve localized

impacts of short duration to individuals within colonies, or burial of achenes that prevents germination. Disturbance frequency will vary with the plan component. Construction frequency for any particular navigation or ecosystem feature would be expected once at a given location over the 50 year period of analysis. Management action frequency for water level manipulation and moist soil management would be annual. Typical burning rotations are approximately every four years, based on Service management activity. The effect and intensity of disturbance depends on the life stage of *B. decurrens* at the site. Water level management or drawdowns would be expected to be beneficial and open up the soil surface seed bank to germination. Burning to reduce woody species invasion would be expected to kill mature *B. decurrens* present in the subject burn unit. If burning were conducted in the spring, late fall, or winter, it would have little impact on the species and clearing would be beneficial (T. Keevin pers. com. 2004). Given the relative fecundity of *B. decurrens* described previously, it is likely that the recovery of a colony from a prescribed burn would be rapid.

Short term impacts to individual *B. decurrens* during construction activity are expected to be outweighed by the long term benefits of floodplain restoration. Improved water level control, wetland restoration, and easement or acquisition of interest in the Illinois River portion of the action area will contribute to *B. decurrens* Recovery Plan objectives for habitat protection and management.

3.3.1 Direct effects

3.3.1.1 Navigation improvements

Continued impoundment and proposed changes in river regulation will not cause any additional impacts to the species or its habitat, i.e. no additional habitat will be lost due to inundation. Consequently, the impacts of impoundment will not threaten the survival and recovery of the species over the life of the project. The future impacts of water level regulation are not anticipated to change, as the regulatory capacity of the wicket gate dams at Peoria and LaGrange will not be altered with the addition of new lock structures. Currently, the effects of wicket gate raising and lowering create drops and spikes respectively in the tailwaters of these dams. Dam operations will be the same as in the past, i.e. stabilization of water levels during low flows and little or no affect on high flows. While natural seasonal low water levels have been eliminated by impoundment, high water and flood events will continue to provide part of the habitat disturbance on which the species depends. Consequently, the impacts of water level regulation will not threaten the survival and recovery of the species over the life of the project.
Tow traffic effects on *B. decurrens* are limited to tow-induced bank erosion. Approximately 88,795 meters of bankline in the Peoria through Pool 26 portion of the Illinois were identified as susceptible to bank erosion, and two locations within the erosional areas are adjacent to *B. decurrens* records (USACE 2004). Proposed mitigation for bank erosion includes bank armoring. Bank armor construction activities may adversely affect individuals by crushing or burial, but long term site stability should be beneficial to the species.

Dredging and dredged material placement will become tools for ecosystem management as well as channel maintenance under the recommended plan. Both the St Louis District and the Rock Island District have dredged material placement coordination processes in place. Prior to the discharge of any dredged material, interagency teams meet to determine the preferred placement site for the dredged material. These teams are composed of representatives of the appropriate

State and Federal agencies. The U.S. Fish and Wildlife Service, along with representatives of the affected State(s), participate in these teams. Additionally, appropriate Federal and State agency representatives are coordinated with concerning endangered species. Although these teams strive to preclude impacts from dredged material placement, there is a potential that *B. decurrens* may occur at sites where seed has settled but the plant has not yet sprouted. Potential impacts of dredged material placement can be avoided or minimized through appropriate coordination with the Service and States. Tier II Section 7 Consultation will be conducted as necessary.

Channel regulating structures and revetments present a potential to adversely affect decurrent false aster populations that occur on bankline areas where habitat modification would occur. Such modification would include bankline grading and placement of stone (covering habitat) for bank revetment, wingdams, and closure structures. Maintenance of existing structures where shoreline modification would occur may also affect the species. There is also a potential that bank grading and associated activities could create conditions suitable for the establishment of new populations of *B. decurrens* due to habitat disturbance. Current construction practices for off-bank revetment, chevron dikes, and bendway weirs do not involve terrestrial habitat destruction and construction is done from the river without terrestrial staging areas.

Potential impacts of constructing and maintaining channel structures and revetment can be avoided through appropriate coordination with the Service. Tier II Section 7 Consultation will be conducted as necessary. Therefore, construction and maintenance of channel structures and revetment will not threaten the survival and recovery of the species over the life of the project.

3.3.1.2 Mitigation

The recommended plan contains 20 sites recommended for mitigation of lost backwaters and side channels on the Illinois Waterway between the Dresden and Alton Pools. Proposed mitigation involves placement of channel closing structures, bank protection, and/or dredging. The effects of these actions are similar to those described in the preceding section on navigation improvements.

3.3.1.3 Ecosystem Restoration

Restoration projects are proposed to alter and improve habitat conditions on up to an estimated 32,000 acres in the Illinois River portions of the study area. Descriptions of proposed ecosystem restoration measures are summarized in *Project Description* preceding. The conservation measure described previously will allow the action agency to develop site-specific plans that reduce the potential adverse effects to *B. decurrens*. We anticipate that few instances will arise where adverse effects will be unavoidable, and that where unavoidable, reproduction, numbers, or distribution of *B. decurrens* will be appreciably reduced.

Island Building

Island building is primarily a process of dredging and placement of dredged material for the express purpose of restoring an eroded feature or providing wind and wave protection to reduce sediment resuspension, improve water clarity, provide bathymetric diversity necessary to provided habitat for a range of aquatic life stages, and provide the topographic diversity

necessary to provide a range of terrestrial habitats representative of the specific river reach. New or restored island sites may present shoreline areas suitable for colonization by *B. decurrens*, and depending on flood frequency may contribute to the total population of the species.

Fish Passage

Fish passage involving reestablishment of lateral hydraulic connectivity could involve tree removal and construction-related disturbance that could open up sites for temporary establishment of *B. decurrens* colonies. This benefit would be expected to be temporary.

Floodplain Restoration

Floodplain restoration, as described previously includes a range of passive measures to restore and manage representative ecotypes, as well as aggressive construction measures typical of floodplain development and flood control projects. These activities occurring in close proximity to maternal roost trees or roosting areas would be expected to influence reproductive success, resulting in take of the species. Floodplain restoration includes timber stand improvement, clearing for grassland restoration, or other landcover modification that has the potential to open up soil surfaces and either expose *B. decurrens* seed or provide open substrate for its colonization depending on flood frequency.

Water Level Management

Water level management includes both small and large-scale drawdowns to expose and consolidate sediment, stimulate valuable vegetation, and simulate natural river processes. Pool-wide drawdowns are seen as feasible on the Illinois Waterway due to river and floodplain morphometry. However, off-channel or backwater drawdowns that expose sediment for seasonal establishment of moist soil species could benefit *B. decurrens* and add additional seed sources if not new self-sustaining populations.

Backwater Restoration

Backwater restoration will primarily involve dredging and dredged material placement, some of which may be used for island construction, and some of which may be used to create topographic diversity beneficial to a variety of terrestrial plants and animals. Dredged material placement often involves the deployment of standard construction equipment at the target locations and has the potential to destroy existing *B. decurrens* colonies as well as open up new substrate for colonization.

Side Channel Restoration

Side channel restoration may potentially affect *B. decurrens* where construction activities involve shoreline work and construction equipment access. Such effects would be minor, temporary, and localized.

Wing Dam and Dike Alteration

Wing dam and dike alteration is anticipated to have the same effects noted previously in *Mitigation* and *Navigation Improvements*.

Island and shoreline protection potentially affecting bankline individuals or colonies of *B. decurrens* is proposed over a total length of 41 miles in this same portion of the study area. This bankline total includes that work proposed to offset navigation induced erosion and that work proposed to protect or restore shorelines and islands as part of the ecosystem component.

Interrelated and Interdependent Actions

The recommended plan contains a suite of administrative, operational, and construction activities that are directed at navigation improvement and ecosystem restoration throughout the UMRS. An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. Such things as timber management and General Plan Land management are all interrelated to both the operation and maintenance of the 9-Foot Navigation Channel Project and implementation of the recommended that integrates these government functions with the ecosystem restoration component of the plan.

The St. Louis District has recently completed an Action Plan for *B. decurrens* on Corps of Engineers General Plan lands within the St. Louis District (USACE 1998). Development of the Action Plan was a joint effort between the U.S. Fish and Wildlife Service and the Corps of Engineers with participation from Dr. Marian Smith (Southern Illinois University - Edwardsville), an expert on the species. The action plan included a monitoring protocol and initial census, evaluation of management techniques, training of site personnel to identify the species, development of an education and outreach program, development of land management objectives, and development of a pre-action checklist for project implementation. The next step is to implement the plan and to incorporate a management protocol into the Corps' Operational Management Plan for the area.

Consistent with the Action Plan, the St. Louis District has completed Phase I (Monitoring Protocol), an initial census of the Environmental Demonstration Area, to determine the locations and general population sizes of *B. decurrens* (USACE *in litt*. to Gerry Bade, November 3, 1999). Similar management possibilities exist on other Corps lands, U.S. Fish and Wildlife Service refuge lands, and lands owned and/or managed by the Missouri Department of Conservation and the Illinois Department of Natural Resources. Implementation of this Action Plan will provide benefits to the species and enhance the potential for its survival and recovery.

An interdependent activity is an activity that has no independent utility apart from the action under consultation. The future need for additional fleeting areas is unknown. However, potential impacts of development of fleeting areas can be avoided through appropriate coordination with the Service. Tier II Section 7 Consultation will be conducted as necessary. Therefore, fleeting will not threaten the survival and recovery of the species over the life of the project.

Indirect Effects

Navigation - Tow traffic was projected to affect approximately 88,795 meters of shoreline on the Illinois River, necessitating mitigation in the form of bank protection. Increased traffic is not expected to increase the amount of susceptible bankline.

Port facilities - The future need for additional port facilities is unknown. However, potential impacts of development of port facilities can be avoided through appropriate coordination with the Service. Tier II Section 7 Consultation will be conducted as necessary. Therefore, development of port facilities will not threaten the survival and recovery of the species over the life of the project.

Exotic species - The future effects of introduced exotic species on *B. decurrens* cannot be predicted at this time. Given the species life history, it would be possible for disease or insects to exploit whole colonies at a time, but their ability to spread to other colonies within a population or to the disjunct populations throughout the species range is unknown. While unquantified, the presence of buried achenes in the floodplain seedbank suggests a measure of resilience to such events. The species ability to compete with invasive plant species is unknown; therefore, the potential effect of exotic species cannot be forecast at this time.

Contaminants - The effects of contaminants on *B. decurrens* have not been researched; however, it is considered vulnerable to herbicide use in low-lying marginal lands for crop weed control (USFWS 1990). Implementation of the recommended plan is not anticipated to contribute to current contaminant loading in the action area. Non-point source contaminants introduced from stormwater or agricultural runoff may be positively influenced by achievement of some floodplain restoration objectives, but watershed or upland treatment/restoration measures are beyond the scope of this study. Therefore, the effects of contaminants on *B. decurrens* cannot be quantified at this time.

Recreation effects - The future need for additional government-operated recreational facilities is unknown. However, potential impacts of development of recreational facilities can be avoided through appropriate coordination with the Service. Tier II Section 7 Consultation will be conducted as necessary. Therefore, development of recreational facilities will not threaten the survival and recovery of the species over the life of the project. Development on private lands adjacent to ecosystem restoration projects is also an indirect effect, but is addressed subsequently in Cumulative Effects.

Other indirect effects are anticipated to arise from administrative actions proposed in the recommended plan, primarily partner agencies' adoption of the adaptive management paradigm, in short "learning by doing," and provision of additional Corps authority for ecosystem restoration. It is likely that all effects to listed species subject to this consultation cannot be foreseen at this time. As part of the adaptive management approach, predictive models are proposed to be developed in the implementation phase of the recommended plan, and will necessarily involve elements of listed species life history. The Service expects that further collaboration among partner agencies to develop, test, and validate assumptions used in such models will result in modifications to the recommended plan that contribute to listed species' recovery Adaptive management requires a more responsive approach to problems and opportunities as they arise and agency regulatory processes can limit responsiveness.

The recommended plan calls for additional authority for ecosystem restoration and will allow the use of Corps channel maintenance capabilities for restoration work in off-channel areas. Because channel maintenance priorities are dictated seasonally by the dynamics of river hydraulics and sediment transport, it will not be possible to predict where specific actions will occur on an annual basis, or on a basis that permits total avoidance of impact to the decurrent false aster. It is likely that although the long term effects of ecosystem restoration will be beneficial, logistically advantageous use of channel maintenance equipment could adversely affect individual plants and colonies on a site-specific basis.

Species response to the proposed action

Smith (2002) identified 26 populations holding an estimated 378,887 individuals in the action area, down from over million individuals in 2001. Elsewhere in the species range, recent monitoring of 28 colonies associated with a highway relocation project in Madison and St Clair counties, Illinois, resulted in summary estimates ranging from one flowering plant to over one million. Eighty percent of the colonies had higher populations in 2003 than in 2002 (Ketzner et al, 2004). The subject highway project lies within the technical study area boundary but would not be affected by implementation of the recommended plan. Populations existing on Federal and state lands are already receiving management consideration. Ecosystem restoration on those lands, as well as water level management improvements on the system that mimic the natural hydrograph, would be expected to elicit a positive response from *B. decurrens*. The life history previously discussed for *B. decurrens* demonstrates fairly specific conditions (soil type, temperature, light) necessary for establishment and persistence in the wild that may be interpreted as sensitivity to change; however, the species is actually dependent on change in the form of periodic disturbance to open new areas for colonization and seed dispersal. Research indicated that factors other than fecundity are responsible for the threatened status of *B. decurrens*; therefore, from a reproductive potential standpoint, the species may be considered very resilient to disturbance. It would be expected to respond positively to appropriately-timed moist soil management and water level management that provide open substrate for germination. As a pioneer or fugitive species dependent on ecosystem disturbance, *B. decurrens* is not a likely representative of ecosystem equilibrium at the individual population or microhabitat scale, and recovery rate may not be a meaningful metric in assessing its response to the recommended plan. Colonies within populations are generally known to only persist for 3 to 5 years. However, it is a representative of the continued existence of dynamic natural processes on a landscape scale, as it is dependent on periodic flooding to reduce competition and disperse seed to newly available habitat. Two goals of the recommended plan are to maintain viable populations of native species in situ; and represent all native ecosystem types across their natural range of variation. Any improvement in water level management on the Illinois River and restoration of portions of its floodplain would be expected to maintain conditions necessary for the continued viability of *B. decurrens*.

3.4 Cumulative Effects

Cumulative effects include the effects of State, local or private actions that have occurred in the action area. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of ESA.

Changes in the Illinois river hydrograph illustrated in Figure 1 are due in part to the construction operation and maintenance of the navigation system, in part to altered hydrology from wetland drainage and agricultural activity (ditching and tiling), and in part to development throughout the upper Illinois River watershed. No estimate of the relative contribution of each factor to discharge represented on the hydrograph has been made, but it is reasonable to conclude that development will continue, and that unstable water levels will continue to dictate vegetation success in the floodway of the Illinois River. Likewise, although programs exist for wetland restoration on private lands, that agriculture will remain a dominant and determining factor in floodplain hydrology and landcover.

Some non-Federal actions in the floodplain of the Illinois and Upper Mississippi Rivers will likely require Federal review under Section 404 of the Clean Water Act (CWA) or Section 10 of the Rivers and Harbors Act. Ecosystem restoration may induce the development of adjacent agricultural properties for outdoor sporting purposes, including wetland restoration, moist soil management, and general conversion of row crop landcover to forest or grassland wildlife habitat. Such conversion would be expected to be beneficial to *B. decurrens*. Examples of non-Federal actions currently underway on the Illinois River floodplain that could be beneficial are those restoration projects undertaken by the Nature Conservancy at Emiquon, a 7000 acre site formerly known as Wilder Farms in Fulton County, and Spunky Bottoms, a 2026 acre site in Brown County, opposite the USFWS Meredosia National Wildlife Refuge (The Nature Conservancy 2004a & b). Also, a consortium of non-profit organizations has acquired the former Hennepin Drainage and Levee District and is in the process of reestablishing elements of the natural hydrology and native plant communities on approximately 2600 acres of floodplain near Hennepin Illinois (The Wetlands Initiative, 2004).

It is possible that unauthorized activities or activities not requiring Federal review under the CWA could adversely affect the aster or its habitat. While some population exist on private lands, it is impossible to determine the magnitude of any such impacts in the absence of comprehensive surveys of all private lands within the species range.

3.5 Conclusion

After reviewing the current status of *B. decurrens*, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of the species. No critical habitat has been designated for this species; therefore, none will be affected.

3.6 Incidental Take Statement

Sections 7(b)(4) and 7(o)(2) of ESA do not apply to the incidental take of listed plant species. However, protection of listed plants is provided to the extent that ESA requires a Federal permit for removal or reduction to possession of endangered plants from areas under Federal jurisdiction, or for any act that would remove, cut, dig up, or damage or destroy any such species on any other area in knowing violation of any regulation of any State or in the course of any violation of a State criminal trespass law.

Conservation Recommendations

Section 7(a)(1) of ESA directs Federal agencies to utilize their authorities to further the purposes of ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. The St. Louis District and the U.S. Fish and Wildlife Service developed an action plan for managing and protecting populations of *B. decurrens* on the Riverlands - Environmental Demonstration Area (EDA). The action plan included a monitoring protocol and initial census, evaluation of management techniques, training of site personnel to identify the species, development of an education and outreach program, development of land management objectives, and development of a pre-action checklist for project implementation. Implementation of this action plan is hereby recommended.

2. The Corps should provide assistance to the Service towards recovery of the species by assembling and providing all its *B. decurrens* survey data in GIS format. In addition, we request the Corps' participation in updating the recovery plan and participation in related recovery actions.

LITERATURE CITED

Baskin, C.C. and J.M. Baskin. 1988. Germination ecophysiology of herbaceous plant species in a temperate region. Amer. J. Bot. 75:286-305.

Baskin, C.C. and J.M. Baskin. 2002. Achene germination ecology of the federally threatened floodplain endemic Boltonia decurrens. Am. Midl. Nat. 147:16-24.

Ketzner, D. P. Marcum, A. Plocher, D. Keene, and R. Larimore. 2004. Results from the decurrent false aster (Boltonia decurrens) recovery project – FAP 999 (New Mississippi River Crossing, Relocated I-70 and I-64 Connector) and FAP 14 (Il Route 3 Relocation), Madison and St Clair Counties, Illinois – 2003. Illinois Natural History Survey, Center for Wildlife Ecology, Champaign, Illinois. 15 pp.

Lee, M.T., and J.B. Stall. 1976. Sediment conditions in backwater lakes along the Illinois River - Phase 2. Il. St. Wat. Surv. Contract Report 176B. 63 pp.

Moss, J. 1997. Stage-based demography of the threatened floodplain species *Boltonia decurrens*. M.S. Thesis, Southern Illinois University, Edwardsville, IL.

Nature Conservancy, The. 2004a. The Emiquon Project. http.//nature.org/wherewework/northamerica/state/Illinois/preserves/art1112.html.

Nature Conservancy, The 2004b. Spunky Bottoms. http.//nature.org/wherewework/northamerica/state/Illinois/preserves/art1113.html

Schwegman, J.E. and R.W. Nyboer. 1985. The taxonomic and population status of *Boltonia decurrens* (Torr. & Gray) Wood. Castanea 50:112-115.

Smith, M. 1991. Life history research for decurrent false aster. Il. Dept. Cons. Contract Report, Springfield, IL. 26 pp.

Smith, M. 2002. Year 2002 inventory of decurrent false aster (*Boltonia decurrens*) U.S. Army Corps of Engineers, Rock Island District, final report. 5pp.

Smith, M., T. Brandt, and J. Stone. 1995. Effects of soil texture and microtopography on germination and seedling growth in *Boltonia decurrens* (Asteraceae), a threatened floodplain species. Wetlands 15:392-396.

Smith, M. 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.

Smith, M., T. Keevin, P. Mettler-McClure, and R. Barkau. 1998. Effects of the flood of 1993 on *Boltonia decurrens*, a rare floodplain plant. Regulated Rivers: Research and Management 14:191-202.

Smith, M., Y. Wu, and O. Green. 1993. Effects of light and water-stress on photosynthesis and biomass production in *Boltonia decurrens* (Asteraceae), a threatened species. Am. J. Bot. 80:854-864.

Stoecker, M.A., M. Smith, and E.D. Melton. 1995. Survival and aerenchyma development under flooded conditions of *Boltonia decurrens*, a threatened floodplain species and Conyza canadensis, a widely distributed competitor. Am. Midl. Nat. 134:117-126.

USACE (U.S. Army Corps of Engineers). 1998. Action plan for managing and protecting populations of *Boltonia decurrens*. 3 pp.

_____. 2004. Biological Assessment of the Upper Mississippi River-Illinois Waterway System Navigation Study. 193pp.

_____. 1999. Tier I of a two-tiered biological assessment - operation and maintenance of the Upper Mississippi River navigation project within the St. Paul, Rock Island, and St. Louis Districts. Mississippi Valley Division, Vicksburg, MS. 111 pp. plus appendices.

_____. In litt. Correspondence to Gerry Bade, U.S. Fish and Wildlife Service, Rock Island, IL. November 3, 1999.

USFWS (U.S. Fish and Wildlife Service). 1990. Decurrent false aster recovery plan. U.S. Fish and Wildlife Service. Twin Cities, MN. 26 pp.

USFWS (U.S. Fish and Wildlife Service). 2000. Final Biological Opinion for the operation and maintenance of the 9-Foot navigation channel on the upper Mississippi River system. 240pp.

Wetlands Initive, The. 2004. The Hennepin & Hopper Lakes Project. http://www.wetlands-initiative.org/pages/page28.html

PERSONAL COMMUNICATION

Keevin, T. 2004. Senior Scientist, U. S. Army Corps of Engineers, St Louis District. Telephone conversation with Bob Clevenstine, Rock Island Field Office, U. S. Fish and Wildlife Service, Rock Island Illinois.