

## **RESTORING FUNCTIONAL FLOODPLAIN AT SPUNKY BOTTOMS**

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### **ABSTRACT**

Spunky Bottoms is a landscape scale restoration project along the Illinois River in Brown County, Illinois. Currently the project includes 833 acres owned and managed by the Illinois Department of Natural Resources and 1193 acres by The Nature Conservancy. The majority of these lands are former natural floodplain of the Illinois River that was leveed and drained for agriculture in the early 1920s. Restoration on 1157 acres of Conservancy property began in 1999 with the planting of 120 acres of upland prairie, 220 acres of bottomland hardwoods, and a significant reduction in pumping that allowed surface waters to accumulate and facilitated the reestablishment of wetland communities. Plant and animal communities have responded with 17 threatened or endangered species being documented since restoration began. Stewardship has included the management of invasive species such as eastern cottonwood, Reed canary grass, and Eurasian water milfoil. Plans are underway for a Section 1135 project with the U.S. Army Corps of Engineers to complete restoration on both Department and Conservancy properties and to provide a managed connection with the Illinois River to increase the ecological functionality of the project.

### **INTRODUCTION**

The dynamic relationship between a river and its floodplain is a key factor shaping the often abundant and diverse plant and animal communities in, on, and around the river. In naturally functioning large-floodplain river ecosystems, floodplain habitats provide a myriad of ecological as well as societal benefits including contributions to the naturalization of hydrology (including flood reduction); management of nutrients and sediments; improvement in water quality; and establishment and maintenance of habitats for abundant and diverse plant and animal communities. Such was the case in the pristine Illinois River ecosystem before hundreds of miles of levees were constructed to isolate approximately one half (over 200,000 acres) of former floodplain from the river by early in the last century, predominantly for agricultural production. Working with partners, The Nature Conservancy identified restoration of functional floodplain habitat as a key strategy for conserving the biological diversity of the Illinois River (The Nature Conservancy 1998). The Spunky Bottoms Project is the Conservancy's first floodplain restoration project along the Illinois River.

### **SITE DESCRIPTION**

The Nature Conservancy initiated the Spunky Bottoms Project in 1997 with the acquisition of 1157 acres along the Illinois River near Versailles, Illinois in Brown County, from the John Hancock Mutual Life Insurance Company (Figure 1). The property is approximately 75 miles upriver from the Illinois River's confluence with the Mississippi River at Grafton and 250 miles downriver from Lake Michigan at Chicago. The majority of the Conservancy land is in the historic floodplain of the Illinois River and had been isolated from the river by constructed levees,

drained by ditching and pumping, and managed for agriculture since the early 1920s. The Conservancy property is part of the Little Creek Drainage and Levee District. Since 1997, an additional 869 acres have been added to the project through acquisition, 833 acres by the Illinois Department of Natural Resources (IDNR) and 36 acres by the Conservancy. The majority of the added lands are also in the drainage district.

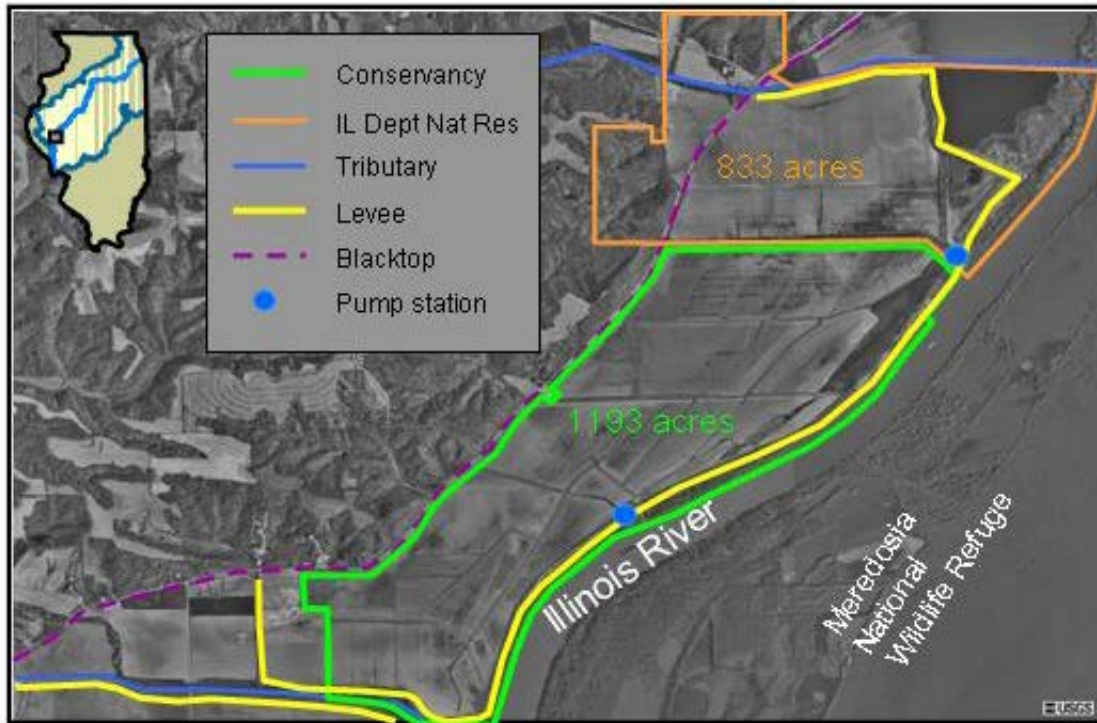


Figure 1. Spunky Bottoms floodplain restoration project along the Illinois River in Brown County, Illinois.

## RESTORATION

From 1997-98 with assistance from The Wetlands Initiative, the Conservancy engaged a group of scientists and managers in the development of a restoration plan for what will become a model for the restoration of functional floodplain (The Wetlands Initiative, 1999). Based on topography, the restoration plan identified the spatial extent of habitats including upland prairie, bottomland hardwoods, wetlands, and open water. A more detailed description of the initial restoration efforts was provided in the proceedings of the 2001 Governor's Conference on Management of the Illinois River System (Blodgett, 2001), and only a brief overview is provided here.

Restoration on Conservancy properties began in January 1999 when the pumping of surface waters into the river was significantly reduced to allow a slow increase in water levels on the landscape over two growing seasons. Moist soil and aquatic plants became reestablished from the existing seedbank and apparently from natural dispersal mechanisms including transport by waterfowl. Approximately 120 acres of upland prairie was planted in May 1999, and in fall of 1999 and spring of 2000 a total of 6500 RPM (Root Production Method) trees of a dozen species were installed on 220 acres.

Since the initial restoration from 1999-2000, we have made supplemental plantings of prairie seeds and bottomland hardwoods, both RPM and bare root stock. Prairie plantings were an attempt to increase the diversity and abundance of forbs species and to offset the dominance of grass species originally planted in 1999. Supplemental bottomland hardwood plantings were also undertaken to increase diversity as well as to offset mortality, albeit limited, of trees planted 1999-2000. It appeared contributors to tree mortality included voles (*Microtus* spp) feeding on roots, cottontail rabbit (*Sylvilagus floridanus*) browse (especially in 2001) and deer (*Odocoileus virginianus*) browsing and rubbing. Survival rates of trees appear to be persistently high. The first evidence of reproduction observed for the RPM trees was mast on several burr oaks (*Quercus macrocarpa*) in 2005, five years after the trees were installed.

## RESPONSE OF PLANT AND ANIMAL COMMUNITIES

While only a relatively short time has elapsed since restoration began at Spunky, results to date have been encouraging. For example, 233 plant (Unpublished data, The Nature Conservancy) and 192 bird (Hobson and Herkert, Submitted) and have been documented in the property. Since restoration began in 1999, a total of seventeen threatened or endangered species have been documented on the site (Table 1).

Table 1. State and federal threatened and endangered species documented at Spunky Bottoms since restoration began in January 1999.

Common name	Scientific name	Status
Decurrent false aster	<i>Boltonia decurrens</i>	ST/FT
Pied-billed grebe	<i>Podilymbus podiceps</i>	ST*
Little blue heron	<i>Egretta caerulea</i>	SE
Black-crowned night heron	<i>Nycticorax nycticorax</i>	SE
Yellow-crowned night heron	<i>Nyctanassa violacea</i>	SE
Least bittern	<i>Lxobrychus exilis</i>	ST
American bittern	<i>Botaurus lentiginosus</i>	SE
Northern harrier	<i>Circus cyaneus</i>	SE
Bald eagle	<i>Haliaeetus leucocephalus</i>	ST/FT
Osprey	<i>Pandion haliaetus</i>	SE
Peregrine falcon	<i>Falco peregrinus</i>	ST
Common moorhen	<i>Gallinula chloropus</i>	ST
King rail	<i>Rallus elegans</i>	SE
Black rail	<i>Laterallus jamaicensis</i>	SE
Henslow's sparrow	<i>Ammodramus henslowii</i>	ST
Yellow-headed blackbird	<i>Xanthocephalus xanthocephalus</i>	SE
River otter	<i>Lutra canadensis</i>	ST*

ST = State Threatened

SE = State Endangered

FT = Federal Threatened

FE = Federal Endangered

\*since delisted

Plant diversity in the upland prairie has increased as new species were planted, but few prairie species have shown up on their own. While moist soil and aquatic plant species diversity continue to increase, relatively static water levels have allowed American lotus (*Nelumbo lutea*) to become the dominant shallow water emergent species. Likewise, a lack of water regime variation has led to an increasing dominance by cattails (*Typha* sp.) and an overabundance of cottonwood saplings along lacustrine littoral border areas.

Evidence indicates a depauperate fish community existed in the ditches at Spunky Bottoms before restoration began in 1999. At that time, the fish community was restricted to the drainage ditches which provided limited habitat diversity and likely was subject to frequently poor water quality due to runoff from an adjacent hog feeding area and the limited assimilative capacity due to low volume of water and sparse aquatic plant community. The fish community was first sampled by the Illinois Natural History Survey using electroshocking in fall 1999. Nine species were collected (Illinois Natural History Survey, unpublished data); common carp (*Cyprinus carpio*) and green sunfish (*Lepomis cyanellus*) and its hybrids comprised a significant proportion of the samples (Figure 3). Neither fish stocking nor active control (elimination) has been undertaken. As restoration has progressed, it appears native fish species have been able to take advantage of improved habitat conditions and increase more rapidly than those less desirable species that are indicative of poor habitat conditions (i.e., carp, green sunfish, and hybrids). In the most recent electroshocking collections (November 2004), largemouth bass (*Micropterus salmoides*) and bigmouth buffalo (*Ictiobus cyrinellus*) numbers were higher than either carp or green sunfish, and no green sunfish hybrids were collected (Figure 2).

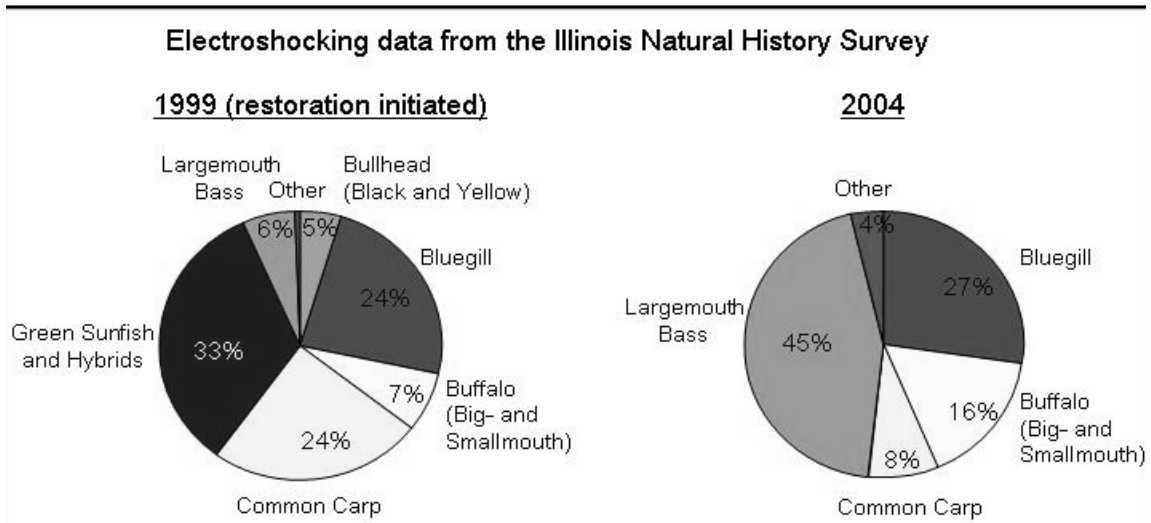


Figure 2. Relative abundance of fish species (excluding gizzard shad) at Spunky Bottoms.

## STEWARDSHIP

To date, most stewardship activities have focused on the management of invasive species. On the upland prairie, prescribed burning has been the main tool used to maintain the tallgrass prairie

habitat. The Conservancy property has been divided into eight manageable burn units and our objective is to burn each unit at least once every three years. However, in general no more than three units are burned in any one burn season to provide sufficient refugia for the prairie fauna. More recently we have developed a more aggressive burn schedule in some units with areas experiencing aggressive cottonwood invasion. These select units are being treated with back-to-back year burning. We have also signed cooperative agreements with two adjacent landowners to incorporate lands enrolled in the Conservation Reserve Enhancement Program (CREP) into our prescribed fire program. In total, approximately 200 acres of upland, mesic tall grass prairie habitat enrolled in CREP and located adjacent to and contiguous with the preserve were burned in 2004.

Currently we have limited ability to manage water levels on the preserve, and levels generally fluctuate less than two feet from season to season and year to year. As a result of these rather static conditions, the transition areas between the wetland and prairie habitats are to subject to invasions of aggressive trees, especially eastern cottonwood (*Populus deltoids*). To date we have used burning, mowing, and chemical treatment separately and in combination in an attempt to manage these invasions.

Burning has been only moderately successful, possibly due to seasonal conditions and low fuel loads associated with cottonwood dominated areas. Often a high percentage of burned cottonwood saplings will re-sprout. For overall mortality on saplings, significantly hot fall burns have proven to provide the best results.

We used a heavy-duty, seven-foot shredder to mow areas where needed to slow the growth of aggressive cottonwood saplings. Experience with the fast growing species has shown that four growing seasons will put the trees at a size beyond the effects of fire or other efficient control methods. Although mowing does stimulate the trees to produce more offshoots, it is effective at keeping them within a size class that is vulnerable to fire and chemical (herbicide) treatment.

For chemical treatment, we initially used spot treatments of Garlon 4A herbicide using backpack sprayers. However, the overall extent of the problem made this ineffective from a site perspective. To increase efficiency in order to get the coverage needed, we modified a PMC WedgeWik brand herbicide applicator (wicker) designed to apply herbicide to soybean fields to control weeds that extended above the soybean crop. We attached the wicker to the hydraulic bucket of our 5410 John Deere tractor (Figure 3A); this allowed us to raise and lower the wicker for the precise application of herbicide to the vertical level needed to impact the trees but not the prairie plants below (Figure 3B).

Reed canary grass (*Phalaris arundacae*), an exotic, cool-season, perennial grass is invasive and a moderate threat at the preserve. We have been selectively treating the grass since our restoration began in 1999. The most commonly used method is spot spraying from a back-pack or ATV-mounted sprayer. During the 2005 season, we borrowed an airboat from IDNR to more easily access ditch edges and isolated colonies of the grass in shallow water. The only herbicide used to date has been glyphosate based products safe for use over and adjacent to bodies of water. Initially the commercial brand Rodeo was used. When Rodeo became unavailable, we started using Aquamaster, a similar herbicide. Typically a 3% active ingredient concentration in a water carrier with a non-ionic surfactant is used. The plant clumps are treated in spring and early summer as they try to establish beyond ditch areas where established colonies have been located perennially.



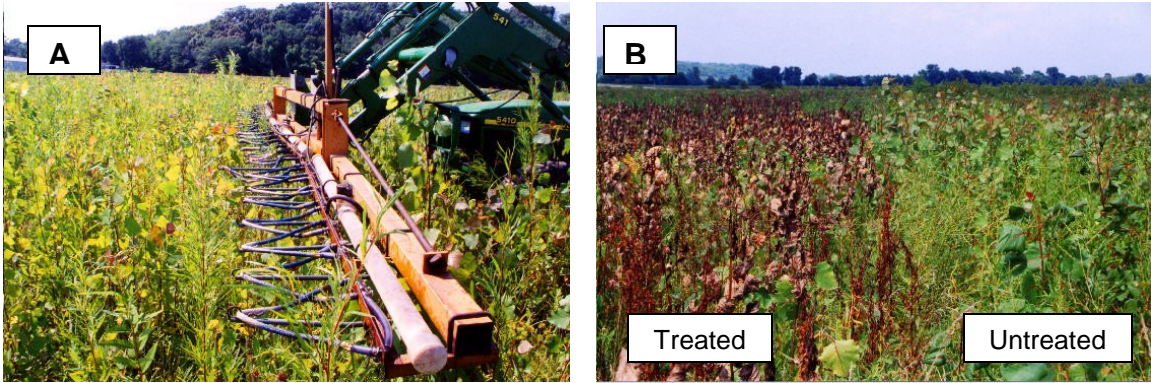


Figure 3. A. Wicker modified to apply herbicide to invasive trees. B. Treated versus untreated trees one week after treatment showing mortality of taller trees (cottonwood and willow) but survival of the shorter prairie plant community.

During fall 2004, staff discovered a relatively small (approximately one acre) population of exotic Eurasian water-milfoil (*Myriophyllum spicatum*) growing in one shallow water area of the preserve. Given the aggressive nature of this invader, plans were made to begin treatment before the next growing season. Through consultation with IDNR fisheries biologist Wayne Herndon, we decided to use Dow Chemicals DMA-4 IVM, a liquid formulation of the dimethylamine salt of 2,4-D, to treat the milfoil. Our goal was create concentrations of between 0.5 and 1.0 parts per million active product ingredient in the water column—concentrations likely to eradicate milfoil without killing desirable native submerged vegetation. By application time in late May 2005, we estimated the formerly small population of milfoil had grown to cover nearly 100 acres. Herbicide was applied using a boat bailer system to draw the product from a boat-mounted container (Figure 4). The entire water body was treated using a grid pattern to evenly distribute the herbicide via the outboard motor's prop wash. Follow-up monitoring one month post application showed encouraging evidence of high mortality rates for milfoil while native coontail (*Ceratophyllum demersum*), elodea (*Elodea canadensis*), and potamogetons (*Potamogeton* spp) appeared unaffected (Figure 5). No living milfoil was found during the remainder of the season. It may not be practical to totally eliminate the robust exotic and there is always a chance waterfowl, the suspected initial vector, or other mechanisms may introduce new populations in the future. Therefore, we have initiated frequent monitoring to facilitate early detection of any reintroductions, thereby providing opportunities for treatment before significant infestation.



Figure 4. Boat bailer system used to distribute herbicide.



Figure 5. One week after treatment, the targeted Eurasian water milfoil (left) was dead or dying while native species such as coontail (right) appeared unaffected.

## **PUBLIC USE**

The project has provided both recreational and educational opportunities. Public fishing is allowed by permit. Participants are required to undergo a brief orientation to the preserve, follow preserve rules, sign a liability waiver, and report their catch. Fishing for largemouth bass is limited to catch and release (i.e., harvest is prohibited) in an attempt to maintain a robust piscivore population to help control common carp numbers. During the spring and summer of 2005, nearly 40 fishers recorded the catch and release of approximately 700 largemouth bass with some reported in the eight-pound class (Figure 6).



Figure 6. A positive response from the fish community provides recreational fishing opportunities for the public.

A public waterfowl hunting program was initiated on Conservancy property at Spunky Bottoms in 2000. Up to five volunteer-constructed hunting blinds are allocated by a daily draw on three mornings a week during the normal waterfowl hunting season. Drawn hunters are charged \$10 to offset hunting program expenses. While the preserve is not managed to maximize hunting opportunities or yield, harvest rates (ducks taken per hunter day) have consistently exceeded those at state managed areas. The overall harvest rate for the 2003 season was 2.54 ducks per hunter day and in 2004 it was 1.56 ducks per hunter day. The most commonly harvested species 2002-2004 were gadwall (*Anas strepera*), mallard (*Anas platyrhynchos*), and wood duck (*Aix sponsa*). Through the waterfowl hunting program, the preserve is used to develop relationships with hunting club members and managers and to demonstrate the multiple benefits of promoting natural vegetation including its value as an attractant for waterfowl.

As a science-based restoration project, Spunky Bottoms continues to be an important research site for various disciplines. Research provides feedback for adaptive management for the project as well as documenting lessons learned to provide guidance for other restoration efforts. On 1 May 2003, forty researchers, students, and managers met at Dickson Mounds Museum for the Spunky Bottoms Research Symposium to discuss past and future research and associated opportunities at Spunky. A proceeding of the symposium is in preparation; it will include a dozen papers and will be published by the Illinois Natural History Survey. In addition to research carried out by faculty and students from numerous agencies, universities, and colleges, the preserve is a frequent fieldtrip destination for local schools. Annually students from Brown County schools, Illinois College, and MacMurray College visit the site to assist with work projects and for educational fieldtrips. Two Rivers Council of the Girl Scouts use the preserve for summer educational camps, and the Conservancy also partners with the University of Illinois Extension to provide Leadership Academy fieldtrips. Western Illinois University incorporates Conservancy-led prescribed fire training and practical experiences at the preserve in their fire ecology curriculum.

## **FUTURE PLANS**

While as can be seen, the partially restored landscape at Spunky Bottoms provides important habitats for numerous species including many threatened and endangered ones, the levee that isolates the property from the river provides a barrier for many other species, especially aquatic organisms. Furthermore, the levee prevents or constrains many important ecological processes that are needed to restore the ecological health of the site and the river system such as connectivity, naturalization of hydrology, sediment and nutrient cycling and management, and distribution of primary and secondary production. Additionally there is a need for improved water level management capabilities to restore more natural water level fluctuations to both promote native plant and animal communities and to control invasive species. Finally, additional work is needed to complete restoration on Conservancy property including more recently acquired properties that are still in conventional row-crop agriculture and for restoration of the IDNR property, also still predominantly in agriculture.

Towards these ends, a Section 1135 Ecosystem Restoration Project is being planned with the U.S. Army Corps of Engineers. Both the Department and the Conservancy will serve as non-federal cost share sponsors, and plans are for the project to be designed, implemented, and managed cooperatively by IDNR and the Conservancy. A draft feasibility report was completed in fall of 2004. The proposed project will include a managed connection with the river and structural features that will provide important water level management capabilities including the



ability to provide aquatic organisms passage into and out of the restored habitats. Such a connection will also increase the functionality of the floodplain wetlands, restoring a measure of the many benefits these systems can provide.

## **ACKNOWLEDGEMENTS**

Partners contributing to past and future success at Spunky Bottoms include The Wetlands Initiative, Illinois Department of Natural Resources, U.S. Fish and Wildlife Service, National Fish and Wildlife Foundation, Natural Resources Conservation Service, Zahniser Institute for Environmental Studies at Greenville College, Illinois Natural History Survey, Illinois State University, University of Illinois at Urbana-Champaign, University of Illinois at Springfield, MacMurray College, Illinois College, Western Illinois University, Grand Victoria Foundation and numerous other local schools, donors, and volunteers.

## **REFERENCES**

The Nature Conservancy. 1998. Illinois River Site Conservation Plan for The Nature Conservancy of Illinois. 73 pages.

Blodgett, K. Douglas. 2001. Restoration of Illinois River Floodplain: The Nature Conservancy's Spunky Bottoms and Emiquon Projects. Pages 210-216 *in* Alesia M. Strawn, editor, 2001 Governor's Conference on the Management of the Illinois River System, Special Report No. 27, Illinois Water Resources Center, Urbana, IL. 245 pages.

The Wetlands Initiative. 1999. Spunky Bottoms Preserve Wetland Restoration Plan. 72 pages.

Hobson, Tharran and James Herkert. Submitted. Wetland Bird Response to Habitat Restoration at Spunky Bottoms Preserve (Brown County).