Riverlands Migratory Bird Sanctuary Prairie Rehabilitation Project

Supported in part by a grant from the Missouri Bird Conservation Initiative

MISSOURI BIRD CONSERVATION INITIATIVE

THE Audubon CENTER AT RIVERLANDS

US Army Corps of Engineers

What is a prairie?

Prairie is an ecosystem dominated by grasses and forbs (herbaceous wildflowers), and few shrubs or trees. Historically, over a third of Missouri—or nearly 15 million acres—was tallgrass prairie. In recent centuries, over 99% of the prairie has been converted to agriculture or other human developments, so existing and restored prairies are extremely important to conserve. Prairies can have very diverse plant and animal communities with unique adaptations to withstand and thrive under a particular set of conditions and disturbances. The plants are adapted to conditions such as extreme temperatures; local geology, soils, and moisture; wind; high light intensity; fire; and grazing. An individual species' ability to withstand such conditions occurs along a gradient and leads to the development of different types of prairie communities. In Missouri, there are 12 different types of prairie communities that fall under the broader categories of bottomland prairie, sand prairie, loess hill prairie, limestone/dolomite prairie, chert prairie, sandstone/shale prairie, prairie swale, and hardpan prairie.




Importance of Prairie:

- Support an amazing diversity of plant, animal, and insect life such as pollinators (e.g., a high quality prairie may have up to 20 plant species growing within a single square yard (Solecki et al. 1986).
- Prairie covers less than 1% of its historical area in Missouri, and therefore is important for the conservation of species that only occur in prairie habitats.
- Prairie plants have deep, dense root systems (can be as deep as 15 ft.) that can absorb large volumes of rainfall, and as a result reduce storm water runoff and help to recharge groundwater supplies. The dense roots systems act as a natural filter to reduce contaminants and nutrients in runoff.

Ecological Restoration: Involves a series of actions that work to improve the recovery of an ecosystem in regards to its health, integrity, and sustainability (SER, 2004). The process requires an understanding of the current state of the habitat, the potential for recovery, and a well-developed plan of action and assessment in order to be successful. The restored prairie and marsh habitats in the Riverlands Migratory Bird Sanctuary were cultivated for a period of time, and restoration began in the late 1980s to bring back the ecosystem functions, structure, and diversity characteristic of natural bottomland marsh and prairies. This was undertaken after it was determined that the soil conditions and topography could support these native plant communities.

Restoring Prairie:

- Choosing species- The species selected for a prairie restoration project have to be carefully chosen. The soil type and moisture levels found at a site make certain species more suitable and better adapted to survive at some sites than others. Some species may do well in dry, rocky soils while others do well in deep, wet soils. Sand prairie areas in the Sanctuary require the selection of species that are adapted to dry, quickly draining soil. Other prairie areas in the Sanctuary very from wet to mesic (moderate moisture) soil condition, so selection of species that grow well under these conditions are selected and planted appropriately.
- Site preparation- Preparing the site is important to the long-term success of a restored prairie. Management issues such as invasive and non-native species can take over a project if the area is not carefully prepared prior to planting.
- Preparing to plant- First, a suitable plant list is developed based on the project location, soil conditions, and moisture levels. Then sources for seeds or seedlings are determined. Note: it is illegal to collect from public lands unless a permit is obtained. Seeds and seedlings can be purchased from an approved native plant nursery. For a list of native plant nurseries in or near Missouri visit grownative.org .
- Seed gathering- Based on the list of desired species, The Center is working with partners (U.S. Army Corps of Engineers and Shaw Nature Reserve) to coordinate seed collections which will help to increase prairie forb diversity in the Sanctuary. Flowers not only bloom at different times of the year, but also the seeds mature at different times of the year. Because of this we will be collecting seeds throughout the growing season to target species that are well adapted to the prairies at Riverlands, but are not currently present on the site.
- Seed adaptations, germination, and planting- Many of our native wildflowers have special adaptations that help them to survive here in the Midwest. For example many native plant seeds have to go through a cold period for at least a certain length of time before the seed will germinate. This is an adaptation that prevents the seed from sprouting in the middle of winter when another snow may not be far away! Thankfully we can mimic this cold period with the proper technique in a fridge during the winter, and then we can propagate the seeds in the spring as conditions warm up. Another option is to broadcast desirable seeds in a prepared location during the winter, and allow the natural freeze/thaw cycles to bring the seeds into favorable contact with the soil to promote germination in the spring when conditions are right. Other seeds may need to be exposed on a soil surface with sunlight in order to germinate, or need their seed coat scraped (scarification). For example many legumes need to be scarified in order to germinate, and the natural way this occurs is by passing through an animal's digestive tract.

Prairie Management in the Sanctuary:

- **Fire–** Historically, fire was used by Native Americans to maintain prairie areas in this part of the country. Areas were burned for a number of reasons, including the management of game habitat, to encourage certain plants to produce nuts and berries, and to create more favorable conditions for traveling. Fire creates a number of conditions that provide a favorable environment for prairie plant survival. A prairie fire increases nutrients by stimulating microbial activity in the soil and releases nutrients from the ash. A fire lengthens the growing season (sometimes several weeks) for prairie plants by burning off leaf litter in the spring and exposing a dark soil surface which absorbs the sun's rays to warm the soil earlier in the year. Prairie plants have buds just beneath the soil, so they are not damaged by fires. Fire also helps to control and prevent shrubs and trees that would establish otherwise. The Sanctuary is divided into distinct units to help manage for long-term prairie conservation and management goals. This management approach creates an environment that supports wintering sites for insects, birds, and other animals in some areas, and produces the benefits of fire to manage and promote the prairie in other locations.

- **Mowing–** In areas where it is difficult to burn and in areas that have become dominated by just a few species of annual weeds, mowing has become an important management strategy. Mowing can be used to increase sun exposure and help newly established prairie plants survive among the faster growing weedy species. Early in their development, prairie plants put a lot of energy into growing large root systems, so they don't grow as tall as weedy annual plants that are focused on growing fast and producing seeds all in one season. Mowing may help promote establishment of more native forbs (wildflowers) when applied at the proper height and frequency by helping them get enough sunlight and resources to develop strong root systems. Mowing can also be an important tool for controlling shrubs and trees that can encroach and shade out grasses and herbaceous wildflowers in the prairie.

- **Herbicide–** Application of herbicide may be used in certain situations to maximize the effectiveness of mowing applications on problematic weeds, shrubs, and trees, or to manage species that cannot be controlled by fire and mowing.

Plant adaptations:

Many prairie plants have finely divided or narrow vertical leaves to reduce overheating and offer less resistance to the wind, fuzzy leaves deflect sun and wind, and leathery or waxy leaves reduce water loss. Prairie plants also have large root systems, up to 2/3 of the plant occurs underground as roots, to more efficiently access water during dry condition and to allow quick recovery after fire or grazing. Plant buds occur at or below the ground to protect the plant and promote regeneration after fire. Many prairie plants have a special form of photosynthesis that allows them to make the most of the high light and temperature conditions, and reduce water loss compared to many other plants.

History: The Riverlands Migratory Bird Sanctuary includes 1200 acres of restored bottomland marsh and prairie and is managed by the USACE (Figure 1). Prior to the construction of the Melvin Price Locks and Dam, this 1200 acre section of land was in crop production. After the construction of the dam, water elevations increased and the croplands were infested with invasive plants such as Musk Thistle (*Carduus nutans*) (USACE, 1993). The USACE researched the historical vegetative cover near the Great Rivers Confluence and developed a management plan that would help reduce and control invasive species while reestablishing a plant community similar to what would have occurred prior to settlement--a mosaic of bottomland marsh and prairie.

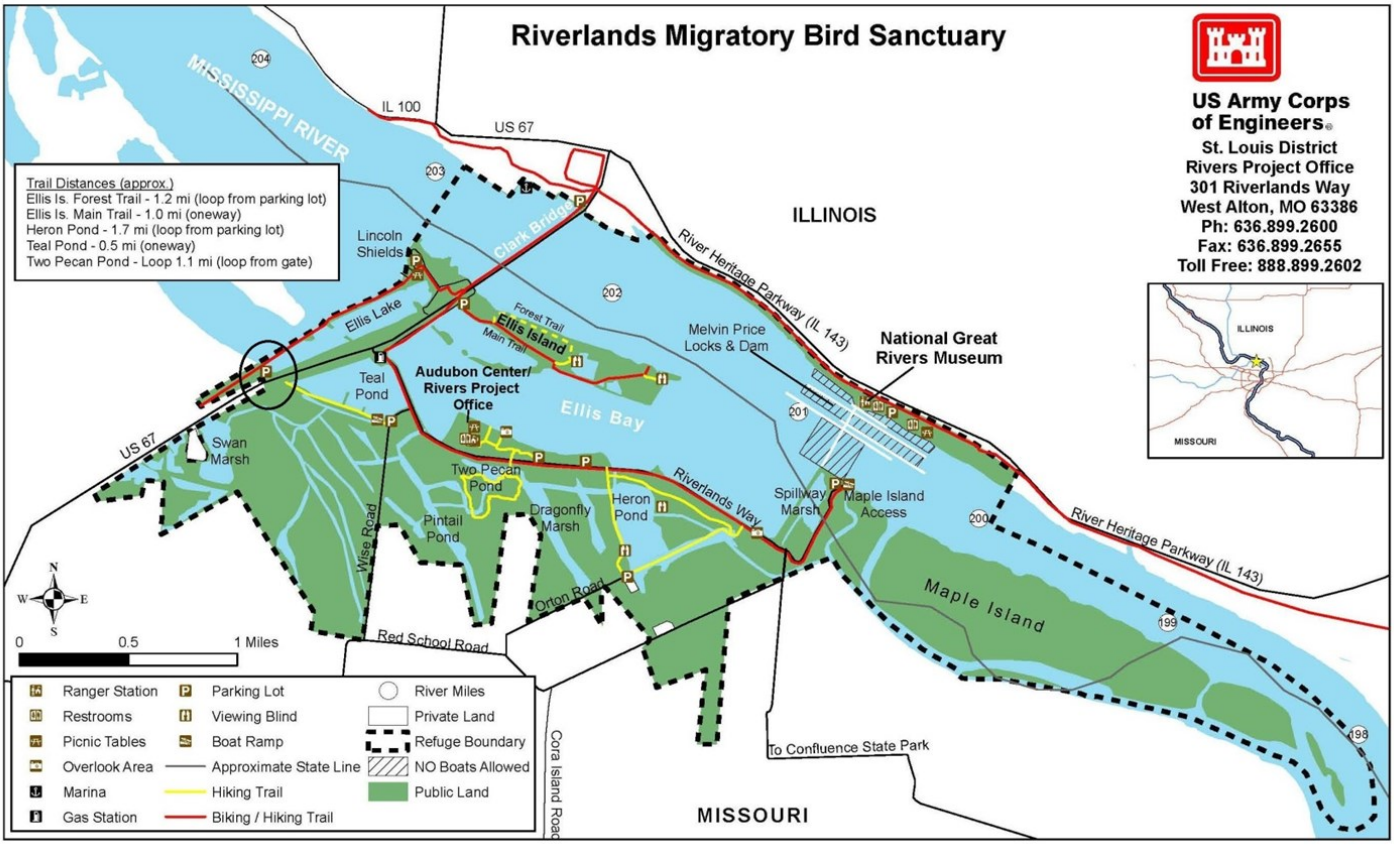

Figure 1: Riverlands Migratory Bird Sanctuary

Restoration began in the late 1980s with plantings of native warm-season grasses which tolerate the soils types found in the Sanctuary, including Big Bluestem (*Andropogon gerardii*), Switchgrass (*Panicum virgatum*), Eastern Gamagrass (*Tripsacum dactyloides*), Indian Grass (*Sorghastrum nutans*), and Prairie Cordgrass (*Spartina pectinata*). Mesic prairie plantings occurred in areas that had well-drained soils; while, wet prairie plantings occurred in areas that had poorly-drained soils.

During the summer of 2013, the Melvin Price Locks and Dam gauge witnessed the fifth highest water elevation on record. The levee which separates the restored marsh and prairie area from the river channel was overtopped and a nearby levee breached. As a result, the bottomland prairie at Riverlands was inundated with floodwaters for several weeks. As water levels started to recede, large patches of prairie were overgrown with Giant Ragweed (*Ambrosia trifida*), Trumpet Creeper (*Campsis radicans*), and Johnson Grass (*Sorghum halepense*) that shaded out prairie grasses and forbs.

Figure: 2013 flood that spread over prairie area at Riverlands

After the flood it was evident that adjustments to the management plan were necessary to maintain diversity of the prairie, and control invasive species (both introduced and aggressive natives) that have colonized in the Sanctuary after flood events. The $20,000 in support from MoBCI allowed us to work with Shaw Nature Reserve personnel and USACE to work on a long-term sustainable plan for the Riverlands prairie and apply this management. As a result of this coordination, a more intensive mowing regime at a height of 8-12 in. in problem areas was implemented in combination with the existing prescribed burn regime (~ every 3 years). These actions aim to better control the dominance of prairie grasses as well as control encroaching woody shrub and tree species on site. Herbicide is used to help manage problematic species that cannot be controlled solely with fire and mowing.

In addition to management strategies to control aggressive species, partners are working together to gather seeds from desirable species that are representative of the conditions found at Riverlands but have not established yet. The seeds are cleaned, processed, and then broadcast in specific management areas to increase local forb diversity. Audubon aims to work with project partners to help support the prairie rehabilitation project, coordinate volunteers during seed collection events, and assist with seed management.

Figure: Seed collection fall 2014