Restoring Large Prairies in the Chicago Region

A Summary of Proven and Promising Techniques

Audubon Chicago Region

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Scientific names for plants follow Swink and Wilhelm (1994).

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INTRODUCTION

One of the great conservation needs in the Chicago Wilderness region is to restore prairies big enough for long-term sustainability – for both their animals and plants. Everywhere east of the Mississippi, the formerly wide-open prairies have been reduced to small fragments. Many efforts are underway to expand and augment such small remnants with good-quality, large restored prairies. The resulting larger prairies, if restored and managed well, may provide long-term conservation benefits by increasing gene pool sizes, allowing more grassland animals to provide their natural ecosystem functions, and allowing forces such as fire to act at a landscape scale and create a dynamic of habitat patches.

Some wildlife species, especially invertebrates, require high-quality plant communities. Many of the invertebrate populations in our 1- to 20-acre remnants are too small for long-term sustainability – unless habitat size, and thus population size, can be increased. Other prairie animals of conservation concern, including birds, herptiles, and mammals, survive today mostly in greatly changed habitats such as meadows of Eurasian grasses and hayfields. The Prairie State deserves many sustainable conservation landscapes of sufficient quality and size to support interacting long-term populations of most of the plants and animals that evolved with this ecosystem.

Organizations in Chicago Wilderness have begun to take up the challenge. In the past few decades, over a dozen large prairie restoration efforts (ranging from hundreds to thousands of acres) have been undertaken around the region by federal, state and county agencies and not-for-profit groups. This document brings together advice from practitioners of large prairie restoration. Its primary audiences include professionals who are new to some of these issues, volunteer stewards, contractors, land management crews and interns, as well as the land management decision-makers of public agencies.

This document is principally concerned with the black soil prairies (or “fine-textured-soil prairies”) – prairies on good soil – once the commonest in our area, now the rarest. Prairies on sandy soils survived better and seem to be more easily restored. But many black soil prairie species are not conserved on sand prairies. This document considers restoration of former cornfields and agricultural grasslands, as well as expansions of quality small areas. Expanding small high-quality areas may be the most practical way for restoration efforts to be significant for many components of the ecosystem including fungi, soil microfauna and microflora, and habitat-dependent invertebrate species, small populations of which may survive in the remnant and spread to new areas. In areas where no remnants exist, recreated prairies have demonstrated the ability to serve as valuable habitat for prairie fauna, particularly birds.

This document focuses on sites that are large enough to host populations of grassland birds, herptiles, small mammals and sustainable populations of invertebrates. Fifty acres is the low end of the range: more prairies of several hundred to many thousands of acres are recommended by numerous planning bodies, including the Illinois Wildlife Action Plan and the Chicago Wilderness Biodiversity Recovery Plan. The techniques discussed

here apply to restoring prairie to lands recently used as hayfields, Eurasian meadows, and row-crop fields.

The primary fauna discussed in this document are the birds, because there has been much regional and local research on restoring bird habitat, and because prairie birds have been shown to need large grasslands. As research provides guidance for other prairie fauna, additional recommendations should be incorporated.

Where accessible references exist for technical aspects of this work, such as in the area of choosing herbicides for weeds, this guide refers to them rather than attempting to repeat the information.

PLANNING

Deciding to undertake a large grassland restoration

1. Is the site appropriate for the intended conservation goal?

Realistic goals make for good planning and the use of scarce resources where they can do the most good.

The former and existing habitats on the site should guide planning. Large prairies can be restored in agricultural fields that were once prairie or in existing grasslands such as hay meadows or old fields. Former prairies currently occupied by tree plantations or unassociated woody growth are appropriate sites for large prairie restoration (although brush removal can be a major expense).

Sites that have existing prairie remnants are a high priority. Studies by Ron Panzer and John Shuey have shown that restorations adjacent to remnants have a greater diversity of rare native insects; they presumably also have a more intact soil biota.

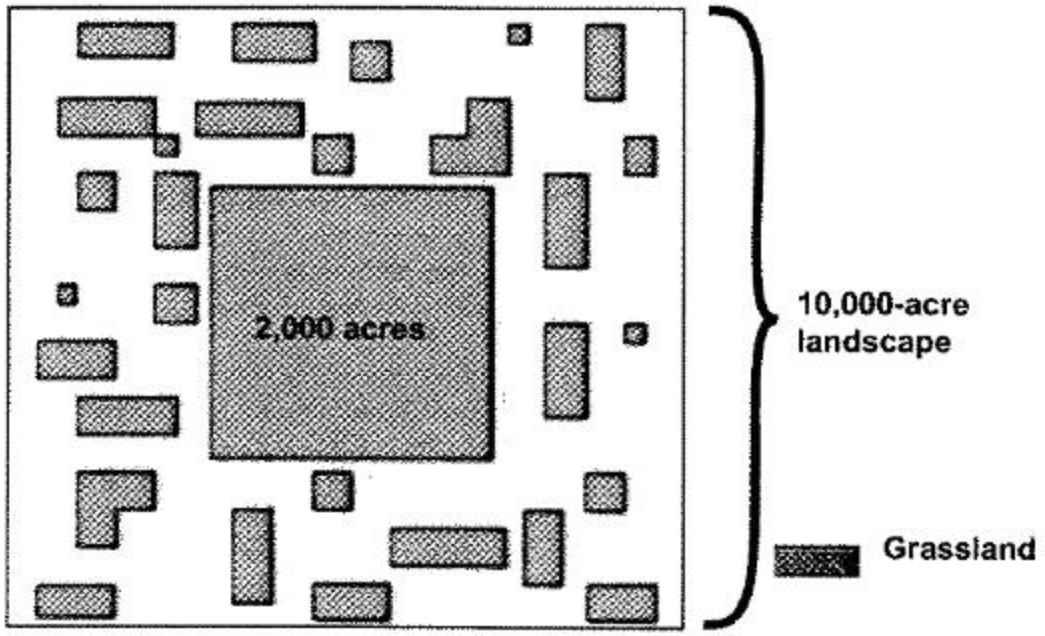
If grassland bird conservation is a goal, areas should be 100 acres or larger. Smaller areas that support plant, invertebrate or other species of conservation concern can be good candidates for expansion, but the planning should focus on the species of concern at the site rather than on large grassland goals generally.

Consider the recreational demands likely to be put on the site. If the goal is to have breeding prairie birds, look for a site where disruptive activities can be restricted from mid-April through the end of July when birds are nesting. For wintering birds of prey that roost on the ground, disruption (especially from dogs and snowmobiles) should be restricted from December through early March.

2. Is the site appropriate for a Bird Conservation Area or for grassland bird habitat?

Grassland birds are the fastest declining birds in the nation (see Appendix 1). For these birds, the highest priority sites would be those that could form part of a Grassland Bird Conservation Area as defined by Partners in

Flight: a 2,000-acre contiguous core plus 2,000 additional grassland acres (in smaller parcels) within a total 10,000-acre landscape. These sites will have the broadest range of species and the best chance to create thriving population centers for multiple species.



Partners in Flight
Bird Conservation Area model landscape

Many grassland bird species also breed on smaller sites. Most can be found on sites of at least 75 acres, and some might use small sites of 30 to 75 acres. Surrounding land use can have a positive or negative influence on grassland birds. Grassland birds may use smaller sites if they are surrounded by open habitats. For example, the 35-acre Grigsby Prairie in Barrington is near the open grassland habitat of horse farms and has many nesting grassland birds. Grasslands surrounded by woodlands, however, may need to be much larger than those in open areas to benefit grassland birds.

If a large, unfragmented grassland dominated by Eurasian pasture grasses (such as various brome, fescue and bluegrass species) is occupied by grassland birds, the value of converting it into a prairie restoration should be carefully weighed. Prairie conversion attempts have in the past resulted in a rank monoculture of tall warm-season prairie grass or a field of tall goldenrod, both marginal for grassland birds. On the other hand, diverse prairies are often a sensible long-term solution for large grassland sites.

3. Are the necessary start-up resources available? Substantial resources may be needed for several years of weed control, brush control, hydrology restoration, seeding, mowing and burning.

4. **Are there resources for the long-term management of the project?** Grasslands are dependent on periodic disturbance and must be burned (or mowed or grazed) regularly in order to prevent woody encroachment. Woody vegetation must be kept to a minimum in areas being managed for grassland birds. Herbaceous weed infestations also must be controlled. Incompatible recreational activities (dirt bikes, off-leash dogs and the like) must be kept in check by culture and enforcement.

5. **Is there community support for the project?** Local citizens and community groups that understand and support the project goals are an invaluable resource. In recent years, local citizens have served as spokespeople at sites where there are pressures for different land uses, where there will be extensive removal of woody vegetation from former prairies (with its potential for public misunderstanding), and where there are needs for additional funding to accomplish project goals. Local volunteer stewards are invaluable not only in helping to establish and maintain the prairie, but in spotting problems, garnering government support and assuring long-term maintenance.

6. **Is the drainage pattern natural?** It is important to analyze the site hydrology and plan where each different vegetation type can be expected to thrive in the restored site. If dry-mesic species are planted where wet-mesic species will flourish, much of the seed will be wasted, and important species will be omitted. If the site has drain tiles, these should be disabled, if possible, before extensive restoration is carried out in the areas that the tiles affect. Otherwise, the species restored may find themselves flooded out after tiles fail or natural hydrology is intentionally restored.

Sequencing is important in hydrologic restoration projects. Invasive woody vegetation should be removed and the most aggressive weeds controlled before disabling drain tiles. Mesic and dry-mesic areas can be seeded before wetlands are restored. Wet area seeding should be limited until artificial drainage has been ended, as the hydrology of the wet areas will be different after tile abandonment.

7. **Are shrublands on site being used by nesting shrubland birds of concern?** It is important to weigh the value of clearing shrubs to create grassland against the value of the existing shrubland. Shrublands are a natural part of the disturbance-driven ecosystem that we refer to as grassland. It may be possible to plan to maintain shrubland habitat on the site along with grassland, or to create or improve nearby shrubland habitat for those birds.

Maintaining a mix of grassland and shrubland habitat is most appropriate on sites larger than 200 acres. On grasslands smaller than this, managing for shrubland habitat will reduce the quality of the grassland, and should be avoided unless priority shrubland species are currently present. In prairies of all sizes, shrubland habitat may be maintained near adjacent woodlands and other edges. Promoting a gradual transition from grassland through shrubland to woodland creates more habitat for

shrubland birds. For purposes of bird conservation, fields smaller than 30-50 acres (depending on surrounding habitat, as noted above) may best be managed for shrub prairie habitat, as few grassland birds will use them. If original populations of rare prairie invertebrates, plants, herptiles or other species that depend on open grassland habitat are present, however, the needs of those species may take precedence.

Goal-Setting

Setting goals and monitoring progress toward them are the most important steps in most restoration projects, yet they are sometimes overlooked. Goals provide necessary benchmarks against which to compare the results of monitoring and determine whether management actions are working.

Goal-setting can include habitats and groups of species that use a particular natural community, and should be based on knowledge of the specific site and its regional context. The Illinois Wildlife Action Plan provides current, science-based information about species of concern in Illinois and the type of management each needs.

PRACTICES

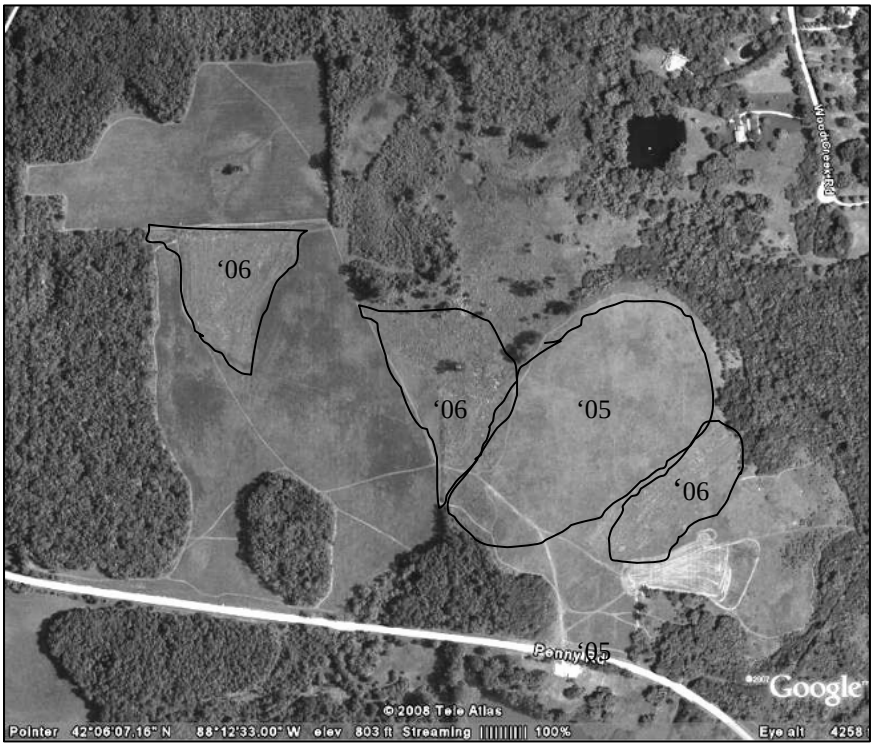
Techniques that improve habitat value of both non-native grasslands and prairie

1. Remove stands of woody vegetation that fragment grassland.

This technique was supported by the research of Chip O'Leary, Dennis Nyberg and others in the 1990s, and has been successfully implemented on many sites to dramatically increase bird populations. Ground-nesting grassland birds usually avoid nesting within 50 or 100 meters of woody vegetation (especially treelines and woodland edges). Prime nesting habitat begins at about 100 meters from trees and dense shrubs. At Spring Creek Forest Preserve near Barrington, Illinois, patches of woody vegetation were removed from three small fields to create a contiguous grassland of 110 acres. Grassland bird populations increased greatly following the vegetation removal. Results are shown on the next page; the four areas where brush was removed are outlined in black.

A similar result was found at Bartel Grassland near Matteson, Illinois. Interior treelines were removed to increase the amount of nesting habitat available for grassland birds. Numbers of grassland birds at points near the treelines increased between 30% and 300%, depending on the species. The graphics on page 10 show how a combination of treelines and other fragmentation had reduced the prime grassland bird nesting habitat on the site to 93 acres. Removal added more than 430 acres to the prime habitat.

It is important to distinguish between woody vegetation that mainly fragments contiguous grassland (such as fencerows and plantations) and woody vegetation that may serve to create shrubland habitat, such as a "soft" edge between two habitats. In the latter instance, retaining native shrubs can allow habitat for shrubland birds.

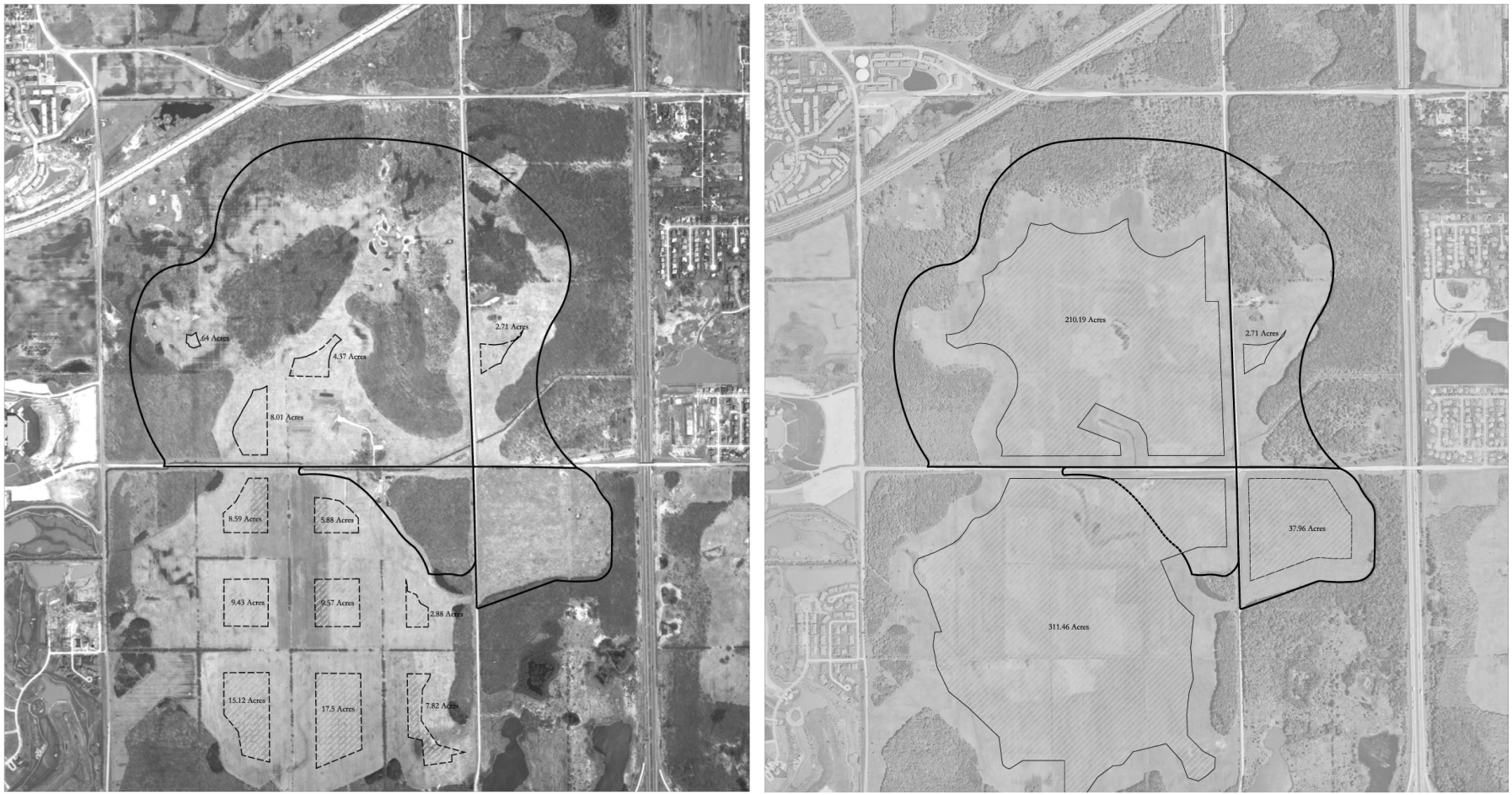


Results of woody vegetation removal in Spring Creek Preserve

January '05 – mowing of approximately 35 acres of brushy encroachment
January '06 – removal of three areas of trees and shrubs (total 18 acres) to make one 110-acre grassland

Grassland Bird Populations at Spring Creek

	June 04	June 05	June 06
Bobolink	2	5	19
Dickcissel	0	0	33
Eastern Meadowlark	3	1	14
Grasshopper Sparrow	0	11	14
Savannah Sparrow	0	8	21
Total Number of Birds	5	25	101



Grassland birds avoid nesting in areas within 1000 meters of trees.
Before removal of treerows and tree plantations, prime habitat is 93 acres. After removal, prime habitat is 523 acres.

2. Circular shapes are optimum, and square shapes are better than long rectangles. Compact shapes minimize the amount of linear edge, hence, exposure to edge effects and edge predators.

3. Plan trails to minimize disruption to wildlife. Research in grasslands has found that generalist species are more abundant near trails, whereas specialist species are less common. Birds are less likely to nest near trails, and nest predation is greater near trails. For this reason, trails should pass through the edges rather than the centers of grasslands when possible. Maintaining a gradual transition from grassland through shrubland to woodland creates more habitat for shrubland birds, which argues against locating all trails immediately adjacent to a woody edge, especially on a large site. These and other factors need to be weighed in designing a judicious trail system.

4. Remove woody invasives that creep into a site.
Burning alone is not likely to get rid of the small brush that invades grasslands. Most species of trees and shrubs continue to resprout after fires. These resprouts compromise the grassland's water-retention and soil erosion-protection functions. They also inhibit the restoration of high-quality matrix species. In some cases, brush seedlings and resprouts are so dense as to preclude the development of a turf of grasses and forbs. Invasive brush in areas that are to be managed as grassland should be cut and carefully herbicided until they are gone.

A variety of brush removal treatments are appropriate depending on the degree and type of degradation:

- It is effective to brush hog or seppi mow the woody species in late summer, fall, or winter (when the ground is firm) followed by foliar herbiciding of resprouts in fall or spring, after the resprouting brush has exceeded about 6” in height. Foliar herbiciding can also be effective in the growing season following a burn. It is often worth it to spray missed resprouts and brush seedlings for a full growing season before planting prairie. If seeds are planted before most brush is dead, a substantial proportion of native seedlings from the plantings may be killed by herbicide during the last stages of brush seedling and resprout eradication.
- Selective cutting and stump herbiciding is an effective method of removing woody vegetation when large numbers of invasive seedlings are not present.
- Gray and silky dogwood (*Cornus racemosa and C. obliqua*) are a natural component of shrublands and savannas – but can be invasive in prairies.

5. Control herbaceous invasives that degrade habitat.

- Not all alien plants are aggressive. While some species have been proven to become so dominant that they degrade the ecosystem, other species that were initially seen as problems have been shown to be outcompeted over time as the natural community improves. Land managers no longer see them as a priority for limited resources. Such non-native but non-problematic species include Queen Anne’s lace (*Daucus carota*), ox-eye daisy (*Chrysanthemum leucanthemum* L. var. *pinnatifidum*) and bluegrass (*Poa* spp.). The major

invasive threats in the region are mentioned below. A local partnership program, the New Invaders Watch List, describes plants that may be poised to invade the region. Consultation with experts, or with some of the resources mentioned at the end of this document, is recommended before expending resources on unfamiliar species.

- The most important invasives to control are the scattered plants and small populations that can be eliminated entirely. Although it seems counterintuitive, the least important areas strategically are the largest and densest populations. These should be tackled only when the multiple-year resources are sufficient to completely eliminate the population. Survival of even a small percentage of the plants will typically result in massive reinvasion if control efforts are not pursued through to completion.
- Areas that are heavily infested with **tall goldenrod** (*Solidago altissima*) should be mowed annually, to weaken the plant. Two mowings – one in June and one in August – may speed the recovery process for areas that are so dominated by tall goldenrod that grassland birds do not nest there. In areas where grassland birds are nesting, omit the June mowing and mow as soon as possible after August 1. These areas will likely be receptive to prairie seed after one or two years of mowing. The mowing should continue until the goldenrod is largely controlled and the prairie species are well established.

  This mowing will not appreciably slow the development of most prairie species, although there are two concerns associated with it. First, in areas or during seasons when especially heavy thatch builds up, the fallen vegetation may be too deep for some prairie seedlings to penetrate. If the dense mowed material can be quickly raked off, baled, or burned, there should be no problem. Second, some or many prairie species may fail to bloom or set seed under a mowing regime – depriving the restoration of much needed additional seedlings. Thus, when good numbers of prairie species are maturing a balance should be struck; skip some years of mowing so that seed can mature and spread, but mow often enough that the goldenrod does not suppress the restored vegetation.
- **White sweet clover** (*Melilotus alba*) and **yellow sweet clover** (*Melilotus officinalis*), like tall goldenrod, can be controlled by mowing. Scattered infestations are best treated by pulling and hand scything, and small patches can be controlled with a weed whip. These methods are especially important in areas where mowing during the breeding season is likely to harm grassland bird nestlings. Where there are scattered sweet clovers, prior to seed set (early or mid July) plants can be pulled and let lie. Scything is most effective during the period described below for mowing. Once seeds are forming (mid to late July), pulled or scythed plants must be removed from the site.

  Areas that are heavily infested with sweet clover should be mowed during the critical interval when cutting will kill the plant but before seed is set. Mowed plants resprout from the axils of live leaves, so the key is to mow after the lower leaves have begun to die and to mow lower than the lowest live leaf. If this can be done before seed set, then no seeds will be produced. Mowed areas should be revisited within a few weeks, since resprouts and delayed blooms are common. Because seeds lie dormant in the ground,

several years of treatment are necessary. At sites where grassland birds are nesting, mowing should be delayed as late as practical.

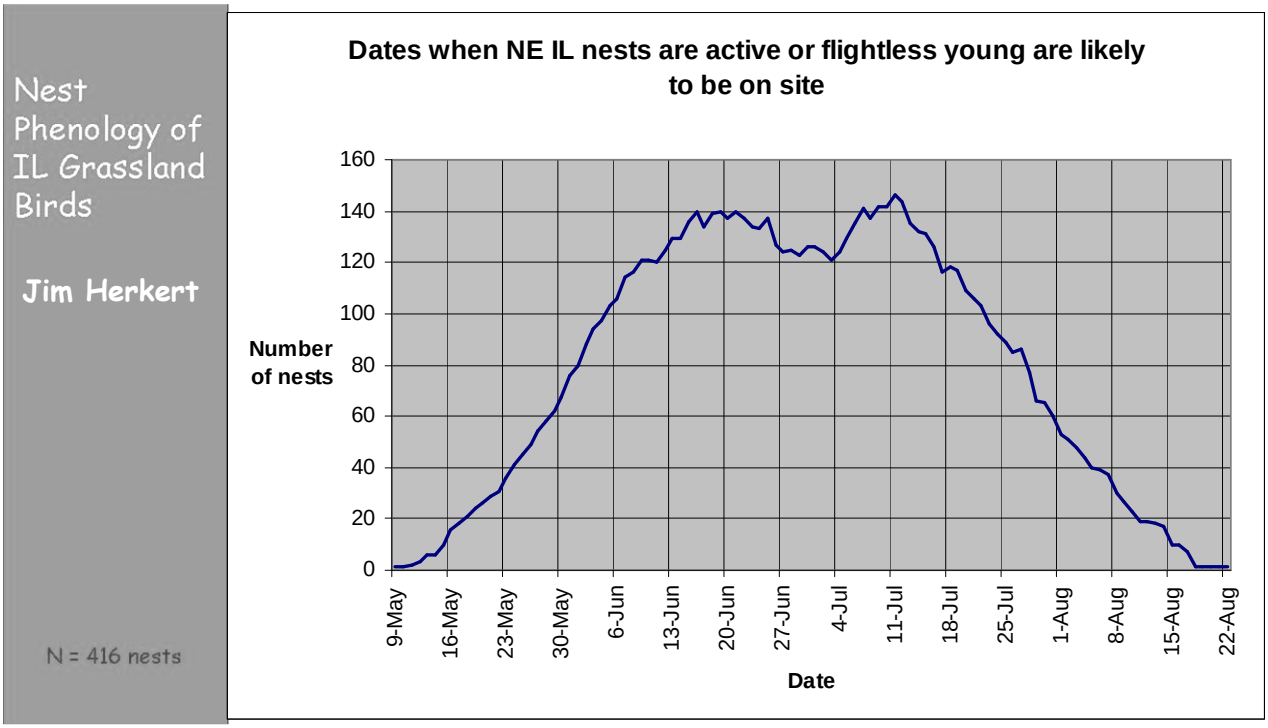
Fall burns stimulate seed germination the following spring. Some managers report success in reducing sweet clover populations using two years of carefully timed burns. First, a fall burn encourages most of the sweet clover seeds in the seed bank to sprout. No burn is conducted the following year, but in the second spring following the fall burn, a late spring burn may kill a large proportion of the resulting plants.

- **Wild parsnip** (*Pastinaca sativa*) and **cut-leaved teasel** (*Dipsacus laciniatus*) are very destructive in prairies and must be herbicided at the first sign of a problem. (See the reference list for sources of information about herbicides.) Wild parsnip causes a skin rash, so it is important to be protected when working around it. While parsnip can be very aggressive in degraded situations, it is said to be controlled by competition in better quality sites.
- It would be difficult to overstate how big a problem **Reed canary grass** (*Phalaris arundinacea*) is in our local wet grasslands and wetlands. Small populations in wet areas should be assiduously eliminated. The most common method is by herbiciding. Early spring and late fall, when natives have not emerged or have already gone dormant, are the best times to herbicide reed canary grass. If a late fall herbicide application is chosen, maturing plants should be mowed, weed-whipped or the like in early summer to prevent seed set. Patches in upland areas should be watched, but are not a high priority unless they are spreading.

  Control of large infestations should only be undertaken when there are sufficient resources. Boom spraying and aerial spraying are methods that have been tried – but not always with lasting success. A method based on literature review has shown early positive results at the Tinley Creek Wetlands project. There, partners have mowed the affected area repeatedly throughout the growing season, never allowing vegetation height to exceed 8", and then applied two fall glyphosate herbicide treatments prior to dormancy. Summer mowing can only be used at sites where rutting of the soil will not be a problem.
- **Leafy spurge** (*Euphorbia esula*), though uncommon in our area, is a very difficult weed to eradicate. An application of Imazapic, ammonium salt to growing leaves and stems in August or September (while the milky sap is still flowing) has shown promise in Lake County forest preserves. Aquatic glyphosate should be substituted in wet areas. Some also recommend a June mowing in advance of this treatment to prevent seeds from forming. The mowing regime described above for reed canary grass has also shown results for leafy spurge, combined with the application of the herbicide. In the case of other challenging weed species for which herbicide applications have proven less than effective, an aggressive mowing regime on targeted plants to weaken them, followed by herbiciding, may be worth trying. In some managers' experience, some native species such as the taller warm-season grasses – Indian grass (*Sorghastrum nutans*), big bluestem (*Andropogon gerardii*) and switch grass (*Panicum virgatum*) – as well as stiff goldenrod (*Solidago rigida*), rattlesnake master (*Eryngium yuccafolium)* and rice cut

grass (*Leersia oryzoides*) can also dominate sufficiently that the diversity of a new planting can suffer. Many managers now plant these species in limited quantities during the early years of restoration.

6. **Reduce maintenance activities, particularly mowing, during the birds' breeding season.** Grassland birds nest from April through August. Maintenance activities that can be scheduled at another time should be avoided during the nesting season, especially during the height of nesting activity which in this region occurs from the first week of May to mid-July (see graph below). In some cases, mowing may be necessary, especially in the first years of a conversion of an agricultural field to prairie. Balancing weed control with protecting grassland bird habitat during the growing season is an important stewardship planning challenge that should be weighted towards the weeds in the early years – and then the birds, as the weeds are brought under control. After that, mowing in support of plant establishment should only be undertaken when necessary to manage challenging weed problems such as sweet clover or Canada thistle (*Cirsium arvense*). Any such mowing should be done in the daytime.



7. **Don't unwittingly bring weed seeds into the site.** Mowers and other motorized vehicles can transport unwanted seed around the site. Clean mowers and other restoration equipment with brooms, power washers, and/or air compressors before bringing them to a site and before taking them elsewhere. It is important to wipe mower blades, and to plan travel routes to minimize contamination from seed caught in vehicle tires or on decks.

8. Plan a disturbance regime. Prairies evolved with fire and need fire to thrive. Fire controls invading woody vegetation, clears litter, recycles nutrients back into the soil, and promotes the growth of native fire-tolerant plant species. Grasslands that cannot be burned can be kept free of brush by mowing, grazing and herbiciding, but this management will not maintain or restore a quality prairie ecosystem.

A Chicago Wilderness study by Marlin Bowles found that prairies burned less than once every two years showed loss of quality. However, frequent burns are poorly tolerated by some grassland animal species. Certain birds (especially the Henslow's sparrow) do not nest in areas that were burned the previous spring or fall; two or three non-burn years following each burn is recommended for Henslow's sparrow breeding areas.

Populations of some arthropod species are severely reduced by annual prescribed fire. In the case of large grasslands that include small high-quality prairies, care should be taken to burn only a part of the high-quality area each year – especially if it is known to have invertebrate species sensitive to burning. For such insects, intervals between burns should be sufficient to allow re-establishment of sustainable populations. (Research suggests one non-burn year following each burn for the majority of sensitive species, and two or three non-burn years for a few species.)

A long-term objective for many large sites is to produce a rotating mosaic of different structural conditions across the wetland, prairie, shrub prairie and savanna landscapes.

It can be counterproductive to burn areas that will not or cannot be planted. Most non-native cool-season meadow grasses – but not tall fescue (*Festuca elatior*) – are rapidly depleted by burning. Burning a Eurasian meadow to control brush without following up with a planting of prairie seeds is likely to increase both brush and tall goldenrod, and to degrade the habitat.

Studies have found that moderately grazed lands provide excellent grassland bird habitat (Walk 2000). Upland sandpiper broods and loggerhead shrikes use patches of grazed grass near taller grass for foraging. Grazing is not widely practiced in the Chicago region, but two efforts are worth mention. At Midewin National Tallgrass Prairie, grazing has been effective at maintaining grassland bird populations. Grazing management requires fences and water for livestock. Patch burn grazing, a form of combined fire and grazing management, has been shown to be preferred by a variety of grassland birds, including upland sandpiper and grasshopper sparrow (Missouri Department of Conservation, 2006).

9. If appropriate, plan for shrub prairie areas. Shrub prairies (or "shrublands") are disturbance-dependent habitats like grasslands, but they have a longer disturbance schedule so that woody vegetation gets a chance to grow at least a few feet tall between disturbances. Natural communities of shrubs and grasses were once part of the landscape, but few survive. Restoring such ecosystems, like restoring the tallgrass savanna, is still in the experimental stage. Shrubland birds are second in

conservation importance after prairie birds. A major Illinois study found that patches of shrubs in a matrix of grasses on moist or wet soils are the best habitat for many of the shrubland species of greatest concern (Robinson et. al., 1999). Shrubland birds are less area-sensitive than grassland birds.

Shrub prairies are thought to have burned less frequently but more intensely than prairies. During an intense burn, the mix of grassland and shrub fuel is capable of burning the shrubs back to the ground, after which they resprout vigorously. The shrubs are initially too short to support most shrub prairie birds, but without this intensive disturbance, shrub prairies become overgrown, cease to be shrub prairie, and no longer support shrubland birds. A staggered 10- to 15-year disturbance schedule may be the best way to assure shrub prairie birds sufficient habitat on a sustainable basis. This would involve a plan that identifies a few shrub prairie areas around the site for staggered disturbance such as mowing or hot burn, one area every three to five years, so that in each individual area the vegetation is set back when it becomes too overgrown for shrubland birds and there is always good habitat in several parts of the site.

When considering managing for shrubland birds, collect baseline data about how these birds are using the site. If there are no other compelling conservation goals, the best plan for a shrubland that is functioning well for birds of concern may well be to leave it alone. That said, many shrubs that currently provide bird habitat are invasives. Some, such as Autumn olive (*Elaeagnus umbellata*), will quickly spread and invade a grassland. Planting native shrubs and replacing non-native shrubs is the best long-term approach. Adding a native shrub component to management plans should be considered when appropriate.

On sites with mixed prairie and shrub prairie, especially those between 75 and 200 acres, allow for shrub prairies to develop at the margins of prairies, not in the centers. This approach will reduce the likelihood that the shrubland will lead to fragmentation if, for unforeseen reasons, the area goes unmanaged for a number of years. Avoid managing for shrubland birds next to high-quality prairie remnants to limit the likelihood that shrubs will degrade the remnant.

Although shrub prairies are not well understood, there is sufficient research, theory and expertise to make recommendations as to what would make quality, sustainable shrub prairies. Some techniques to maintain shrubland patches in a grassland:

- staggered disturbance rotation schedule. Mow different shrub areas (with brush hog or seppi) when they become sufficiently overgrown that they no longer serve as good habitat for priority shrubland species.
- very hot burns. To promote this, plant prairie species in shrubby grassland areas, especially those that spread by rhizomes and those that produce the most fuel.
- herbiciding and hand coppicing (pruning) in overgrown sections. Herbicide non-native shrubs, and, if needed, plant native shrubs to replace them, from seed or nursery stock

- Plant or coppice oak (especially bur, scarlet and black oak) to recreate extensive areas of oak grubs (short, repeatedly burned oaks with large root systems) that probably were key components of pre-settlement shrublands.

Because shrubland management is new, it is important to keep records of management activities and monitor results over the short, medium and long term. An inventory and map of locations of native shrub species would be a helpful first step toward long-term shrubland management.

10. Monitor results. Collecting information about plants and wildlife helps project managers to gauge the impacts of restoration and management actions and also allows managers to share lessons learned. Management logs can be used to record detailed information such as dates, methods, techniques and equipment used.

Planting Large Prairies

In this section, interseeding into existing turf and planting former row crop fields are both discussed.

1. Review and gather information about your site. Original land survey notes can give you a sense of the former natural communities on the site. Information about historical land uses can alert you to potential issues with contamination, compaction, and soil disturbance. Soil maps and observations can give you clues about how water flows through the site. Where the various sections fall on the moisture gradient will, to some extent, determine the natural communities that can be planned there

2. Consider wildlife as you choose your seed and select your disturbance plan. Different grassland bird species have been shown to prefer different grassland structures. Vesper and grasshopper sparrows are found nesting in shorter grasses with more bare soil, while Henslow's sparrows and sedge wrens prefer taller grasses. Bobolinks prefer a medium litter layer, while eastern meadowlarks and most notably Henslow's sparrows use the high litter associated with a few years without burns. Monocultures of tall grasses or fields dominated by aggressive forbs (wildflowers) are not well used by grassland birds of conservation concern. Both native and non-native plants can degrade grassland bird habitat. For example, at Springbrook Prairie, areas dominated by stiff goldenrod and grey-headed coneflower to the exclusion of grasses are not well used by grassland birds.

3. Make a determination about the origin of seeds the restoration will use. Record the seed protocols in the restoration plan. It is standard practice for most restoration efforts to use local seed from areas of soils similar to the restoration site. Many restoration plans stipulate seed from within 50 or 100 miles of the restoration site. Highly local seed sources (original prairies and wetlands along with seed-production or restored areas based on local seed) are so few and small that sufficient quantities of such seed may not be available for diverse

restoration of large sites. Although it may not always be possible at this time to do large and diverse restorations with seed from less than 50 or 100 miles (due to limited seed availability) many managers recommend using such seeds if possible.

There are two principal concerns with seed that did not originate in local spontaneous populations. First, the seed may lack the genetic alleles necessary for long-term survival under local conditions. If local seed is not used, substantial resources may be invested in the restoration only to see some of the species fade away over time due to populations that cannot tolerate local climate, soils, diseases, or other conditions. Second, the populations established from this seed may have temporary "invasive" properties. In this case, a given species may proliferate aggressively and decrease the biodiversity of the site – eliminating other species that have important ecosystem functions to provide – and would take valuable resources to restore. In the latter case, the invasive population may also eventually succumb to some local condition, but by then the damage will have been done.

To increase the amount of local seed available, some project managers acquire local seed for contractors to grow in production beds for seed harvest. (This approach can be expensive and, for some species, require many years before substantial seed is produced). Many purchase seed or plants. Most local native plant nurseries share good information about their seed sources. Some managers supplement local seed with bulk seed from commercial sources farther away (often with limits of 100 to 150 miles) with the hope that the local seed in the mix will supply any otherwise missing genetic alleles. Some practitioners recommend wider geographic limits for species that are wind pollinated, and narrower limits for insect-pollinated species.

Some managers also consider global climate change. Restoration areas will need to respond to new patterns of temperature; rainfall patterns, including amounts, seasonality, composition (acid, nitrogen, sulfur, etc.); and other factors. Long-term evolutionary processes have created the Earth's biodiversity as the environment has change over the millennia. Unfortunately, not only is the current pace of change radically accelerated, but gene flow has been disrupted by fragmentation. For these reasons, it may be desirable to use and document diverse seeding strategies (more local seed at some sites, more diverse at others). For some large sites, managers seek the broadest selection of seed from both local and more distant (especially more southern) areas.

Both general types of restorations (genetically local and genetically diverse) have potentially important roles to play. The restored areas where seed was limited to the immediate local area may turn out to be the only sites where certain species or certain valuable genetic alleles survive, given that they may have lost out to more aggressive competitors in all other areas, at least in the short term. These species or alleles may conserve important traits evolved over millennia in local soils and with local pathogens and competitors.

Conversely, the restoration sites based on seed from broader geographic areas may be the only places where other species or alleles survive. It is not unreasonable to

imagine that a richer gene pool will be required to make it possible for some species to adapt to changes. Indeed, some entire species may find the resources to compete and adapt only in such areas, and we may subsequently have to rely on those populations for reintroductions to preserves where the genetically restricted populations have died out.

When different restorations employ different strategies, and document their efforts, results can be compared over time. As the current generation of restorations mature, it should be increasingly possible to test theories on the pluses and minuses of more local versus more diverse seed sources.

4. Harvesting large volumes of seeds Nachusa Grassland and Midewin National Tallgrass Prairie are large sites that have facilities with extensive seed cleaning and storage equipment. Seed is collected by hand and mechanically, using harvesters. Midewin National Tallgrass Prairie and the Chicago Botanic Garden have dedicated plant propagation areas with beds of plants whose seeds are harvested. Seed increase programs (seed beds, etc.) work, but require input and management (and proximity to a water source). If put in an accessible area, they provide opportunities for interpretation, and more accessible work areas for volunteers unable to easily access large restorations. Some volunteer projects have had good results raising rare seed for harvest in the residential yards of volunteers.

5. Wetland areas Most grasslands of any size incorporate wetlands such as wet prairie, sedge meadow, or hemi-marsh. Wetlands should be included in the burn rotation just like any other grassland type. Wet plantings develop very quickly, and can give a false sense of success. They are often then overrun with fast-expanding, difficult-to-control invasives. The native plantings in drier areas don't develop as quickly, but with good management they are less likely to be destroyed by invasives.

Wetland areas should be watched carefully for any sign of reed canary grass (*Phalaris arundinacea*), purple loosestrife (*Lythrum salicaria*), or common reed (*Phragmites australis*). These weeds should be aggressively treated and the site kept under surveillance for several years after the treatment is completed. Cattail (*Typha* spp.) and especially narrow-leaved cattail (*Typha angustifolia*) and its hybrid forms, although native, can dominate a wetland to the exclusion of a more natural and healthy diversity. It should be aggressively controlled in new plantings. For more information about restoring wetlands, see the reference list.

6. Interseeding Prairies can be restored by seeding into bare ground or interseeding into an established turf in a Eurasian meadow or degraded prairie. High-quality seed is both ecologically valuable (in great demand for many projects) and expensive to gather, grow, or buy. Therefore, seed should be broadcast as part of a well-prepared plan. Seed does well planted in late fall or early winter after a fall burn. Alternatively, it can be planted in early fall (or early winter, if necessary) with the duff burned off the following spring. The seeding area should be well chosen or well prepared (see below), and the seeded areas should be aggressively managed for a number of years following seeding.

a) Principles of interseeding

- **Most receptive areas:** Best for interseeding is a sparse turf, through which the soil can be seen all summer long. In uplands, such areas may be characterized by poverty oat grass (*Danthonia spicata*), Canada bluegrass (*Poa compressa*), sedges (*Carex* spp.) and Queen Anne's lace (*Daucus carota*). Wetter areas may have open turfs of redtop (*Agrostis alba*) and Dudley's rush (*Juncus dudleyi).* Such areas can be interseeded without additional preparation and may not need burning during the first few years.
- **Denser grass weakened by fire or mowing:** Turfs dominated by such species as Kentucky bluegrass *(Poa pratensis*), smooth brome (*Bromus inermis*), timothy (*Phleum pratense)* and most other "old field" species can be converted into receptive, open turfs by one to four years of burning. Late spring burning works best for this purpose. However, tall fescue (*Festuca elatior*) is not weakened by burning. If it is present, this grass may take the place of the other species, so areas with fescue should be seeded quickly and aggressively after a burn. Dense tall fescue can also be controlled by herbicide before seeding begins. In any areas where the cool-season grasses are being set back by burning, it is important to aggressively plant a robust mix of seed to deter weeds. If tall fescue is not present, it may be best for seeding to wait two or more years after the burn for the turf to open.
- **Promoting native species growth:** If the existing vegetation is dense, interseeded areas may benefit from mowing during the growing season, whenever the turf threatens to become so dense that small seedlings may be starved of light. (Many prairie species grow only an inch or two tall in early years under interseeding conditions.) A diverse and largely weed-free prairie may be established in the five or so years it will take the seeds of conservative species to develop into mature plants. Use caution mowing when breeding birds are present, as described on page 14.
- **Gradual transition promotes grassland bird habitat:** Most European pasture and hay meadow grasses are desirable as grassland bird habitat and as a matrix that is readily receptive to interseeding with prairie species. Thus, mowed hayfields are valuable intermediate habitat for grassland birds while being receptive to interseeding when seed is available. When adequate seed is available, burning such areas converts them to quality prairie in a few years.
- **Major weed threats:** tall goldenrod (*Solidago altissima*), white sweet clover (*Melilotus alba*), teasel (*Dipsacus laciniatus*), wild parsnip (*Pastinica sativa*), purple loosestrife, reed canary grass, crown vetch (*Coronilla varia*), leafy spurge (*Euphorbia esula*), and bird's foot trefoil (*Lotus corniculatus*). Suggestions for addressing invasive weeds are found on pages 11-14. Burning interseeded areas is discussed below.

b) Control weeds before seeding. In the case of species that can be controlled by a combination of mowing, scything and pulling (for example, white and yellow sweet clovers and tall goldenrod) this work should be well under way or mostly completed prior to seeding. In the case of areas dominated by species that cannot be effectively controlled without herbicide (teasel, reed

canary grass, cattail and giant reed), these species should be substantially eliminated before valuable seed is invested in those areas.

c) Mow unseeded areas. In order to maintain a healthy turf for interseeding (and grassland bird nesting habitat) in the grasslands where no burn regime is in place, the grassland should be mowed. A mowing of a third to a half of the site every other year should suffice to maintain the habitat.

7. Replanting a row crop field

- **Soil Preparation** To control the weeds common in disturbed ground, agricultural fields intended for prairie plantings should be kept in production until prairie is installed. Many land managers plant "roundup ready" soybeans for a year or two before they begin a restoration. At Midewin National Tallgrass Prairie, two consecutive years of planting these glyphosate-resistant soybeans in combination with regular herbicide treatments has proved to be the best system to kill off cool-season grasses and annual weed seed banks before planting a restoration. Since soybean yields go down in the second year, this might not be feasible in some situations. At Nachusa Grassland, plantings after a corn crop have been successful: stubble is burned off, the field is harrowed and seed is broadcast in fall (to work its way into the ground over the winter).

  Some managers have emphasized that starting with a minimum of weeds is important. It is far better to spend an extra year on weed control than to try to control weeds that are growing among precious young prairie plants. Choose weed control methods carefully; it is important to ensure there are not harmful residual chemicals left in the soil at planting time. If Atrazine or other long-lasting soil residual herbicide is used on the crop, it should be discontinued a year or more prior to planting.
- **Installation** Seed can be planted any time from November through June. Drill seeding is an effective method if equipment is properly calibrated, but caution should be used to ensure that forbs are not planted too deep. Some managers drill the grasses but merely broadcast the forbs, allowing rain and frost to work them into the ground. Broadcast seeding, whether by hand or tractor, may result in a more natural pattern and be less expensive. It is often done around Thanksgiving time, to allow the seeds to work down into the soil over the winter. Legume seed is best mixed with inoculants and raked in during spring.
- **Establishment** Except where competition is minimal, most prairie plants will only grow a few inches in their entire first year (although weeds will be much taller). In the second year, a few forbs will begin to flower, especially biennials like black-eyed Susan (*Rudbeckia hirta*), and biennial weeds will flower. By the third year, the perennials will begin to mature and bloom.
- **Mowing** In the first year, when prairie species are just beginning to grow, many weed problems can occur. Canada thistle (*Cirsium arvense*) is one of the worst offenders. It can be critical to mow often (especially in rich moist soils) and to set the mower blades at about the height of the young

prairie plants. In the second year, monthly mowing should be considered if there are significant weed problems. By the third year, mowing should be unneeded except for areas with persistent weeds, such as sweet clover or Canada thistle.

- **Burning** Once the prairie is established, a regular controlled burn program as described in #10 below is the best way to maintain a healthy ecosystem.

8. Seeds vs. plugs Plugs are very valuable in wetland restoration. In restoring sedge meadows and wet grasslands, rhizomatous plants such as broad-leaved wooly sedge, hairy-leaved lake sedge and common lake sedge (*Carex pellita, atherodes* and *lacustris),* prairie cord grass (*Spartina pectinata*) and blue joint grass (*Calamagrostis canadensis*) establish a thick turf that resists invasives. Common tussock sedge *(Carex stricta)* is best planted in bottomless 10" peat pots to recreate a tussock. Plugs are best planted in the spring.

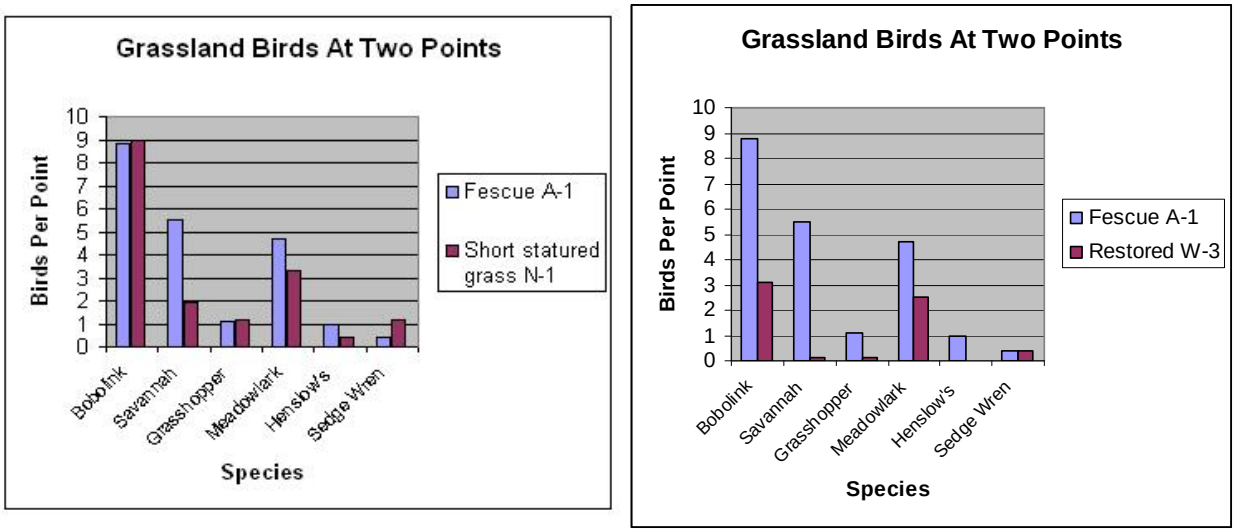
Certain important species of mesic and dry prairies are primarily available through plugs, and should be considered if funding allows. Such species include false toadflax (*Comandra umbellata),* hoary puccoon *(Lithospermum canescens),* and prairie violet *(Viola pedatifida).* These species may not be commercially available, so contract growing should be considered.

9. Seed mixes Developing the best seed mixes for large prairie restorations is a work in progress. Early efforts typically proved to be poor habitats for grassland birds, butterflies and other animal species of conservation concern. These prairie restorations were usually dominated by a few very tall and aggressive native species (especially big bluestem grass). Remnant prairies have a great diversity of species, including many shorter conservatives, and as a result, the community structure is shorter and more complex than in the restorations that were typical in previous decades. While the tall and aggressive native prairie species have a long-term role, many managers now omit them in the early stages of plantings.

Many agencies have been experimenting with a seed mix that omits big bluestem (*Andropogon gerardii*), switch grass (*Panicum virgatum*), and Indian grass (*Sorghastrum nutans*) in favor of some of the shorter-statured grasses, particularly little bluestem (*Andropogon scoparius*) and prairie dropseed (*Sporobolus heterolepus*). Springbrook Prairie in Naperville is a mature example of this kind of planting. Results there show that this mix has been successful for grassland birds.

Cool-season native grasses are expensive and not widely propagated, but the warm-season grasses do not begin to grow until after the birds arrive. Cool-season grasses and sedges are an important part of the mix for bird habitat, and also to provide competition to cool-season invasives such as thistle and sweet clover. Sedges, wild ryes (*Elymus* sp.) and prairie dropseed (*Sporobolus heterolepus)* can provide this cool-season component.

McHenry County Conservation District has experimented with employing a mix of cool-season non-native grasses and short prairie grasses. Monitoring has shown many prairie bird species to prefer this mix over either pure cool-season non-natives or typical prairie restorations. The District expects also to experiment with planting of mixed native cool- and warm-season grasses. (See Appendix 2.)



Results from three points at Springbrook Prairie: the graph on the left compares grassland bird numbers in a non-native fescue field with a restored prairie of short-statured grasses (mostly little bluestem). The graph on the right compares the fescue field with a restoration dominated by taller prairie grasses (big bluestem and Indian grass). Joe Suchecki.

Most grassland bird species prefer a low to moderate amount of forb cover, no more than 40%. Studies at Springbrook show that fields dominated by weedy forbs are not well used by grassland birds. Based on the work at Springbrook and elsewhere, some managers exclude aggressive forb species from initial plantings, but will restore them to the grassland in later years. Examples are rattlesnake master (*Eryngium yuccifolium*), wild quinine (*Parthenium integrifolium*), and stiff goldenrod (*Solidago rigida*).

10. Controlled burning Most established grasslands should have a rotational burn plan that leaves some areas unburned for animal species of concern. Grassland in the early establishment phase should be burned annually, if possible, until the restored community is well established. An excellent reference for our region is *Natural Fire and Controlled Burning in the Chicago Wilderness Region: A Model Policy.*

- In areas to be seeded, a fall burn is desirable. The year's seed may be broadcast subsequently in late fall or winter. If a fall burn is not possible for an area scheduled to be seeded, then a spring burn (preferably late spring) is crucial. For general maintenance in interseeding projects, for as many years as cool-season grasses dominate sections of the grassland, late spring burns will be most effective at controlling them. Winter burns are least effective for control of both cool-season grasses and brush.

- In interseeding projects, old field areas dominated by bluegrass, redtop, timothy, smooth brome, and/or orchard grass (*Dactylis glomerata*) should not be burned – for example as a means of brush or sweet clover control – unless adequate seed is available. Burning weakens and eventually kills most of the Eurasian pasture grasses – which, in the absence of prairie seed, would likely be replaced by such problem species as tall goldenrod, brush and sweet clover. Tall fescue can be unreceptive to interseeding and is not controlled by fire. Fescue areas should be restored last.
- If a fall burn is anticipated, seed should be broadcast only after the burn. If a spring burn is anticipated, most seed should be broadcast in the previous fall or early winter, to assure opportunity for the seed to work its way down into the ground. Burning the thatch over seed that has overwintered in the turf will not damage most of the seed and will foster excellent conditions for seedling establishment.

REFERENCES AND RECOMMENDED RESOURCES

Chicago Wilderness. 2003. Natural fire and controlled burning in the Chicago Wilderness region: A model policy. Chicago Wilderness Publications and Products. http://www.chiwild.org/members/resources/index.cfm (accessed March 10, 2009).

Czarapata, Elizabeth J. 2005. *Invasive Plants of the Upper Midwest: An Illustrated Guide to their Identification and Control*. Madison, Wisconsin: University of Wisconsin Press.

Heaton, Duane. 2000. Conserving local habitat for declining grassland birds: A green paper by the Bird Conservation Network. Bird Conservation Network. http://www.bcnbirds.org/greenpapers.html (accessed March 10, 2009).

Harper, M.G., C.H. Dietrich, R.L. Larimore and P.A. Tessene. 2000. Effects of prescribed fire on prairie arthropods: An enclosure study. *Natural Areas Journal* (20)4: 325-335.

Hartley, M.K., W.E. Rogers, E. Siemann and J. Grace. 2007. Responses of prairie arthropod communities to fire and fertilizer: Balancing plant and arthropod conservation. *American Midland Naturalist* 157: 92–105.

Herkert, James R., Robert E. Szafoni, Vernon M. Kleen and John E. Schwegman. 1993. Habitat establishment, enhancement and management for forest and grassland birds in Illinois. Division of Natural Heritage, Illinois Department of Conservation, Natural Heritage Technical Publication #1, July 16, 2009. Springfield, Illinois. Northern Prairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/resource/birds/manbook/index.htm (accessed December 10, 2009).

The Illinois Comprehensive Wildlife Conservation Plan & Strategy, Version 1.0. July 2005. http://dnr.state.il.us/ORC/WildlifeResources/theplan/final/ (accessed November 9, 2009).

Johnson, Douglas H., Lawrence D. Igl and Jill A. Dechant Shaffer (Series Coordinators). 2004. Effects of management practices on grassland birds. August 12, 2004. Northern Prairie Wildlife Research Center, Jamestown, ND. Jamestown, ND: Northern Prairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/resource/literatr/grasbird/index.htm (accessed December 10, 2009).

Midwest Invasive Plant Network. Why should I care about invasive plants: How invasive plants affect hunting, fishing, boating, gardening, hiking, biking, horseback riding, and other recreational activities in the Midwest. http://www.mipn.org/InvasivesBrochure.pdf (accessed April 23, 2009).

Miller, Scott G., Richard L. Knight, and Clinton K. Miller. 1998. Influence of recreational trails on breeding bird communities. *Ecological Applications* (8)1: 162-169.

Missouri Department of Conservation. 2008. Evaluation of a grazing system for maintaining grassland integrity and improving upland bird habitat. Natural Resources Conservation Service, Conservation Innovation Grant: NRCS 68-3A75-5-203. Missouri: Missouri Department of Conservation.

Nachusa Grasslands. 2009. Friends. www.nachusagrasslands.org (accessed March 10, 2009).

New Invaders Watch List: Early Detection and Rapid Response Network. 2009. http://ctap.inhs.uiuc.edu/newinvaders/collaborators.aspx (accessed March 10, 2009).

O'Leary, Chip H. and D.W. Nyberg. 2000. Treelines between fields reduce the density of grassland birds. *Natural Areas Journal* (20)3: 243-249.

Panjabi, A.O., E.H. Dunn, P.J. Blancher, W.C. Hunter, B. Altman, J.Bart, C.J. Beardmore, H. Berlanga, G.S. Butcher, S.K. Davis, D.W. Demarest, R. Dettmers, W. Easton, H.Gomez de Silva Garza, E.E. Iñigo-Elias, D.N. Pashley, C.J. Ralph, T.D. Rich, K.V. Rosenberg, C.M. Rustay, J.M. Ruth, J.S. Wendt and T.C. Will. 2005. The Partners in Flight handbook on species assessment. Version 2005. Partners in Flight Technical Series No. 3. http://www.rmbo.org/pubs/downloads/Handbook2005.pdf (accessed March 10, 2009).

Panzer, Ron. 2002. Compatibility of prescribed burning with the conservation of insects in small, isolated prairie reserves**.** *Conservation Biology* 16(5):1296-1307.

Panzer, Ron and Mark W. Schwartz.1998. Effectiveness of a vegetation-based approach to insect conservation. *Conservation Biology* 12(3): 693-702.

Packard, Stephen and C. Mutel (eds.) 1997. *Tallgrass Restoration Handbook: for Prairies, Savannas and Woodlands.* Washington, DC: Island Press.

Partners in Flight-U.S. 2009. Best management practices-grassland ecosystems. http://www.pwrc.usgs.gov/pif/pubs/BMPs.htm#grassland (accessed March 10, 2009).

Robinson, Scott K., E.J. Heske and J.D. Brawn. 1999. Factors affecting the nesting success of edge and shrubland birds. Springfield, IL: Illinois Department of Natural Resources.

Rocky Mountain Bird Observatory. 2002. Partners in Flight: Species assessment database. http://www.rmbo.org/pif/scores/scores.html (accessed March 10, 2009).

Sample, David W. and Michael J. Mossman. 1997. Managing habitat for grassland birds- a guide for Wisconsin. PUBL-SS-925-97. Madison, WI: Wisconsin Department of Natural Resources http://www.npwrc.usgs.gov/resource/birds/wiscbird/index.htm (accessed March 10, 2009).

Walk, Jeff W. and R.E. Warner. 2000. Grassland management for the conservation of songbirds in the Midwestern USA. *Biological Conservation* 94: 165-172.

Appendix 1

BREEDING BIRDS OF CONCERN - CHICAGO WILDERNESS AREA

A PRODUCT OF THE BIRD CONSERVATION NETWORK - BCN SURVEY

For the complete report, see www.bcnbirds.org/trends07

CW-PR1: Priority 1 - A species of high regional importance and also national concern with strong declines and severe threats to breeding. Immediate conservation attention & priority, species-specific management.

CW-PR2: Priority 2 - A species of moderate regional importance or national concern with moderate to large declines. Some individualized attention. Moderate conservation and management priority.

CW-PR3: Priority 3 - A species of moderate importance with a population that should be maintained to prevent growing threats & future declines. Generalized management should include planning for the species.

IL-THRT: Threatened in Illinois **IL-ENDGR:** Endangered in Illinois

FREQUENCY: The percentage of all monitoring points where the species was detected during at least one year of the analysis. This is a conservative way of comparing how widespread each species is in the area.

GRASSLAND BIRDS	**CW Priority**	**Frequency**	**BCN Trend**
DICKCISSEL	CW-PR1	11.8%	Significant Decrease
HENSLOW'S SPARROW	CW-PR1	14.5%	Significant Increase
GRASSHOPPER SPARROW	CW-PR1	15.7%	Significant Decrease
BOBOLINK	CW-PR1	20.4%	Stable
SHORT-EARED OWL	CW-PR2	0.0%	
NORTHERN HARRIER	CW-PR2	0.5%	
SEDGE WREN	CW-PR2	12.6%	Significant Decrease
EASTERN MEADOWLARK	CW-PR2	25.2%	Stable
UPLAND SANDPIPER	CW-PR2	0.1%	
WESTERN MEADOWLARK	CW-PR3	0.3%	
VESPER SPARROW	CW-PR3	1.2%	
SWAINSON'S HAWK	IL-ENDGR	0.0%	

SHRUBLAND BIRDS	**CW Priority**	**Frequency**	**BCN Trend**
LOGGERHEAD SHRIKE	CW-PR1	0.0%	
NORTHERN BOBWHITE	CW-PR1	0.3%	
BLACK-BILLED CUCKOO	CW-PR1	0.7%	
BELL'S VIREO	CW-PR2	0.2%	
BLUE-WINGED WARBLER	CW-PR2	2.0%	
YELLOW-BREASTED CHAT	CW-PR2	2.4%	
BROWN THRASHER	CW-PR2	12.7%	Stable?
WILLOW FLYCATCHER	CW-PR2	17.5%	Significant Decrease
FIELD SPARROW	CW-PR2	27.6%	Stable
ORCHARD ORIOLE	CW-PR3	5.0%	Significant Increase
EASTERN KINGBIRD	CW-PR3	17.4%	

WOODLAND & SAVANNA	**CW Priority**	**Frequency**	**BCN Trend**
WHIP-POOR-WILL	CW-PR1	0.0%	

CERULEAN WARBLER	CW-PR1	0.1%		
RED-HEADED WOODPECKER	CW-PR1	2.5%		
VEERY	CW-PR2	1.1%		
YELLOW-BILLED CUCKOO	CW-PR2	2.2%		
CHIMNEY SWIFT	CW-PR2	4.9%		
GREAT CRESTED FLYCATCHER	CW-PR2	17.1%	Decrease?	
NORTHERN FLICKER	CW-PR2	25.7%	Decrease?	
BALD EAGLE	CW-PR2	0.0%		
LOUISIANA WATERTHRUSH	CW-PR3	0.0%		
PROTHONOTARY WARBLER	CW-PR3	0.1%		
ROSE-BREASTED GROSBEAK	CW-PR3	7.2%	Increase?	
WOOD THRUSH	CW-PR3	10.8%	Significant Decrease	
WETLAND BIRDS	**CW Priority**	**Frequency**	**BCN Trend**	
KING RAIL	CW-PR1	0.0%		
COMMON TERN	CW-PR1	0.1%		
AMERICAN BITTERN	CW-PR1	0.1%		
YELLOW-HEADED BLACKBIRD	CW-PR2	1.2%		
FORSTER'S TERN	CW-PR2	0.0%		
BLACK TERN	CW-PR2	0.0%		
BLACK-CR. NIGHT-HERON	CW-PR2	1.6%		
COMMON MOORHEN	CW-PR2	0.0%		
LEAST BITTERN	CW-PR2.	0.1%		
MARSH WREN	CW-PR3	3.4%		
LITTLE BLUE HERON	IL-ENDGR	0.0%		
OSPREY	IL-ENDGR	0.0%		
SNOWY EGRET	IL-ENDGR	0.0%		
WILSON'S PHALAROPE	IL-ENDGR	0.0%		
YELLOW-CR. NIGHT-HERON	IL-ENDGR	0.0%		
BLACK RAIL	IL-ENDGR	0.0%		
PIPING PLOVER	IL-ENDGR	0.0%		
SANDHILL CRANE	IL-THRT.	1.5%		
Urban Birds	**CW Priority**	**Frequency**		
PEREGRINE FALCON	CW-PR2	0.1%		

*CW Priorities are based heavily on Partners in Flight classifications for BCR Regions 22 and 23. The Chicago Wilderness Region falls on the edge of these two regions, and the scores between BCR 22 and 23 are sometimes different. When the two scores differed, scores were manually assigned, taking into account the Chicago area's importance for the species in question - including the species range, trend in the CW region, local population size, and historic status in the area. For species not mentioned in Partners in Flight, the US Fish and Wildlife Service report Birds of Conservation Concern 2008 and national shorebird and waterbird plans were used to assign priority level.

Appendix 2

Mixing Native and Non-native Cool-Season Grasses for Bird Habitat in Prairie Reconstructions Ed Collins, McHenry County Conservation District

In the spring of 2002, McHenry County Conservation District staff initiated an experimental planting in former agricultural land using a mixture of native prairie grasses, forbs and cool-season non-native grasses. The rationale behind the experiment was predicated on breeding bird data collected over multiple years and on multiple sites. These surveys indicated a preference for cool-season grass cover by a number of indigenous grassland species including bobolinks, grasshopper sparrows, eastern meadowlarks and savanna sparrows. These same species seemed to universally reject prairie reconstructions dominated by large grasses such as Indian grass and big bluestem.

The site selected was the Nippersink North Branch Conservation Area, a 500-acre site located just west of the town of Richmond, Illinois. The site possesses a high-quality wetland complex along the North Branch of Nippersink Creek and a degraded savanna community currently undergoing restoration work. Much of the rest of the site was composed of ruderal fields, agricultural land, brushy areas and numerous fence lines at the time of the experiment. A multiple-use bicycle, snowmobile and hiking trail bisects the site.

The primary experimental fields were 105 acres in size and in row crop production in the growing season immediately prior to seeding. The mixes were planted using a Truax drill in fields prepared by using a farm disc. Eighteen species of dry to dry-mesic forbs and two species of native grasses were planted as well as three species of cool-season grasses.

Native grasses included little bluestem and side oats grama, both selected to match site soil parameters and because their low profile growth pattern were similar to the structural components of old field areas being utilized by native grassland birds on other sites. In addition, three non-native cool-season grasses, Kentucky bluegrass, smooth brome and redtop were also used in the grass mixture. Native grasses were used at a ratio of 3:1 to non-native cool-season grasses.

Monitoring of breeding grassland birds has been conducted for a number of years since the planting has taken place.

Initial Results

As expected, the hybrid prairie developed a lower profile similar to many old fields and abandoned pasture areas. Native forbs developed well on most of the site, especially in drier areas. Cool-season grasses also established across the entire site, again as expected.

The site has been utilized heavily by native grassland birds. In part this has been due to the large-scale grassland restoration that has occurred onsite, including both conventional and hybrid prairies. In addition brush removal and fence line elimination has expanded and connected grassland blocks. Prescribed burning has been utilized on a regular basis as a management tool.

Species utilizing the hybrid grassland as breeding habitat have included Henslow's sparrow, bobolink, grasshopper sparrow, savanna sparrow, sedge wren and eastern meadowlark. These species have been recorded in significant numbers and have

shown a preference for the hybrid grassland. From this perspective, the experiment was successful. The use of a mixed cool-season grass matrix in conventional prairie reconstruction efforts does produce breeding grassland bird habitat.

As the site contains prairie reconstructions dominated by warm-season grasses only, cool-season grasses only and the hybrid prairie, many grassland birds have utilized different portions of the site at different times of the growing season. Such a mix of habitat types also mitigates the potential for any individual species lacking necessary habitat due to yearly management cycles such as prescribed burning.

The process is not without drawbacks, however. These include narrowing the window of opportunity for prescribed burning due to early “greening” of cool-season grasses. Depending on local conditions this phenomenon may essentially eliminate the option of burning in some years and may produce unacceptable amounts of smoke in others. While many forbs did establish well in the hybrid matrix, others did not, and enrichment is being undertaken in some areas of the experiment.

Future attempts to further refine this experiment will include the substitution of native cool-season grasses such as June grass in lieu of non-native cool-season grasses, increasing the number and amount of forbs in the mix and lowering overall percentages of cool-season grasses even further.

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