MANAGING GRASSLANDS

FOR BIRDS IN OHIO

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ON THE COVER
COMMON YELLOWTHROAT

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COMMON YELLOWTHROAT

EXECUTIVE SUMMARY

Grasslands are vital for wildlife and deliver key ecosystem services, including soil stabilization, water filtration, carbon storage, and recreation. In Ohio, historic prairies and savannas have nearly vanished due to agriculture, urbanization, and natural succession. Today, less than 1% of Ohio's native grasslands remain, placing many species dependent on these systems at risk. Urgent, science-based management and restoration are essential to reverse these declines.

Ohio's grasslands sustain diverse plant and animal communities, including pollinators, game species, and birds such as bobolink, Henslow's sparrow, and northern bobwhite. These birds depend on open habitats with specific vegetation structures and often require large, contiguous areas (typically over 40 acres). Habitat loss, agricultural intensification, woody encroachment, and invasive species are major threats. Management strategies must consider the entire annual cycle — breeding, migration, and overwintering — to ensure long-term viability.

Ohio's grasslands encompass native prairies, agricultural fields, exotic grasslands (pastures, hayfields, fallow fields), and restored habitats such as CRP lands and reclaimed mines. High-quality sites include a mix of warm- and cool-season grasses, diverse forbs, and minimal woody vegetation. Forbs are essential for supporting insects that feed chicks, while moderate shrub cover offers winter shelter for species like northern bobwhite.

Periodic disturbance is essential to maintain plant diversity and prevent succession in grasslands. Effective tools include prescribed fire, grazing, mowing, herbicide application, discing, and interseeding. Fire and grazing restore ecological processes, enhance structural diversity, and promote forb growth, while mowing serves as an alternative where fire or grazing are impractical. Targeted herbicide controls invasive species and woody encroachment, and discing with interseeding revitalizes older grasslands. Management timing is critical to avoid or reduce impacts during the nesting season (typically mid-April–July).

Large, contiguous grasslands with feathered edges — gradual transitions between fields and forests — offer optimal habitat for many grassland birds. Fragmentation and urbanization, however, reduce suitability and increase nest predation and brood parasitism. Conservation strategies should focus on maintaining diverse grasses and forbs; applying rotational disturbances such as fire, grazing, or mowing; and controlling invasive species early and consistently. Because most grassland habitat lies on private lands, engaging landowners through programs like the Conservation Reserve Program (CRP) is critical. These programs provide financial and technical support for establishing and maintaining grasslands, making landowners key partners in conservation. By implementing best practices and leveraging these programs, Ohio can safeguard grassland ecosystems, reverse bird population declines, and contribute to regional and global conservation goals.

INTRODUCTION

WHAT IS A GRASSLAND?

Grasslands include a wide variety of open habitats, including fallow fields, pastures, and hayfields, and unsurprisingly, they are abundant with various grass species. They typically contain many forbs, or flowering plants, but few trees and shrubs. Grassland ecosystems can exhibit a range of moisture conditions, from dry to wet, with wet grasslands occasionally featuring scattered wetland pockets. Meadows, old fields, surface mines reclaimed primarily with grasses, savannas, and prairies are all considered grasslands. If trees and shrubs become established, grasslands can quickly transition to shrublands or young forests during a process known as succession.

Grasslands deliver important ecosystem services, provide recreation opportunities, and support diverse wildlife populations. Grasslands reduce soil erosion, help control floods, improve water quality, recharge groundwater, and sequester carbon (Bengtsson et al. 2019). Opportunities for recreation in grasslands include hunting, birding, photography, hiking and other exercise, foraging for medicinal and edible plants, and specialty crafts.

RECENTLY ESTABLISHED GRASSLAND

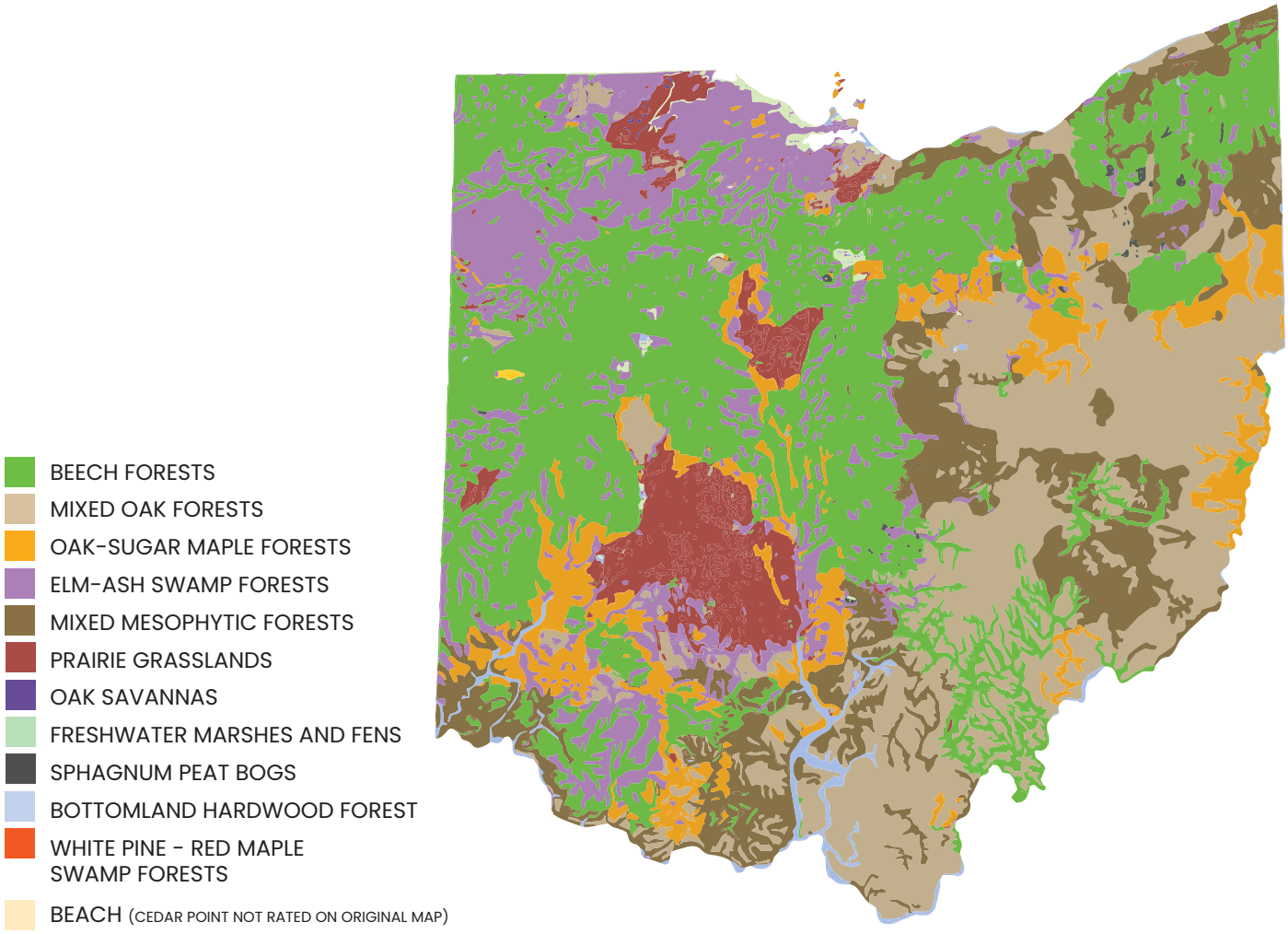
GRASSLAND ECOLOGY

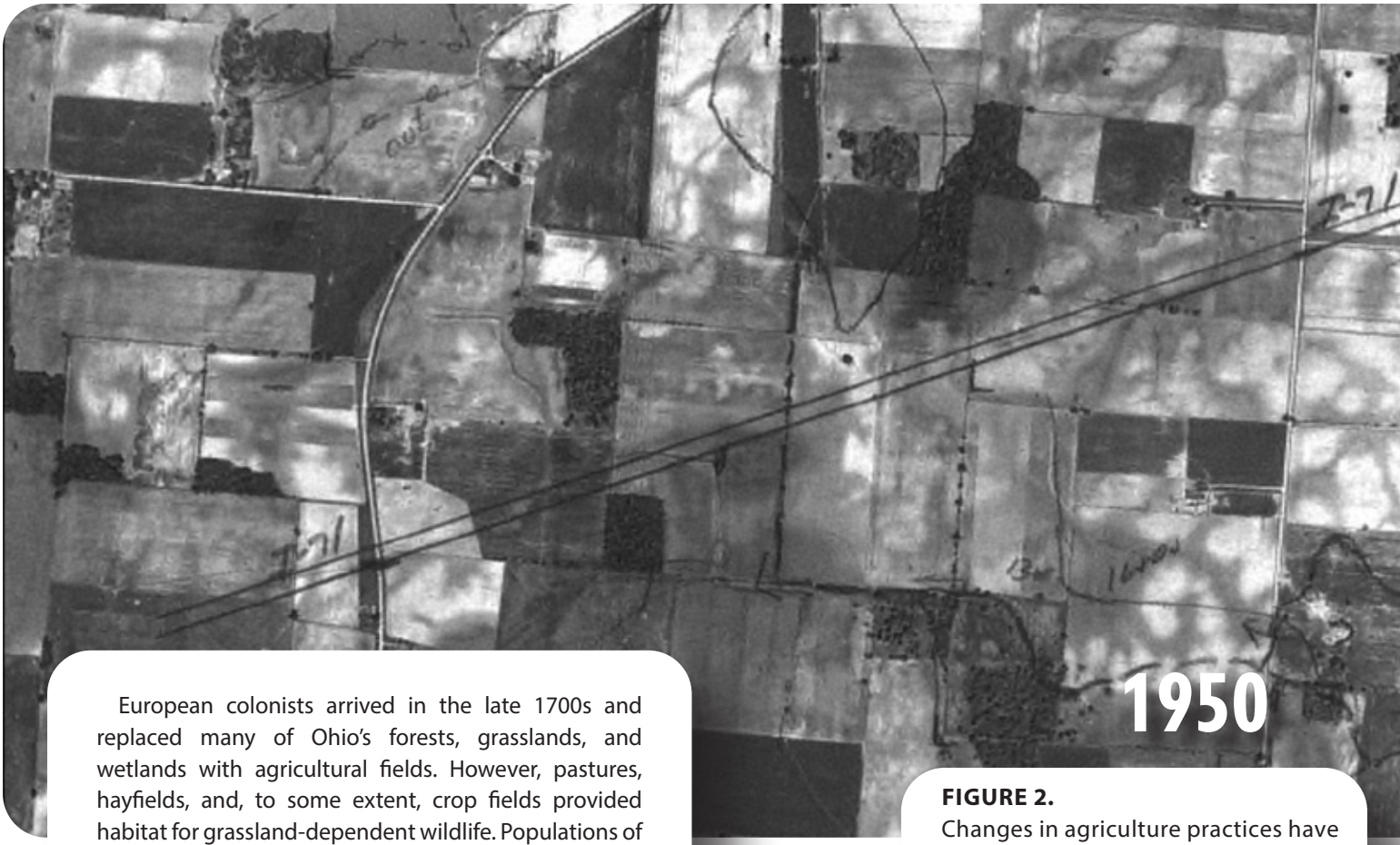
HISTORICAL DISTRIBUTION OF GRASSLANDS IN OHIO

Forests and grasslands coexisted in Ohio prior to European settlement. Although forests were the most dominant system, grasslands, prairies, and savannas of various sizes were found throughout the state (Sears 1926)(Figure 1). Ohio's grasslands supported unique plant communities and teemed with wildlife (Sears 1926). Most of the larger grasslands were in areas with poor or wet soils in central and northwestern Ohio, which limited the establishment of shrubs and trees, but disturbances also created small grasslands across the state (Sears 1926, Forsyth 1970). Primary natural disturbances were attributed to windstorms, fire, bison, elk, and beavers. Finally, Native Americans used prescribed fire and tree clearing to create or maintain grasslands.

PAST VEGETATION IN OHIO

Figure 1. Adapted from Sears 1926 and Forsyth 1970





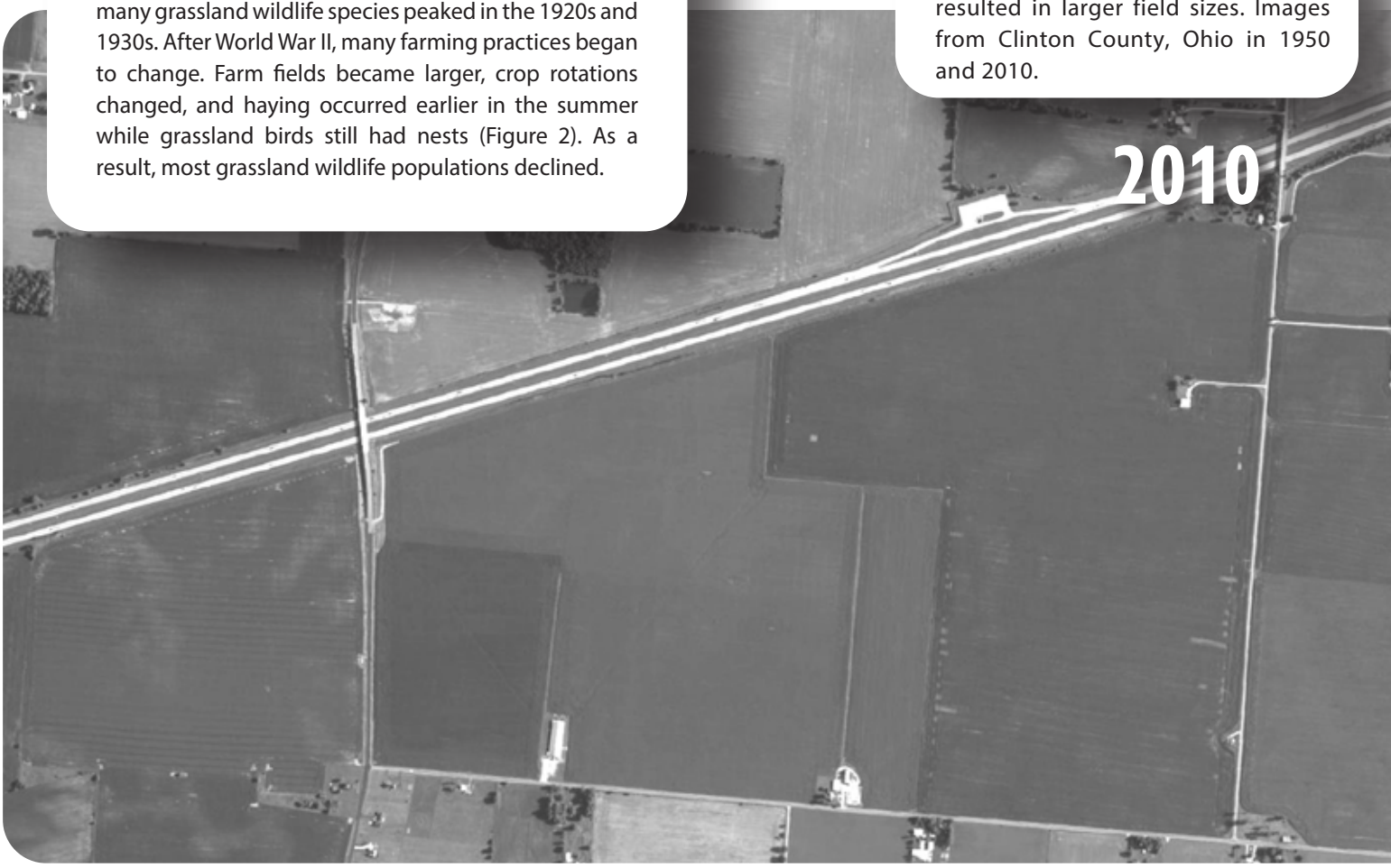


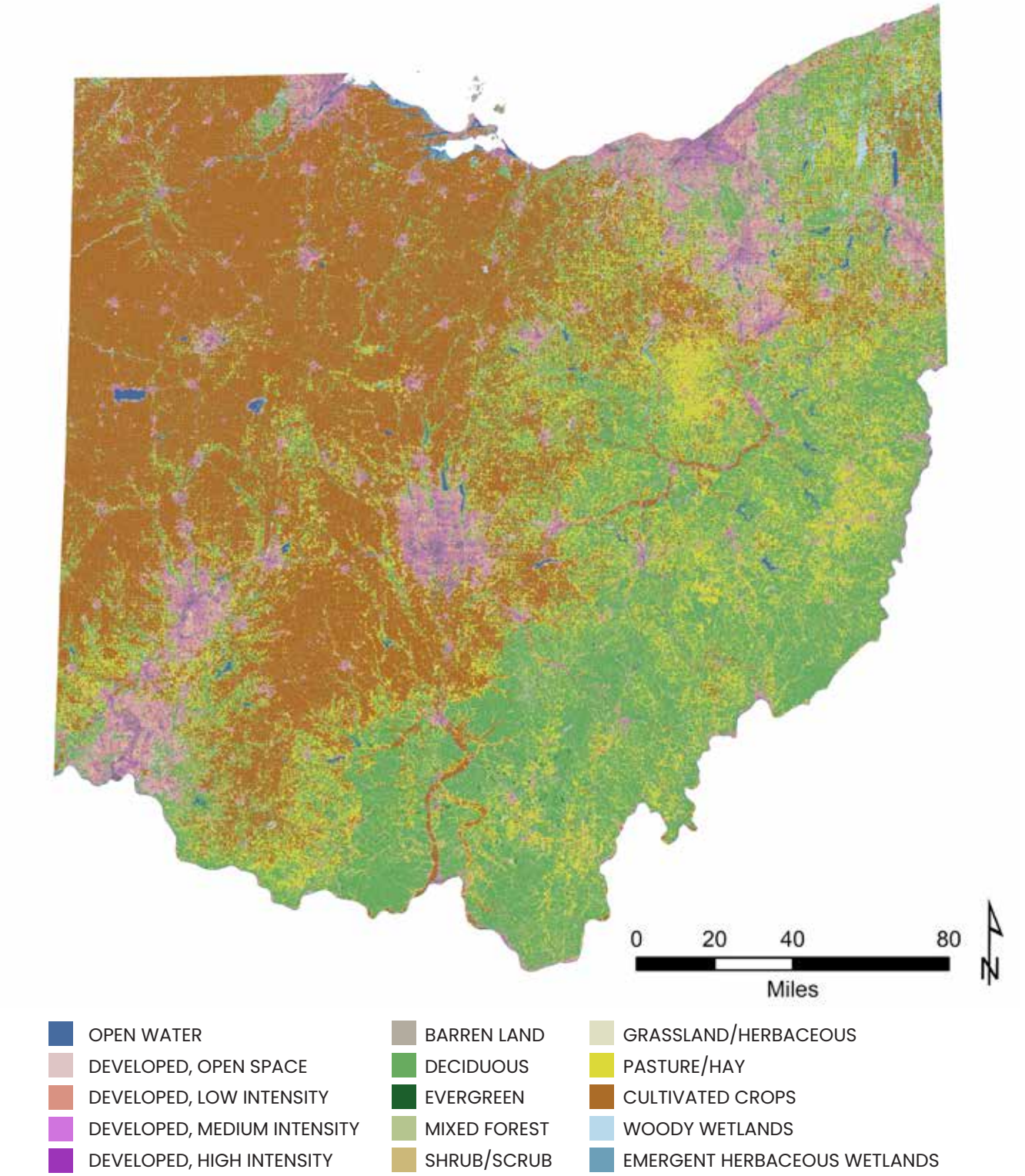
FIGURE 2.
Changes in agriculture practices have resulted in larger field sizes. Images from Clinton County, Ohio in 1950 and 2010.

European colonists arrived in the late 1700s and replaced many of Ohio's forests, grasslands, and wetlands with agricultural fields. However, pastures, hayfields, and, to some extent, crop fields provided habitat for grassland-dependent wildlife. Populations of many grassland wildlife species peaked in the 1920s and 1930s. After World War II, many farming practices began to change. Farm fields became larger, crop rotations changed, and haying occurred earlier in the summer while grassland birds still had nests (Figure 2). As a result, most grassland wildlife populations declined.

CURRENT VEGETATION IN OHIO

Although grasslands in Ohio have changed, they remain a vital ecosystem and an important part of Ohio's natural and cultural heritage (Figure 3). In this handbook, we provide guidelines for managing existing grasslands and establishing new grasslands to conserve these unique ecosystems. While our primary focus is providing grassland habitat for birds, grassland management can benefit numerous other wildlife species as well as people.

FIGURE 3. Current land cover in Ohio, adapted from the 2024 National Land Cover Database.



GRASSLAND COMPONENTS

TYPES OF GRASSES

Perennial grasses are the foundation of grassland habitat. Grasslands are made up of two types of grasses: **cool-season grasses** and **warm-season grasses**. These terms (warm season and cool season) refer to the temperature ranges that provide optimal growth.

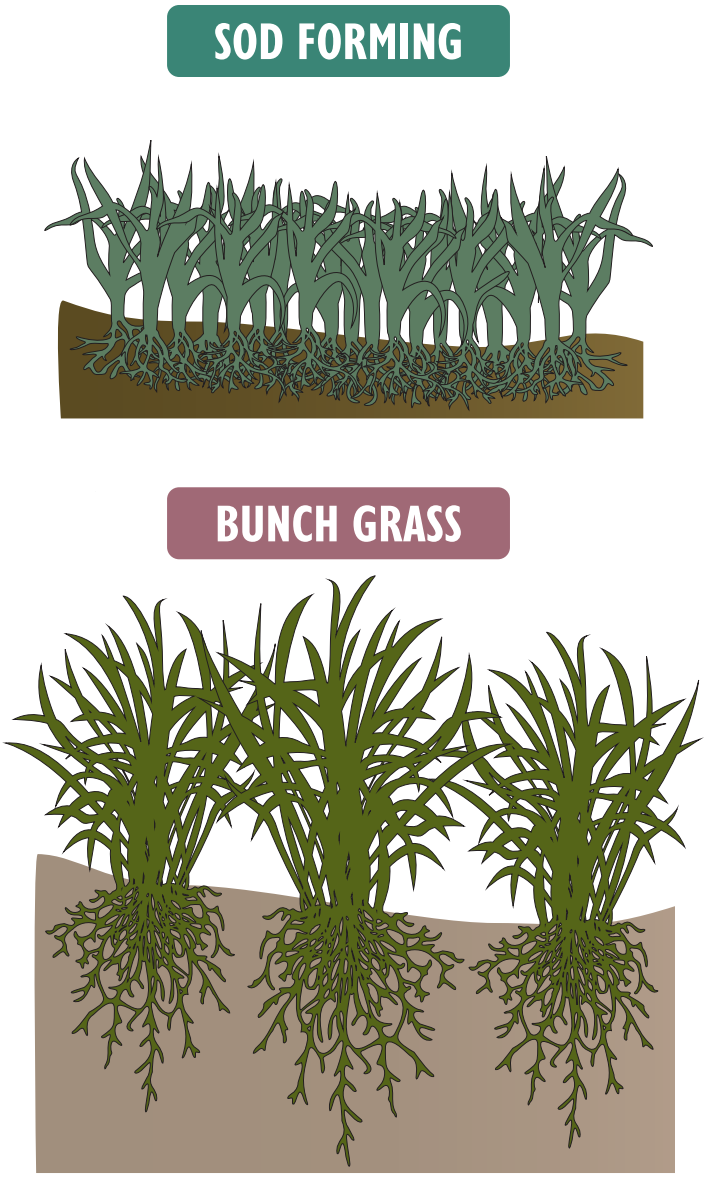
Cool-season grasses grow in cooler temperatures, in Ohio, this is typically during spring and fall. These grasses tend to go dormant during the hot summer months and cold winter. Some cool-season grasses like tall fescue, Kentucky bluegrass, and smooth brome are sod-forming. Sod-forming grasses create a structure that is not preferred by some species of grassland birds by forming a dense, uniform mat of vegetation (Figure 4). Many old fields, pastures, and wet fields are dominated by these species. Many cool-season grasses in Ohio were introduced from Europe; however, not all cool-season grasses are nonnative. Cool-season bunch grasses include Canada wild rye, timothy, and orchard grass (Appendix). These species benefit wildlife by allowing increased forb diversity and more bare ground.

Warm-season grasses are most active when temperatures are 80-95° F (June-September in Ohio). Warm-season grasses use water more efficiently than cool-season grasses. Thus, warm-season grasses are more competitive when water is limited. They have deep root systems and produce vast amounts of biomass in a short time.

Many warm-season grass species are used in grassland restorations, and most prairie grasses are warm-season grasses. Typically, native warm-season grasses are bunch-forming, which creates open space on the ground's surface for grassland nesting birds such as ring-necked pheasant and northern bobwhite. Some aggressive warm-season grasses can dominate fields if no disturbance is included in the management (e.g., Indiangrass, big bluestem). Some warm-season grasses can grow very tall in Ohio (>5 ft), which is beneficial to some grassland birds but detrimental to others. Common species of warm-season grasses include big bluestem, little bluestem, and switchgrass (Appendix).

To maximize grassland bird and wildlife diversity, it is best to have a combination of warm- and cool-season grasses across the landscape because different species benefit from different types of grass.

FIGURE 4. Comparison of the structure of sod-forming and bunch grasses



SEDGES AND RUSHES

Sedges and rushes are two plant categories often lumped with grasses because they appear similar. Sedges often have triangular-shaped stems, whereas rushes are typically round-stemmed. Grasses usually have hollow, round stems and nodes along the stem. Sedges and rushes are more likely to be in areas with moist or wet soil. There are many native and nonnative sedges and rushes that often grow in wet pockets within a grassland. Many of these species provide food resources for wildlife and add to the species diversity of grasslands. Typically, there is no need to control sedges or rushes, and they are considered beneficial components of grasslands.

SEDGES AND RUSHES

FORBS

FORBS

Forbs are herbaceous flowering plants that are not grasses, sedges, or rushes. Forbs also include nitrogen-fixing legumes like clovers. Grasslands that best support pollinators and other wildlife contain a diversity of forbs with different flower colors, flower shapes, and bloom periods. Some common native forbs are listed in the appendix.

Managing to maximize forb diversity in a grassland will benefit most grassland wildlife species. Generally, increasing forb abundance and diversity also increases the abundance, diversity, and biomass of insects, especially pollinators, and other invertebrates. Invertebrates are a key component of many grassland bird diets, especially for chicks. Therefore, forb-rich grasslands can offer abundant food resources for birds. In addition, seeds produced by forbs are consumed by many wildlife species.

SHRUBS AND BRAMBLES

Small, woody plants less than 12 feet in height with no single trunk are considered shrubs. Most grassland birds tolerate some shrubs within grasslands, provided the shrubs remain small and do not form dense colonies. Shrubs provide cover for grassland birds like northern bobwhite and American tree sparrow. Brambles are a diverse group of perennial herbs, shrubs, or trailing vines that are noted for their prickly stems and berry-like, usually edible fruits. Many shrub and bramble species provide a food source in the form of soft mast, like berries. In Ohio, several invasive shrub species can quickly spread across and dominate a grassland and need to be removed. Some common shrub species native to Ohio that may be found in grasslands include American plum, hazelnut, blackberry, and raspberry.

BLACKBERRY SHRUB

TYPES OF GRASSLANDS

In Ohio, there are several types of grasslands, some native, some classified as agricultural grasslands, and some that have been restored to prairie following past land uses. All types have at least some value to birds.

PRAIRIE

NATIVE GRASSLANDS

Examples of native grasslands include prairies, both wet and dry, as well as savannas. A **prairie** is a permanent grassland found in North America composed of species of grasses, sedges, and forbs, and few to no woody plants. Historically, wet and dry tallgrass prairies were found throughout Ohio. Although a few remnant patches still exist, less than 1% of the original grassland extent remains intact. Today, most prairies in Ohio are recent restoration plantings. Shortgrass prairies exist in the western United States but do not occur as far east as Ohio.

WET PRAIRIE

A **wet prairie** is a grassland that has saturated soils for part or all of the growing season. Depending on the plant species and hydrological cycles, a wet prairie could be classified as a marsh, fen, or bog, all types of wetlands.

OAK SAVANNA

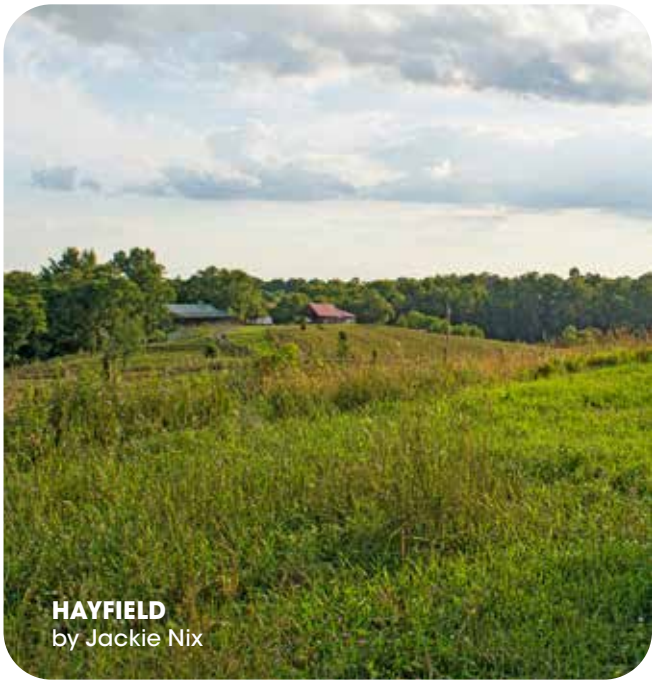
Finally, a **savanna** is a grassland with scattered trees. The trees do not form a closed canopy, allowing sunlight to reach the ground and support the grasses and forbs below. In Ohio, the trees in savannas are mostly oak species. These areas are sometimes called oak savannas or oak openings and are most common in northwestern and southern Ohio. These tend to be situated on sandy soils with dry conditions.

Regardless of the type, native grasslands, with a high diversity of plants, provide valuable resources for birds.

CATTLE GRAZING IN A NATIVE GRASS PASTURE

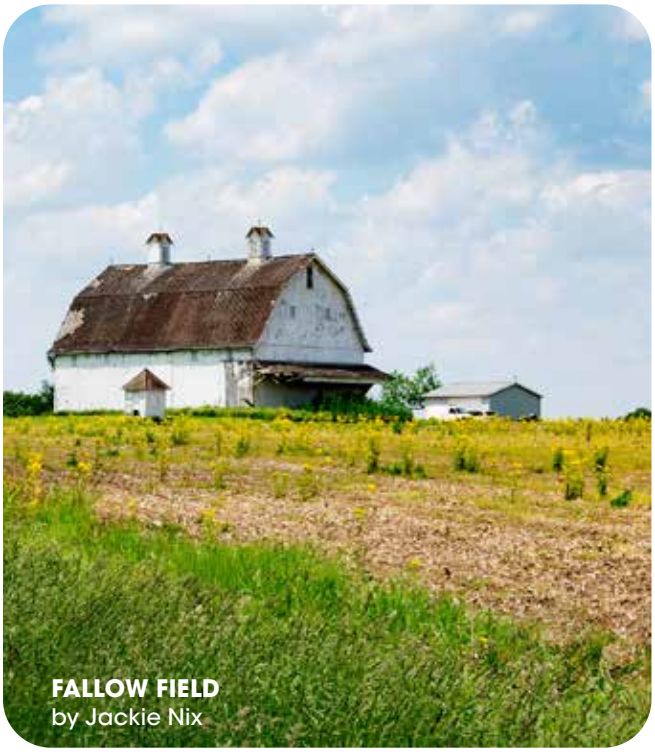
AGRICULTURAL GRASSLANDS

Examples of agricultural grasslands include pastures, hayfields, no-till row crop fields, fallow fields, cover crops, and fence rows. **Pastures** are grasslands that are grazed, often by cattle or other livestock. The benefits of pastures to wildlife vary greatly depending on plant community and pasture management. Some pastures consist of a diversity of native grasses and forbs, whereas others are primarily comprised of nonnative grass monocultures. While light grazing supports diverse plant and wildlife communities, continuous heavy grazing favors only a few species.



HAYFIELD
by Jackie Nix

In a **hayfield**, grasses and/or legumes such as orchard grass, timothy grass, and alfalfa are grown for hay. Hayfields offer ideal cover and nesting sites for grassland birds such as bobolinks, grasshopper sparrows, and eastern meadowlarks. However, early and intensive haying often destroys valuable habitat and active nests. Timing and pattern of haying can often allow haying practices to continue successfully in conjunction with providing bird habitat. Delay the first haying until after the initial nesting attempts have fledged young, typically no earlier than July 15 in Ohio. However, some species may still have active nests and dependent young into August. Delaying haying even longer can further reduce the risk of nest loss.



FALLOW FIELD
by Jackie Nix

A **fallow field** is land that is plowed but not cultivated for one or more seasons to allow the soil to recover (Sample and Mossman 1997). Annual tillage consistently sets back plant community succession and therefore maintains early-successional plants often considered undesirable by farmers. The undesirable plant species are often dictated by the crop last present, but as years pass plants from the seedbank and nearby areas infiltrate the field. Some of these less desirable species can provide food resources for wildlife. Fallow fields offer habitat to birds such as horned larks and vesper sparrows that prefer sparse cover and areas of bare ground.

RESTORED GRASSLAND

Agricultural lands that do not disturb the soil through tillage utilize a practice called **no-till agriculture**. Fields managed in this way are often covered with remnants of the previous year's crop in addition to weeds, both of which provide resources to birds (VanBeek et al. 2014). Cover crops such as clover, rye, and wheat are planted after harvest or between cash crops. They improve soil health, reduce erosion, manage nutrients, increase water availability, and suppress weeds. Fields that use cover crops also provide habitat for birds, especially in the early spring when little else is green (Wilcoxen et al. 2018). However, termination of cover crops creates an ecological trap for early nesting species of grassland birds, like ring-necked pheasant, by creating cover that will disappear with planting.

OLD FIELD
by Michael Smith

Old fields are often temporary and in successional stages on their way to becoming a young forest. Their origin can vary from restored fields left unmanaged to agricultural fields or pastures that have not been utilized for 5-10 years. These areas can be temporarily beneficial to grassland wildlife. Some sites revert to a mixture of shrubs, brambles, and tree seedlings like dogwood, blackberry, and hawthorn, respectively. With management, old fields can be be a continual source of habitat for a variety of grassland birds. Old fields are valuable habitat for a variety grassland wildlife species including northern bobwhite and American woodcock.

RESTORED GRASSLANDS

Restored grasslands include any area which has been purposefully planted with grasses and forbs, regardless of whether a grassland previously existed there. These grasslands may contain cool-season or warm-season grasses. Common examples include reclaimed surface mines, agriculture fields, old fields in the early stages of succession, and utility rights-of-way.

Grassland habitat for birds can also be incorporated into agricultural lands voluntarily or through conservation programs. The **Conservation Reserve Program** (CRP) has been the most successful program for that purpose. Grassland habitat can be restored as whole fields or as buffers along cropland, streams, fence rows, wet areas, or other less productive areas for row crop agriculture. Not only do CRP land and other restored grasslands provide resources for birds, they create safe travel corridors for other wildlife. When planted as whole fields or as buffers along waterways, grasslands can reduce sediment and excess nutrient runoff and improve water quality.

GRASSLAND ON A RECLAIMED SURFACE MINE

Reclaimed surface mines primarily occur in eastern and southeastern Ohio, where extensive areas of land were surface mined for coal. Prior to 1972, these reclaimed lands were often planted with trees. After 1972, reclaimed land was consistently planted into nonnative cool-season grasslands. Most of these cool-season grasslands remain in a state of arrested succession for about 20 years due to poor soil quality and are some of the most stable grasslands in the state. These areas offer critical habitat for declining grassland birds such as Henslow's sparrow and bobolink in a predominantly forested region within Ohio. Unfortunately, invasive species such as autumn olive are invading these grasslands, creating a serious challenge for land managers. Recent projects using native prairie species planted directly into reclaimed lands have been successful in establishing prairies, and current reclamation in Ohio may be to native prairie or to nonnative cool-season mixes.

RIGHT-OF-WAY

A **right-of-way** is a legal right to pass along a specific path through property belonging to another. Rights-of-way are often granted for transportation and utility transmission purposes. In Ohio, establishing grasslands along a right-of-way is a management strategy that can benefit both birds and those entities responsible for vegetation management within the right-of way. Given their consistent management, rights-of-way will remain as grasslands and not succeed into forest, thus providing consistent grassland bird habitat. A potential downside of rights-of-way habitat is that they are typically very narrow, which may be problematic for grassland bird species requiring larger territories.

AIRFIELD AT MIDDLE BASS ISLAND

Most **airports** in Ohio maintain grass fields surrounding runways to reduce the chances of collisions with birds, trees, and other wildlife. Portions of grasslands directly near the runways are often mowed. However, there are many areas on airports that are only mowed occasionally to prevent the establishment of trees and shrubs. As a result, airports often provide excellent habitat for many species of grassland birds. For instance, upland sandpipers nest almost exclusively at airports in Ohio (Rodewald et al. 2016) and short-eared owls frequently use airports to overwinter.

GRASSLANDS AS WILDLIFE HABITAT

Many species of wildlife rely on Ohio's grasslands, including important game species like northern bobwhite, wild turkey, American woodcock, eastern cottontail, and white-tailed deer. Pollinators also use grasslands in Ohio, including the declining monarch butterfly. Wildlife species that depend on grasslands are important components of Ohio's biodiversity, both historically and in the present day. These species, especially birds, did well until recently, largely due to their ability to colonize farmlands, old fields, and hayfields (Askins 1999).

GRASSLAND BIRDS

A grassland bird is a species of bird that relies on open, upland habitat, usually with a considerable grass component, for all or part of its life (Vickery et al. 1999). The presence of grassland birds can be a good indicator of the overall quality of a grassland ecosystem, where higher quality grasslands support a greater diversity and abundance of plant and animal species. They provide recreation through viewing, photography, and hunting opportunities. Game birds like ring-necked pheasant and northern bobwhite bring economic benefits to rural communities (USDOI et al. 2018). Yet, many species of grassland birds have declined throughout North America, including Ohio.

In North America, grassland bird populations have declined more than any other group of birds since the 1970s (Sauer et al. 2017, Rosenberg et al. 2019). Causes for declines include habitat loss, changing agricultural practices, tree and shrub invasion, and succession (Matson et al. 1997, Vickery and Herkert 2001, Askins et al. 2007). Grassland bird declines are alarming. However, their ability to co-exist with human disturbance by living in agricultural fields means that as long as we understand the habitat needs of these species it is possible to adapt our grassland management and co-exist with these unique specialist birds.

The Great Plains, which host many of the core populations of grassland birds, have lost considerable amounts of grassland in recent decades. Only 30% of Great Plains grasslands remain compared to the historic extent (Samson et al. 2004) (Figure 6). Maintaining grasslands in Ohio broadens wildlife diversity within the state, provides important habitat, and helps offset grassland loss in other regions (Norment 2002). Grasslands in Ohio provide breeding, overwintering, and stopover habitat for a wide variety of birds. Managing grasslands contributes to multi-state and international conservation efforts of grassland birds. By following best management practices, we can maximize benefits for grassland dependent birds and wildlife.


BOBOLINK

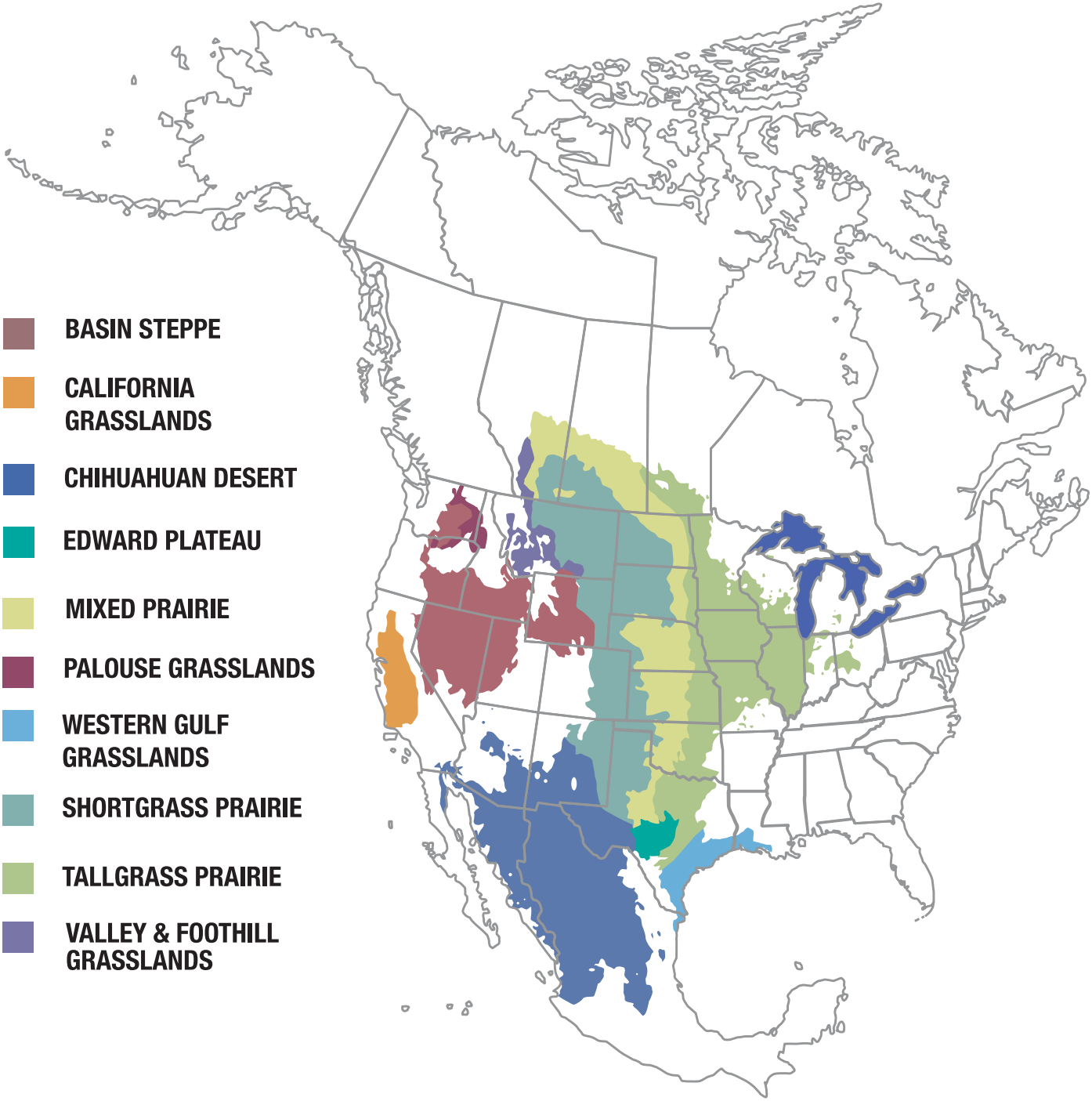

UPLAND SANDPIPER


VESPER SPARROW

Some of Ohio's remaining grasslands are located on public land. Many of these areas are managed to maintain grasslands and provide critical areas for grassland birds. However, as less than 5% of Ohio is publicly owned, private landowners play a crucial role in providing habitat for these species. Farm bill programs offer incentives to private landowners who establish and maintain grasslands, significantly influencing the availability of this habitat type across the landscape. Private landowners with existing or potential grassland areas are encouraged to contact local experts to learn about opportunities to contribute to the initiative and increase grassland bird populations in Ohio (see page 45).

HISTORICAL DISTRIBUTION OF GRASSLANDS IN NORTH AMERICA

FIGURE 6. Historical distribution of grasslands in North America by type



REQUIREMENTS OF GRASSLAND BIRDS

Grassland birds are divided into two categories. Grassland specialists, also called obligate grassland birds, are dependent on grasslands for all life stages, including breeding, overwintering, and migration, and rarely use other habitat types (Vickery and Herkert 1999). Some examples of grassland specialists native to Ohio include bobolink, Henslow's sparrow, and upland sandpipers (Figure 7). Grassland generalists, also called facultative grassland birds, use grasslands for all or part of their full annual cycle, however, grassland generalists use other types of cover, as well. Some examples of birds considered to be grassland generalists in Ohio include northern bobwhite, ring-necked pheasant, mourning dove, and red-winged blackbird (Figure 8).

FIGURE 7. Some species of birds that are grassland specialists

FIGURE 8. Generalist grassland bird species

GRASSLAND USE BY BIRDS IN OHIO

Adapted from Sample and Mossman 1997 and key literature for grassland birds.

TABLE 1. Habitat needs for grassland birds in Ohio.

SPECIES	GRASSLAND SIZE (ACRES)	VEGETATION HEIGHT	WOODY TOLERANCE	GRASS COMPOSITION	FORB COMPOSITION	LITTER LAYER	BARE GROUND	STATUS
Northern Bobwhite	20 - 100		0-30%	Med	Low – High	Low-High	Sparse - Thick	Resident
Ring-necked Pheasant	20 - 100		0-30%	Low – High	Low - High	Low-High	Sparse - Thick	Resident
American Golden-Plover	100 or less	< 5″	< 10%	Low	Low	Med-High	Sparse	Migrant
Killdeer	20+	< 5″	0-30%	Low	Low	Mod-High	Sparse	Migrant, Breeding
Upland Sandpiper	100+	< 5″ – 24″	< 10%	Low – High	Low - High	Moderate	Sparse - Moderate	Migrant, Breeding
Northern Harrier	100+	< 5″ – > 24″	0-30%	Low - High	Low – High	Low-High	Sparse - thick	Migrant, Breeding, Winter
American Barn Owl	40+	< 5″ – > 24″	0-30%	Low - High	Low - High	Low-High	Sparse - Thick	Resident
Short-eared Owl	100+	< 5″ – > 24″	0-30%	Low - High	Low - High	Low-High	Sparse - Thick	Migrant, Breeding, Winter
American Kestrel	20+	< 5″ – > 24″	0-30%	Low - High	Low - High	Low-High	Sparse - Thick	Resident
Horned Lark	40+	< 5″	< 10%	Low	Low-Med	Mod-High	Sparse	Resident
Sedge Wren	40+	>12″	< 10%	High	Low-Med	Low	Thick	Migrant, Breeding
Grasshopper Sparrow	40+	<24″	< 10%	Med	Med	Moderate	Moderate	Migrant, Breeding
Lark Sparrow	10+	<5″	0-30%	Med	Med	High	Sparse	Breeding
Clay-colored Sparrow	10+	<24″	0-30%	Med	Med	Moderate	Thick	Migrant, Breeding
Field Sparrow	2+	5″+	0-30%	Med	Med	Low	Thick	Resident, Migrant Breeding, Winter
American Tree Sparrow	2+	5″+	0-30%	Med	Med	Low-High	Sparse - Thick	Migrant, Winter
Vesper Sparrow	20+	<24″	0-30%	Low	Low	High	Sparse	Migrant, Breeding
Henslow's Sparrow	40+	24″+	< 10%	High	Low-Med	Low	Moderate - Thick	Migrant
Savannah Sparrow	40+	<42″	< 10%	Med	Med	Low-Mod	Moderate	Breeding
Bobolink	40+	<42″	< 10%	Med	Med	Moderate	Moderate	Migrant, Breeding
Eastern Meadowlark	40+	<42″	< 10%	Med	Med	Moderate	Moderate - Thick	Migrant, Breeding
Dickcissel	40+	<42″	< 10%	Med	Med	Moderate	Moderate	Breeding

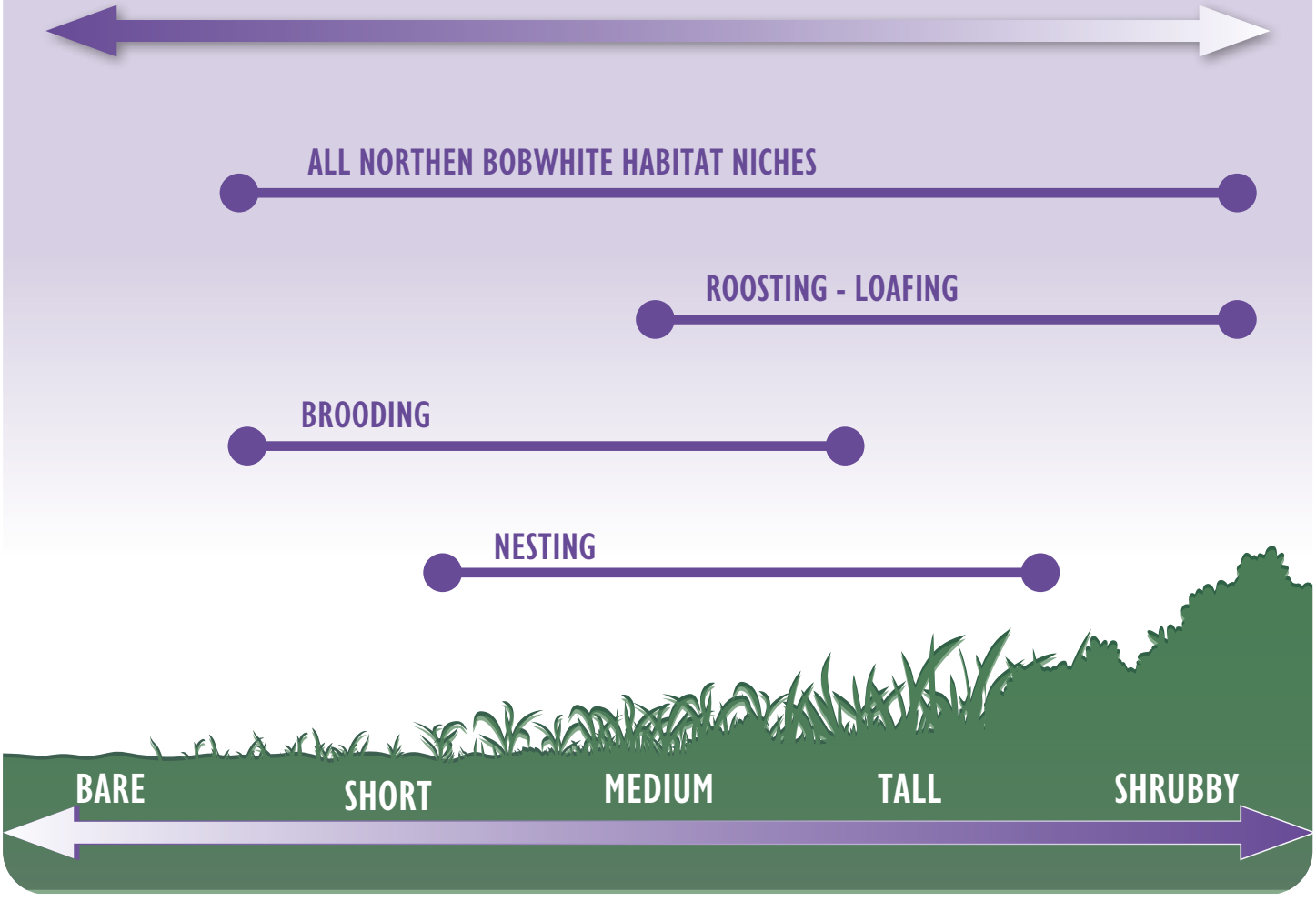
MANAGING FOR THE FULL ANNUAL CYCLE OF BIRDS

Many bird species need grasslands throughout the year, particularly resident grassland birds such as ring-necked pheasant and northern bobwhite, which rely on grasslands in a local area (Figure 9). The local areas then need to meet all the demands of their full annual cycle (e.g., nesting, post-breeding, overwintering). Other species, such as grasshopper sparrow and bobolink, migrate to Ohio to breed. They cross state or international borders during migration. For instance, bobolink that nest in Ohio migrate from their wintering grounds in Argentina. Some migrating birds use grasslands in Ohio as stopover habitat, where they can refuel and rest before continuing their journey. Additionally, boreal-breeding grassland birds such as the American tree sparrow and short-eared owl use Ohio's grasslands for overwintering.

Ensuring that grasslands in Ohio meet the needs of bird species during all parts of their full annual cycle can help to stabilize populations of declining species. For example, northern bobwhite are most often limited in Ohio by overwinter survival. Providing shrubby cover alongside grassland nesting cover adjacent to a food source can provide shelter from snow, ice, and predators during winter.

NORTHERN BOBWHITE HABITAT SELECTION DURING THE FULL ANNUAL CYCLE

FIGURE 9. Habitat needs for northern bobwhite throughout the full annual cycle



AREA SENSITIVITY AND LANDSCAPE CONTEXT

Some grassland birds are not found in small patches of habitat (<40 acres). Instead, they require large, open areas. These species are area-sensitive, and the minimum size threshold varies among species. For instance, many species of grassland birds, like bobolink and upland sandpiper, are absent or rare in grasslands less than 25 acres in size (Herkert 1994, Vickery et al. 1994, Helzer and Jelsinki 1999, Ribic et al. 2009)(Figure 10). Typically, the number of grassland bird species increases as the size of the grassland increases (Herkert 1994).

Fragmentation of grasslands not only causes habitat loss but also reduces the grassland size. As grassland patches decrease in size, species richness and incidence of many grassland specialist birds decrease (e.g., Herkert 1994). When grassland birds nest in fragmented grasslands, rates of brood parasitism by brown-headed cowbirds increase and they may experience increased predation rates (Benson et al. 2013). However, area sensitivity may be mitigated by other factors, such as the amount of grassland or forest within the local landscape (Johnson and Igl 2001, Horn and Kofford 2004, Ribic et al. 2009, Shahan et al. 2017). For example, a small, isolated grassland (e.g., < 80 acres) surrounded by forest or row crops is unlikely to be used by grassland specialists whereas a similar-sized parcel with other grasslands nearby would likely be used.

Not only can the size of a grassland affect its use and suitability, but the shape of a grassland can determine its value to grassland specialists. As the proportion of edge surrounding a grassland decreases, grassland specialists often increase in abundance. In contrast, abundance of bird species dependent on grasslands decreases as the proportion of edge increases (Helzer and Jelsinki 1999, Davis 2004).

SIZE OF GRASSLANDS NEEDED PER BIRD SPECIES

FIGURE 10. Minimum size of grasslands used by four species of grassland birds

URBANIZATION AND DEVELOPMENT

Urbanization and development continue to expand throughout Ohio and North America, resulting in grassland loss. Increases in development tend to decrease most grassland bird populations (Berry et al. 1998, Haire et al. 2000, Forman et al. 2002, Veech 2006, McLaughlin et al. 2014) and increased vehicle traffic reduces use of grasslands by grassland birds (Forman et al. 2002). Protected grasslands in developed areas may serve as important reserves for many grassland birds, especially if they are further from roads (Buxton and Benson 2016).

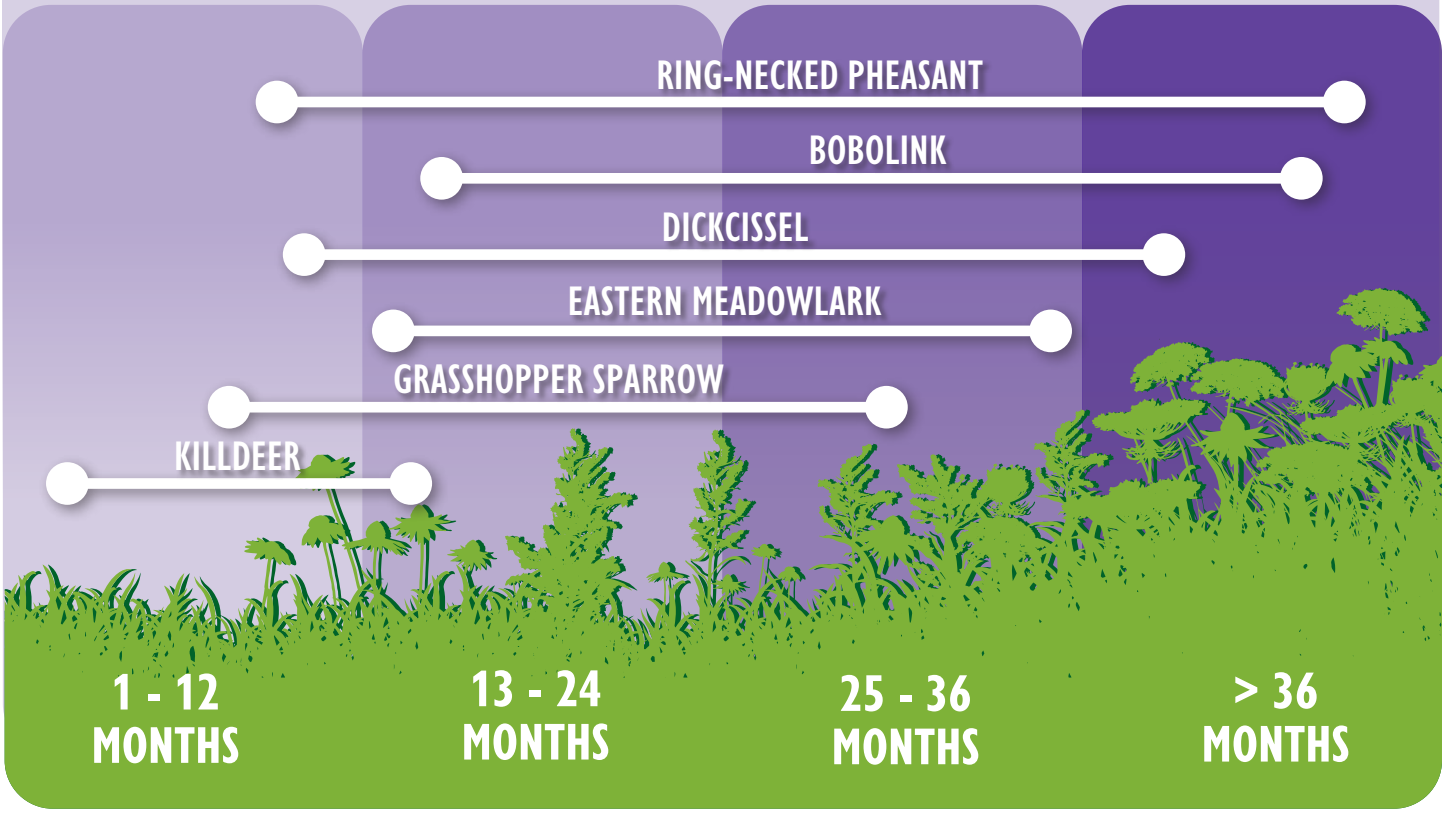

OLENTANGY RESEARCH PARK

DIFFERENCES IN SUCCESSIONAL NEEDS FOR SPECIES

Much like forests and wetlands, grasslands vary by their stage of succession— the natural progression, development, and replacement of plant species over time. Disturbance like fire, grazing, or mowing sets back grassland succession and is vital to managing for the diverse needs of grassland species. Species of grassland birds respond to disturbance differently (Fuhlendorf et al. 2009, Hovick et al. 2014)(Figure 11). For example, killdeer and horned lark nest in highly disturbed areas that are often characterized by bare soil and short grass, including row crops. At the other end of the spectrum, species such as Henslow's sparrow primarily use grasslands that have not been disturbed for three or more years, preferring areas with thick, dense grass that often includes a thick layer of litter and thatch, or accumulated dead grass and forbs. They are often found nesting in old fields and on reclaimed surface mines in Ohio. Working to maintain a variety of grassland stages across the landscape will promote grassland bird diversity and abundance.

BIRD PRESENCE IN MONTHS SINCE DISTURBANCE TO GRASSLAND

FIGURE 11. Habitat selection by a variety of grassland bird as a function of time since disturbance. Adapted from Fuhlendorf el al. 2009.



Some species may use different grassland types at different stages of their full annual cycle (Sample and Mossman 1997, Figure 11). For instance, ring-necked pheasants require thick, dense grasslands for nesting to provide concealment. After nests hatch, female ring-necked pheasants bring their broods to more recently disturbed areas with high forb content. These areas provide abundant insects and invertebrates, an important food source for pheasant chicks, and travel lanes for chicks. During winter, ring-necked pheasants require dense, standing cover to provide protection from snow and cold.

RING-NECKED PHEASANT
by Don Mroczkowski

MANAGING GRASSLANDS

Owning and managing good grassland habitat for birds and other species of wildlife is a very rewarding endeavor. Grasslands require routine disturbances to maintain diversity and protect against woody encroachment. These disturbances can include woody plant removal, invasive plant management, prescribed fire, mowing, and grazing. It is recommended that landowners select more than one type of disturbance to use on a rotational basis with alternating methods and timing, depending on management objectives. Disturbance types include grazing, fire, mowing, tillage, and herbicide. For example, mowing a grassland at the same time every year will reduce plant diversity by selecting for species that are dormant during that time. It is also beneficial to avoid disturbing the entire grassland at once, as leaving some areas untouched provides refuge and forage for wildlife. A diversity of management applications is likely to result in a more diverse grassland.

WOODY ENCROACHMENT

Woody encroachment, a natural process of an increase in woody stems, is part of plant community succession in Ohio and can create temporary scrub-shrub habitat or eventually grow into early-successional forest (Figure 12).

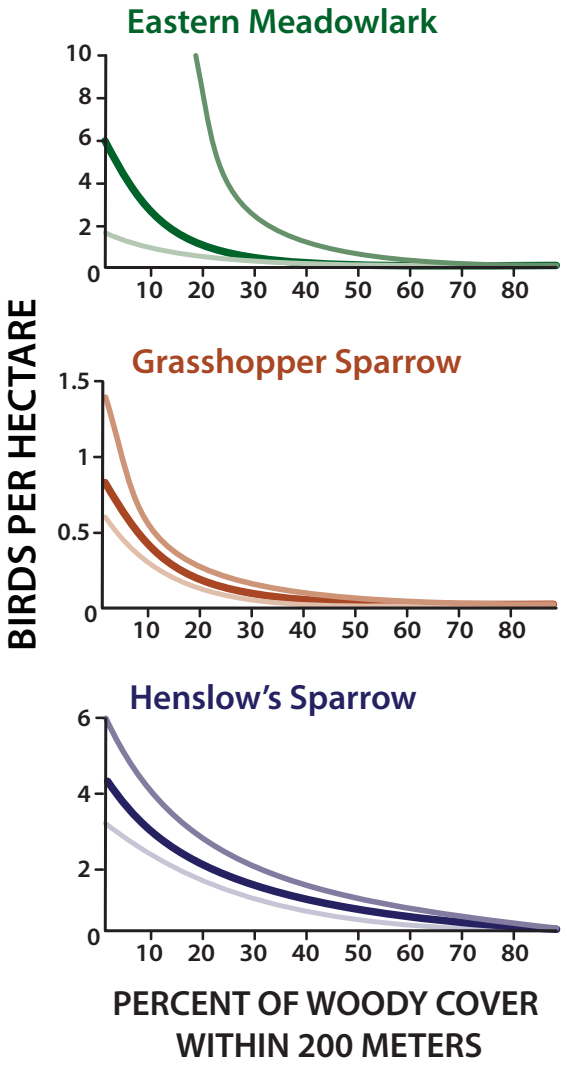
This thick scrub-shrub habitat can be important for bird species dependent on early forest successional habitat. However, woody encroachment usually impacts most grassland species negatively. The occurrence and abundance of many species of grassland birds decline as the number of trees, shrubs, or amount of forest increases (Grant et al. 2004, Thompson et al 2014, Lautenbach et al. 2020)(Figure 13).

TREE AND FOREST ENCROACHMENT

FIGURE 12. Example of woody encroachment into an Ohio grassland. Birds can facilitate woody plant encroachment in some grasslands

GRASSLAND BIRD RESPONSE TO WOODY ENCROACHMENT

FIGURE 13. Grassland birds decrease in abundance as the amount of woody cover increases. Adapted from Lautenbach et al. 2020.




REMOVAL OF AUTUMN OLIVE

As woody encroachment increases, the diversity of other communities dependent on grasslands, like herbaceous plants and insects, decreases (Ratajczak et al. 2012). Because of these declines, management that includes control of woody encroachment through herbicide, mowing, or burning should be used where grassland habitat is desired.

Without management of woody plants, grasslands in Kansas converted to closed-canopy forest in as little as 40 years (Briggs et al. 2002). In Ohio, this rate of succession is quicker considering that most Ohio grasslands are often fragmented and adjacent to forested areas, which increases seed dispersal of trees and shrubs. Additionally, the state receives considerably more precipitation than prairie systems in the Great Plains, accelerating the growth of many woody plants. Many invasive or aggressive trees and shrub species are the primary culprits expanding into Ohio grasslands, including autumn olive, bush honeysuckle, black locust, honey locust, Callery pear, eastern cottonwood, red maple, and eastern red cedar. Grasslands can also revert to monocultures of dogwood. In Ohio, grasslands can quickly be overtaken by woody plants and can become shrublands in as little as 5 years and forests in less than 30 years. Where woody encroachment is particularly bad, treatment with herbicide may be necessary in addition to mowing or burning.

INVASIVE TREES AND SHRUBS


BULL THISTLE


CALLERY PEAR TREE

INVASIVE HERBACEOUS SPECIES

Invasive nonwoody species such as reed canary grass, Johnson grass, teasels, thistles, and sericea lespedeza reduce the diversity of grasslands (e.g., Eddy and Moore 1998). Many nonnative cool season grasses are also invasive and problematic for grassland birds.

INVASIVE HERBACEOUS PLANTS

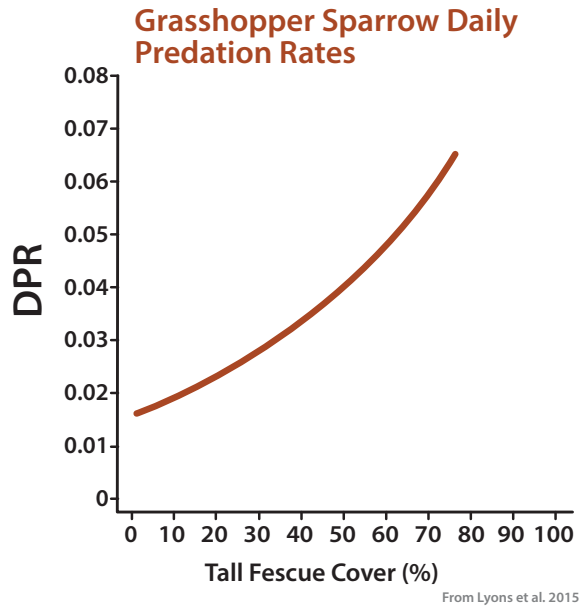

REED CANARY GRASS


JOHNSON GRASS

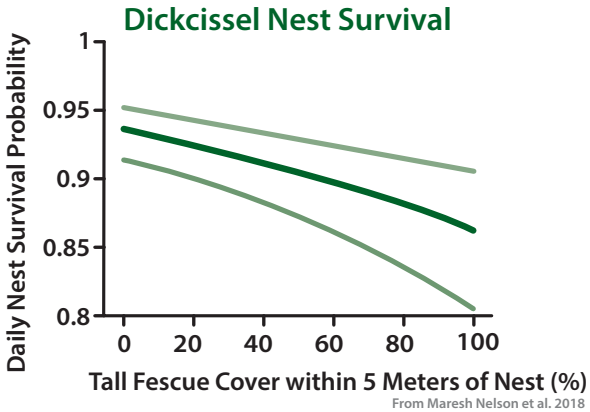
For example, tall fescue and smooth brome reduce nest survival of grassland birds and should be avoided whenever possible (Lyons et al. 2015, Maresh Nelson et al. 2018, Shew et al. 2019; Figure 14). There are also native grasses and forbs, such as some goldenrods, big bluestem, and Indiangrass, that can be aggressive and outcompete other plant species without additional management (e.g., McCain et al. 2010). Any species that takes over and creates a monoculture is not beneficial.

INVASIVE PLANT NEST SURVIVAL

Figure 14. Daily predation rates at nests can increase and nest survival can decrease as the amount of invasive plants increases



From Lyons et al. 2015



From Maresh Nelson et al. 2018


INDIANGRASS


TALL FESCUE

GRASSLAND EDGE IMPROVEMENT

Grassland edges are important for many species of grassland birds because these edges provide food and cover. Historically, woodland edges in Ohio exhibited gradual transitions between a woodland and grassland habitats. These transitional areas, or feathered edges, likely hosted a unique suite of small trees, native shrubs, grasses, and forbs.


STEM DENSITY OF A DOGWOOD


1 YEAR POST-REMOVAL


2 YEARS POST-REMOVAL

Today, much of Ohio's grasslands exhibit abrupt, or hard, edges between grasslands and woodlands. Edge feathering creates areas of native shrubs, grasses, and forbs between a grassland and forest edge. This creates a more gradual transition from field to forest that is important to many species of grassland birds.

There are two basic methods to manually create feathered edges: (1) plant native grasses, forbs, and shrubs between grasslands and mature forest edges or (2) remove trees, preferably undesirable or nonnative species, on a woodland edge to allow natural regeneration of native shrubs, grasses, and forbs. The second method of grassland edge improvement is focused on exposing woodland edges to sunlight. Selectively cutting canopy or subcanopy trees increases sunlight and stimulates germination and growth of native understory shrubs, brambles, and forbs. This can be done without cutting mast-producing trees and shrubs such as small oaks, hickories, cherries, hawthorns, crabapple, raspberry, dogwoods, elderberry, and viburnums. Monitoring preferred and intended plant species within edges is critical as nonnative, invasive shrubs and grasses also colonize and dominate grassland edges.

AMERICAN BISON GRAZING IN A GRASSLAND

GRAZING

Ohio's grasslands evolved with grazing animals like American bison and elk. Grazing animals were dependent on grassland plants for forage, and grassland plant communities were reset and reshaped by the disturbance of grazing animals.

Not surprisingly, grassland plants evolved adaptations to tolerate grazing animals. Many grassland plants are long-lived perennials with extensive root systems, able to survive years of grazing, fire, and drought. Others have shorter life cycles, existing for only a year or two between disturbances. Grazing reshapes grasslands, creating areas of variable height, structure, composition, and bare soil, which impacts grassland bird use. For example, some grassland birds prefer to nest in dense native grasses while others prefer sparse grass cover with areas of bare soil throughout.

CONTINUOUS GRAZING VERSUS MANAGEMENT INTENSIVE GRAZING

Grazing, along with fire, remains a natural disturbance that managers can use to maintain quality grassland bird habitat. Grazing is considered one of the most cost-efficient management strategies for large tracts of grassland habitat. This section focuses on how landowners and livestock managers can use working grasslands to provide quality habitat for grassland birds. However, interested parties should consider meeting with resource professionals at local USDA service centers to assist with developing a grazing management plan.

The result of grazing can be beneficial or detrimental depending on five factors: grazing height, frequency (how often a pasture is grazed), duration (length of grazing period), stand diversity, and rest interval (amount of time between grazing periods; Waller et al. 1985). A mixture of perennial grasses and forbs are the foundation of grassland bird habitat; so their health is vital to the ecosystem. Each year, perennial grasses must store an adequate amount of carbohydrates in their roots to flourish the following growing season. A grassland that begins the winter in poor condition from overgrazing will be less likely to produce healthy plants during the next growing season (Waller et al. 1985).

Stocking density is the number of grazing animals per unit area at a given time. Managers can increase or decrease the stocking density to achieve certain objectives. When stocking densities are exceeded, grasslands become overgrazed and the grasses too short for grassland bird habitat. Overgrazing can cause other environmental resource concerns such as soil erosion, reduced water infiltration, and plant mortality. Low grazing pressure causes animals to select the best forage, often creating ungrazed zones that are more likely to transition to woody cover. Conversely, higher stocking rates combined with shorter grazing periods reduce selectivity, increase disturbance, and allow grasslands more time to recover during the rest of the season.

CATTLE GRAZING NATIVE GRASSES

COW IN A CONTINUOUSLY-GRAZED PASTURE

Continuous grazing is a technique where managers allow livestock to graze a pasture without rest periods, making it simple to manage but less productive. In this system, selective grazing and high stocking rates often cause uneven forage use, nutrient concentration, and eventually shrub encroachment.

Management intensive grazing is a technique that divides large pastures into smaller pastures, or paddocks. Movement to a different paddock can occur weekly, daily, or even multiple times a day. The rate that managers move animals depends on the rate of forage production and animal nutritional demands, which varies regionally and throughout the year. Before animals return to the same paddock, an adequate rest interval or grass height must be met.

For both grazing techniques, stocking density remains an important consideration. Both grazing strategies can provide positive outcomes for grassland birds if planned appropriately. A producer can work with a resource professional at their local USDA service center to select a strategy of grazing that meets their goals for livestock production and grassland bird management

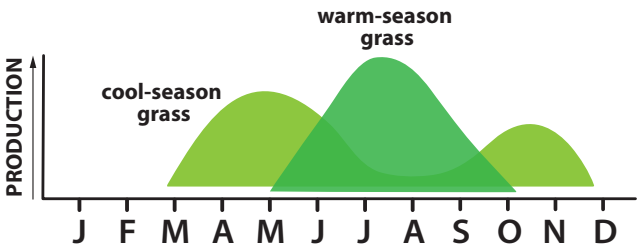
CATTLE GRAZING NATIVE GRASSES

GRAZING DIVERSE FORAGES

Implementing separate cool-season and warm-season grass pastures in one grazing system can benefit livestock managers and grassland birds. A livestock system that uses cool-season and warm-season grass pastures reduces drought risk for livestock producers and maximizes available forage for livestock. Cool-season grasslands can be grazed in spring through early summer before switching to warm-season grasslands during the summer months, when cool-season grass growth slows and warm-season grass growth increases (Figure 15). In the fall, return livestock to cool-season grasslands again when warm-season grass growth slows. A combination of cool-season grass pastures and warm-season pastures accommodates more grassland bird habitat preferences than a single type alone. For example, some grassland birds may prefer shorter plant height and spring growth of cool-season grasses and others may prefer the taller plant height and bunch-forming structure of warm-season grasses. (Keyser et al, 2011).

GROWTH PATTERNS OF GRASSES

Figure 15. Growth patterns of cool-season and warm-season grasses in Ohio.



From: Keyser, P.D., G. E. Bates, J. Weller, C. A. Harper, E. Doxon Holcomb. 2015. Grazing Native Warm-Season Grasses in the Mid-South. SP 731-C

CONTROLLED BURN

PRESCRIBED FIRE

When used properly, fire can restore the ecological processes of fire-adapted plant communities, remove organic material, expose soil, stimulate seed germination, and reduce competition from undesirable plant species. Prescribed burns can make other management methods easier by exposing undesirable woody vegetation for herbicide treatment or aiding in site preparation for seeding desirable grassland plants. Fire can effectively manage undesirable trees and shrubs in grasslands, but success varies upon timing and target species. For example, eastern red cedar can be killed by fire but some nonnative plants like Callery pear or autumn olive vigorously resprout after being burned. Firebreaks created to contain the fire can be mowed or tilled into boundaries, which creates different vegetation areas within grasslands. Firebreaks are often seeded with legumes or green broadleaf plants which provide insect diversity throughout the grassland area while maintaining a re-usable fire lane for the future.

Fire can benefit a grassland in many ways but should only be used to achieve specific management goals. Fire might not always be the best tool to meet a particular goal. Prescribed burning can be used to target undesirable plants during a susceptible stage in a plant's life cycle, like when a plant is producing seed or putting on new growth. Prescribed fire should only be carried out by qualified and experienced personnel. The ODNR Division of Forestry certifies prescribed fire managers through field training and continuing experience. In contrast, the Ohio Environmental Protection Agency regulates smoke from prescribed fire within the state. All prescribed fires need to be executed under written burn plans with stringent conditions to meet specific management objectives and retain public safety. Be sure to check with these organizations for requirements pertaining to training, permits, and other considerations prior to conducting a prescribed burn. A list of contractors that are available to conduct prescribed fire can be found online (https://tsi.osafdirectory.com/find-vendor) Alternatively, a list may be available at local Soil and Water Conservation District or Ohio Division of Wildlife offices.

THE DAY OF A CONTROLLED BURN

ONE MONTH AFTER A CONTROLLED BURN

CONTROLLED BURN

CONTROLLED BURN

HUMAN PERCEPTIONS OF FIRE

Prior to European colonization, fire was a common disturbance on Ohio's landscape. Lightning strikes ignited natural fires that burned thousands of acres of forests and grasslands. Native Americans utilized fire to protect communities from wildfires, encourage new plant growth that attracted wild game, and clear areas for hunting. Early colonists learned to use fire to clear land for agricultural use. However, as more people occupied the landscape, the use of fire became dangerous and less acceptable. As timber production increased across North America, the perception of fire as a threat to forest resources and industry grew. Decades of fire suppression, among other factors, have led to increasingly catastrophic wildfires and, subsequently, negative perceptions of fire.

Today, a fire that is started to accomplish certain objectives, called a prescribed fire, can only be used under stringent conditions that follow state and federal regulations. Maintaining open communication about burning on private land is crucial to creating understanding amongst neighbors who may be affected by smoke or see a prescribed fire being conducted. It is the responsibility of the fire manager to ensure communications take place before the fire is ignited and employ this management tool in a safe, professional manner.

DORMANT-SEASON BURNS

Dormant-season burns are conducted between late October and early April. Native, warm-season grassland plants are predominantly dormant during this time, which allows fire to carry through the grasses more effectively. Burning during the dormant months can also reduce impacts to wildlife species such as pollinators, snakes, rabbits, deer, and most grassland-nesting birds. Dormant burns can have collateral damage if all the available habitat is burned within an area. Burning, like many disturbance methods, should only be applied to a portion of the available habitat whenever possible.

Spring burning, generally March–April, is an effective tool for controlling early cool-season grasses. Burning an area when cool-season grasses have emerged but before undesirable spring plants can reproduce creates good growing conditions for desirable warm-season grasses and forbs. In Ohio, spring burns should be completed prior to April 15 to avoid destroying grassland bird nests. It is important to note that if a grassland is already filled with tall, warm-season grasses, spring burns can stimulate the growth of these grasses, which lowers species diversity of the grassland.

DORMANT-SEASON PRESCRIBED FIRE

Fall burning, generally October–December, can be effective for managing stands of warm-season grasses because it targets these plants during or shortly after they have reproduced, which can set them back and keep them from producing seed. Burning at this time can also set back cool-season grasses and help prep an area to overseed with native forbs. While the timing of these burns removes winter cover that is important for many species of wildlife, it can favor the growth of forbs the following season.

A combination of spring burning and cattle grazing or fall burning are good methods to control both warm-season and cool-season grasses and increase grassland plant species diversity.

GROWING-SEASON PRESCRIBED FIRE

GROWING-SEASON BURNS

Prescribed fires conducted during the summer months must be conducted with specific objectives because these burns can result in collateral damage to wildlife species, including grassland birds and pollinators. Since growing-season fires burn green vegetation, they typically burn slower and produce more smoke than dormant-season burns. When conducting growing season burns, it is appropriate to reduce the size of the burn units to smaller patches within the grassland to reduce wildlife and smoke impacts. If cool-season grasses are of concern within the grassland, a burn during this timeframe can stimulate the growth of those species that could later be handled by a post-burn herbicide application. Burning during the growing season can aid in reducing densities of some aggressive warm-season grasses like big bluestem or Indiangrass, especially when coupled with herbicide treatments. Growing season burns can control woody shrubs and trees more effectively. Additionally, fields containing warm-season grasses typically start regrowing after the burn. Earlier growing season burns, such as those conducted in late July or August,would allow for regrowth of cover prior to winter. Growing-season burns remove biomass and create bare ground, which can promote forb establishment. However, late-season burns reduce warm-season grasses, lowering overall plant density and increasing the risk of invasion by nonnative species. To mitigate this, pair burns with complementary practices such as targeted herbicide treatments or interseeding desirable forb seed mixtures.

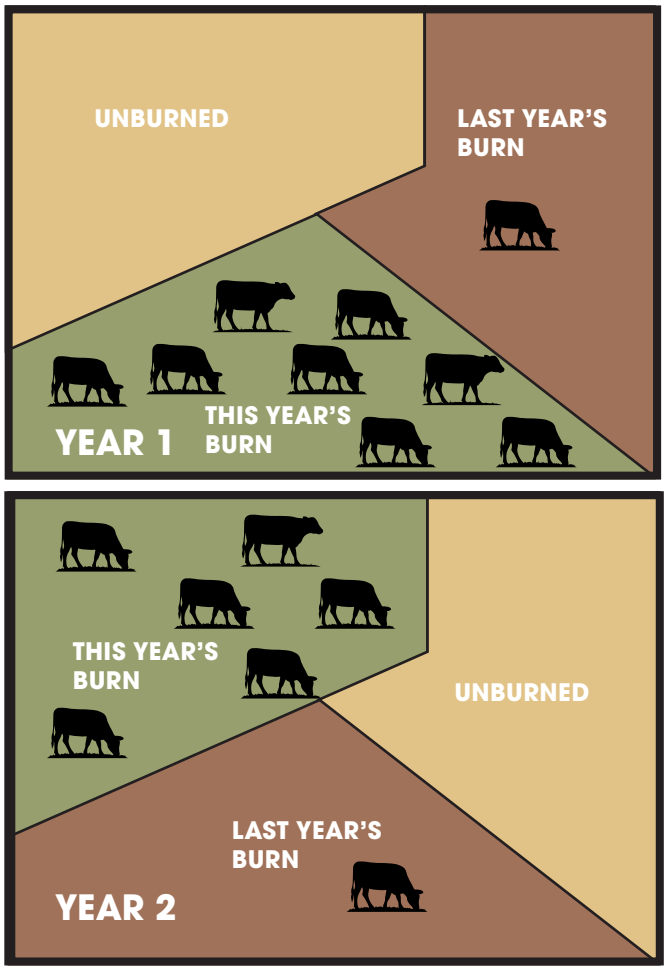
STRATEGIES FOR USING FIRE AND GRAZING

Patch-burn grazing combines the use of fire and grazing to manage grasslands. This strategy embraces the natural, dynamic disturbances that many grassland plants and birds are adapted to. The general premise of patch-burn grazing is to manage a grassland in thirds. Each year, a prescribed fire is conducted on one third of the grassland. Following the fire, grazing animals tend to concentrate on the lush, nutrient-rich regrowth of the recently burned pasture. When the next third of the grassland is burned the following year, the grazing animals then concentrate grazing on that patch (Figure 16). Patch-burn grazing mimics a natural regime because it promotes periods of intensive grazing in recently burned patches followed by multiple years of recovery with minimal to no grazing (Helzer, 2009). A grazing system that encourages long-lived perennial plants and shorter-lived annual plants creates suitable habitat for many species of grassland birds. Native grassland plant communities seem to thrive under this strategy of management, as do grassland birds.

One advantage to livestock managers using patch-burn grazing is that internal fencing is not required (Helzer 2009) because the grazing animals naturally congregate on the most recently burned section. Animal concentration and grazing intensity can be managed by adjusting the stocking density.

PATCH BURN GRAZING

FIGURE 16. Example of burning rotation and cattle response to patch-burn grazing.



MOWING GOALS

If fire, grazing, or herbicides are not options, mowing may be the only management tool available. Attempt to minimize mowing during the growing season, as it creates thatch, promotes sod-forming grasses, and can harm wildlife—including pollinators, birds, deer fawns, small and medium-sized mammals, amphibians, and reptiles—if done improperly. It is imperative that mowing operations are conducted to minimize harm to nesting grassland birds. Whenever possible, mowing should not occur between April 15 and July 15 as this is the primary nesting season for grassland birds. Mowing during this period results in the loss of eggs or nestlings. Grasslands enrolled in conservation programs may have more restrictive dates. For example, some federal programs in Ohio restrict mowing from March 1 to July 15.

MOWING TIMING AND TECHNIQUE

The timing of mowing is critical for achieving management goals and should align with the biology of the target vegetation. Like prescribed fire, mowing is most effective when timed to disrupt undesirable plants during vulnerable stages of their life cycle such as seed production or active growth. Following the principle "mow high, go slow, and keep your power up" helps maximize effectiveness while minimizing equipment damage and costly repairs.

Selective mowing can be used to target invasive species like Canada thistle and common teasel, preventing them from setting seed and spreading. This approach avoids mowing the entire field by focusing only on infested patches. To prevent the spread of invasive plants between sites, it's essential to clean the tractor and mower deck before moving to a new location.

SPOT-MOWED FIELD DURING THE GROWING SEASON

STORM OVER FIELDS
by Olga Volodina

WEATHER AND MOWING

Grasslands should be mowed when vegetation is dry to prevent windrowing or clumping, which can smother desirable plants and cause equipment issues. Dry vegetation is less likely to stick to machinery, reducing the risk of rust, corrosion, and heat buildup from debris. After mowing, equipment should be thoroughly cleaned with a power washer or air compressor to prevent the spread of invasive seeds, minimize wear and tear, and allow for easier inspection and early detection of maintenance issues.

USING A ROTARY MOWER TO MOW CRP LAND

STYLES OF MOWERS

Two types of PTO-driven (Power Take-Off) mowers are commonly used with tractors: **rotary** and **flail** mowers.

ROTARY MOWERS

Rotary mowers are available in both three-point hitch models, powered by the tractor's PTO shaft, as well as pull-behind models with their own small engine. They use horizontally rotating blades beneath the deck powered by a central gearbox. Most models operate at 540 RPM, although 1,000 RPM versions exist, and can handle woody stems up to 3-4 inches in diameter. Sizes range from compact, 4-foot, single-gearbox units to large, 15-foot, multi-gearbox decks. Rotary mowers are durable and effective for cutting both grass and woody vegetation, provided ground speed, PTO speed, and deck height are properly managed. Excessive ground speed can result in poor cutting and windrowing rather than even distribution of clippings. For best results, operators should use slower speeds and higher mower heights, adjusting gear, power, and deck settings as needed.

ROTARY MOWER

FLAIL MOWER

FLAIL MOWERS

Flail mowers, also available in three-point hitch and pull-behind configurations, use small blades mounted on a horizontal shaft driven by a gearbox. They can cut woody stems up to 2 inches in diameter and are also available in 540 and 1,000 RPM models. Though less common than rotary mowers, flail mowers excel at finely chopping and evenly dispersing vegetation without windrowing. They are ideal for mowing grass and broadleaf plants, but caution is needed in unmanaged grasslands, as dense woody growth can damage the blades. As with rotary mowers, proper adjustment of tractor speed, power, and mower height is essential for optimal performance.

TOP-MOWING RESTORED FIELD TO BENEFIT SEEDLINGS

MOWING AND DIFFERENT VEGETATION TYPES

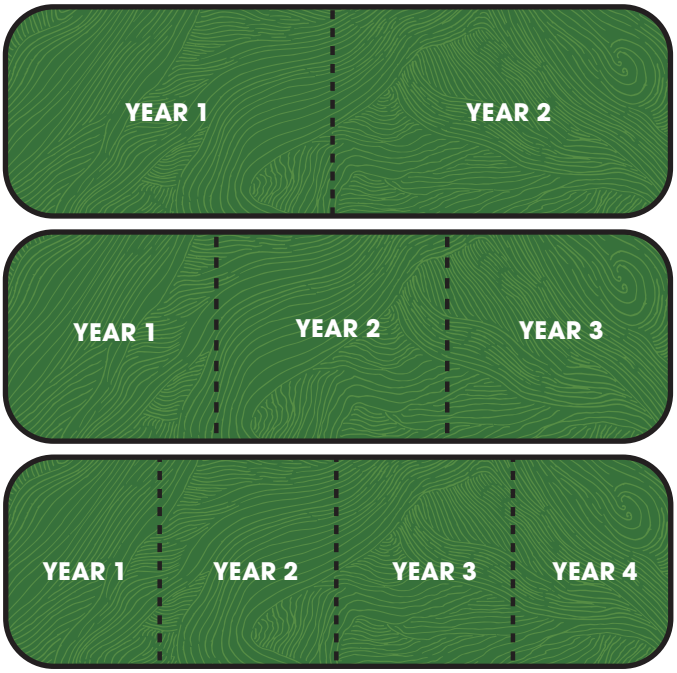
COOL-SEASON GRASS

Cool-season grasses like orchard grass, timothy, Canada and Virginia rye, and smooth brome grass can benefit from rotational mowing during the warmest part of the year. Mowing should be done during August, after the primary grassland bird nesting season, and should occur on a three-year rotational basis. It may be beneficial to divide a cool-season grass field into manageable units like thirds or quarters (Figure 17) so a portion of each field can be rotationally mowed each year if there is a problem with woody encroachment. As with prescribed fire, mowing in rotational units over a period of a few years leaves important wildlife cover on the landscape during management events.

Rotational mowing for cool-season grasses is beneficial for multiple reasons. First, mowing helps suppress encroachment of unwanted vegetation, particularly the establishment of woody plants. Second, mid- to late-summer mowing can distribute the ripened seed of cool-season grasses. Without mowing management, broadleaf and woody competition tends to outcompete cool-season grasses over a 10-year period. For example, Canada goldenrod is a beneficial native species but it can also form monocultures and exude chemicals that prevent forb diversity. Canada goldenrod can be controlled by spot mowing or rotational mowing and should be mowed prior to blooming to prevent the species from taking over large expanses. Spot-mowing for woody encroachment should occur during late winter. Rotational mowing should be conducted after the primary nesting season with a mowing height of 8-10 inches. This retains some cover for wildlife and keeps mowing debris thin. Maintaining tractor PTO and ground speed prevent material from being windrowed.

MOWING IN QUARTERS

FIGURE 17. Dividing a cool-season grass field into manageable units like thirds or quarters



COOL SEASON GRASS

WARM SEASON GRASS
by Lars Johansson

WARM-SEASON GRASS

In the absence of prescribed herbicides, fire, or grazing, warm-season grasses like big bluestem, Indiangrass, little bluestem and switchgrass can be managed with periodic mowing to limit the encroachment of woody vegetation and undesirable plants. Mowing in late summer, close to the end of the primary nesting season (after July 15), can prevent undesirable plants from going to seed. However, mowing in the growing season will result in excessive thatch. Mowing warm-season grasses during the growing season alone will not effectively control them but it can serve as a pre-treatment for easier application of herbicides. Mowing heights during late summer should be no lower than 12 inches to minimize mowing debris, which may smother beneficial wildflowers and forbs. Mowing during this time allows for some regrowth of warm-season grasses before winter. Winter mowing can also be conducted on a rotational basis to keep woody vegetation small and under control. Again, setting up a field into rotational units can keep most of the wildlife cover on the landscape during a critical time of year for wildlife. Mowing when the ground is frozen and free of snow makes for easy work as the tractor and mower are not as stressed as when mowing green vegetation. When the weather is below freezing, woody vegetation cuts cleaner and obstacles can be easier to see. Efforts should be focused on woodland edges where woody encroachment occurs quickly. Winter mowing heights can be lower than during the summer, but care should be taken to not windrow vegetation or create a layer of thatch that impedes growth of forbs and native warm-season grasses during the next growing season.

BIGELOW CEMETERY STATE NATURE PRESERVE
by Richard Smith

WOODY VEGETATION

Left unmanaged, woody vegetation increases in density and size, shading and crowding out herbaceous plant communities within a few years. Grasslands in Ohio can become dominated with woody plants unless managed with prescribed fire, mowing, grazing, and/or herbicides. Mowing woody vegetation is hard on operators, equipment, and budgets. To be effective and easy on equipment, this operation is best done slowly and frequently. This means mowing with full power settings, low travel speeds, and re-treatment intervals of to two to four years, depending on growth rates. The stem diameter of woody vegetation to be mowed must fall within the specifications of the mower being used. Cutting woody vegetation that is larger than the equipment can handle (typically vegetation 3 inches and larger for rotary mowers) causes damage and undue stress to the equipment. Specialty mowers such as brown tree mowers, tree mulching mowers, hydroaxes, other heavy-duty machines are available through contractors for larger woody vegetation. Many of these tools fit on a compact track loader platform, which is highly maneuverable and creates minimal ground pressure during wet conditions. Mowing low during late winter may inhibit resprouting during the spring. Following up with herbicide to spot spray resprouts can be a very effective technique to control woody vegetation.

SPRAYING HERBICIDE

HERBICIDE

The use of herbicides to control undesirable vegetation is often necessary to optimize the use of time and financial resources when managing grasslands. Repetitive mowing, cutting, or pulling all undesirable plants is not always a feasible option for control. Given the diversity of available herbicide products specific to a wide variety of plants and habitats, herbicide treatment can be one of the most effective means to selectively manage grasslands, especially when combined with other management tools. Choosing the right herbicide chemistry is key to making applications selective. Broadleaf herbicides target broadleaf plants while sparing grasses, whereas grass-specific herbicides control grasses without harming most forbs or sedges. Some herbicides are selective only at certain label rates; as rates increase, they become more broad-spectrum and less selective. Adhering to guidelines on the herbicide label is essential to minimize damage to non-target vegetation. Further, understanding the life cycle of the target vegetation is important to select the correct blend of active ingredients and concentrations. For example, applying herbicide before seed production rather than after is generally more effective in controlling target species. Furthermore, some species such as teasel only produce seeds in their second year. Because of this, biennials can be easier to control in their first year, with a dormant-season herbicide application when many native species are not actively growing. Cool-season grasses are best controlled in cooler seasons when they are green and they are actively growing.

SPRAYING HERBICIDE BY HAND

Herbicide is often used to selectively control aggressive plant species within a grassland. However, care must be taken in the selection and application of an herbicide product to ensure that it meets the management plan objectives and minimizes risk to non-target plant species. Application methods are instrumental in minimizing non-target damage and promoting safety. For example, it may be more effective and efficient to remove woody vegetation mechanically and then paint the stems with herbicide. Low-volume applications with small tank sprayers or backpack sprayers can be used to target woody stems with oil-based herbicide during the dormant season to minimize non-target mortality. Foliar spraying can be used on small-and medium-sized plants with minimal overspray. Once woody vegetation gets taller, basal, hack-and-squirt, or cut-stump applications become safer for the applicator and more targeted for the vegetation. Low-volume applications can also result in cost savings.


HERBICIDE

In most cases, multiple years of control will be needed as the seed bank will persist for a few years. Additional herbicides can be applied to reduce germination of species from the seed bank, but these should be used with caution and strict adherence to labeling because they take longer to degrade in the environment. Additional information on herbicide treatment for a particular species is available from your local USDA service center, OSU Extension office, or herbicide dealer. Many single species control sheets and pesticide application courses and certification are offered through the Ohio Department of Agriculture and OSU Extension. These educational resources are highly recommended because pesticide laws in Ohio require applicators to follow the label prescriptively when it comes to mixing, applying, cleanup, and disposal of herbicides, containers, and equipment. All registered herbicides are approved by the Environmental Protection Agency (EPA) for specific uses, along with being approved by the Ohio Department of Agriculture for use in Ohio. Some restricted-use herbicides can only be purchased by certified applicators. If extensive application of any herbicide is required, consider becoming certified or hiring a licensed commercial applicator.

Try to prioritize areas where infestations of aggressive native or invasive plant species need to be controlled. For instance, start by targeting areas with small infestations and work towards areas with higher levels of infestation. Starting in areas with the greatest infestations allows smaller infestations to become larger and more difficult to manage. Multiple years of follow-up treatment may be required, especially for larger infestations, although the amount of effort should decrease each time. Maintaining and enhancing vegetation diversity through selective herbicide applications and interseeding will be instrumental in closing the gaps to reduce reinfestation of invasive species When herbicides are applied in accordance with the label, control of undesirable vegetation can be effectively achieved in an environmentally safe process. Whenever possible, it is best to use herbicide in conjunction with other methods to minimize its costs and maximize effectiveness.


HERBICIDE

DISCING IN COOL SEASON GRASSES

TILLAGE

Tillage is a management technique used to introduce disturbance into grasslands. Its primary goals are breaking down thatch, reducing plant density, exposing bare soil, increasing plant diversity, and ultimately changing plant community composition and structure to benefit wildlife.

Although tillage is commonly used in agricultural settings to prepare fields for planting, it can also be an effective standalone method for managing grassland habitats. Tillage breaks down thatch, reduces perennial vegetation density, and exposes bare soil, allowing dormant species to grow from the soil seed bank. Typically, tillage under 4 inches in depth is followed by a surge of annual forb and grass species and an increase in diversity and density of forbs in the field.

The short-term reduction of thick grasses and the increase in bare ground improve mobility and foraging opportunities for many bird species. Additionally, greater forb diversity provides more food for seed-eating birds and attracts invertebrates, which are critical for many grassland birds. Changes in the plant community and the resulting wildlife benefits can be easy to see and understand, but other things to consider before tillage include what equipment is needed and how to use it, when and how much to disc, specific target species to suppress or encourage, and what can go wrong.

There are many types of tillage implements used in agriculture — cultivators, rippers, chisels, plows, tillers, mulchers, and discs — each serving different purposes. Grassland tillage differs from traditional agriculture in that it often occurs while the soil is full of living roots and above-ground vegetation is still alive or attached. This creates more resistance on equipment and can lead to clumping or mechanical issues. A heavy offset disc is one of the most effective tools for disturbing grasslands. It can break up soil and root systems effectively, though it may still struggle in fields with thick vegetation. To reduce resistance and improve effectiveness consider using an additional technique. Prescribed fire can be used to remove excess plant material before tillage occurs. Mowing one to two weeks prior to tillage can also help break up vegetation. Multiple passes with the disc may be necessary to achieve desired results.

The timing and intensity of tillage depend on your management goals and current field conditions. For fields dominated by native warm-season grasses, two or more passes at least 9 inches deep with a heavy offset disc may be needed to expose at least 50% of the soil surface. The goal is not a finely tilled seedbed but a patchy disturbance. Growing season tillage (August–September) is most effective at reducing native grasses when plants are pulling their reserves down into their root systems in preparation for winter. Dormant season tillage (late fall to winter) can still yield good results though typically with less impact on established grasses. Fields dominated by introduced grasses may respond similarly, but these grasses often recover quickly unless herbicide is applied in conjunction with tillage.

Tillage is often used to suppress thick grasses and stimulate annual vegetation and forb growth, but it can also control dominant or undesirable forbs. For example, certain goldenrod species can become dominant in a field and herbicide and tillage can be effective control methods. Tillage can also stimulate the germination of undesirable species from the seed bank, which can then be targeted with follow-up herbicide treatments.

While tillage can be highly beneficial, it comes with risks. Tillage can unintentionally stimulate the growth of undesirable species, as some seeds remain dormant and viable in the soil for decades. This risk increases when unwanted species are already present in or near the field. In such cases, tillage should be approached cautiously, with realistic expectations and a plan for potential herbicide follow-up. Tillage also carries the risk of soil erosion and water quality issues, particularly on slopes or in floodplains. Similar to mowing, tillage can harm wildlife through direct mortality or temporary habitat loss. To minimize these impacts, avoid tillage during nesting and brood-rearing seasons — spring and early summer — and rotate tilled areas annually to maintain year-round habitat and promote diverse successional stages. Keeping tillage to smaller strips or areas within the field allows for better control of invasive species.

SPRING SEEDING

INTERSEEDING

Interseeding involves sowing seeds into existing grasslands — often in conjunction with another treatment — to enhance plant diversity and structure rather than starting from bare ground. It typically uses lower seed rates and different mixes than full restorations. This method is most effective when introducing species suited to the site but not currently present. However, similar diversity gains can be achieved through disturbance methods like grazing, burning, tillage, or herbicide applications, especially if the desired plant community was recently present. Some conservation programs, such as the Conservation Reserve Program, may require interseeding to meet plant community standards.

Interseeding is almost always paired with site preparation to reduce competition and expose soil, improving seed-to-soil contact. Common prep methods include burning, tillage, or herbicide application, often timed for late summer or fall to thin grasses and promote bare ground, with seeding in winter via drill or broadcast. Monitoring is essential, as disturbance can stimulate undesirable species from the seedbank. Selective herbicide use may be needed to control these but should follow proper protocols. Any seeding method can work as long as good seed-to-soil contact is achieved. In a common scenario, herbicide application, followed by a growing-season burn, and a dormant season seeding would be ideal to provide a bare-ground window long enough for forb germination and growth the first season.

FLUFFY SEED BOX OF DRILL

ESTABLISHING NEW GRASSLANDS

Establishing a new grassland is a rewarding but complex process that requires careful planning, site preparation, and long-term management. Whether the goal is to support pollinators, provide wildlife habitat, or restore native prairie, success depends on matching appropriate methods to the site's current condition and long-term objectives.

SITE SELECTION AND PREPARATION

Grasslands can be successfully established across a wide range of soil types and topographic conditions, making them suitable for restoration in many landscapes. Commonly restorable areas include pastures, hayfields, old fields, brushlands, and former agricultural fields. Each of these habitat types presents unique challenges and may require different tools and techniques for effective restoration.

NO-TILL SEED DRILL

In the case of bare ground, such as land recently disturbed by construction or agriculture, this disturbance can present an ideal opportunity for grassland establishment. However, that disturbance does not eliminate the seedbank of competitive species; in fact, it can often stimulate the germination of weeds. As a result, herbicide applications are often necessary following disturbance and may be needed in conjunction with planting. When bare soil is present and competition is minimal, seeding should occur as soon as possible to take advantage of the open conditions. Including fast-growing annual species in the seed mix can help quickly cover the soil, suppress weeds, and provide a protective canopy while slower-growing perennials become established. Recommendations for seed mixes and seeding methods are provided in later sections.

SOIL TESTING

Before planting, it's important to test the soil at the site. Soil testing kits are available through local Soil and Water Conservation District offices, typically for a small fee. Knowing the pH and nutrient levels can guide seed mix selection and determine whether amendments are needed. While cool-season grasses may benefit from fertilization, most native prairie species are adapted to low-nutrient soils and do not require fertilizer.

If the site is not bare ground, the next critical step in site preparation is the removal of undesired vegetation. The tools and techniques used vary depending on the current plant community and the desired restoration outcome. In most cases, effective control of unwanted species requires multiple treatments over more than one growing season to address plants that emerge at different times. Fall planting is generally not recommended, as it can limit the effectiveness of site preparation and reduce establishment success.

Begin with prescribed fire or mowing to reduce biomass and open the canopy. Follow-up treatments may include chemical control with herbicide, mechanical disturbance such as tillage, or solarization for small areas. If the goal is to completely remove the existing vegetation and start fresh, more intensive methods such as a broadcast herbicide application or full-site tillage may be necessary. In cases where you are working within an existing grassland, targeted disturbance techniques like spot herbicide application, selective tillage, or prescribed fire can help shift the plant community toward your desired composition.

Another common restoration approach is converting a cool-season grassland to a warm-season prairie. While this is often feasible, it becomes challenging when the site is overgrown with invasive shrubs or trees. In such cases, the dominance of woody vegetation can significantly slow the restoration process. For areas with sparse brush, manual removal using chainsaws can be effective, but safety protocols should be followed; chainsaw work should be done by at least two people. For denser shrub or scrub habitats, mechanical tree-mulching equipment can be used to clear several acres per hour. The thicker and more mature the woody vegetation, the more time and effort will be required to restore the site to herbaceous cover.

In areas with heavy autumn olive encroachment, stumps can be cut at ground level using chainsaws or below ground level using mulchers. Pallet forks mounted on a tractor provide a practical alternative to buckets for uprooting the root systems of large, scattered shrubs. Regardless of the method used, areas that are brush-mowed or mulched will typically require follow-up herbicide treatment during the following season to control resprouting. If root systems remain intact after mowing, a broadcast herbicide application can be used to suppress regrowth before seeding. Once the site is adequately cleared and treated, a no-till drill designed for native grasses and forbs can be used to establish the new plant community.

NO-TILL

HERBICIDE TREATMENT APPLIED TO SELECTIVELY TARGET COOL-SEASON GRASSES

HERBICIDE TREATMENT APPLIED TO SELECTIVELY TARGET WARM-SEASON GRASSES

HERBICIDE

Herbicide is a highly recommended method to kill undesired vegetation in restoration projects. Woody vegetation may require mechanical removal in addition to herbicide in a similar method to the management section above. If you are completely replacing a plant community, a broadcast spray across the entire area during the growing season is typically necessary at least once. For removing particular species, targeted application is recommended. Speak to natural resource professionals for recommendations about specific herbicide application. Herbicide licensing is available from the Ohio Department of Agriculture and is required under many situations. Initial control of undesirable plants is important to minimize issues with maintenance later. It is recommended to spend at least a full growing season with multiple applications. It is crucial to spend adequate time in exhausting the current seed bank so that planted seeds have a better chance to gain dominance. Furthermore , herbicides designed to be applied after planting can help to control weeds as the planted seed mix grows. These herbicides are typically coupled with specially designed seed mixes to be most successful. They can extend weed control after germination of the planting.

SPRING
CONTROLLED BURN

PRESCRIBED BURNS

Burns, described above in more detail, can also be an effective method of preparing a site for seeding. However, keep in mind that while burns can kill woody vegetation, grasses and forbs often have stimulated growth the next growing season. If you need to completely replace the plant community, this method may not be effective. This method is more useful if you want to interseed.

CONTROLLED
BURN

DORMANT
SEASON TILLAGE

TILLAGE

Tillage breaks down thatch, reduces the density of perennial vegetation, and exposes bare soil. Downsides of tillage include potential erosion from soil disturbance and the increased likelihood of undesirable species growing from the seed bank. Tillage can be done across an entire site or targeted to particular areas with undesirable plant communities. Tillage at the beginning of a restoration project can make the following season of herbicide applications more effective.

Tillage for grassland management differs from traditional agricultural settings in a number of ways, key among them being it is usually done while the soil is full of living roots with lots of plant material above ground that is alive or still attached to the ground. Avoid tillage in the spring and early summer when nests and young animals are abundant.

TILLAGE
ATTACHMENT USED
FOR TILLAGE

NO-TILL
SEED DRILL

SEED MIX SELECTION

Picking the plant species can be the most exciting — and overwhelming — part of planting a grassland. When selecting a seed mix for grasslands, there are a number of considerations. Most seed suppliers have suggested mixes or offer customized mixes for larger orders. Standard mixes can work well and oftentimes favorite or additional plants can easily be added to the mix. Keep in mind that grasses usually increase in abundance and other species decrease with time. To maximize diversity, consider having at least 50% of the seed mix composed of non-grass species. Try to pick a variety of flower colors and shapes to benefit a variety of pollinators and maximize showy blooms. Choose species that bloom during different periods so there are flowers throughout the growing season. This will benefit wildlife as well, as a greater variety of plants results in more diverse food resources for birds and other wildlife species. Adding in annual flowers, like cosmos and coreopsis, will provide blooms while the perennial forbs are becoming established. These species will disappear with time and will likely be completely gone by year five.

SEEDING METHODS

The most important part of seeding is to get the seed in contact with the soil. There is no best seeding method; each technique is useful for different conditions. Two common methods for seeding are broadcasting and drilling. Some species, like milkweeds, require a cold period to germinate. Other species, like many native warm-season grasses, can be planted in the spring. Work with natural resources professionals to identify the best timing and method for the desired seed mix.

SEEDING
BY HAND

BROADCAST SEEDING

Broadcast seeding, by hand or with equipment, is possible when soil is directly exposed. When broadcast seeding, it is recommended that half of the seed is spread over the entire area first, and then the other half be spread perpendicular to the first pass. This allows you to fill in areas you may have missed and ensures a more even spread of species. Often, lighter seeds come to the top of the mix while heavier and smaller seeds stay at the bottom. Adding sand to your seed mix can help you see where you have already been. All broadcast seeders are not made equally and some handle native prairie seed mixes better than others. The addition of inert carrier materials like sand, pelletized lime, or boiled rice hulls help some seeders better handle prairie mixes. Research your options and seek professional advice when in doubt. In some cases, it may make sense to increase seeding rates by 25% when broadcasting compared to drilling seed. However, consult a resource professional to ensure the increased rate is appropriate in each circumstance.

NO-TILL
SEED DRILL

NO-TILL SEED DRILL

No-till seed drills can often be rented from local soil and water conservation districts. These can be pulled behind a tractor and create furrows in which the seed is automatically dropped into a shallow strip of scarified ground made by the coulters. Typically, these drills have press wheels that act as depth gauges so seed is planted just underneath the surface or on top of the surface, depending on the settings.. This method ensures excellent seed-to-soil contact, uniform planting rates, and minimizes soil disturbance. Since this method does not disturb the roots of existing plants, unless herbicide was fully effective some of the existing plants will continue to grow.

PLUGS

Finally, transplanting seedlings can be a successful option for introducing new species to a field, albeit a costly one. Often referred to as plugs, transplanted living plants can compete with existing vegetation more readily than planted seeds. This method is worth consideration when the seeds of desired species are very costly or their establishment success rates are low when planted in natural settings. uniform planting rates, Plugs are also worth consideration when targeting species that are slow to mature and may not bloom for several years after the initial seeding. Plug planting and interseeding are great ways to enhance wildlife habitat but are not a substitute for routine management activities.

PLUGS

MANAGEMENT IN THE FIRST THREE YEARS AFTER PLANTING

Prairie plants tend to be slow growing, following the adage, "The first year they sleep, the second year they creep, the third year they leap." Therefore, monitoring and managing your prairie for the first three years is critical to establishment. Your project site may appear weedy at first and face competition from undesirable species, especially annual weeds. Control of undesirable species is especially important in the first two years. Mowing in early summer before undesirable plants produce seeds can be effective, and mowing can be repeated throughout the summer as needed to control emerging weeds. These establishment mowings should be 10-12 inches above the ground; mowing shorter can damage the planted seedlings. During establishment, the goal is focused on ensuring the grassland gets off to a good start. Achieving this goal is temporarily a higher priority than avoiding disturbance during the primary nesting dates. Cleaning off your mowing equipment beforehand is recommended to prevent the introduction of undesirable species. Spot herbicide application on thicker patches or problematic perennial weeds such as Canada thistle may also be warranted and require professional advice. While you can't expect the prairie species to fully cover the ground in the first couple of years, you should see them present, albeit small, across your planted area. Additional seeding in the second or third year can fill in gaps as needed.

SUMMARY

SUMMARY

Our grasslands today have changed from those historic to Ohio as human management of them has shifted. However, there are management options that benefit both people and wildlife. Using rotational grazing strategies, implementing diverse native plants, and incorporating disturbances, including prescribed fire, are all possibilities to consider when planning your ecologically sound grassland management.

BOBOLINK
by Grayson Smith

RESOURCES FOR LANDOWNERS

CONSERVATION PROGRAMS

Farm Bill conservation programs have had an enormous effect on grassland bird conservation, especially on private lands. Most of these farmland programs are administered by the federal government, but some have been initiated by local and state governments. Early conservation programs like the Soil Bank from the Agricultural Act of 1956 focused on landowners voluntarily retiring land for payment from the federal government. After the Soil Bank program was implemented, many states reported increases in ring-necked pheasant abundance and harvest (Berner 1988, Taylor et al. 2018) and eastern meadowlarks nested in fields enrolled in the Soil Bank program (Roseberry and Klimstra 1970).

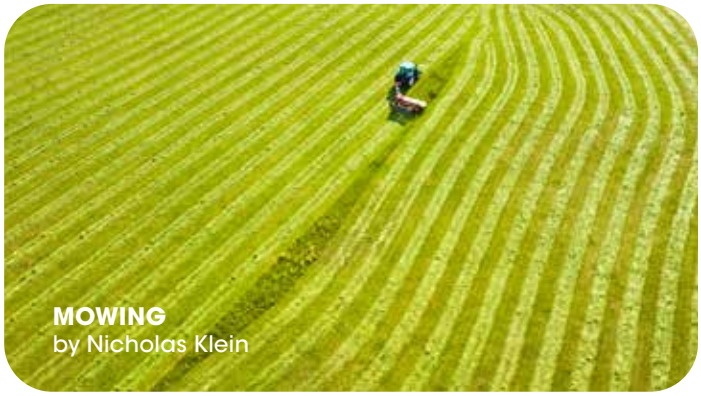
The Conservation Reserve Program (CRP) was established in the 1985 Farm Bill. The CRP pays landowners to establish cover, primarily grassland, in exchange for an annual rental payment from the federal government. Contracts are typically 10 to 15 years in duration. The CRP has been extremely beneficial for many grassland birds due to the broad reach of the program. Within the Midwest, CRP grasslands have benefited many grassland birds like bobolink, eastern meadowlark, grasshopper sparrow, Henslow's sparrow, northern bobwhite, and ring-necked pheasant (Herkert 2007, Herkert 2009, Hiller et al. 2015, Taylor et al. 2018).

FINANCIAL ASSISTANCE PROGRAMS FOR LANDOWNERS

- **Conservation Reserve Program (CRP):** this program is operated by the Farm Service Agency. It provides financial support and cost-share for a variety of grassland practices.
- **Conservation Stewardship Program (CSP)**: this program is operated by the Natural Resources Conservation Service (NRCS) and provides financial resources for many agricultural and forestry practices.
- **Environmental Quality Incentives Program (EQIP):** this program is operated by the NRCS. It provides financial assistance for a variety of grassland, shrubland, and forestry practices.

RESOURCES FOR PEOPLE WHO CAN ASSIST

- **Wildlife Management Consultant:** Works for the Ohio Division of Wildlife to assist landowners with habitat management.
- **Farm Bill Biologists**: Works for Pheasants Forever and Quail Forever and provides technical assistance with grassland establishment and management.
- **Soil and Water Conservation District (SWCD):** Organized by the county. SWCD offices are usually composed of several employees. One or two may specialize in wildlife or grassland management.
- **Natural Resources Conservation Service (NRCS):** a federal agency that usually has local service centers. Employees provide technical and financial assistance for a wide variety of agricultural, grassland, forest, and wildlife management.
- **Farm Service Agency (FSA)**: a federal agency that provides financial assistance for land management. FSA administers many Farm Bill programs, including CRP.
- **Ohio State University Extension:** Provides educational opportunities for many grassland and wildlife management techniques.
- **Local Park Districts:** Local park districts often provide expertise and may assist landowners.



MOWING
by Nicholas Klein

CASE STUDIES

MANAGING FOR RING-NECKED PHEASANT AND NORTHERN BOBWHITE

Northern bobwhite and ring-necked pheasant are both resident species in Ohio, so management for the full annual cycle is critical. Overall, a property managed for these two upland game birds should aim to provide a diverse mix of grass and forb species. Ideally, the grassland would consist of about 30-50% forbs.

RING-NECKED PHEASANT

From April through July, it is essential to provide undisturbed grassland where the vegetation is at least 8 inches tall. This provides adequate nesting cover for hens. Grass provides concealment for pheasants, increasing the likelihood of a nest successfully hatching. If possible, delay mowing and haying in these areas until after July 15, when most hens have completed their nests.

As mentioned previously, abundant and diverse forbs can be beneficial for chicks of pheasants and bobwhite. Forbs typically support diverse insect communities, which are high in protein and allow chicks to grow rapidly. Forbs are also less dense than grasses, allowing chicks to move more easily as they forage. Having bare ground within the grassland can also facilitate movement of young chicks.

Maintaining small, native shrubs like American plum, hazelnut, raspberry, or blackberry along the border of the grassland or in patches within the grassland is important for northern bobwhite. These shrubs provide critical cover from predators and often serve as covey headquarters during the winter. Pheasants also use shrubs as cover, especially during the winter. It is important to set shrubs back every few years so that the shrubs don't take over the grassland. Thick, native warm-season grasses, especially switchgrass, provide excellent winter cover for pheasants.

When managing grasslands for pheasants and bobwhite, maintain a rotation of disturbance. Avoid disturbing the entire grassland in any given year. Aim to keep complete management on about one third or half of the grassland each year. This provides cover for pheasants and bobwhite by leaving a portion of the grassland undisturbed. The rotational disturbance can include use of prescribed fire, tillage the field, or mowing to combat woody encroachment and maintain plant diversity. Aim to reduce invasive and problematic species in the grassland, like teasel and thistle.

MANAGING FOR GRASSLAND

BOBOLINK
by Nina Harfmann

SONGBIRDS

Similar to pheasants and bobwhite, April to July is critical for nesting grassland songbirds. If possible, delay mowing and haying in these areas until after July 15 (at the earliest) or August 1, when most birds have completed their nests. When managing grasslands for songbirds, maintaining a rotation of disturbance can create a diversity of structure across the grassland. Different species may use the grassland based on the recent disturbance. For instance, Henslow's sparrows and sedge wrens are likely to use areas with thick, dense grass two-plus years since disturbance. Species like bobolink and dickcissel are more likely to use areas with mixed forbs and grasses one to two years post disturbance. In Ohio, most grassland-specialist songbirds use vegetation that is 40 inches or shorter; maintain grasslands at or below that level. All grassland-specialist songbirds avoid tall woody vegetation, so keeping tall trees and shrubs out of the grassland is imperative. In general, try to maintain a diverse grassland plant community, with about 30 – 50% forbs.

HENSLOW'S SPARROWS
by Brian Woolman

NORTHERN BOBWHITE
by Daybreak Imagery

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AMERICAN GOLDFINCH

APPENDIX

TYPE	COMMON NAME	SCIENTIFIC NAME	STATUS
GRASSES	**Indiangrass**	*Sorghastrum nutans*	Native, aggressive
	Switchgrass	*Panicum virgatum*	Native
	Big Bluestem	*Andropogon gerardii*	Native, aggressive
	Little Bluestem	*Schizachyrium scoparium*	Native
	Sideoats Grama	*Bouteloua curtipendula*	Native
	Eastern Gamagrass	*Tripsacum dactyloides*	Native
	Canada Wild Rye	*Elymus canadensis*	Native
	Prairie Junegrass	*Koeleria macrantha*	Native
	Sand Dropseed	*Sporobolus cryptandrus*	Native
	Rough Dropseed	*Sporobolus compositus*	Native
	Timothy Grass	*Phleum pratense*	Introduced, aggressive
	Tall Fescue	*Festuca arundinacea*	Introduced, invasive
	Reed Canary Grass	*Phalaris arundinacea*	Introduced
	Kentucky Bluegrass	*Poa pratensis*	Introduced
	Orchard Grass	*Dactylis glomerata*	Introduced
	Johnson Grass	*Sorghum halepense*	Introduced, invasive
FORBS	**Black-eyed Susan**	*Rudbeckia hirta*	Native
	Brown-eyed Susan	*Rudbeckia triloba*	Native
	Partridge Pea	*Chamaecrista fasciculata*	Native
	Illinois Bundleflower	*Desmanthus illinoensis*	Native
	Common Milkweed	*Asclepias syriaca*	Native
	Butterfly Milkweed	*Asclepias tuberosa*	Native
	Swamp Milkweed	*Asclepias incarnata*	Native
	Compass Plant	*Silphium laciniatum*	Native
	Wooly Yarrow	*Achillea borealis*	Native
	False Sunflower (Ox-eye)	*Heliopsis helianthoides*	Native
	Wild Bergamot (Bee Balm)	*Monarda fistulosa*	Native
	Foxglove Beardtongue	*Penstemon digitalis*	Native
	Stiff Goldenrod	*Solidago rigida*	Native
	Ohio Goldenrod	*Solidago ohioensis*	Native
	New England Aster	*Symphyotrichum novae-angliae*	Native
	Sky Blue Aster	*Symphyotrichum oolentangiense*	Native
	Blue Vervain	*Verbena hastata*	Native
	Gray-headed Prairie Coneflower	*Ratibida pinnata*	Native
	Giant (Tall) Ironweed	*Vernonia gigantea*	Native
	Wild Strawberry	*Fragaria virginiana*	Native

TYPE	COMMON NAME	SCIENTIFIC NAME	STATUS
FORBS	Plains Coreopsis	*Coreopsis tinctoria*	Native
	Purple Prairie Clover	*Dalea purpurea*	Native
	Bigleaf Mountain Mint	*Pycnanthemum muticum*	Native
	Roundhead Lespedeza	*Lespedeza capitata*	Native
	Purple Coneflower	*Echinacea purpurea*	Native
	Bull Thistle	*Cirsium vulgare*	Invasive
	Canada Thistle	*Cirsium arvense*	Invasive
	Serecia Lespedeza	*Lespedeza cuneata*	Invasive
	Spotted Knapweed	*Centaurea stoebe*	Invasive
	Teasel	*Dipsacus sp.*	Invasive
TREES	Black Locust	*Robinia pseudoacacia*	Aggressive, Native
	Honey Locust	*Gleditsia triacanthos*	Aggressive, Native
	Eastern Red Cedar	*Juniperus virginiana*	Aggressive, Native
	Callery (Bradford) Pear	*Pyrus calleryana*	Invasive
SHRUBS	American Elderberry	*Sambucus canadensis*	Native
	American Hazelnut	*Corylus americana*	Native
	American Plum	*Prunus americana*	Native
	Carolina Rose	*Rosa carolina*	Native
	Chokecherry	*Prunus virginiana*	Native
	Common Ninebark	*Physocarpus opulifolius*	Native
	Common Prickly-ash	*Zanthoxylum americanum*	Native
	Coralberry	*Symphoricarpos orbiculatus*	Native
	Dogwood	*Cornus spp.*	Native
	Hawthorn	*Crataegus spp.*	Native
	Sumac	*Rhus spp.*	Native
	Autumn Olive	*Elaeagnus umbellata*	Invasive
	Bush Honeysuckle	*Lonicera sp.*	Invasive
	Multiflora Rose	*Rosa multiflora*	Invasive
	Raspberry, Blackberry	*Rubus sp.*	Native

NORTHERN BOBWHITE

TYPE	COMMON NAME	SCIENTIFIC NAME	STATUS
BIRDS	Northern Bobwhite	*Colinus virginianus*	
	Ring-necked Pheasant	*Phasianus colchicus*	
	American Golden-Plover	*Pluvialis dominica*	
	Killdeer	*Charadrius vociferus*	
	Upland Sandpiper	*Bartramia longicauda*	
	Northern Harrier	*Circus hudsonius*	
	American Barn Owl	*Tyto furcata*	
	Short-eared Owl	*Asio flammeus*	
	American Kestrel	*Falco sparverius*	
	Horned Lark	*Eremophila alpestris*	
	Sedge Wren	*Cistothorus stellaris*	
	Grasshopper Sparrow	*Ammodramus savannarum*	
	Lark Sparrow	*Chondestes grammacus*	
	Clay-colored Sparrow	*Spizella pallida*	
	Field Sparrow	*Spizella pusilla*	
	American Tree Sparrow	*Spizelloides arborea*	
	Vesper Sparrow	*Pooecetes gramineus*	
	Henslow's Sparrow	*Centronyx henslowii*	
	Savannah Sparrow	*Passerculus sandwichensis*	
	Bobolink	*Dolichonyx oryzivorus*	
	Eastern Meadowlark	*Sturnella magna*	
	Western Meadowlark	*Sturnella neglecta*	
	Dickcissel	*Spiza americana*	

PURPLE CONEFLOWERS AT SMITH CEMETARY STATE NATURE PRESERVE
by Andrew Lane Gibson

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Funding for the Wildlife Restoration Act comes from an excise tax on firearms and ammunition. The Sport Fish Restoration Act is funded by an excise tax on fishing tackle, fish finders, and trolling motors; import duties on fishing tackle, yachts, and pleasure craft; and a portion of motorboat and small engine fuel taxes.

The U.S. Fish and Wildlife Service annually apportions Sport Fish and Wildlife restoration funds to state fish and wildlife agencies. The Ohio Division of Wildlife uses these funds to acquire land, restore habitat, produce and stock fish, conduct fish and wildlife research, secure fishing access, construct and operate target ranges, and provide aquatic and hunter education.

Together with state hunting and fishing license sales, the acts provide the backbone for fish and wildlife management across the nation. The economic contributions of anglers, hunters, and trappers provide a reliable funding source to conserve the resources we all enjoy.

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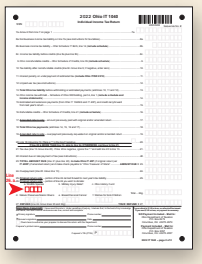

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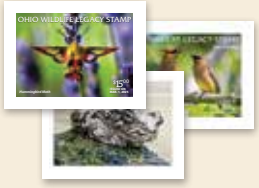

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