Chapter 2

Using native warm-season grasses to enhance wildlife habitat

Native grasslands are the most endangered ecosystem in the Mid-South. As a result, several wildlife species associated with grasslands in this region (particularly grassland birds) have experienced steep, long-term declines. Establishing and managing nwsg can enhance habitat conditions for those species that need early successional habitats to meet various life requirements (see Appendix 1), especially when a variety of legumes, other forbs and shrubs are growing in association with the grasses. Many properties are managed specifically for wildlife, while on others, wildlife management is a secondary objective to farming or some other land-use practice. Regardless, nwsg can be used to meet objectives in both scenarios. The first step is to develop a comprehensive management plan that includes a current assessment of the property, future goals and objectives and a timeline for development. The necessary steps for developing wildlife habitat within the constraints of the goals and objectives then can be identified.

Figs. 2.1 and 2.2 Native warm-season grasses and associated forbs can remain viable in the seedbank for many years. Many thousands of acres currently forested across the Mid-South were oak savannas just a couple of hundred years ago. This scene on the Catoosa Wildlife Management Area near Crossville, TN shows what timber thinning and annual burning can do in just five years. None of this area (1,000 acres) has been planted or sprayed, but the early-succession plant community has arisen naturally from the seedbank.

Figs. 2.3 and 2.4 Plenty of bare-ground space should be available in a field managed for wildlife. This allows better mobility for small wildlife, enables forbs to germinate from the seedbank, offers enhanced foraging habitat for seed and invertebrates, and provides dusting opportunities.

Benefits of nwsg over other cover types

Fields of nwsg are attractive to many wildlife species because of the **structure** presented. Simply put, nwsg are promoted for wildlife because they provide an excellent **source of cover**. The grasses themselves offer little as a food source and stands of **nwsg are not food plots**. Providing quality cover for wildlife is extremely important because cover is more often a limiting factor for wildlife than food. The availability and quality of cover on a property often limits the number of species (richness), as well as the number of individuals within a species (abundance). However, quality cover for one species may be quite different for another and the type of cover needed for one species often changes two or more times during the year (as described below). Fortunately, depending upon density, age, associated vegetation and management, nwsg can be used to meet several different cover requirements for many different species.

Structure

Because most nwsg grow in clumps or "bunches," open space at ground level can be provided when the grasses are not too dense. An open structure at ground level makes fields of nwsg and associated forbs especially attractive to small wildlife, including bobwhite quail and rabbits, as well as young wild turkeys. Mobility for animals no more than 6 inches tall is enhanced when the structure at ground level is open. Dense vegetation at ground level makes it difficult for these animals to travel and feed. A build-up of dead vegetative material (thatch) also precludes mobility of these animals. When faced with such habitat conditions, broods of quail, turkeys and grouse often use the periphery of a field instead of the interior. When these conditions prevail, available habitat, in essence, is removed; thus, the area's carrying capacity (the number of animals

Fig. 2.5 Insects and other invertebrates are the primary source of nutrition for bobwhite chicks and many other birds. Invertebrate abundance may be high, but that doesn't matter if invertebrate availability is low. Managing for the correct brood habitat structure that allows chicks to feed upon invertebrates should be the primary consideration, not invertebrate numbers.

an area can support) is reduced. Forced movement through such areas causes increased energy expenditure, which requires additional feeding to meet physiological and nutritional demands. Increased movement and exposure can lead to increased mortality, resulting from exposure to the elements, starvation and/or predation. All of this can result in stagnant or declining populations.

In addition to increasing mobility, an open structure at ground level facilitates feeding by broods and some songbirds, such as grasshopper sparrows, field sparrows, Henslow's sparrows and eastern meadowlarks. Invertebrates are the primary food of young broods; however, vegetation and seed become increasingly prevalent in the diet as broods mature. Seed is not available when a thatch layer is present, because quail do not scratch and turkeys do not begin scratching until approximately 4 months of age (about the time acorns begin to fall). When the structure at ground level is open with sparse bunches of nwsg and various forbs and the ground layer has been "cleaned" by burning, conditions for feeding and movement are optimum. Seed from legumes (and other desirable forbs) that have fallen to the ground then are available and insects and other invertebrates can be picked off surrounding vegetation easily. **It is important to realize open structure at ground level is determined largely by grass density and vegetation composition. In fact, optimum conditions for most species occur with only about 50 percent grass coverage. That means at least half the vegetative cover is forbs and scattered shrubs. The only way desirable vegetation composition and an open structure at ground level can be maintained is by periodic burning and/or disking.** Management techniques for nwsg are described on in Chapter 6.

Sparse stands of nwsg with an open structure at ground level are obviously attractive for brood rearing, but they are also used for nesting (remember: one bunch of nwsg represents one potential nesting site) if the field has not been burned or disked in the past year. In fact, senescent (dead) leaves of previous years' growth are used by birds and rabbits to construct and line nests. An attractive aspect of nwsg is that senescent leaves may remain erect into the following growing season (especially broomsedge). This serves three functions. First, thatch build-up is reduced when senescent leaves remain erect, enhancing mobility discussed earlier. Second, these

Fig. 2.6 Senescent grass from the previous year's growth is important nest building material for birds, such as this bobwhite nest.

leaves are readily available as nesting material. And third, some birds, such as Henslow's and field sparrows, dickcissels and indigo buntings, nest aboveground amongst the senescent flowering stems of the previous growing season.

Although moderately dense stands of nwsg may not be as attractive for brooding, they are used for nesting and escape cover. Obviously, these stands may have more potential as nesting sites than sparse stands, but they also offer more protective cover, especially during winter. Extremely dense stands, however, inhibit movement of some small animals and decrease in value for brooding, loafing, feeding and nesting cover. At this point, management is needed to thin the stand.

Adequate bedding and escape cover can be a limiting factor for white-tailed deer on some properties, especially where row-crop agriculture and/or cool-season pasture/hayfield is the dominant land-use practice. In these situations, deer often feed on rowcrops during the night, but travel one or more miles before dawn to bed and remain on adjacent properties with adequate cover during the day. Nwsg can offer excellent cover for deer to bed during the day. In fact, does readily use fields of nwsg to bed fawns in the summertime. Fawns remain still and bedded in the protective cover until the doe returns every few hours to allow nursing. Where quality fawning habitat occurs, fawn survival increases.

Fig. 2.7 Stems of big bluestem, indiangrass, and switchgrass often fall over and lodge through winter. This material provides cover for several wildlife species. There is a rabbit nest under these stems of big bluestem.

Fig.s. 2.8 and 2.9 Dense stands of nwsg may offer quality nesting and escape cover for many bird species. Brooding cover and food availability within these stands, however, is compromised. The structure and composition of dense nwsg stands can be improved with management.

The picture on the left shows dense nwsg in the 4th year after planting. The picture above is a section of the same field that was disked the previous May. The pictures were taken on the same day.

Importance of forbs and brush

It is important to realize the presence of forbs is critical in making a field of nwsg most attractive to wildlife. Blackberries, ragweed, pokeweed, partridge pea, native lespedezas and beggar's lice all produce quality seed, cover and forage for wildlife. While grasses provide structure for nesting and cover adjacent to the grass clump or bunch, many forbs (such as ragweed) provide a relatively wide protective canopy for quail and turkey broods and songbirds feeding and moving about underneath. For wild turkeys, this "umbrella canopy" is best when about 2–3 feet tall in June, covering the young brood, yet allowing the hen adequate visibility above the vegetation to detect potential predators. Later in the season, many forbs produce fruit and seed that are an important source of energy through the summer and into fall and winter. For deer, rabbits and groundhogs, forbs (especially legumes) offer more nutritious and palatable forage than grasses, with higher percentages of protein and total digestible nutrients.

Scattered brush and small trees also can make a field of nwsg and associated forbs more attractive to many wildlife species, particularly bobwhites

Fig. 2.10 Scattered brush is very important for many songbirds as well as bobwhite quail. Soft mast producers, such as this wild plum thicket, are particularly desirable.

Table 2.1 CP and ADF of selected forbs and grasses

Crude protein and acid detergent fiber analyses for selected forbs and shrubs collected in June after burning a field in April, McMinn County, TN, 2005. It is important to note that while some wildlife species are selective browsers or grazers, plants are not necessarily eaten based on nutritional content. For example, deer did not browse or graze all of the plants in the chart below. While old-field aster and pokeweed were grazed heavily, blackberry, goldenrod, ragweed and 3-seeded mercury were only browsed or grazed occasionally. For other species, such as passion flower and sericea lespedeza, there was no sign of grazing or browsing at all, even though crude protein and digestibility ratings were high.

Common name	Scientific name	CP	ADF	Selectivity by deer	Value as brood cover	Seed value for birds
blackberry	*Rubus* spp.	19.29	18.91	Med	High	High
Canadian horseweed	*Conyza canadensis*	32.85	19.75	Low	Low	None
goldenrod	*Solidago* spp.	16.14	26.19	Med	Med	None
honeysuckle	*Lonicera japonica*	16.16	34.21	Low	Low	Low
old-field aster	*Aster pilosus*	23.25	30.69	High	Med	None
partridge pea	*Chamaecrista fasciculata*	29.56	36.47	Low	Med	High
passion flower	*Passiflora incarnata*	36.64	18.91	None	None	Low
pokeweed	*Phytolacca americana*	32.01	11.98	High	High	High
ragweed	*Ambrosia artemisiifolia*	17.80	23.90	Med	High	High
sericea lespedeza	*Lespedeza cuneata*	22.19	32.62	None	Low	Low
3-seeded mercury	*Acalypha virginica*	24.66	16.73	Med	Med	Med
beggar's-lice	*Desmodium* spp.	28.22	20.70	Med	High	High
winged sumac	*Rhus copallinum*	23.05	12.46	Med	Med	Med
prickly lettuce	*Luctuca serriola*	21.70	21.20	High	Low	None

Fig. 2.11 Blackberry

Fig. 2.12 Pokeweed

Fig. 2.13 Beggar's-lice

Fig. 2.14 Sumac

Figs. 2.11–2.14 Blackberry, pokeweed, beggar's-lice and sumac are quality wildlife plants and should be encouraged along with native warm-season grasses. The presence of forbs in with native grasses is most important for forage, seed production, cover and structure to help keep native grasses erect through winter.

and several species of songbirds. Bobwhites often use brushy cover as a "covey headquarters" during fall and winter. Indigo buntings, dickcissels, yellow-breasted chats, northern cardinals, prairie warblers and white-eyed vireos use scattered clumps of shrubs and small trees for perching and nesting. Many shrubs and small trees also offer a valuable food source for many birds and mammals. Examples include wild plum, smooth sumac, staghorn sumac, winged sumac, American crabapple, hawthorn, wild cherry, persimmon, elderberry, hazelnut, common witch hazel, Carolina buckthorn and

Fig. 2.15 Scattered clumps of sumac provide nesting structure for dickcissels, indigo buntings, yellow-breasted chats and others. Sumac clumps also provide shade, which is critical for bobwhites during summer. Sumac produces seed and browse, eaten by deer that also bed under the shade in summer.

Figs. 2.16 and 2.17 Nwsg provide excellent cover for escape and roosting during winter. Nwsg can provide winter cover in cropped fields by establishing buffer strips. Deer, such as this yearling buck, seek out fields of native grass for bedding cover in winter.

Robin Mayberry

devil's walkingstick. Maintaining the appropriate amount and composition of shrub cover for the focal species requires periodic disturbance (particularly fire). Techniques for preventing a field from being overtaken by non-desirable woody species are discussed on page 133.

Winter habitat

Fields of nwsg can provide an excellent source of cover during winter (provided the grasses are not previously mowed or destroyed otherwise). These fields are often magnets for rabbits, over-wintering sparrows and deer. This can be especially critical for small wildlife at a time when quality cover is at a premium. Taller nwsg species, such as big bluestem, indiangrass and switchgrass, "lodge" (remain somewhat upright, leaning against each other) and provide suitable cover for wildlife even after winter rains, snow and wind. Nwsg that remain erect best through winter include broomsedge and the *Blackwell* and *Shelter* cultivars of switchgrass. Deer seek out these areas on cold, clear days because they can remain hidden in the tall grass, yet are able to absorb the sun's warm rays. In low-

Fig. 2.18 Winter rains and snow often cause tall nwsg to lodge in winter. This provides beneficial cover for rabbits and wintering sparrows. Here, a rabbit has been using this spot.

lying bottomlands that periodically flood in winter, fields of switchgrass (especially the *Kanlow* variety) can attract large numbers of ducks when shallowly flooded. Mallards, black ducks, pintails and green-winged teal readily feed upon available switchgrass seed. Naturally, as prey species use an area, predators follow. Thus nwsg fields also provide habitat for various predators, including red foxes, coyotes, red-tailed hawks, northern harriers, American kestrels and short-eared owls.

Using nwsg when wildlife is the primary objective

When a property is managed specifically for wildlife, the most important consideration is matching the habitat types available to the preferred habitat composition and arrangement for the focal species (see Table 2.2). Close attention should be given to the percentage of an area in various habitat types. For example, ideal habitat composition for bobwhites might be 50 percent early succession habitat including various nwsg, forbs and shrubs, 10 percent mast-producing hardwoods (managed on a relatively short rotation), 10 percent rowcrops (soybeans, corn, wheat) and 20 percent brushy cover. An ideal composition for white-tailed deer might be 40 percent mature forest (primarily oaks), 25 percent brushy cover (young forest, thickets, etc.), 20 percent rowcrops (soybeans, corn, wheat) and 15 percent native grassland (complemented with various forbs and shrubs). Ideal habitat composition, however, will not provide full benefits to wildlife unless habitat arrangement is addressed. A major focus should be to manage the habitat "mosaic" that has been created to benefit wildlife most.

Juxtaposition

Juxtaposition refers to the arrangement (and more specifically, the *placement*) of habitats. This is an important concept when managing an area for wildlife, especially wildlife with relatively small home ranges. Arranging cover, food and water all in close proximity helps minimize travel and exposure for animals using those resources. Arranging nesting cover adjacent to quality brooding cover minimizes necessary travel and exposure soon after hatching for broods. This can lead to improved survival and increased populations over time. When using nwsg in

Fig. 2.19 Juxtaposing necessary habitat types can reduce travel and exposure for some species. Here, quality nesting cover has been placed adjacent to quality brood rearing cover on the Kyker Bottoms Wildlife Refuge in East Tennessee. Quail populations on this area have been above one bird per acre since proactive burning and herbicide management strategies were initiated in 2000.

Table 2.2 Guide to major habitat types preferred by selected wildlife.

Primary species managed	Percent early succession	Arrangement of early succession	Percent cool-season legumes and annual grains	Percent rowcrop	Percent mast-producing hardwoods	Percent low brushy cover
Bobwhite quail	20–70	Blocks ≥ 3 acres or strips ≥ 50' wide	In firebreaks	5–30	5–20	20–40
Cottontail rabbit	10–70	Blocks 1–5 acres or strips ≥ 50' wide	In firebreaks or small fields	5–30	15–30	20–50
Wild turkey	10–30	Blocks ≥ 2 acres	2–5; In firebreaks or fields	5–40	30–60	10–30
White-tailed deer	5–30	Blocks ≥ 2 acres	2–5; In firebreaks or fields	5–40	30–60	20–40
Scrub/shrub songbirds (field sparrow, blue grosbeak, indigo bunting, yellow-breasted chat)	30–70	Blocks ≥ 5 acres or strips ≥ 50'	In firebreaks	<10	0	50–70
Grassland songbirds (grasshopper sparrow, Henslow's sparrow, eastern meadowlark, dickcissel)	70–100; without shrubs	Blocks or complexes ≥ 100 acres	In firebreaks	<10	0	<20

a management plan, it is important to consider the size, shape and *placement* of the field in the arrangement. When managing for bobwhites and other species with small home ranges (such as rabbits), all habitats needed to meet various seasonal requirements should be within a 40-acre area and, optimally, should be *juxtaposed* in close proximity.

Whereas the amount of nwsg acreage needed varies among wildlife species, it is always a good idea to have early-successional habitat well-interspersed across the entire property, ensuring this habitat type is located within the home range of all wildlife that need it. Locating a particular habitat type in only one portion of a property may exclude many animals from having

access because it is out of their home range. It should never be assumed the habitat needs of quail, rabbits or any other species have been met just because one field of nwsg has been established. In addition, establishing nwsg is only one component of habitat management. Incorporating nwsg into a wildlife management plan should complement other practices, such as forest management and old-field management (which, in most fields, ***is*** nwsg and associated forbs and shrubs). Obviously, what is recommended for a 10-acre property will not be adequate for a 100- or 1,000-acre property. Table 2.2 provides general guidelines regarding the proportion of a property that should be managed in a particular habitat type for various species.

Another important consideration is the surrounding properties (that is, the surrounding landscape), especially for properties or landowner cooperatives less than 1,000 acres. If suitable habitat is lacking on surrounding properties for animals to immigrate to and emigrate from, it is possible the local population may become stagnant or begin to decline. It is also in these situations where predation can become a limiting factor. Predators are fully capable of identifying areas with an abundance of prey. Once located, predation rates can become artificially increased and limit small game populations, even where quality habitat exists.

Planning nwsg acreage for bobwhites and cottontails

Bobwhite quail is the most commonly targeted species for management when using nwsg. However, the biggest obstacle to restoring quail populations to levels of years past may be habitat fragmentation. While the issues surrounding this problem are beyond the scope of this manual, it is important to be aware of the situation and limitations it can present, especially when managing habitat (including fields of nwsg) for quail on relatively small acreages and in isolated "quail areas."

Habitat fragmentation adversely affects quail (and other wildlife species dependent upon early-successional habitat) by isolating local populations. Habitat fragmentation for quail occurs when much of the quality cover over a large area (such as 5,000 acres) is slowly replaced by unsuitable habitat, such as housing developments, shopping centers, continuous and maturing forestland, and unsuitable pasture/hayfields (such as tall fescue and bermudagrass). On a landscape level, the percentage of suitable habitat can decline substantially over time. Often, this change in habitat composition is not perceptible until populations have become isolated. This precludes emigration of quail from one area to another, which limits the flow of genetic variability. Isolated populations are also much more vulnerable to severe declines resulting from environmental pressures. For example, poor nesting success and brood survival two years in a row

may reduce an isolated population to a level from which it cannot recover. Increased pressure from predators or over-hunting may produce the same effect; however, a non-isolated population may be able to withstand these pressures as birds immigrate from surrounding areas and buffer the losses. **Where isolated populations occur, it is also common to see little or no increase in the population even when extreme efforts are made to enhance quail habitat. This is frustrating to the land manager, who then often blames the lack of quail on predators or some other "obvious" reason for the decline.** Nonetheless, where viable populations of quail and rabbits are possible, it is critical that habitat arrangement is considered closely and managed appropriately.

No minimum acreage has been determined to best fit the needs of quail; however, nesting success and brood survival may be higher when larger fields (2–10 acres or more) are available. When only small fields and strips of suitable cover are available on a limited portion of the landscape, it is possible for nest predators (such as raccoons and skunks) to obtain a search image for these areas. Because quail are attracted to nwsg for nesting, smaller patches and strips of nwsg can become effective "predator traps," where a raccoon, for instance, could move through a narrow strip or small patch and destroy several nests in a single night. A larger field or wide buffer strip (≥ 50 feet) makes finding a nest more like the proverbial needle in a haystack. Many land managers have wondered why the quail population on their property did not increase after a strip or small patch of nwsg was planted. Naturally, there is much more to managing and increasing quail populations than merely establishing nwsg; however, it is quite possible for quail-nesting success to *decline* after implementing a theoretically beneficial management practice because the habitat was not positioned correctly and/or was insufficient in size and shape. While it is often not practical or sensible to control *predators*, it is practical and sensible to control *predation*. This is possible by managing cover correctly.

Quality brood habitat should be located adjacent to nesting habitat. According to the structure and composition of the field (density of grass bunches and presence of forbs and shrubs), a field may contain quality nesting and brooding habitat, but more often the best brood habitat is in the field that was burned or disked the previous winter. Escape cover (brushy cover, thickets) should be located along at least one side of a field managed for brood habitat. In addition, escape cover should be located along one side of a potential food source, such as rowcrop fields.

While fields with irregular-shaped borders may increase the amount of edge, if the composition and structure of the field is well-suited for quail,

Figs. 2.20 and 2.21 Blocks of cover are recommended over narrow strips of cover. A raccoon or skunk could find every quail nest in this narrow strip of broomsedge (above) in a single night; whereas searching through a wide buffer strip (below) or an entire field of cover is more like finding the proverbial needle in a haystack.

Chris Wolkonowski

Fig. 2.22 This field is managed by burning and/or disking sections on a 2–3-year rotation. This type of management provides diverse plant composition and structure and resembles a field of edge, which benefits bobwhites, early succession songbirds, rabbits, deer and turkeys.

an increase in edge will not necessarily benefit the birds. The objective is to create a *field of edge*, providing attractive habitat across the entire field rather than just along the border of the field. This also applies to rabbits. Fields of nwsg and associated forbs and shrubs can support an amazingly high rabbit population. When quality habitat is established and maintained throughout the field, the majority of rabbits are no longer found along the edge, but in the interior of the field. Locating nwsg fields adjacent to young forest stands or streamside (riparian) woody cover provides excellent habitat for rabbits. Rabbits do not seem as sensitive to larger acreages as quail and have responded surprisingly well to smaller fields (<2 acres).

Planning nwsg acreage for deer and turkeys

Larger animals, such as white-tailed deer and wild turkeys, will use nwsg fields regardless of size. Larger fields, understandably, may harbor more fawns during summer than smaller fields; however, the best response by deer will occur when nwsg fields are well-dispersed across the property. Because adult does maintain a well-established dominance hierarchy, relatively

small (<5 acres) high-quality fields for fawning may be used by only one doe— that being the dominant doe in the resident doe group. The majority of use by other adult deer in the summertime may be determined largely by the composition and quality of forbs present in the field. Forbs comprise approximately 70 percent of a deer's diet during the growing season. Grasses are rarely eaten at this time. The nutritional quality and palatability of forbs may be increased the growing season after a winter burn.

Depending on the structure and vegetation composition within a field, wild turkeys may use it for nesting. Similar to the concerns for quail nesting, success of wild turkey nests also might be higher when larger fields are used. Normally, wild turkey hens choose to nest adjacent to some type of object (such as a tree, stump, deadfall, clump of brush). However, if the average field height is $\geq$ 3 feet with bramble growth and scattered shrubs, the field will be more attractive to nesting hens and may contain several nests.

Planning nwsg acreage for songbirds

As with quail, habitat fragmentation has been a major factor associated with the decline of many grassland songbirds. Grassland birds use a wide range of field sizes; however, most species prefer larger blocks of habitat. Some species, such as grasshopper sparrows, rarely use blocks of habitat smaller than 100 acres. Other species, such as Henslow's sparrows, dickcissels and eastern meadowlarks, readily use patches or fields only 20 acres in size (depending on landscape context; see below). One determinant of habitat use is territory size of individual male birds. A male eastern meadowlark may establish a territory of eight acres where he sings in the center and attracts females. Intruding males are driven away. In this situation, it is obvious why a grassland complex of 100 acres or more is needed to sustain a viable local population of eastern meadowlarks, though relatively small fields may be occupied by small numbers of birds.

The overriding determinant regarding use of nwsg fields by many grassland birds is the composition of the surrounding landscape. If there are few other suitable grassland fields in the surrounding *thousands of acres*, some birds, such as Henslow's sparrows, may not occur in the area. This is especially true in vastly wooded areas where a field has been created and nwsg established. It is most difficult (if not impossible) to attract such birds to an *island* of suitable nwsg in a vast *sea* of forest, regardless of habitat quality in a given field or area.

Another challenge when managing grasslands for songbirds is providing grassland habitats in a variety of species assemblages and successional stages. Some grassland songbirds prefer tall grass, others nest in short

Figs. 2.23 and 2.24 Habitat fragmentation is a serious issue for many wildlife species. Some grassland songbirds require blocks of habitat no less than 100 acres, such as the field above. It would be foolish to assume area-sensitive grassland birds, such as grasshopper sparrows, would use small openings located in vast forested areas, such as this aerial view of the Nantahala National Forest in western North Carolina. It is important to realize the composition and structure within a given field might be ideal, but overall use may be minimal or nonexistent because of the surrounding habitat conditions.

grass and others use fields with more forbs and/or shrub cover (Table 2.2). Thus, not only is it important to manage for a variety of field sizes, fields dominated by different grass/forb/shrub mixtures and fields in various stages of succession (years since burning/disking) are also needed.

Considerations for nwsg management

A field of nwsg is no better than the technique(s) used to manage it. If not managed correctly, nwsg can become rank and unattractive to many species over time. Prescribed fire, disking and grazing are recommended for managing nwsg and associated old-field habitats. Regardless of the management practice used, it is most important to manage fields on a rotational basis. Because structural requirements vary among species and seasons, it is certainly not recommended to set back succession on an entire field (depending on field size) or on all fields present (depending on the number of fields and their proximity on a property) at one time. For example, if brood habitat and forage quality are prime in a field the summer after a winter burn, and nesting habitat and soft mast availability are prime two or three years after a burn, then it is undesirable to burn all available habitat every year. Escape cover may be best three or four years after burning. For these reasons, fields should be managed on a rotation. This can be accomplished in a number of ways.

Sections of a field can be separated with a firebreak(s) so they can be burned on a rotation corresponding with the number of sections. For example, a 20-acre field is "separated" using firebreaks into five sections, approximately four acres each. Section 1 is burned in year 1, section 2

Steve Capel

Fig. 2.25 This landowner in Virginia has gone out of his way to see that nesting cover is juxtaposed to brooding cover. A variety of successional stages and cover types, all in close proximity, is advantageous to bobwhite quail and several other wildlife species associated with early-succession communities.

burned in year 2, section 3 burned in year 3, and so on. This way, brooding habitat, nesting habitat and escape cover (diverse habitat conditions) are provided in the same field each year. Likewise, if three or more fields are located in close proximity and the fields are relatively small (< 3 acres), entire fields can be burned on a three-to-five-year rotation, according to the land management objectives and focal species being managed. Often, the rotation used is based upon the response of the field, especially if woody growth is excessive, invasive plants are problematic and/or vegetation litter is accumulating rapidly. Techniques to deal with these problems and other troubleshooting tips are discussed in Chapter 6.

Using nwsg when wildlife is a secondary objective

James Woodall

Fig. 2.26 Quality soil doesn't have to be taken out of production to establish native warm-season grasses. Here, nwsg were planted to provide wildlife habitat on relatively unproductive rocky ground where crop production was marginal. This stand is 6 weeks old.

The majority of early-successional habitat in the Mid-South is privately owned and farmed. In many situations, wildlife management is not the primary objective; however, **a conscientious farmer is a true environmentalist** and certainly interested in conserving natural resources, which includes allowing for adequate wildlife habitat in a farm management plan. Nwsg can be used to accomplish this objective. Because nwsg are most effectively managed by burning, they can be used on areas with steeper slopes and/or rocky soils that might be difficult to maintain by mowing or disking. Also, because nwsg are adapted to grow relatively well in poor soils, these areas can be targeted for nwsg establishment, while preserving better soils for production agriculture. A very popular approach is to enroll in one of the cost-share assistance programs made available by the US Department of Agriculture (USDA).

Using USDA programs to meet objectives

Many opportunities exist for farmers and other landowners to receive incentive payments, sign-up bonuses, cost-share and technical assistance to establish nwsg buffers, hay, pasture and wildlife habitat in a variety of USDA programs (see Appendix 2). Most landowners are not familiar with the term "buffers" or the potential improvements they can provide a farming operation and wildlife habitat. Simply, buffers are strips or areas of intentionally managed permanent vegetation that help control soil erosion and chemical and animal waste runoff while providing wildlife habitat. Wildlife benefits are gained by making maximum use of field

edges (increasing usable space) by creating valuable nesting and brood-rearing cover.

Often, landowners want to improve habitat in a large field, but are reluctant to break up the field by planting hedgerows with shrubs and/or trees. In this case, a nwsg buffer can provide excellent escape cover and create more usable wildlife space, while not committing those areas to woody vegetation. When buffers are surrounded by bare cropfields, they are easily and safely burned in late winter or early spring to control invasion by woody vegetation and improve conditions for wildlife. Where burning is not possible, woody encroachment in buffers can be suppressed by spraying various selective herbicides (such as triclopyr) that do not harm nwsg (see ***Herbicides—Woody competitors***, page 133).

Fig 2.27 Native warm-season grasses complement other farm management practices well. Whether established specifically for wildlife or for haying or grazing, native warm-season grasses should be incorporated into the farm management plan of every conscientious producer.

Buffers can provide both environmental and economic benefits, especially if landowners receive annual payments for establishing and maintaining nwsg buffers within certain USDA programs. Environmental benefits, such as improved water quality by reducing runoff and increasing infiltration, can be achieved when buffers are used to prevent sediments, fertilizers, animal waste and pesticides from entering streams, rivers and other water bodies. Research by the USDA Agricultural Research Service National Sedimentation Laboratory in Oxford, Mississippi has indicated nwsg are very good filters during concentrated flows. In fact, a buffer of switchgrass 3 feet wide has been shown to filter the equivalent of a tall fescue buffer 20 feet wide.

Fig. 2.28 Buffers established adjacent to drainages can prevent sediment flow and provide critical habitat that can support many wildlife species and help increase wildlife populations. A native grass buffer is much needed along the edge of this drainage ditch.

Although positive effects on water quality may be realized with narrow buffers, relatively wide buffer strips (≥50 feet) should be used to improve wildlife habitat.

Research by Mississippi State indicated densities of wintering native sparrows were more than twice as high in 65–130-feet wide nwsg buffers than

Fig. 2.29a Nwsg buffers can lead to increased numbers of quail and songbirds using rowcrop fields, even cotton.

Response of bobwhites to nwsg in USDA programs

Various programs supported through the Farm Bill give renewed hope for achieving landscape-level habitat improvement for bobwhites. As a result, bobwhite populations have responded amazingly well. For example, in Crockett County, Tennessee, areas with newly planted nwsg were monitored from 2000–2003 using a whistling bobwhite index on Conservation Reserve Program (CRP) areas (both block and buffer strip practices) using nwsg (n = 24) and control areas (n = 18). The primary land-use practice in Crockett County is row-crop agriculture with cotton the primary crop. All sites monitored were in production agriculture with similar land-cover characteristics, except control areas did not have any acreage in nwsg. There were no nwsg planted in Crockett County until 2000, when approximately 600 acres were established. In 2001, an additional 1,200 acres were planted.

The average whistle count per minute for all CRP sites increased from summer 2000 to summer 2003 by 232 percent, while the average for all control areas decreased by 46 percent. Not all nwsg stands, however, produced a positive response for bobwhites. Little or no increase was observed on stands established near large forested areas. The largest increases were recorded in more open landscapes that were predominately open fields and hedgerows.

	2000	2001	2002	2003
Fields with NWSG	1.5	2.1	3.2	3.8
Fields without NWSG	1.3	0.8	0.9	0.7

The importance of nwsg for nesting cover in open agricultural landscapes was most obvious during this study. One CRP site was a 100-acre cotton field that contained several shrubby areas along abandoned steep slopes and sediment basins. During 2000, only one bobwhite was heard the entire summer. In 2001, the 100-acre cropped area was planted to nwsg. The shrubby areas were not planted, but retained to provide important shrub cover and break up the field. By the summer of 2003, more than four bobwhites could be heard on any given day, with a call rate of one "BOB-WHITE" every five seconds any time during the morning. Fall covey counts documented five large coveys using this area.

Landowner selection and use of nwsg in USDA programs are key to the restoration of local and regional bobwhite populations. Once established, however, management of these grasses is very important to maintaining and/or increasing wildlife populations.

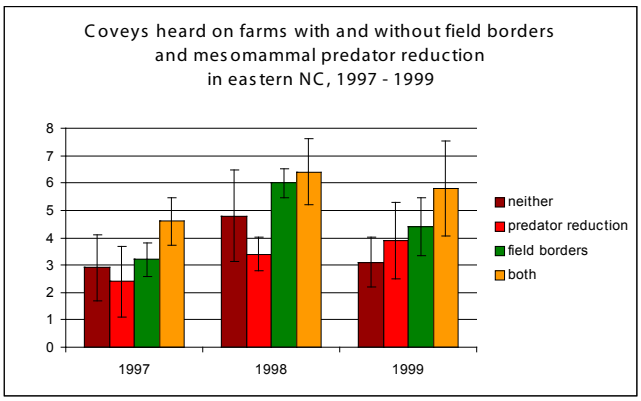


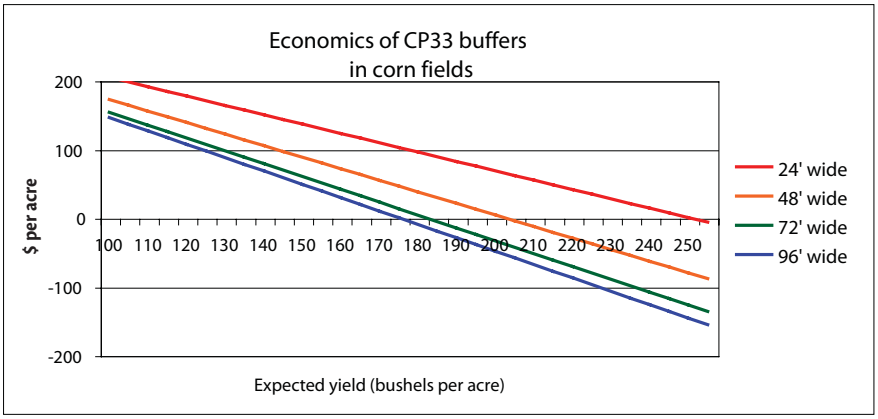
Fig. 2.30a-b Fallow borders around crop fields was the driving factor behind increasing bobwhite populations in North Carolina. Predator control alone did not work. Only when coupled with field borders did trapping mesomammals (racoons, skunks, opossums, foxes) help increase numbers of bobwhite coveys. (Palmer and others 2005)

Table 2.3 Comparison of wintering sparrow densities (per acre) on rowcrop fields in eastern North Carolina with and without field borders, February 1997, 1998 (Marcus and others, 2000).
Most birds (93percent) detected in the field edges were sparrows, including song (*Melospiza melodia*), swamp (*Melospiza georgiana*), field (*Spizella pusilla*), chipping (*Spizella passerina*), white-throated (*Zonotrichia albicollis*) and savannah (*Passerculus sandwichensis*), and dark-eyed juncos (*Junco hyemalis*).

	with field borders	**without field borders**
Whole-field density	3.6	1.6
Field edge density	14	5.2

in CP33 (CRP Continuous Signup field borders practice) buffers 23–33 feet wide. Wider buffers also harbored more bird species than narrow buffers. Nonetheless, even narrow buffers were advantageous. Bobwhites and dickcissels were completely absent from fields without buffers, while fields with buffers contained these species. Fields with buffers also provided quality nesting habitat. Again, fields with wide buffers contained disproportionately more nests (2.1 nests/acre) than those with narrow buffers (0.1 nests/acre), while no nests were found around fields without buffers.

Planting is not always necessary! By simply allowing field borders to grow fallow, wildlife populations dependent on early-succession habitat should increase. In a four-year study in North Carolina, both bobwhite and wintering sparrow populations increased on farms after field borders were delineated and allowed to grow fallow around crop fields. In fact, even on farms where exhaustive predator removal took place, bobwhite populations remained steady or declined, **unless field borders were established.** The researchers at NC State showed *predator* control alone did not work,



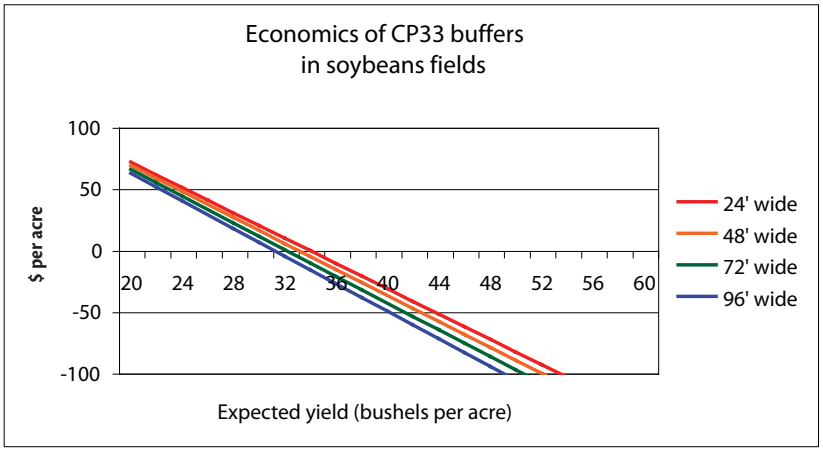


Figure 2.31a and b. These data depict the results from a model developed by Dr. L. W. Burger at Mississippi State University to evaluate economic tradeoffs associated with establishing CP33 field buffers in production soybean and corn fields. Based on Tennessee data (10-year average corn price, $1.98/bu, corn land rental rate, $45.00/ac; 10-year average soybean price $5.72/bu, soybean land rental rate, $37.75/ac), the graphs demonstrate the loss or gain in revenue on a per acre basis for each swath of a 24-foot combine around a field edge when that edge is placed into the CP33 program. Field edges are typically the least productive part of the field as a result of competition with adjacent brush, trees or other vegetation. As an example, a 24-foot (1 swath) CP33 buffer on a corn field with an expected yield of 175 bu/ac, will result in a $100/ac net gain in revenue for the producer for the enrolled acres. A 72-foot (3 swath) buffer on that same field will enhance considerably more habitat for wildlife and still provide about $10/ac in revenue on enrolled acres. As expected, the economic gain associated with CP33 enrollment is reduced as field productivity increases, but the wildlife value increases.

unless *predation* was controlled. The results of the NC study clearly indicated that providing nesting and brood-rearing cover was the reason for the increase in quail populations. Only after the habitat was improved did trapping mid-sized mammalian predators have a positive impact. By providing quality field buffers, adequate screening cover was afforded the quail hens and chicks, which made it difficult for predators to detect them. From an economic standpoint, it is much more efficient (and effective) to spend money on improving early-succession habitat for nesting and brood rearing than trapping alone.

Wildlife isn't the only thing to benefit when fallow borders are incorporated. Farm profits can increase as well. By taking field borders out of production, fuel, fertilizer, lime, seed and herbicide costs are reduced. This, coupled with the fact that borders along wooded areas naturally produce less yield (because of competition for nutrients and sunlight), helps to increase crop profit margins.

Economic benefits are realized by taking marginally productive areas out of production and protecting environmentally sensitive areas (such as riparian buffers, highly erodible soils). Landowners may be eligible for

Fig. 2.32 and 2.33 By taking edges of crop fields out of production and establishing nwsg buffers, sediments are trapped, wildlife habitat is created and money is saved. Establishing field buffers is truly a win-win situation for producers.

cost-share assistance to establish buffers and receive annual payments for 10–15 years, depending on the program enrolled. Many buffer locations currently cropped have as much as 40 percent yield loss in some locations, adding additional monetary losses to the farming operation. Popular USDA programs (such as Conservation Reserve Program) can make these areas profitable if enrolled into buffer practices like filter strips or riparian forest buffers. Additional economic gains for landowners can be realized through hunt leases and nwsg hay and seed production.

One of the most important aspects of establishing buffers is selecting the proper vegetation to ensure environmental gains *and provide wildlife habitat*. Consideration should be given to soil type, weed pressure and

Figs. 2.34 and 2.35 The difference in the amount of cover provided by filter strips planted to non-native cool-season grasses, such as this tall fescue (left), and those planted in nwsg is striking and obvious. If you were a quail or rabbit, where would you rather be? In the tall fescue filter strip or in the switchgrass/kobe lespedeza filter strip (right)?

the focal wildlife species. Buffers planted in non-native grasses, such as tall fescue and orchardgrass, may provide erosion control benefits but do not provide quality wildlife habitat. Nwsg, however, provide equal or better erosion control benefits **and** provide valuable wildlife habitat as well. Shorter species (such as little bluestem and sideoats grama) may be selected when improving quail nesting and brood-rearing habitat. Taller species (such as big bluestem, indiangrass and switchgrass) may be used to provide stream bank stabilization and escape cover for rabbits, quail and deer.

Types of nwsg buffers

There are several types of buffers with a variety of names to describe similar buffers with similar benefits. Common types of buffers include field borders, filter strips, riparian forest buffers and contour buffer strips. Field borders are areas established to permanent vegetation along the outer edge of agricultural fields, and can be established around an entire field or just along one or more sides. Filter strips are strips of grass established adjacent to a creek or other water body. Their primary purpose is to trap sediment, fertilizers and pesticides during rain events, but they also provide wildlife habitat when nwsg are used. Riparian forest buffers are a mixture of trees and shrubs planted parallel to streams to filter runoff and absorb nutrients, while providing food, cover and travel corridors for wildlife. Riparian forest buffers, as well as native grass buffers, also can be used to help stabilize streambanks. Riparian forest buffers sometimes include a strip of nwsg between the crop field and the tree planting. Contour buffer strips are bands of perennial vegetation alternated with wider cultivated bands farmed on the contour. Contour buffer strips can be established on existing cropped terraces. Check with your local Farm Service Agency office regarding practice specifications.

Problems associated with tall fescue and other perennial cool-season grasses

Tall fescue is an introduced, perennial cool-season grass originating in Europe. It was first found growing in North America in 1931 on a farm in eastern Kentucky by E.N. Fergus, a professor at the University of Kentucky. It is thought the grass was originally introduced to this farm as incidental seed, present in other grass seed from Europe, which was planted to this site before the owner at that time purchased the farm in 1887. After testing, the grass was released in 1943 as the variety Kentucky 31. Tall fescue was widely accepted in the Mid-South region and a tremendous amount of acreage was planted to Kentucky 31 through the 1950s. The trend continued and by the 1970s, tall fescue had become the most important cultivated pasture grass in the United States. Today, tall fescue is grown on more than 35 million acres and there is hardly a field in the Mid-South that has not been planted to tall fescue at some time in the past 50 years.

Many problems are associated with tall fescue, both for livestock and wildlife. Problems for livestock are associated with an endophyte fungus *(Neotyphodium coenophialum)* found within tall fescue that produces ergot alkaloids, which are highly toxic to livestock. Cattle consuming tall fescue (either grazing or as hay) often experience poor weight gains, reduced conception rates, intolerance to heat, failure to shed the winter hair coat, elevated body temperature and loss of hooves. Problems with horses are more severe, especially 60–90 days prior to foaling. Fescue toxicity in horses often leads to abortion, prolonged gestation, difficulty with birthing, thick placenta, foal deaths, retained placentas, reduced (or no) milk production and death of mares during foaling. As a forage, tall fescue and other perennial grasses are least preferred by white-tailed deer among cool-season forages. Cottontail rabbits had lower weights and smaller litters in tall fescue habitats. When fed a diet of tall fescue seed, bobwhites exhibited cloacal swelling, which ultimately led to increased mortality. Undoubtedly, many of the toxic effects of tall fescue on wildlife that consume the seed or foliage are unknown.

Known problems of tall fescue for wildlife are associated more with the structure created by the growth habit. Other introduced, cool-season perennial grasses (such as orchardgrass, bromegrasses, timothy and Kentucky bluegrass) also develop sub-optimal growing conditions near ground level. Although classified as bunchgrasses, the growth habit and structure of tall fescue, orchardgrass, bromes and timothy is dense, making travel by many small wildlife species (especially ground birds) difficult. In addition, leaves of these grasses droop and fall upon senescence, creating a deep layer of thatch. The dense growth structure and thatch layer preclude birds from picking up seed off the ground and prevent seeds in the seedbank from germinating. Thus, vegetative diversity and weed seed available as food for wildlife are drastically reduced. Tall fescue (and other perennial cool-season grasses) also provides poor winter cover for wildlife because of a lack of overhead cover.

Cool-season perennial grasses (especially tall fescue and bromegrass) are very competitive. When grown in association with nwsg, perennial cool-season grasses will, over time, lead to reduced coverage of nwsg and render otherwise suitable cover undesirable. When grown in association with clovers in a firebreak or forage plot, tall fescue and orchardgrass will dominate the site within 18 months, leaving little to no clover available for forage.

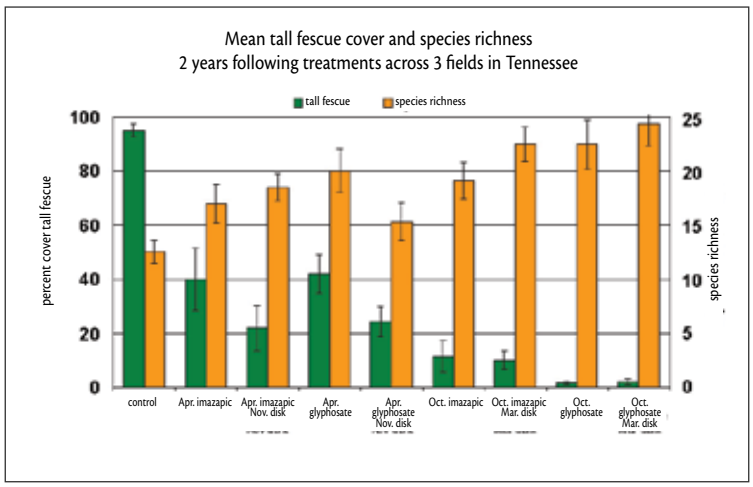


Fig. 2.36 Tall fescue and other non-native, perennial, cool-season grasses are analogous to an ugly shag carpet covering a beautiful hardwood floor. Once the carpet is removed, you can finally see what is underneath. Allowing the seedbank to respond is the best way to promote early-succession habitat on many sites. The data above show how species richness increased on three sites across Tennessee after tall fescue coverage was reduced. (Gruchy 2007)

Fig. 2.37 The structure presented in a field dominated by tall fescue is not conducive to travel by bobwhites, field sparrows, or young turkeys or grouse. Not only is movement through the field restricted, but plant diversity within the field is severely reduced because of the competitive cover and sod. Finding seed and insects in this type of environment would be impossible for a small bird.

Fig. 2.38 Orchardgrass
In terms of structure and overall wildlife value, orchardgrass is no different from tall fescue. Forage value for wildlife is extremely low, seed value is zero, relatively few invertebrates are associated with the grass itself and orchardgrass will out-compete clovers in a firebreak within two growing seasons. Orchardgrass should not be considered a "wildlife-friendly" grass.

Fig 2.39a Tall fescue

Fig 2.39b Orchardgrass

Fig 2.39c Annual forbs

Fig 2.39a–c These pictures show (a) the structure presented within a plot of tall fescue, (b) an adjacent plot of tall fescue sprayed with imazapic (Plateau®) the previous fall, which resulted in a plot of pure orchardgrass, and (c) an adjacent plot of tall fescue sprayed with glyphosate the previous fall and subsequently disked, which resulted in a plot of ragweed and sticktights (*Bidens aristosa*). This sequence of photos shows 1) the structure presented by tall fescue and orchardgrass are identical, 2) fields of tall fescue should be sprayed with glyphosate instead of imazapic if orchardgrass is present, and 3) the annual weed community provides a desirable open structure at ground level.

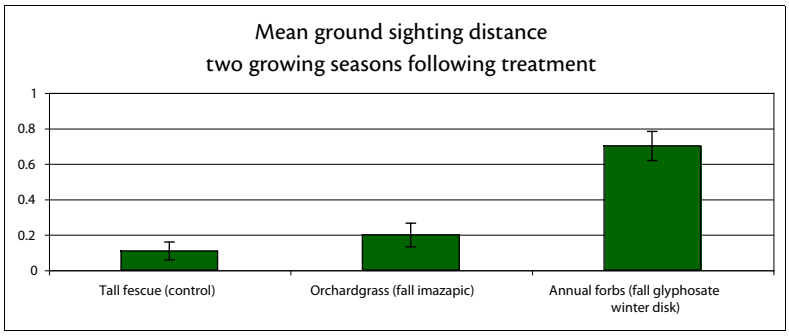


Fig 2.40 These data correspond to Figures 2.39 a – c and show ground sighting distance (openness at ground level) within fields dominated by tall fescue and orchardgrass are identical