Native warm-season grasses and early successional wildlife habitat: Past lessons and a new vision

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Abstract Tall fescue (*Festuca arundinacea*) and other non-native perennial cool-season grasses (such as orchardgrass (*Dactylis glomerata*), timothy (*Phleum pratense*), bromegrasses (*Bromus* spp.), and bluegrass (*Poa annua*)) provide poor wildlife habitat. Native warm-season grasses, especially big (*Andropogon gerardii*) and little bluestem (*Schizachyrium scoparium*), indiangrass (*Sorghastrum nutans*), and switchgrass (*Panicum virgatum*), have been promoted to replace non-native cool-season grasses and enhance early successional wildlife habitat. Initially, problems associated with establishing nwsg and landowner misperceptions slowed the progress of early succession habitat enhancement on private lands. More recently, improvements in planting equipment, herbicides, and seed quality have increased establishment success. Wildlife response to native grass plantings generally has been positive, especially when an abundance of wildlife-friendly forbs and scattered shrubs occur with the grasses. Landowners and many public wildlife managers, however, still have misperceptions about native grass plantings. Specifically, there is considerable confusion as to the appearance of quality early successional habitat. A persistent "farming mentality" finds fields with a diverse composition and structure unappealing. Instead, many landowners and managers typically wish to see fields of planted native grass appear like a tall fescue field—thick, clean and even, visually pleasing, with no "weeds." Prime early successional cover is often created simply by killing (thus removing) the non-native grass "carpet" and then stimulating the naturally occurring seedbank with fire and/or disking. There is no need to plant native grasses and forbs where a seedbank of desirable species await release. We advocate using the seedbank where possible to create "an early successional community," as opposed to a planted native grass field, to provide attractive habitat for wildlife dependent upon early succession.

INTRODUCTION

A historical perspective Land-use patterns have changed dramatically across the South in the past 50 years (Heard et al. 2000). The biggest change is human encroachment into rural areas (Southern Forest Resource Assessment 2002). Thousands of acres of potential wildlife habitat are lost each year to a growing suburbia. Moreover, land that isn't lost to urban development has changed greatly. The small family farms of yesteryear have disappeared along with small rowcrop fields that were fallow during much of the year, weedy field borders and fencerows, and brushy creek banks. Today, remnant farmland is stressed to produce high yields on larger fields that are double- or triple-cropped annually and cleaned with herbicides, leaving no fallow growth for wildlife habitat. Many fields

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that were in rowcrop production through the 1960's were planted to pasture or hay through the following decades, often just to keep the fields from "growing up," rather than for financial gain. Virtually ***all*** of these pastures and hayfields were planted to non-native perennial grasses, such as tall fescue and bermudagrass (*Cynodon dactylon*), which provide little wildlife benefit and displace potential quality early successional cover (Barnes et al. 1995). Many of these fields are not even used for haying or grazing, but simply mowed (that is, "bushhogged") one or more times through the growing season, often as a source of recreation by the landowner who enjoys working outside.

Through this period, many wildlife species dependent upon and/or associated with early successional plant cover experienced significant population declines (Peterjohn and Sauer 1999). These declines have been well documented for many species of birds, including northern bobwhite (*Colinus virginianus*), loggerhead shrike (*Lanius excubitor*), Henslow's sparrow (*Ammodramus henslowii*), field sparrow (*Spizella pusilla*), grasshopper sparrow (*Ammodramus savannarum*), and eastern meadowlark (*Sturnella magna*), and similar trends have been documented for eastern cottontail (*Sylvilagus floridanus*). Although there are few factors associated with these declines, the overriding cause is habitat loss and/or conversion to unsuitable cover (Dimmick et al. 2002). The loss of and conversion of desirable to undesirable plant cover types and the associated population decline for many early successional wildlife species occurred so slowly that it was not perceived by most landowners and wildlife managers until fairly recently.

Initially, many factors were blamed for population declines. For example, predation, disease, and inadequate food supply all were suspected and investigated to some degree as the cause for northern bobwhite declines. More recently, however, rigorous habitat investigations and population modeling have identified broad deficiencies in habitat quality on a landscape scale for most species strongly associated with early successional cover types (Burger 2002). Managers now realize the importance of habitat connectivity and landscape-scale conservation, and that many early successional species cannot be managed on a field-by-field basis (Guthery 1997). Nonetheless, habitat improvement begins at the individual field level and there is a strong push from the conservation community for landowners to improve habitat for wildlife dependent upon early successional cover. This effort includes a wide variety of programs that provide cost-share assistance and sign-up incentives designed to persuade landowners to change many current land-use habits (Heard et al. 2000).

PROBLEMS ASSOCIATED WITH PAST HABITAT IMPROVEMENT EFFORTS

Habitat improvement efforts have included eradication of non-native perennial grasses and establishment of native grasses, usually native warm-season grasses (nwsg). Switchgrass, big and little bluestem, and indiangrass have been the primary species recommended by state wildlife agencies, the Natural Resources Conservation Service (NRCS), and non-profit organizations. As private lands management initiatives have been developed, 5 main problems associated with these habitat improvement recommendations have become evident.

Lack of non-native grass control Non-native perennial grasses, such as tall fescue and bermudagrass, lack desirable cover and provide poor structure for many birds and other small wildlife (Barnes et al. 1995, Bond et al. 2005). Thick growth at ground level makes travel through fields dominated by these non-native species difficult. Seed availability also is reduced by the sod and thatch produced. Forb coverage is limited because of the literal "carpet" of grass that blankets the seedbank and limits germination. Before any habitat improvements can be made, it is imperative that these grasses be eradicated.

Many fields have been planted to nwsg without first spraying and effectively killing the existing non-native grass cover with the appropriate herbicide. Burning and disking do not kill these undesirable grasses (Greenfield et al. 2001, Madison et al. 2001). Even if nwsg are established successfully, non-native grasses grow amongst the nwsg within 2 years if they are not eradicated beforehand. Thus, even though nwsg are growing on the site, field conditions for wildlife remain suboptimal. The ubiquitous field of tall fescue with scattered bunches of senescent broomsedge rising above comes to mind. Although desirable nesting cover for bobwhites is present at the base of broomsedge, mobility within the field and food availability is limited at best.

Nwsg planted in fields containing bermudagrass pose an especially unique problem. Although herbicide advancements in the last 10 years have made nwsg establishment much easier, there is no herbicide that will kill bermudagrass growing in association with nwsg. Thus, the planted native grass must be killed to eradicate bermudagrass growing underneath. Many planting efforts have been for naught because bermudagrass was not eradicated before the field was planted. Even more common is the field of bermudagrass that was sprayed once, with apparent success, but patience was not exercised, and as the bermudagrass returned (albeit with less coverage) it was able to spread once again throughout the field over the course of a few years. **Eradicating bermudagrass requires at least 2 years!** Residual seedlings from the seedbank and sprouts from stubborn rootstock must be treated the year after the initial spraying. Native grasses and forbs should not be planted (for wildlife) until the seedbank has been evaluated. It is foolish to spend time and money planting if the seedbank holds problem plants that will render the effort useless or if desirable plants are present and await release.

Lack of establishment success Early attempts (1980's through the mid-1990's) at habitat restoration with nwsg was set back severely because of establishment problems. Establishment success has improved dramatically with recent advancements in planting equipment (e.g., no-till drills specifically designed for nwsg seed with long awns) and herbicides (Harper et al. 2004). However, despite these advancements, difficulties establishing native grasses and forbs still occur. Most notably, planting seed too deep and too late in the growing season and competition with undesirable plants lead to many planting failures. As a result, many landowners and managers become discouraged and recommended against planting nwsg because the seed did not germinate quickly (if at all) and the seedlings did not grow quickly during the year of establishment and/or did not compete well with "weeds."

Improper species mixtures and high seeding rates Prior to development of the appropriate drill attachments, it was difficult to sow the fluffy seed of bluestems and indiangrass. As a result, most managers planted switchgrass. The seed was small and smooth (much like millet) and it was easily top-sown or drilled. There were problems with plant competitors, especially with non-native warm-season grasses (such as crabgrasses and johnsongrass), but the patient manager could usually establish a stand of switchgrass within a couple of years. Thus, for many, establishing nwsg meant sowing a pure stand of switchgrass. Moreover, expectations as to what the field should look like undoubtedly were influenced by past experiences with non-native cool-season grasses. Managers planted thick stands of switchgrass, often using 8 – 10 pounds of pure live seed (PLS) per acre. As a result, wildlife response was mixed. It was recognized that a thick stand of switchgrass was not much different structurally than a thick stand of johnsongrass. Food availability was terribly low in these switchgrass monocultures because of a lack of desirable forb cover. Indeed, a pure stand of switchgrass was about as unnatural as a field of tall fescue.

As cost-share assistance programs began to enroll considerable acreage into nwsg and equipment improvements were made (late 1990's), more bluestems and indiangrass were planted. However, problems associated with field image continued. Mixed stands of nwsg were planted at 6 – 10 pounds PLS per acre, which resulted in a *thick mixed* stand with few forbs present in the field. Landowners began to think this was what "early successional habitat" should look like because that's what the biologists prescribed. Again, wildlife response was mixed, and it was common to see reduced wildlife activity in those fields with dense grass that were not burned or disked (Dykes 2005). Grass density generally became excessively dense 4 – 5 years after planting.

Lack of recognition of desirable early successional cover Although relatively high seeding rates were commonly recommended, grass density in many fields was *apparently* sparse. Landowners and many managers were accustomed to planting non-native cool-season grasses and food plots where it was common and *expected* to see dense grass seedlings coming up all over the field. A stand of sparse native grass seedlings was viewed as a failure. This, coupled with a plethora of "weeds" (which were as often as not most desirable forbs) germinating from the seedbank, stimulated many landowners and managers to mow, spray, or disk the field! Often, the field was re-planted in non-native cool-season grasses because the native grass planting had "failed."

Recognizing quality early successional cover is terribly difficult for most landowners, even those with a primary interest in wildlife. Maintaining a "clean and even" landscape without "weeds" is firmly engrained with most landowners. Thick stands of grass limit forb coverage, and this reduces habitat quality for most wildlife species that use early successional cover. Forbs and brambles, such as pokeweed (*Phytolacca americana*), ragweed (*Ambrosia artemisiifolia*), blackberries (*Rubus* spp.), native lespedezas (*Lespedeza* spp.), beggar's-lice (*Desmodium* spp.), partridge pea (*Chamaecrista* spp.), and several asters (*Aster* spp.) and goldenrods (*Solidago* spp.), provide structural diversity, more openness at ground level, quality forage, and an important seed source (Gruchy 2007). Forbs also attract high numbers of pollinators and other invertebrates, which are an important food source for many birds. Shrubs represent

yet another critical component for a number of wildlife species. Scattered shrubs provide additional cover and diverse structure needed by northern bobwhite and several "scrub-shrub" songbirds. Many shrubs, such as wild plum (*Prunus* spp.), sumac (*Rhus* spp.), elderberry (*Sambucus canadensis*), hawthorn (*Crataegus* spp.), and devil's walkingstick (*Aralia spinosa*), also provide soft mast for birds and mammals and are important components in early successional wildlife habitat.

Lack of management Although a number of management options exist to maintain early successional cover (Harper 2007, Harper et al. 2007), most fields enrolled into conservation programs were not "set back" or managed until 2004 when mid-management practices were prescribed by the NRCS to invigorate fresh growth and improve the structure and composition of enrolled fields. Unfortunately, a "reluctance to burn" attitude prevented many landowners and some wildlife managers from using fire to manage fields, leaving only mowing, disking, and herbicide applications as viable management options. Unless heavy offset disk harrows were available, it was impossible to disk the thick, tall mixtures that were recommended and planted; thus, most landowners used mowing as a management practice (Dykes 2005). This only made field conditions worse. Mowing was (and still is) most often accomplished during the summer. Landowners commonly reported killing young wildlife (such as fawns and nestlings) and the cover necessary for reproductive success was destroyed during the time of year it was needed most. Mowing also accumulated thatch and other debris, reducing openness at ground level and limiting germination and growth from the seedbank (McCoy et al. 2001, Dykes 2005, Gruchy 2007).

A NEW VISION

Recent research has shown burning and/or disking are necessary to reduce grass density and improve the structure and composition of early successional wildlife habitat (Gruchy and Harper 2006, Gruchy et al. In press). Further, managers have begun to realize 3 – 4 pounds PLS per acre is plenty of grass seed when planting native grasses is necessary. When coverage of native grass does not exceed 60 – 70 percent, plenty of bare ground space is available to allow forbs from the seedbank to germinate. If desirable forbs are not present in the seedbank, they should be planted with the grasses. This is necessary to develop an *early successional community*, replete with a variety of forbs, grasses, and scattered shrubs, which is used by an array of wildlife species. **This composition and structure is absolutely crucial when trying to replicate the quality habitat with which our native wildlife evolved**.

Ideal early successional cover is often created simply by eradicating non-native cover and allowing the seedbank to respond. Indeed, seed from many native grasses and forbs remain viable in the seedbank at least for more than 100 years, as evident by their germination and growth following clearing and burning mature forest. Recent research has shown dramatic increases in wildlife populations when naturally occurring forbs and grasses are allowed to develop in place of non-native cover (Palmer et al. 2005).

Is there a need to plant? If quality early successional habitat can be created by stimulating the seedbank, is it necessary to plant? **We don't think so**. However, there are some considerations when direct planting is not used.

An obvious consideration is waiting to see what the seedbank contains. This requires patience and time. Evaluating the seedbank 1 – 2 years after spraying existing non-native cover is difficult for some landowners, especially those who want improved cover "now." Seedbanks vary greatly from site to site, but there are some generalities that hold true. Forested areas at least 60 – 70 years old usually contain extremely rich seedbanks with few if any non-native early successional species. Within 2 years after clearing, a diverse early successional community is usually established without planting. Old pastures, however, are always full of non-native grasses and forbs. Knowledge of selective herbicides and timing of spraying and burning is necessary to remove undesirable plant species and promote desirable species. Fields that have been in agricultural production for many years often have a severely depleted seedbank, especially fields with a history of continued herbicide use. Planting is generally necessary when establishing quality early successional cover on these sites.

The remaining major consideration when promoting quality early successional cover for wildlife is landowner perception. The specific plants often being promoted – "weeds" – are what landowners have fought against for years. Creating the structure desirable for many species of wildlife that depend upon early succession is not aesthetically pleasing to most people; these fields look unkempt. To most onlookers, it reflects laziness of the owner and an unwilling attitude to "tend their property properly." Concern over what others might think is a real issue in persuading people to more appropriately manage for quality early successional plant communities. An aggressive educational campaign from natural resources professionals will be necessary to overcome this stigma and help the public see these fields not as weedy wastelands, but as native plant communities harboring abundant wildlife. As we see it, this is the next step in helping landowners enhance habitat so wildlife species dependent upon native early succession can rebound from precipitous population declines.

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