

# EROSION CONTROL

## November-December 2000

# Native Warm-Season Grasses for Erosion Control You Gotta Be Kidding!

Here's a win-win situation: Establishing native warm-season grasses in one season or less for erosion control and the enhancement of wildlife habitat.

By Thomas G. Barnes, Brian E. Washburn

Mention the native prairie grasses or native warm season grasses (NWSG) to most erosion control specialists, and they are likely to look at you and think, "This guy must have a screw loose. I can't use those because it takes three to five years for a stand to become fully established, and by that time all of my soil will be washed down to the Gulf of Mexico." Furthermore, they might inform you that the seed is expensive and needs special seeding equipment to sow. But when we tell them about our research over the past five years and how we can establish big bluestem, Indiangrass, and little bluestem in a single growing season, their attitude changes. We explain our work on eastern Kentucky strip mines with new no-till equipment and new herbicides. I contend that they can effectively establish these grasses in a single growing season.

How is that possible? The answer lies in two developments. The first is using new no-till native grass drills designed to cut through heavy grass sod and place seed at the proper depth. The second is the release of a relatively new herbicide, American Cyanamid's Plateau. This article provides a summary of our research and some management guidelines on how erosion control specialists can begin exploring the use of NWSG for erosion control on strip mines, highway rights of way, prairie plantings, and wildlife habitat.

### **NWSG and Wildlife**

Why are wildlife biologists conducting research on the establishment of NWSG? Because of the way the KY-31 tall fescue, a commonly used grass for erosion control, impacts wildlife. Tall fescue has been planted on more than 30 million ac. in the eastern United States for erosion control, for livestock forage, and on conservation reserve set-aside acres. More than 97% of all tall fescue fields are infected with an endophytic fungus that causes numerous reproductive and nutritional problems for livestock and wildlife. Livestock eating tall fescue typically have reduced weight gains, lower reproductive rates, and reduced milk production. Estimated annual costs to the livestock industry range from \$500 million to \$1 billion. Beef cattle operators traditionally "manage" around the problem. Dairy and horse operators, however, have no tolerance for endophytic fescue because it causes lowered milk production and spontaneous abortions in horses.

What about tall fescue and wildlife? Our studies document that tall fescue does not provide habitat for quail or rabbits. The dense, matting nature of the grass provides no overhead protection from avian predators, and the lack of bare ground limits birds from moving under the grass canopy to catch insects, find seeds, select a nesting spot at the base of a grass clump, or escape the harshness of winter. There is little plant diversity, which limits the birds' ability to select a nutritious diet, and there is insufficient seed production to maintain a viable population. The seeds and leaf tissue do not meet protein or mineral requirements for breeding or growing quail. We also found that quail do not prefer fescue seed, either infected or noninfected, compared to ragweed and foxtail seeds. When we forced quail to eat tall fescue, they exhibited higher mortality (almost 50% died) compared to other diets. Other studies have documented that grassland songbirds, Canada geese, and Zebra finches do not like tall fescue and lose weight when forced to eat the seeds. Quail populations continue to decline, and replacing fescue with NWSG provides for quail nesting, brood rearing, and winter habitat.

While our primary interest in establishing NWSG is for wildlife habitat, erosion control is another excellent reason. There are myths about how these grasses are not well suited for erosion control because they are bunch grasses. To quote

from J.E. Weaver's book, *Prairie Plants and Their Environment: A Fifty-Year Study in the Midwest*, "Frequently, half - and often much more - of every plant...is invisible.... (For roots) of *Andropogon scoparius* (little bluestem)...a lateral spread of 1.5 feet in the surface foot of soil is usual and a depth of 5 feet is ordinarily obtained. The upper 2 to 3 feet of soil is especially well occupied, but branching is profuse almost to the root tips." These grasses have tremendous root systems that hold the soil in place. The key for erosion control is getting the seeding rate heavy enough and the seeds established quickly.

Additional reasons for establishing these grasses and associated legumes and wildflowers include building organic matter in the soil, providing habitat for wildlife and butterflies, and producing high-quality hay (or grazing) for livestock. These species can be established with no fertilization on a variety of sites, including locations with poor soil characteristics and nutrition. Finally, establishing NWSG is an attempt to help re-create native prairie and the aesthetic values associated with this ecosystem.

## Research Program and Results



**No-till NWSG drills provide the most consistent results seeding these grasses because they have augers in the hopper and pickers that move seed into the tube.**

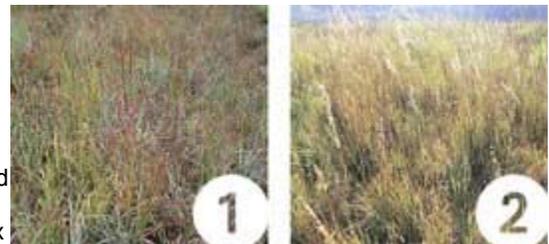
Our initial studies only focused on how to kill fescue. We found that a single spring application of glyphosate (we used Roundup) following a prescribed burn effectively reduced the amount of tall fescue to less than 1%. We monitored the plant communities for two years and found that by the second year, the fescue began reinvading our plots and became a dominant component by the end of the second growing season. Our next step involved planting something to provide habitat for wildlife. This began our foray into establishing NWSG.

Our first NWSG establishment study met with a fate similar to that of the project Martha S. Mitchell reported in the July/August 2000 issue of *Erosion Control* ("Going for Green: Creating a Prairie on New Ground"). It looked like a total failure. We had expected that, because the literature said it takes three to five years to establish these grasses. We were patient. About that time, the imazapic herbicide, Plateau, was released and promised to revolutionize how we establish NWSG. We conducted trials with the imazapic-containing product.

We set up our initial study comparing the use of glyphosate to imazapic for killing fescue and establishing NWSG at 10 locations across Kentucky. This study involved different physiographic provinces including the Cumberland Plateau, Outer Bluegrass, Interior Highland Rim, and Mississippi Coastal Plain. Each site represented a different soil type and soil nutritional profile. Each study site involved a field that was dominated by KY-31 tall fescue (< 85% cover). We used a standard seeding mixture (6 lb. pure live seed [PLS]/ac.) that included 2 lb. PLS each of big bluestem, little bluestem, and Indiangrass. We used a Truax Flex-II no-till drill for seeding.

Both glyphosate and imazapic did an excellent job of killing the fescue. At five of the locations, NWSG was successfully established the first growing season; that is more than one plant per square foot. Extensive weed competition at the other test locations, even in the imazapic plots, slowed the growth of the grasses. By the end of the second growing season, however, these plots still had excellent cover by the NWSG. For comparison purposes, we used the label-recommended rates of 2 qt./ac. glyphosate and 12 oz./ac. imazapic. We added 1 qt. of 28-0-0 liquid fertilizer/ac. and 1 qt. of methylated seed oil (MSO)/ac. to the imazapic tank mix. We prescribed-burned each plot in March, applied the herbicides in mid-April when the fescue was actively growing at 6 in., and seeded in mid-May.

The results of a second study, initially designed to evaluate the effect of nitrogen fertilizer on the growth of NWSG, mimicked those of our first study. The second study was not replicated at different locations. We burned the fescue field, applied the imazapic herbicide tank mixture in April, and seeded in late June. By the end of September, the NWSG provided more than 75% cover, and most plants flowered and produced



**1. Big bluestem establishment using 12 oz./ac. imazapic at the end of the initial growing season. 2. NWSG establishment on eastern Kentucky strip mine three years after initial seeding.**



**3. First-year plot on eastern Kentucky strip mine dominated by side-oats grama. 4. Six weeks after seeding NWSG into fescue sod using 12 oz./ac. imazapic. Notice the density of grasses and the lack of weedy competition.**

viable seed the first growing season.

A third study looked at using glyphosate to kill the fescue, followed by an application of imazapic for residual weed control. Our protocols were similar to previous experiments. We found that the 12-oz./ac. imazapic treatment still provided the best establishment for big and little bluestem and Indiangrass. However, using 2 qt./ac. of glyphosate after a spring burn followed by 4 oz./ac. of imazapic at seeding also provided excellent results.

Conclusions from these studies are convincing. We are confident that we can no-till establish these grasses in a single growing season. The key to establishment is obtaining good weed control and paying attention to detail.

We conducted one final establishment study looking at conventional tillage options. This time we prepared a standard seedbed by plowing, disking, and cultipacking prior to seeding. We broadcast the seed for this experiment and then cultipacked after seeding. We found that 4 oz./ac. of imazapic herbicide provided excellent weed control, and we obtained very successful stands after the first growing season. In untreated plots, a variety of exotic grasses, such as Johnson grass, giant foxtail grass, and crabgrass, outcompeted the native grasses. Other weedy species, including ragweed, also invaded and crippled the establishment of NWSG.

Remember our initial study that we called a "failure"? It turns out it wasn't a failure after all. At the beginning of the third growing season, we applied 12 oz. of imazapic in mid-April with no surfactant or fertilizer to those plots. Each plot had no more than 10-15% cover by NWSG at the beginning of the experiment. By the end of the growing season, the NWSG cover increased to 85-100%. Many of the NWSG seedlings were in the stand; they were suppressed by intense weed competition. The imazapic killed the weeds, and the NWSG flourished.

We used this information to design our last experiment, an attempt to quantify how much imazapic herbicide we could use to remove fescue from old fields that contained NWSG. No planting was required, just applying herbicide to kill fescue and "release" the NWSG. We used various rates of imazapic herbicide with and without a non-ionic surfactant (NIS) and with and without burning. We found that both burning and the use of an NIS increased the effectiveness of the herbicide. We obtained the best results by burning in March followed by an application of 10 oz./ac. of imazapic with an NIS in mid-April. Using this treatment, we effectively removed the fescue in all cases, and NWSG increased to be the dominant vegetation. One of many observations was that tall dropseed and an annual dropseed - in addition to broomsedge, Elliott's broomsedge, and little bluestem - were very tolerant to the 10-oz. treatment. A number of native wildflowers also "survived" this heavy treatment. These included prickly pear cactus, adder's-tongue fern, scaly blazingstar, several thoroughwort species, verbena, frost aster, large senna, widow's cross sedum, sneezeweed, green milkweed, yellow flax, and pencil flower.

### Practical Information

How can our research help erosion control specialists establish NWSG? Below are tips to help successfully establish these grasses in a single growing season.

First, proper planning before seeding will determine the success or failure of seeding these grasses. Second, pay attention to detail when seeding and applying herbicides. Third, Plateau is not a miracle herbicide that kills all other grasses. Carefully read the label.

Four critical factors affect the success of any NWSG planting: (1) seed quality, (2) planting depth, (3) weed control, and (4) weather. You can control all but the weather. *The two most critical factors that determine the success of any NWSG seeding are placing the seed at the proper depth (no more than 0.25 in. deep) and controlling competing vegetation during establishment (use of imazapic herbicide).*

Plan to seed NWSG is during the fall or winter preceding establishment. Take soil samples to your local county Extension office for soil fertility recommendations. Apply lime, potassium, and phosphorus as recommended. Do not apply nitrogen



**5. Same location at the end of the growing season. Cover averaged over 75%. 6. Truax no-till drill seeding site of photo 4.**



**7. Indiangrass establishment using 12 oz./ac. imazapic at the end of the growing season. 8. Big bluestem establishment at the end of the growing season. The fescue in this treatment was killed with 2 qt./ac. glyphosate. Four oz./ac. imazapic were applied at seeding.**

before planting.

Determine the site and soil conditions, because these will dictate which grass species to use. For example, wet sites dictate the use of prairie cord grass, switchgrass, or eastern gama grass. Mesic sites can be seeded with big and little bluestem, Indiangrass, or prairie dropseed. Xeric sites should be seeded with side-oats grama, little bluestem, and blue grama. Always follow the manufacturer's label when using any herbicide product. Some of these grasses are not labeled for use with Plateau, which works best as a preemergent herbicide with big bluestem, little bluestem, and Indiangrass. The herbicide will kill seedling eastern gama and switchgrass and should not be used with these species. It has been labeled for use with other NWSG, but we have no research data to validate successful establishment of these species. The native wildflower seeds that will germinate through the 12-oz./ac. no-till Plateau rate include partridge pea, Illinois bundleflower, purple and white prairie clover, black-eyed Susan, lance-leaf coreopsis, and ironweed. We are currently conducting research on the tolerance of various other wildflowers and hope to recommend additional species tolerant to the herbicide.

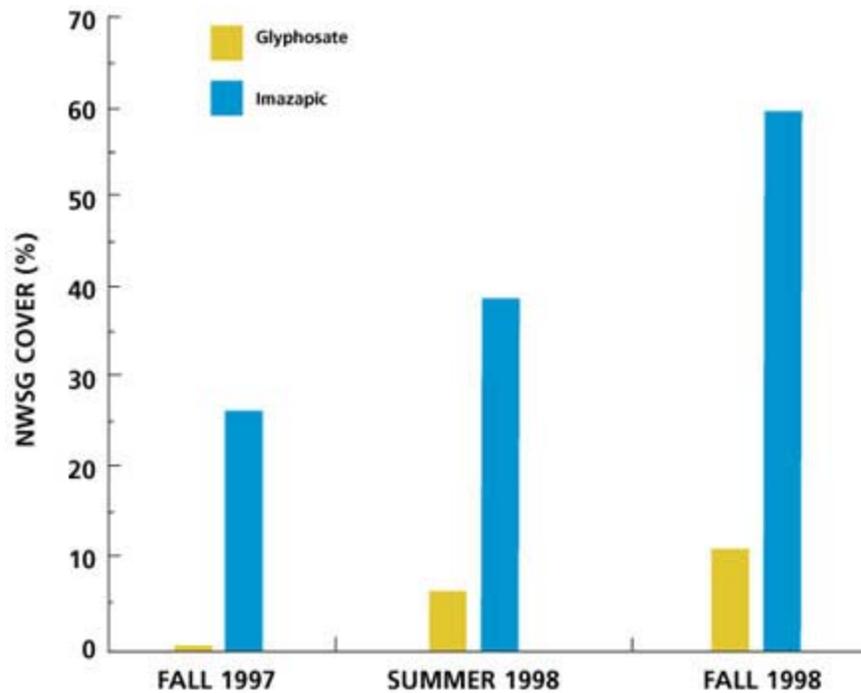
Once you have determined which grasses and/or forbs to use, contact nurseries to get information about price, seed quality, and availability. More than 50 nurseries currently sell NWSG. Select a reputable nursery, because you often get what you pay for with NWSG seed. Do not purchase "cheap" or inexpensive mixes. There is a reason they are cheap or inexpensive. The Kentucky Cooperative Extension service offers a publication free of charge containing nursery names and addresses. The best mixes will have a good germination rate and do not contain annuals or invasive flowers such as dame's rocket, cornflower, or Queen Anne's lace. To ensure you receive good-quality seed, purchase your wildflower and legume seeds separately and create your own mix of grasses and legumes. While this might cost more, it will guarantee that you get the species mixture you want and get first-quality seed. If you get legumes, be sure that the inoculant is included with the seeds.

The recommended seeding rate for establishing wildlife habitat is 6 lb. PLS/ac. A recommended seeding rate for erosion control is 8-12 lb. PLS/ac.

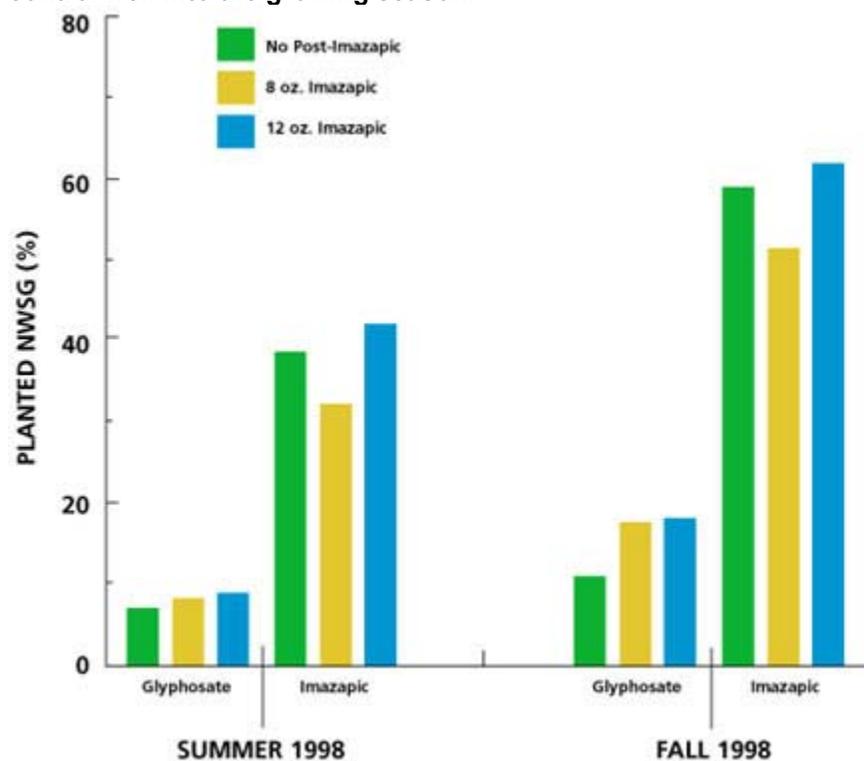
The best method for no-till establishment is to burn the field in late winter or early spring. If that isn't possible, you can hay (or heavily graze) the fescue. Removing standing fescue and the litter allows good fescue regrowth and obtains a good kill with the herbicide. Apply the following tank mixture to kill fescue sod: 12 oz./ac. of imazapic herbicide, 1 qt./ac. of MSO, and 1 qt./ac. of 28-0-0 liquid fertilizer. Apply the mixture in mid-April when the fescue actively grows and has reached a height of 6-8 in. You can add 1 qt./ac. of glyphosate to the tank mix (and reduce the imazapic to 8 oz./ac.) if you desire a quicker fescue kill. If you are killing other cool-season grasses or legumes, such as Kentucky bluegrass, timothy, orchard grass, or smooth brome, you can use glyphosate for the burndown at 2 qt./ac. followed by 4 oz./ac. of imazapic at seeding for residual weed control. For conservation reserve seeding you cannot use more than 4 oz./ac. of imazapic. The recommended protocol for conservation reserve planting is the same for the other grasses mentioned above.

Seed in mid-May or when soil temperature exceeds 65°F. You can seed as late as July 15, depending on rainfall. The best method of seeding uses a no-till drill specifically designed for seeding the fluffy seeds characteristic of these grasses. Switchgrass can be planted with a conventional grass drill, and eastern gama grass should be seeded with a corn planter. Proper seeding depth is 0.25 in., and it is better to have seed on the top of the ground than buried too deep in the furrow. As much as 30% of the seed can be on the top of the furrow.

The recommended protocol using conventional tillage or on bare soil calls for creating a good seedbed through plowing and disking, then packing the prepared seedbed with a cultipacker or a roller. At planting, apply 4 oz. of imazapic and seed with an NWSG drill. You can also broadcast seed if you cultipack the field before seeding and immediately after seeding to ensure good seed-soil contact. In that case, increase your seeding rate by at least 25%.



This simple graph shows a comparison of imazapic and glyphosate herbicides for establishing NWSG. Imazapic provides extended weed control well into the growing season.



Imazapic is more effective as a preemergence than a postemergence herbicide. After two growing seasons, the postemergence treatments had higher levels of NWSG. These levels, however, were much lower than plots treated preemergence.

If weed problems develop the first year, mow the field at a height of 12 in. once in July or August. Our research shows that when seeded properly with the use of imazapic herbicide, weeds are not a problem. Thereafter, burning every three to five years is the best maintenance for these grasses. Research indicates, however, that mowing or grazing to a height of no lower than 6-12 in. can also be effective and can create some of the same desired outcomes as burning.

If you want further information about our research, you may either contact Thomas G. Barnes or look up the publications listed at the end of this article.

Does it sound easy to establish NWSG? It is. With planning, preparation, and paying attention to detail, you can establish NWSG in one growing season. If wildlife biologists can do it, so can you.

Topics: [Seed and Soil Amendments](#)

---