Tennessee Native Grasslands Workshop

"The State of the State"

Murfreesboro, Tennessee

January 24, 2007

WORKSHOP PROCEEDINGS

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Foreword

Grasslands have been a part of the Tennessee landscape for millennia. Native Americans managed these grasslands primarily with the use of fire. That fire prevented woody encroachment, improved forage quality, and facilitated hunting. Early European settlers witnessed these primeval grasslands in many parts of the state including the Great Valley, the Plateau, the Big Barrens, and in many smaller patches scattered across the state. One account, from as early as 1783, reported such grasslands in the Cumberland Mountains and described the area as a "vast upland prairie covered with the most luxuriant growth of native grasses, pastured over as far as the eye could see, with numerous herds of deer, elk, and buffalo, ...". Similar reports were commonplace in other sections of the Southeast. Captain John Smith observed of the forests around Jamestown that "a man may gallop a horse amongst these woods any waie, but where the creekes and Rivers shall hinder." However, because of the value of these lands to agriculture, they quickly succumbed to the plow. In the Twentieth Century, we have further diminished remnant grasslands through fire policies, overgrazing, and introduced grasses that have out-competed the natives. Beginning in the 1970s, there seemed to be a renewed interest in native grasses and grasslands in the Southeast. That interest has grown in more recent years due to the continued decline of the northern bobwhite, the recognition that grassland songbird populations are experiencing more rapid declines than any other guild, increased awareness of the conservation needs of native communities, especially those that are fire-adapted, the emergence of biofuels, and the discovery the endophytes in tall fescue. One milestone of that building interest is the establishment of the Mid-South Center for Native Grassland Management at the University of Tennessee in 2006. Today in Tennessee, there is broad interest in native grasslands for all of these reasons and more. The diversity of groups represented at this first-ever "State of the State" workshop is witness to that fact. Where we will go in the future is not entirely clear. That we must work together for common interest in these native grasslands in this region and beyond, however, is clear. Most conservation efforts in our history have been much like the turning of the proverbial oceanliner and have developed not in months or even years but in decades. Today we are standing on the achievements of those who have worked on these issues over the past 30 years - at first just a few by themselves, gradually more joined them, and today, a substantial group. Much of the success of this accumulated effort will be decided over the next ten years. And so again, working together is more critical now than in the past. Today's conference is about just that, finding out who is working on what, and how we can better join forces to move further sooner.

– PDK

Agenda

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7:45 Registration
8:30 Introduction and Overview – Pat Keyser, Center for Native Grassland Management
8:40 Native Grasses and Conservation in the Mid-South – Deena Wheby, NRCS
Conservation Perspectives for Native Grasses – Gary Myers, TWRA

Moderator, John Waller
9:00 A Historic Perspective of Grasslands – Ed Clebsch, UT (retired)
9:20 Native Grasses for Hay Production – Gary Bates, UT
9:40 Grazing Native Grasses – Greg Brann, NRCS & John Waller, UT

10:00 am Break

Moderator – Robin Mayberry, USDA-NRCS
10:30 The Role of Native Grasses in Providing Wildlife Habitat – Craig Harper, UT
10:50 Restoration and Maintenance of State Natural Areas – Kevin Fitch, TDEC
11:10 Catoosa Savanna Restoration – Clarence Coffey, TWRA (retired)
11:30 Native Grass Restoration and Management on Federally Owned Lands in Tennessee – Brad Bingham, USFWS & Steve Bloemer, USFS/LBL
11:50 USDA Farm Bill Programs – John Rissler, NRCS & J. R. Kelley, FSA

Lunch break 12:10 – 1:15 (on-site lunch provided)

Moderator – Dick Conley, TWRA
1:15 TWRA Native Grass Efforts and Programs – Mark Gudlin, TWRA
1:35 USDA-NRCS Plant Materials Programs – Paul Rodrigue, NRCS
1:55 Prescribed Burning Issues: TDF Assistance on Grassland Burns – John Kirksey, TDF
2:15 Use of Herbicides in Establishment and Management of Native Warm Season Grasses – Mike Hansbrough, NRCS
2:35 Biofuels – Jim Byford, UT-Martin & Burt English, UT

3:00 pm Break

3:30 Opportunities for, and Challenges to, Establishing Native Warm Season Grasses on Reclaimed Mine Lands – David Ledford, RMEF
3:50 Roundtable Discussion – open discussion, Q & A, uncovered topics, etc.
4:30 Where to from here? – Pat Keyser, Center for Native Grassland Management
5:00 Adjourn

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ABSTRACTS FOR ORAL PRESENTATIONS

A Historic Perspective of Grasslands

Clarence Coffey, Tennessee Wildlife Resources Agency, Retired

If you were to ask the average nature lover to describe the Southeastern region of North America as it appeared at the time of Columbus, you would probably get a variety of answers. However, most would begin by describing vast forestland heavily stocked with huge virgin timber. We have all heard that a squirrel could climb a tree on the Atlantic coast and travel to California without stepping on the ground. A closer look at history shows those images to be far from the truth.

Early American travelers have recorded their observations of the land they saw, its plant community, the wildlife and encounters with Native Americans. By studying the historic journals of early American explorers, hunters and traders one can readily discover that Southeastern North America was dotted with a very diverse landscape.

Early American travelers left descriptions of vast grasslands, canebrakes and savannas in their writings. One writer told of large garden-like savannas he observed as he floated down the Tennessee River. There are even accounts of prairie chickens in the barrens of Kentucky.

The next question to arise after reading descriptions of savannas, barrens, glades and meadows is how did they come into existence? Forest openings came into existence as a result of varying forces including soil conditions, grazing wildlife and periodic fires. Early explorers have recorded many accounts of Indians using fire to clear land to hunt, to renew the forage base for wildlife, and to aid in increasing visibility around villages for security purposes.

It is interesting to note the existence of grasslands in the past, but just as intriguing to discover their benefits and how we can recreate some of that rare habitat.

Native Grasses for Hay Production

Gary Bates, Department of Plant Sciences, University of Tennessee

Native warm-season grasses have usually been thought of a species to be used for wildlife production. The use of native grasses is not limited to wildlife cover and food. The forage produced from these grasses can be used as a feed source for livestock. There are several situations in which native grasses can be successfully used for forage. The primary characteristics that make native grasses attractive as a forage crop is that they are warm-season grasses, meaning they produce the majority of their growth during the summer period, when high temperatures result in reduced growth of cool-season grasses.

Forage from these grasses can make an acceptable hay crop. Yields of 2-5 tons per acre can be expected, depending on rainfall, soil type, as well as other environmental conditions. The nutrient content of this forage can be as high as 16-17 percent crude protein, if harvested correctly.

The potential for hay production from native grasses is the result of its production during the summer. In order to fully understand the reason for this, it is important to realize the problems in hay production systems. There are two main factors that influence the nutrient content of a hay crop. First is the stage of maturity of the plant. As plants mature and get older, the protein and energy content of the plant decreases, while the fiber content increases. From a practical standpoint, grasses need to be cut just before the seedheads begin to emerge, and then about every 30 days thereafter. Every day that harvest is delayed, the protein and energy content drops, while the fiber content increases. Hay produced from a young, immature plant can be outstanding quality, while hay from an old, mature plant will be low quality. This trend holds true for all forage crops, regardless of whether they are warm-season or cool-season plants.

The second factor that influences hay quality is the exposure to the environment. Once a plant is cut for hay, the protein and energy content slowly begins to drop due to respiration losses. These losses do not stop until the plants dries. If rain falls on forage that has been cut for hay but not baled, leaching of protein and energy can occur. High temperatures and low humidity will result in the quick drying of a hay crop, resulting in little nutrient loss. Cool, wet conditions will result in the slow drying of a crop, causing higher nutrient loss. If, during the drying process, the hay is rained on, even more nutrient loss will occur.

Since delayed harvest and exposure to the environment are the two major factors that influence hay quality, forage species that produce their growth during the summer have less problem in hay production. There is less chance of having to delay harvest due to rain in the forecast. Once the hay is cut, the higher temperatures result in the faster drying, resulting is less respiration and leaching loss. It is not that these grasses are better quality, but that the weather generally provides better hay making conditions.

Tips for using native grasses for forage

1. Maintain an adequate stubble height. If these plants are grazed or cut below 6-8 inches, yield and persistence may be reduced. If the plants are to be used for pasture, a controlled grazing program will prevent the overgrazing of the plants. Harvest the plants, either through grazing or hay, when they reach approximately 30 inches tall.

2. Forage quality is influenced by stage of maturity. The crude protein and energy content of the forage can be high, but if the plants are allowed to produce seedheads, or if harvest for hay or grazing is delayed for over 35-40 days, nutrient content will be severely reduced.

3. Soil fertility is important. Even though these grasses are adapted to poor soil fertility, in order to produce large amounts of high quality forage, adequate levels of potash, phosphate and nitrogen should be provided. Also, soil pH should be kept above 6.0. Once the stand is established, keep potash and phosphate levels in the medium range. This can be monitored

through a soil test once every 2-3 years. Nitrogen should be only be applied to native grasses if soil moisture is not limiting to growth, and if extra forage production is desired.

Grazing Native Grasses

Greg Brann, US Department of Agriculture, Natural Resources Conservation Service
John Waller, Department of Animal Science, University of Tennessee

Grazing can be considered a tool to manage native grasses; much like fire, grazing removes biomass allowing light to initiate vegetative growth. Grazing can be used to improve habitat for plant and animals. Grazing can reduce a native grass stand or improve it. The manager's objective is vital in developing a prescribed grazing plan. The manager has lots of options to accomplish his objective. Multi-species grazing with several different animal species allow a manager more options concerning plant selectivity. For example horses primarily eat grass and graze low whereas goats primarily browse and eat high. Varying the grazing technique can also provide diversity in the forage consumed and ultimately composition of the plant community. Typically moderate grazing has the greatest diversity and density of plant and animal life. However, certain species of wildlife thrive in a habitat that is grazed low while others thrive in habitat that is not grazed or infrequently grazed. Varying the grazing system has benefits when managing for all wildlife.

Native grasses have several attributes: filling in low production gap of tall fescue, drought tolerance - deep rooted, efficient nutrient uptake, and equivalent gains or better than tall fescue with lower fertility. Resting cool season forages improves their production and length of use, improves forage quality during summer, and warm season grasses improve conception rates relative to tall fescue. Having a variety of forage species improves forage distribution, which in turn provides a greater opportunity for the producer to extend his grazing period while providing more rest and recovery for forage species. When forages are grazed properly re-growth is improved substantially.

There are several good forage species to choose from for the summer warm season. For the cool season, Virginia wildrye is the best alternative to tall fescue. It grows at relatively the same season as tall fescue and animals perform well on it but yield is lower, typically less than 2 tons per acre versus 3 tons for tall fescue. It should be managed between a height of 4 and 10 inches. Switchcane, although a warm season grass, holds its leaves throughout the year. Also switchcane would be considered a bit woody by most producers.

Native warm season grasses have somewhat different maturity dates. Eastern gamagrass and switchgrass are the earliest maturing followed by big bluestem, indiangrass, and little bluestem. Yields of warm season native grasses are typically equal to or higher than tall fescue with half the nitrogen. The big advantage is that warm season grasses grow in the summer slump period of tall fescue. Livestock perform relatively well on these native grasses; average daily gains on switchgrass in a Nebraska study were 1.3 to 1.5 pounds per day. Gains on Indiangrass and big bluestem were between 1.5 and 1.8 pounds per day. Gains are reported as high as 2.8

pounds per day for eastern gamagrass. Studies using native grasses as part of the grazing system reported 70 pounds better gain during the grazing season.

Research has shown photosensitivity of horses and goats when consuming switchgrass. Apparently photosensitivity is not a problem with cattle. Toxicity is worse with moldy switchgrass hay due to a combination of saponins and possibly aflatoxins. One study showed an increased incidence when alfalfa was fed with switchgrass. Grazing and properly cured switchgrass are not as likely to cause problems.

Recommended fertility of native warm season grasses after the first year is 0 to 120 pounds of nitrogen per acre depending on stand and desired production. Phosphorus and Potassium application based on soil test apply 0 to 120 pounds per acre.

Grazing management: Turn animals in at 16" to 24", manage native grasses by taking half/ leaving half, rotate livestock off at 8" to 12". Native grasses perform best when rested 30-50 days between grazing. High density "flash" grazing controls weeds the best. Retaining a minimum of 12" stubble height at first frost improves plant vigor the following year. Therefore, it is best not to graze after August 15. Stocking densities of over 2.5 animals per acre has the greatest impact on quail nesting.

Yields are equivalent to tall fescue with half the nitrogen; therefore, protein levels are lower. However, much of the protein in native grasses is "by-pass protein". By-pass protein allows protein to be absorbed more efficiently in the large intestine. Crude protein levels can reach 15 % in spring at the pre-heading stage and decline to 8% in late August. Digestibility is typically between 45 and 55 %. However, there is some evidence that carbohydrates in NWSG digest differently than cool season grasses so traditional tests don't adequately reflect feed value. The nutrient needs of a dry pregnant beef cow are 7.9% protein and 53.6% TDN or for an average lactating 1000 pound beef cow, 9.6 % protein and 56.6% TDN.

Consider adding diversity to the forage system with native grasses to

- improve grazing distribution
- provide more rest and recovery for cool season grasses
- decrease fertility demand
- improve forage diversity and animal selectivity
- use as a management tool similar to fire
- maintain livestock gains in the summer
- improve wildlife habitat

The Role of Native Grasses in Providing Wildlife Habitat

Craig Harper, Department of Forestry, Wildlife, and Fisheries, University of Tennessee

Native grasses can provide quality early succession habitat for many species of wildlife. Depending on the composition and structure of vegetation and the amount of habitat present, various wildlife species are attracted. Pure grass stands may attract eastern meadowlarks,

Henslow's sparrows, and, if large enough, grasshopper sparrows. Fields containing native grasses along with several forbs and shrubs, however, are much more attractive to a wider variety of wildlife species. Bobwhite quail, indigo buntings, field sparrows, yellow-breasted chats, blue grosbeaks, dickcissels, wild turkeys, eastern cottontails, white-tailed deer, and many others prefer fields containing native grasses, forbs (such as ragweed, beggar's-lice, pokeberry, partridge pea, native lespedezas), and scattered shrubs (such as sumac, wild plum, blackberry). Native grasses provide cover and nesting structure. Forbs and shrubs provide cover and nesting structure, *as well as food* (seed and soft mast). **The ideal composition for the greatest number of wildlife species is about 50 percent native grass and 50 percent forbs, with desirable shrubs scattered widely throughout the field**.

If fields are left unmanaged for several years, they typically become rank with dense grass growth, thatch, and undesirable woody encroachment. Mobility for small wildlife (such as quail broods) and seed availability can become limited. Dusting space is also limited and the seedbank is suppressed. When adjacent to woods, saplings from red maple, boxelder, sweetgum, winged elm, locust, and others can become established and overtake the field.

Fields must be disturbed periodically to set back succession and maintain optimum structure and composition for many wildlife species, including bobwhites**. This is best accomplished with prescribed fire and disking**. Fire consumes dead vegetation, stimulates fresh growth, and creates open space at ground level. Burning also stimulates the seedbank and recycles nutrients, increasing forage quality for rabbits, deer, and groundhogs. Disking also stimulates the seedbank, facilitates decomposition of dead vegetation, and creates an open structure at ground level. Disking can be used to thin grass cover and promote additional forb cover. Selective herbicides may be necessary to promote desirable plants and eradicate non-native species (such as tall fescue, orchardgrass, bermudagrass, johnsongrass, crabgrass, and sericea lespedeza). **Bushhogging (mowing) is not recommended**. Mowing only accumulates additional thatch and debris on top of the ground, suppresses the seedbank, makes seed unavailable to birds, and destroys usable cover. If conducted during summer, mowing also destroys wildlife directly, as nests, hatchlings, fawns, and rabbits are commonly killed.

Depending upon vegetation response, fields should be managed on a 2 – 4-year rotation to ensure different successional stages are available. Brooding cover and forage are optimum the growing season after burning. Nesting cover is optimum 2 – 3 years after burning. Escape cover might be optimum 3 – 4 years after burning. By the fifth year, if not before, succession usually needs to be set back with fire or disking.

Season of management influences vegetation composition and structure. Burning in March – early April favors native warm-season grasses. Woody saplings may be top-killed by burning at this time, but they usually re-sprout. Burning in September effectively kills the majority of woody encroachment. In fact, September burning is as effective as herbicide applications in killing woody species. Disking in the fall and winter generally favors desirable forbs; however, disking in the spring may promote undesirable grasses, such as johnsongrass and crabgrass.

Restoration and Maintenance of State Natural Areas

Kevin C. Fitch, Tennessee Department of Environment and Conservation

The mission of the Tennessee Division of Natural Areas is to restore and protect the plants, animals, and natural communities that represent the natural biological diversity of Tennessee. The Division carries out its mission through four program areas including the Natural Areas Program. The Natural Areas Program was established in 1971 with the passage of the Natural Areas Preservation Act. Seventy-five Natural Areas (108,621 acres) are currently protected under this act. Many of these Natural Areas are managed through Cooperative Management Agreements with other local, state and federal agencies as well as with non-governmental organizations. The Natural Areas Program seeks to include adequate representation of all natural communities that make up Tennessee's natural landscape, and provide long-term protection for Tennessee's rare plant communities and the rare, threatened, and endangered plant and animal life included.

Natural areas represent some of Tennessee's best examples of intact ecosystems and serve as reference areas for how natural ecological processes function. The Natural Areas staff utilizes all available research specific to the ecosystems included within each Natural Area to formulate adaptive management strategies allowing for the application of appropriate management techniques and the establishment of appropriate goals and objectives. For example, control of invasive exotics within grasslands may precede the application of prescribed fire to prevent the spread of invasives following disturbance. Additionally, mowing may be utilized to control the invasion of woody species during a one to two year period with prescribed fire applied during the interim. This allows for the control of woody species annually while allowing for litter to accumulate so that prescribed fire can be applied in the most effective manner in adjacent forested burn units (i.e., litter continuity is critical for the spread of prescribed fire within forests and woodlands).

The Natural Areas Program currently manages and oversees 75 Natural Areas 19 of these (over 5,500 acres) include a mosaic of forest/woodland with grasslands and cedar glades and barrens imbedded. Invasive species management and prescribed fire are adaptively applied for the expansion and maintenance of rare species and communities included.

Catoosa Savanna Restoration

Clarence Coffey, Tennessee Wildlife Resources Agency, Retired
Karl Kilmer, Tennessee Wildlife Resources Agency

During the mid 1990’s pine beetle infestations became widespread in East Tennessee and quickly spread west to the Cumberland Plateau. On the Catoosa Wildlife Management Area, TWRA foresters and biologists became aware of pine beetle damage in 1998.

After briefing the Wildlife Commission on the eventual timber loss due to pine beetle damage, a salvage operation was initiated in 1999. The salvage operation continued for the next 2½ years into 2001. During that time, approximately 1, 555 acres of pines were cut across Catoosa in the salvage operation.

As the Catoosa timber salvage operation progressed, the response by the plant community was dramatic. Grassland plants like big bluestem, little bluestem, broomsedge, Indiangrass and many forbs began to quickly respond to the opening of the forest canopy. The increased growth of native warm season grasses was not that unexpected. Over the years, TWRA personnel had observed scattered clumps of big bluestem and other grasses wherever fires had been set either accidentally or planned.

After noting the widespread presence of native grasses on TWRA lands, managers decided to experiment with some of the pine salvage area to see if savanna could be established. Prescribed burning was initiated in the spring of 2002 in two burn units and the results were very encouraging. Native warm season grasses and a wide variety of native legumes and other forbes began filling in the open spaces vacated by the removal of timber and the leaf litter covering the ground.

Today there are around 1,500 acres of savanna habitat on the Catoosa Wildlife Management area with a projected goal of over 3,700 acres at some point in the future.

Native Grass Restoration and Management on Federally Owned Lands in Tennessee

Brad Bingham, US Fish and Wildlife Service, Department of the Interior
Steve Bloemer, US Forest Service, Department of Agriculture

Native warm season grasses (NWSG), due to their usefulness and resilience, have been utilized and managed for on federally owned properties for many years. Various federal agencies have embraced the importance of native grasses and their many uses to address an array of problematic situations encountered.

Tennessee Valley Authority (TVA) began restoration and management of NWSG on Land Between the Lakes (LBL), a 170,000-acre national recreation area located in western Tennessee and southwestern Kentucky, in the late 1970's with the discovery of a 12-acre remnant of barrens habitat near Golden Pond, Kentucky. This remnant is now located within LBL's Elk and Bison Prairie where many acres are presently being managed for NWSG. The US Forest Service (USFS) assumed management duties in 1999 and since has continued to place an emphasis on native grass management and restoration efforts.

Presently there are approximately 1,018 acres of native warm season grasses on LBL, including 284 acres in Tennessee, and 734 acres in Kentucky. The 2004 LBL Land and Resource Management Plan (Area Plan) had an objective to restore native grasses and forbs to 750 acres of open lands within the first 10 years of Area Plan implementation, and about 500 of those acres remain to be accomplished. The Area plan has a long-term (50-year) objective of 2,600 total acres of native grassland on LBL.

The LBL Area Plan also provides for development of 8,630 acres of Oak Grassland Demonstration areas. The focus of these areas is to restore upland vegetation to conditions approximating those found at the time of European settlement. On upper slopes and ridges across the area, grasslands (less than 10 percent canopy closure) and open oak woodlands (10-60 percent canopy closure) are interspersed in variable mixtures. Understories are dominated by native grasses and wildflowers. Most mid- and lower-slopes support open oak forests (60-80 percent canopy closure), with understories containing regenerated oaks in sufficient numbers to provide for sustaining oak on these sites over time. These oak grasslands will be maintained with fire, and environmental education and recreation programs will be developed for these areas.

Cherokee National Forest lands suitable for NWSG are fairly restricted to large river bottoms or creek bottoms. If the USFS acquires fescue fields, it will attempt to convert them to NWSG. Presently there are less than 200 acres of NWSG on the Cherokee National Forest. The Current Land and Resource Management Plan calls for conversion of an additional 140 acres of fescue fields to NWSG in 10yrs.

Native grasses are also managed on US Fish and Wildlife Service (USFWS) properties at the Tennessee National Wildlife Refuge (TNWR) and Dale Hollow National Fish Hatchery (DHNFH). TNWR manages approximately 10 ½ miles of dikes established in switchgrass and approximately 50 acres of Tennessee Valley Authority powerline rights-of-ways in a native grass mix. In addition TNWR manages a five acre tract of native grass serving as a buffer zone around a spring and its run for the globally rare barrens topminnow (*Fundulus julisia*). DHNFH currently manages a nine acre mixed native grass plot established on Corps of Engineers property in an effort to demonstrate to the public the usefulness of native grass as a buffer.

Approximately 180 acres of native grasses have been established through various projects implemented by the Nashville District of the U.S. Army Corps of Engineers. This includes projects related to levee management, gas line rights-of-ways, and erosion control.

Native grass restoration is also an integral part of U.S. Park Service philosophy and is implemented on a regular basis. Big South Fork has restored approximately 300 acres of native grasses over the past few years, and continues to convert fescue to native grasses annually. Several additional acres are scheduled for restoration within the next five years.

USDA Farm Bill Programs

John Rissler, US Department of Agriculture, Natural Resources Conservation Service
JR Kelley, US Department of Agriculture, Farm Services Agency

The 2002 Farm Bill has given landowner many options to plant, revitalize and protect native grasslands. An overview presentation will be given describing many of the programs and accomplishments of the available Farm Bill Programs. Much of the information to be discussed can be found at http://www.nrcs.usda.gov/programs/. Program information more specific to TN can be found at http://www.tn.nrcs.usda.gov/programs/ .

Tennessee Wildlife Resources Agency Native Grass Efforts and Programs
Mark Gudlin, Tennessee Wildlife Resources Agency

In 1987, TWRA began a Statewide Small Game Program that primarily focused on implementing efforts to restore bobwhite quail populations. With the realization that the loss of native grasslands had played a big role in the decline of bobwhite quail, cottontail rabbits and other grassland species, TWRA began to promote the establishment and restoration of native warm season grasses (nwsg). While the commercial propagation in the private sector and use of native grasses for wildlife and agriculture (haying and grazing) was not new to the central portion of the U.S., working knowledge and experience with these grasses by wildlifers, conservationists, and particularly the use of nwsg for haying and grazing on lands east of the Mississippi River was minimal at that time.

In the last 16 years or so, TWRA has been a catalyst for many efforts aimed at increasing the use and proper management of native grasses in our state and the mid-south region. Briefly, the most major efforts include:

Native grass no-till seed drills: Through periodic purchase of drills by TWRA and two efforts that provided grants to Soil Conservation Districts for drill purchase, a system has been developed to make these drills available for use by private landowners and public lands managers across the state. A list of the 56 drills available for Spring 2007 is included in the Proceedings appendix. By TWRA phasing out its previously dominant role of providing free use of native grass drills, there should be more incentives for the private sector to fill this need.

Farm Wildlife Habitat Program: This TWRA cost-share program has provided assistance to private landowners to enhance wildlife habitat on their lands (typically 75% cost-share, up to $1,000 maximum in any state fiscal year) under a 5-year contract, as well as cost-share for sportsmans clubs (mainly Quail Unlimited chapters; 90% cost-share) who desired to work with TWRA to improve quail habitat on public lands. Between 1989 and June 2006, 3,269 acres of native grasses have been established on private lands and another 4,217 acres on public lands, many on TWRA WMAs. In 2000, TWRA began including an option in the FWHP for landowners that wanted to plant native grasses for hay, allowing higher seeding rates and allowing 75% of the stands to be hayed in years 3-5 of the contract (see http://www.state.tn.us/twra/wildlife/fwhp.pdf).

Native Grass Publications: Since the establishment and management of native grasses is so different from other grasses and forages most Tennessee landowners are familiar with, proper technical assistance is a must. Between 1996-2003, TWRA purchased several thousand copies

of an existing 10-page Virginia/North Carolina native grass publication and distributed them to landowners and biologists.

Over time, we have collectively learned a lot more about native grasses and technology in equipment and herbicides have increased planting success. Recognizing a need for an updated, more in-depth reference for landowners, TWRA teamed up with UT and the USDA-Natural Resources Conservation Service in Tennessee to produce a publication in 2004 titled "A Landowner's Guide to Native Warm-Season Grasses in the Mid-South" (C.A. Harper, G.E. Bates, M.J. Gudlin, and M.P. Hansbrough, 27pp., color). An additional lengthier, professional-level manual is due to be printed in 2007.

Wildlife Management Areas: Excluding larger areas that are owned and primarily operated by other agencies (e.g. Cherokee National Forest, Land Between the Lakes), TWRA estimated there were almost 9,700 acres of native grasslands in 2006 on its WMAs. WMAs with fairly large native grassland acreage include: (West TN) Natchez Trace-513 acres, Reelfoot-429 acres, Tumbleweed (410), Wolf River-254 acres, and Barkley-160 acres; (Middle TN) AEDC-791 acres, Bark Camp Barrens-150 acres, Haynes Bottoms-400 acres, and Yahnali-325 acres; (Plateau) Bridgestone/Firestone-730 acres, Catoosa-1,750 acres (approx. 1,400 are savannah), Cordell Hull-235 acres, Oak Ridge-335 acres, and Yuchi Refuge-227 acres; (East TN) Chuck Swan-290 acres and Tellico Lake-173 acres.

CRP Incentives: Prior to the initiation by USDA of the Environmental Benefits Index, which helped steer acres accepted in CRP to more wildlife-friendly plantings, TWRA provided additional one-time incentive payments to help influence participating landowners to choose native grasses or other wildlife-friendly plantings. Among the incentives were an extra $30 per acre for native grass plantings in CRP general signups 16 and 18 (1997-2000), and an extra $50 per acre in the Continuous Signup 19 (2001-2002) for native grass buffers. Along with other practices, these incentives influenced 13,257 acres of native grass whole-field enrollments and 1,404 acres of native grass buffers. A total of $551,693 was spent in total on all wildlife practices included in this incentives effort.

Pilot Buffers Project: In order to help gauge the acceptance of landowners for native grass field borders, TWRA initiated a pilot project (2000-2004) in two focus areas. One was a 5-watershed area at the congruence of Chester, Hardeman and McNairy counties in west TN dominated by row-crop agriculture. The other area was the larger Nolichucky watershed in east Tennessee, dominated by fescue pastures and surrounding forestland. Landowners were paid $100 per acre per year for 5 years to establish and maintain 33' wide native grass buffers. Thirty-nine landowners maintain buffers through the end of the contract period. A follow-up questionnaire at the end of the contract indicated landowners were generally pleased with the buffers and 76% of respondents in both focus areas perceived an increase of quail on the buffered area of their farms, estimated at an increase of one covey per 4.4 acres of buffer. These results, along with buffer projects in several other SE states, were presented to USDA during the successful effort to get the CP33-Habitat Buffers for Upland Birds authorized in the CRP Continuous Signup.

Mid-South Center for Native Grassland Management at UT: In an effort to more rapidly foster acceptance of native grasses in agriculture and on-farm conservation, TWRA has obligated a total of $250,000 over 5 years to help initiate the establishment of the Center at the University of Tennessee.

EQIP Native Grass Incentives: In order to accelerate the adoption of native grasses in the NRCS Environmental Quality Incentives Program, NRCS and TWRA combined incentives for conversions to native grass hay/pasture, field borders, and filter strips. Approximately 1,240 acres were enrolled in 2006. Similar incentives were offered for the 2007 EQIP signup.

USDA-Natural Resources Conservation Service Plant Materials Program
Joel L. Douglas, US Department of Agriculture, Natural Resources Conservation Service

The Plant Materials Program of the USDA-Natural Resources Conservation Service (NRCS), through its conservation partners, selects and releases conservation plants for protecting, restoring and enhancing our nation's natural resources. For over 70 years, the Plant Materials Centers and Plant Materials Specialists nationwide have collected, evaluated, selected and released over 600 conservation plants to control soil erosion on various landscapes, protect and improve water and air quality, enhance wildlife habitat, beautify roadsides, provide livestock forage, and protect coastal zones. In addition to conservation plant releases, the Plant Materials Program develops technology for establishment and management of plant releases to meet conservation objectives. Utilizing selected, tested, and cultivar release options, the program makes conservation plant releases available for commercial production. Each plant release option is characterized by varying degrees of plant evaluation performance, selection methods and field testing as established by the Association of Official Seed Certifying Agencies. For more information on plant science technology developed by the USDA-NRCS Plant Materials Program visit our website at http://www.plant-materials.nrcs.usda.gov/.

Prescribed Burning Issues: Tennessee Division of Forestry Assistance on Grassland Burns
John Kirksey, Tennessee Division of Forestry

There are two apparent issues with prescribed burning in Tennessee: 1. Interest in using fire as a tool is growing, and 2. Issues surfacing from use of prescribed fire can be expected to increase as fire use increases. The former issue is being discussed extensively. Focusing on the second of these topics, there are a number of factors involved. Among these are: a) appropriate prescription (time/place/process/rationale) for using fire, b) safety, c) cost, d) burner competence/qualification/training e) vendor availability, f) liability, g) legislation, h) smoke management, i) stakeholders, j) partnerships, k) cooperation/coordination, and others. Prescribed fire in Tennessee affects a fraction of the acres that it does in most of our neighboring states. However the issues are very much the same, albeit to a smaller scale. It is important that those with a stake in using fire understand the issues and seek common ground in promoting and protecting the right to burn.

The Tennessee Division of Forestry (TDF) has been involved in suppressing wildfires since the early 1920's. TDF has also been involved in using fire as a resource management tool for several decades. Forestry offers its prescribed burn services to landowners for forest management in almost every locale of the state. Forestry's capability to provide prescribed burn vendor service for grass or other non-forest management practices varies from none to high. Factors affecting TDF's availability for prescribed burn vendor service are: a) personnel and equipment numbers, b) wildfire activity, c) other workload responsibilities, d) availability of other vendors, e) complexity, f) weather, g) administrative decisions, and others.

Use of Herbicides in Establishment and Management of Native Warm Season Grasses
Michael Hansbrough**,** US Department of Agriculture, Natural Resources Conservation Service

Native Warm Season Grasses (NWSG) do not compete well with non-native vegetation (e.g., tall fescue, johnsongrass, bermudagrass, crabgrass). Weed control is a major factor in determining the success of newly planted NWSG stands. Competition from unwanted plants can severely slow the establishment of NWSG to the point landowners and managers perceive a failure. However, proper selection and use of herbicides can greatly enhance NWSG stands and success of establishment, and can further be used in management of older NWSG stands.

The planting of NWSG and establishment will generally occur in two types of conditions: cropland or existing vegetation (commonly fescue sod). Herbicide recommendations will differ for planting in cropland vs. planting in existing sod or other vegetation. Planting NWSG in cropland residue can be as simple as applying 4-8 oz./acre of an imazapic herbicide before or at planting. If winter annuals and other weeds are present, tank mix an additional 16-32 oz/acre of glyphosate and apply preemergence if planting in cropland residue.

However, more care and knowledge of different spraying treatments are needed to successfully eradicate sod areas prior to planting NWSG. Existing sod, such as tall fescue,

should be mowed, hayed, or grazed before peak growing periods to stimulate new growth prior to herbiciding. Recent studies by the University of Tennessee (UT) have documented that tall fescue should be eradicated in the fall with glyphosate or imazapic products for best results. Imazapic herbicides are not recommended for areas seeded in switchgrass or eastern gamagrass, as injury or loss of stand may occur. However, other herbicides (e.g. metsufuron methyl, triclopyr, dicamba, sulfosulfuron) can be useful for weed control in pure switchgrass stands.

As with any area, proper herbicides should be selected depending on the vegetation present (e.g., bermuda, tall fescue). Spray rigs should be calibrated and targeted vegetation should be allowed to have several inches of new growth and be actively growing the day of spraying. In the spring, after vegetation has been killed, no-till NWSG using a specialized NWSG drill in the treated area to a depth of ¼ inch and apply a soil active herbicide to achieve residual weed control. After herbiciding, NWSG establishment may be sparse if no-till drilling occurs in vegetation that is still growing, or if dead vegetation is thick and hasn't been removed via prescribed burning.

Herbicides can be a very valuable tool in the establishment stage, and also in the management of NWSG stands. After establishment, herbicides such as (imazapyr, triclopyr, dicamba, imazethapyr, and even glyphosate) can be used to successfully manage stands of native grasses. Imazapyr products performed very well in reducing saplings and releasing native legumes in a recent UT study. These herbicides and others can be used to thin stands for wildlife, change vegetative composition, and control saplings and other unwanted plants to achieve resource objectives.

Biofuels

Jim Byford, College of Agriculture & Applied Sciences, University of Tennessee at Martin
Burt English, Department of Agricultural Economics, University of Tennessee

Biofuels are organic-based transportation fuels that include ethanol, biodiesel, and methanol. They may be used in 100% batches, but are generally blended with either gasoline or petroleum diesel - - i.e., E10 is a blend of 10% ethanol and 90% gasoline. Biolfuels offer several advantages, including:

- cleaner burning (net zero contribution to the greenhouse effect)
- all byproducts are economically useful
- reduce dependence on foreign oil
- help re-vitalize rural economics

Disadvantages include:

- not yet readily available (sufficient production and distribution infrastructure not yet in place to satisfy demand)
- All current engines can efficiently use E10, but even though technology

has been developed to enable engines to efficiently use E85 and E100, most current cars can't.

The production process involves converting sugar (through enzymes and yeast) to ethanol and CO_2. Starch (from corn, wheat, milo, etc.) must first be converted to sugar. Cellulose (from wood, switchgrass, corn stalks, etc.) must be converted to hemicellulose, then to starch, then to sugar. While the starch-to-ethanol process is currently functional and cost efficient, the cellulose-to-ethanol process is 3 to 5 years away in development.

As of 2005, the United States needs 143 billion gallons of ethanol to replace all gasoline, and 14.3 billion gallons to replace MTBE (at 10%) as an antioxidant. MTBE has been found to seriously contaminate ground water. With export and feed corn, we can replace 20.9 billion gallons. With sustainable biomass (an NREL study found we have 1.3 billion tons annually on a sustainable basis), we can replace another 100 billion gallons - - a total of 120.9 billion gallons (85% of our need).

A UT study looked at the feasibility of the U. S. providing 25% of all energy it consumes through renewable resources by the year 2025. This not only involves transportation fuels, but heating, cooling, electricity, etc. Renewable energy includes the following:

- geothermal
- hydro
- solar photovoltaic
- wind
- biomass resources

Opportunities for, and Challenges To, Establishing Native Warm Season Grasses on Reclaimed Mine Lands

David Ledford, Rocky Mountain Elk Foundation

With the recent boom in coal prices, and the increased demand for electricity, there is an ongoing increase in coal surface mining activity in the central and southern Appalachians, including Tennessee. While the effects of surface mining on wildlife and the landscape are profound, the required reclamation process provides an opportunity to create a wide variety of habitat types during the reclamation process. Reclamation can vary from complete reforestation to hayland/pastureland to industrial and commercial development. If the post-mining land use calls for the establishment of grasslands, and the objective of the landowner is habitat for grassland species, there is an opportunity to establish large expanses of native warm season grass communities on reclaimed mine sites. The real or perceived barriers to this are financial, regulatory, and a lack of experience with these grasses. If these can be overcome, we have tremendous opportunities to establish habitat for declining grassland and early successional wildlife species.

ABSTRACTS FOR POSTERS

Watershed Stabilization and Wildlife Habitat Management Through Multiple Use Native Grassland Management

John Gruchy, William Minser, and Craig Harper, Department of Forestry, Wildlife and Fisheries, University of Tennessee

Native warm-season grasses (NWSG) provide increased benefit over non-native sod-forming grasses for soil and water conservation because they are deep rooted, adapted to local soil types, require less fertilization/maintenance than sod-forming grasses, and provide quality early successional habitat for several species of wildlife. Additionally, NWSG can be used for high-quality livestock forage. Many landowners are still unaware of the benefits of NWSG, or are hesitant to convert portions of their fields. We provided financial and technical assistance for landowners in Blount and Knox Counties interested in converting non-native grass fields to NWSG. We applied herbicides to eliminate tall fescue (fall – Gly-4 2 qts/ac), johnsongrass (late summer – Gly-4 2 qts/ac), and bermudagrass (late summer – Arsenal AC 24 oz/ac) in 2006. Where livestock forage is the primary objective, NWSG will be planted in spring 2007. NWSG species or mixtures will be selected based on landowner goals, site characteristics, and weed context. Fields will be hayed only once, then allowed to regrow and provide winter cover. Where wildlife habitat is the primary objective, NWSG will be planted a low rates (2 – 4 PLS lbs/acre) or allowed to emerge from the seedbank. These sites will not be hayed, but will be managed with prescribed fire, disking, and selective herbicides to maintain a low density of native grass (20 – 50% cover) and a high density of desirable forbs with interspersed patches of shrub cover.

Effects of seasonal herbicide applications with and without disking on tall fescue renovation and resulting habitat for bobwhites in Tennessee

John Gruchy and Craig Harper, Department of Forestry, Wildlife and Fisheries, University of Tennessee

Conversion of tall fescue to managed native warm-season grasses (NWSG) benefits many wildlife species associated with early successional habitat. Planting nwsg, however, may not be necessary depending on the composition of the seedbank. Treatments were implemented in a randomized complete block design with replication during 2003 and 2004 at 3 study sites across Tennessee to determine the effects of seasonal herbicide applications and disking on tall fescue eradication and resulting vegetation composition and structure. Treatments included: fall glyphosate (Gly-4 2 qt/acre); fall glyphosate followed by spring disking; fall imazapic (Plateau 12 oz/acre); fall imazapic followed by spring disking; spring glyphosate; spring glyphosate

followed by fall disking; spring imazapic; and spring imazapic followed by fall disking. Vegetation composition and structure were measured in June, July, August, September, and November 2004 and February, April, June, July, and August 2005. All treatments reduced percentage tall fescue cover compared to control one growing season after treatment. Fall glyphosate, fall glyphosate followed by spring disking, fall imazapic, and fall imazapic followed by spring disking reduced tall fescue coverage more effectively than spring herbicide applications two growing seasons after treatment. Reduction in tall fescue coverage increased ground sighting distance during the brooding season and angle of obstruction during the wintering period for bobwhites. Disking following herbicide application increased desirable forb coverage, including common ragweed, beggar's-lice, and beggar-ticks. Imazapic reduced coverage of some undesirable species, such as johnsongrass, and increased coverage of broomsedge; however, on 2 sites, imazapic applications resulted in increased coverage of orchardgrass, which was structurally identical to tall fescue. Fall glyphosate applications are recommended to eradicate tall fescue. Disking may be implemented before mid-March to improve bobwhite brood-rearing and feeding habitat. Imazapic may be applied in the spring following tall fescue eliminating to control johnsongrass, crabgrass, yellow nutsedge, and other undesirable species and increase desirable NWSG, thereby improving habitat for nesting bobwhites.

Native Grasses for Landfill Cover

Mark Gudlin, Tennessee Wildlife Resources Agency
Tom Golden, Tennessee Dept. of Environment and Conservation – Solid Waste Division
Mike Goodman, Environmental Manager, Temple Inland

Native warm-season grasses (NWSG) have many characteristics that should make them an attractive choice for landfill cover. They are well adapted to poor soils, provide better soil stabilization once established due to their deep roots, are more drought-tolerant than commonly used cool-season grasses, are a rapid builder of "A" soil horizons, require significantly less inputs of soil amendments (lime, fertilizer), require less annual maintenance, and provide potential post-closure income to operators as either a hay crop, local ecotype seed source, or even biomass production. In addition, potential for restoring native prairie vegetation and improving habitat for many declining upland wildlife species such as bobwhite quail, cottontail rabbits and several grassland-associated songbirds offer operators a tool to enhance public relations.

NWSG have been successfully established on several landfill sites in Tennessee in recent years. However, the lack of more widespread use of NWSG as landfill cover seems to stem from general lack of knowledge by operators, unfamiliarity with establishment techniques, habituation to using fescue, and concerns about NWSG root penetration of the landfill cap and erosion concerns during the establishment period. At this time, the authors are not aware of any instances of cap penetration in Tennessee or where NWSG have been used on landfills in other states.

Research needs include scientific documentation of any landfill integrity problems associated with cap penetration by roots, performance and economics of using various short-term initial stabilization with cover crops, mulches, or erosion blankets, and impacts on performance

of different NWSG species from limitations on root depth due to shallow (typically 3' or less) soils on top of the landfill cap.

With the growing use and knowledge of native grasses in the conservation community and with adequate research addressing the identified needs, we anticipate the use of NWSG as landfill cover will increase in the future.

Nesting Success and Relative Population Densities of Grassland Birds on Military, Private, and TWRA Land in the Big Barrens, TN and KY

Daniel Hinnebusch, James Giocomo, David Buehler, Department of Forestry, Wildlife, and Fisheries, University of Tennessee
Daniel Moss, Directorate of Public Works, IMSE-CAM-PWE, Fort Campbell

Fort Campbell Army Base, on the border of TN and KY, has sustained an almost complete complement of grassland species and provides an excellent opportunity to study grassland birds. Continuing a project started in 1999, we expanded our bird monitoring efforts to include areas outside the base in the 1.2 million acre area known as the Big Barrens Region in TN and KY. We monitored 152 bird nests (92 on Fort Campbell) in native warm season grasslands and collected a sufficiently large sample size to calculate Mayfield nesting success estimates for 5 species (22 Prairie Warbler [*Dendroica discolor*], 62 Field Sparrow [*Spizella pusilla*], 20 Henslow's Sparrow [*Ammodramus henslowii*], 15 Indigo Bunting [*Passerina cyanea*], and 16 Dickcissel [*Spiza americana*] nests). Nesting success on Fort Campbell was similar to that observed in previous studies on the base, but all 5 species for which we could calculate nesting success had low success (≤30.0%). We also measured bird density and vegetation at 5 Fields within Fort Campbell, 2 Tennessee Wildlife Resources Agency (TWRA) Wildlife Management Areas, and 6 private fields. Our results indicate that these three grassland habitats support somewhat different bird communities. We observed higher densities of grassland obligate species on military and private fields than on TWRA fields. Our nest success estimates for the 5 species mentioned above indicate low success overall for the Big Barrens. Density estimates indicate that both military and private fields support a nearly complete grassland bird community while TWRA fields lack many of the grassland obligate species.

Educational Opportunities Associated with Native Warm Season Grass Research Plots

Eric Pelren, Paula Gale, and Richard Joost, University of Tennessee at Martin

Educational experiences in Agriculture and Natural Resources need to be both practical and academic. Establishment of a native warm season grass (NWSG) stand on the field testing and demonstration farm at UT Martin has provided a plethora of opportunities for hands on instruction in a variety of disciplines. Planted in spring 2001, the initial NWSG stand was overtaken by undesirable broadleaved forbs by spring 2003. Subsequently, a study was designed to test various treatments for recovering the stand. The treatments that were tested included mowing (one, two or three times during the growing season), burning, and three herbicide applications. Treatments were applied in 2004 and 2005 and have provided faculty in several disciplines the opportunity to utilize the plots for outreach, teaching, and research. This poster

presents examples of some of the data generated by faculty and students. Disciplines making use of the plots during the research period included wildlife biology, plant science, soil science, and landscape management. In addition to course lab visits to the plots and student participation in the treatment applications, individual students have been involved in various research participation projects utilizing the plots during the treatment period.

Appendix One – Suppliers of Native Grass Seed

Growers/Suppliers

Bamert Seed Company
1897 County Road 1018
Muleshoe, TX 79347
(800) 262-9892
(806) 272-5506
www.bamertseed.com

Ernst Conservation Seeds
9006 Mercer Pike
Meadville, PA 16335
(800) 873-3321
www.ernstseed.com

Garrett Wildflower Seed Farm
1591 Cleveland Rd.
Smithfield, NC 27577
(919) 989-3031
garrettwfseed@mindspring.com

Lickskillet Seeds Inc.
22324 State Hwy HH
Gallatin, MO 64640
(660) 663-3095
www.lickskilletseeds.com

Native American Seed
3791 N. US Hwy 377
Junction TX 76849
(800) 728-4043

Osenbaugh Grass Seed
Rt. 1 Box 44
Lucas, IA 50151
(800) 582-2788

Roundstone Native Seed LLC
9764 Raider Hollow Road
Upton, KY 42784
(270) 531-2353
www.roundstoneseed.com

Sharp Brothers Seed Co.
396 SW Davis Street – LaDue
Clinton, MO 64735
(800) 451-3779
(660) 885-7551
www.sharpbro.com

Stock Seed Farms
28008 Mill Road
Murdock, NE 68407-2350
(800) 759-1520
(402) 867-3771
www.stockseed.com

Turner Seed Co.
211 County Road 151
Breckenridge, TX 76024
(800) 722-8616
www.turnerseed.com

Suppliers

Adams-Briscoe Seed Co.
P.O. Box 19
325 East Second Street
Jackson, GA 30233
(770) 775-7826
www.abseed.com

Applewood Seed Co.
5381 Vivian Street
Arvada, CO 80002
303-431-7333
www.applewoodseed.com

C.P. Daniel's Sons Inc.
P.O. Box 119
Waynesboro, GA 30830
(800) 822-5681
(706) 554-2446

Carl R. Gurley, Inc.
P.O. Box 995
Princeton, NC 27569
(919) 936-5121

Pennington Game Food Seed
P.O. Box 192
Madison, GA 30850
(706) 342-1234
www.penningtonseed.com

Seeds, Inc.
2435 Harbor
Riverside Station
Memphis, TN 38113
(800) 238-6440
(901) 775-2345

Spandle Nurseries
RFD#2, Box 125
Claxton, GA 30417
(800) 553-5771
www.spandles.com

Tennessee Farmers Co-op
200 Waldron Road
PO Box 3003
LaVergne, TN 37086-1983
(615) 793-8400

www.ourcoop.com

Turner Seed
P.O. Box 739
LaVergne, TN 37086
(615) 641-7333

Your local state farmers co-op, Southern States Co-op, farm supply outlet, or other seed vendors may be also able to provide you with native grass seed or to locate other sources.

Buyers are urged caution to compare seed quality (germination, purity rates, percent inert material) when shopping among vendors.

Inclusion on this list does not entail endorsement, nor is any discrimination intended by omission from this list of known growers and supplier.

Appendix Two – Native Warm Season Grass Drills Available for use in Tennessee

Native Warm Season Grass Drills - Publicly Available Rev. March 2007

County	Contact	Phone	Comments
Bedford	Bedford County Soil Conservation District	931-684-1441	Rental fee *Drill to be available beginning Spring '07
Benton	TWRA Region I Dan Fuqua	731-423-5725 or 1-800-372-3928	
Bledsoe	Bledsoe County Soil Conservation District	423-477-2532	Rental fee
Blount	Blount County Soil Conservation District	865-983-2011	Rental fee *Drill to be available beginning Spring '07
Bradley	Bradley County Soil Conservation District	423-472-5731	Rental fee
Carroll	Carroll County Soil Conservation District	731-986-4473	Rental fee
Crockett	Crockett County Soil Conservation District	731-696-5537	Rental fee
Chester, McNairy, Hardin, Madison	Madison County Soil Conservation District	731-668-1544	Rental fee
Claiborne	Claiborne County Soil Conservation District	423-626-3811 x101	Rental fee *Drill to be available beginning Spring '07
Dickson	Dickson County Soil Conservation District	615-446-2449x101	Rental fee *Drill to be available beginning Spring '07; Stationed at Co-op Fert. Bldg.
Dyer	Dyer County Soil Conservation District	731-287-9224	Rental fee
Fayette	Fayette County Soil Conservation District	901-465-2631	Rental fee
Fentress	Fentress County Soil Conservation District	931-879-8212	Rental fee *Drill to be available beginning Spring '07
Franklin	Franklin County Soil Conservation District	931-967-2521	Rental fee

Gibson	Gibson County Soil Conservation District	731-855-0023	Rental fee
Giles	Giles County Soil Conservation District (2)	931-363-2675	Rental fee *2nd drill to be available beginning Spring '07
Hardeman	Harden County Soil Conservation District	731-658-3227	Rental fee
Haywood	Haywood County Soil Conservation District	731-772-2965	Rental fee
Henderson/Decatur	Henderson/Decatur County Soil Conservation District	731-968-3551	Rental fee
Henry	Henry County Soil Conservation District	731-642-0761	Rental fee
Humphreys	Humphreys County Soil Conservation District	931-296-3442	Rental fee
Humphreys/Houston/Stewart	TWRA Region I Dan Fuqua (2)	731-423-5725 or 1-800-372-3928	
Knox	Knox County Soil Conservation District	865-671-3830	Rental fee
Lauderdale	Lauderdale County Soil Conservation District	731-635-7686	Rental fee
Madison	Madison County Farmers COOP	731-668-3070	Rental fee
Marion	Marion County Soil Conservation District	423-942-2244	Rental fee *Drill to be available beginning Spring '07
Obion	Obion County Soil Conservation District	731-885-6480	Rental fee
Overton	Overton County Soil Conservation District	931-823-2722	Rental fee *Drill to be available beginning Spring '07
Rhea	Rhea County Soil Conservation District	423-775-2272	Rental fee
Roane	Roane County Soil Conservation District (3)	865-376-2392	Rental fee
Scott	Scott County Soil Conservation District (3)	423-569-8960 or 931-879-8212	Rental fee

Sumner	Sumner County Soil Conservation District	615-452-3838	Rental fee *Drill to be available beginning Spring '07
Robertson	Robertson County Soil Conservation District (3)	615-382-9863	Rental fee
Tipton	Tipton County Soil Conservation District	901-475-3350	Rental fee
Williamson	Williamson County Soil Conservation District	615-794-8488	Rental fee
Wilson	Wilson County Soil Conservation District	615-444-1890	Rental fee *Drill to be available beginning Spring '07
TWRA - Region I - Southeast	TWRA Regional Biolgist Ed Harrson - Jackson	731-423-5725 or 1-800-372-3928	
TWRA - Region II - North	TWRA Regional Biologist Region II Russ Skoglund - Nashville (2)	615-781-6622 or 1-800-624-7406	
TWRA - Region II - South	TWRA Regional Biologist George Buttrey - Nashville (2)	615-781-6622 or 1-800-624-7406	
TWRA - Region III	TWRA Regional Biologist Dick Conely - Crossville (4)	931-484-9571 or 1-800-262-6704	
TWRA - Region IV	TWRA Regional Biologist David Brandenburg - Morristown (3)	423-587-7037 or 1-800-332-0900	

Appendix Three – Summary of Surveys of Organizations Managing Native Grasses in Tennessee

County	Landowner	Acres	Year	Contact
Coffee	Arnold AFB	569	1997	Lamb
Franklin	Arnold AFB	187	1997	Lamb
Cheatham	Army Corps	9	1999	Hedrick
Cheatham	Army Corps	30	2002	Hedrick
Cheatham	Army Corps	25	2006	Hedrick
Rutherford	Army Corps	40	2000	Hedrick
Davidson	Army Corps	25	2005	Hedrick
Wilson	Army Corps	10	2005	Hedrick
Jackson	Army Corps	40	2005	Hedrick
Davidson	Army Corps	1	2000	Hedrick
Davidson	Army Corps	14	2003	Hedrick
Monroe	USFS	25	1995	Lewis
Washington	USFS	25	2000	Lewis
Polk	USFS	50	1998-2000	Lewis
Cocke	USFS	25	1997	Lewis
Stewart	Ft. Campbell	9582	na	Leonard
Montgomery	Ft. Campbell	8164	na	Leonard
Carroll	Milan AAP	252	2003	Stephenson
Gibson	Milan REC	0.5	1995	Brown
Gibson	Milan REC	3	2002	Brown
Gibson	Milan REC	33	2004	Brown
Maury	Middle TN REC	1	1997/2001	Onks
Marion	TN DEC	6	2001	Spear
Waupaca	TN DEC	3	2002	Spear
Humphreys	TN DEC	25	2003	Spear
Anderson	TVA	11	2002	James
Anderson	TVA	5	2003	James
Anderson	TVA	10	2004	James
Benton	TVA	156	2000-2004	James
Campbell	TVA	33	1999-2000	James
Claiborne	TVA	11	1999-2000	James
Grainger	TVA	6	1997	James

Hamblen	TVA	10	1998-2005	James
Hawkins	TVA	8	2003	James
Meigs	TVA	15	2001	James
Meigs	TVA	6	2002	James
Meigs	TVA	58	2004	James
Meigs	TVA	57	2006	James
Monroe	TVA	20	2000	James
Monroe	TVA	15	2005	James
Rhea	TVA	57	2005	James
Sullivan	TVA	22	1999	James
Stewart	USFS - LBL	284	na	Bloemer
various	TWRA - West TN	2429	na	Gudlin
various	TWRA - Middle TN	2006	na	Gudlin
various	TWRA - Plateau TN	4465	na	Gudlin
various	TWRA - East TN	795	na	Gudlin
Williamson	Nashville Natives	5	2003	Sudbrock
Rutherford	Nashville Natives	20	2004	Sudbrock
Davidson	Nashville Natives	2	2004	Sudbrock
Grundy	So. Cumberland SRA	30	1995	Reynolds
Sequatchie	So. Cumberland SRA	2	2004	Reynolds

Appendix Four – Registered Attendees and Affiliations

Applegate	Roger	Tennessee Wildlife Resources Agency	Nashville	TN	Roger.Applegate@state.tn.us
Akins	Wally	TWRA - Region III - Chickamauga WMA	Decatur	TN	James.Akins@state.tn.us
Atkins	Scott	Tennessee Valley Authority	Guntersville	AL	jsatkins@tva.gov
Banker	Tom		Silver Point	TN	banker@twlakes.net
Bates	Gary	Univ of Tennessee - Plant Sciences	Knoxville	TN	gbates@utk.edu
Beason	Stephen	US Army Corps of Engineers	Lancaster	TN	stephen.c.beason@usace.army.mil
Beaty	Shorty	Hamilton Co. Soil Conservation District	Chattanooga	TN	renita.beaty@tn.nacdnet.net
Berkley	Mike	GroWild, Inc	Fairview	TN	growildmbe.aol.com
Bilbrey	Stacy	US Army Corps of Engineers	Carthage	TN	Stacy.L.Bilbrey@lrn02.usace.army.mil
Bingham	Bradley	US Fish & Wildlife Service	Cookeville	TN	bradley_bingham@fws.gov
Bishop	Adrea Shea	TDEC, Natural Heritage	Nashville	TN	andrea.bishop@state.tn.us
Blackford	Chris	Roundstone Native Seed, LLC	Upton	KY	
Bloemer	Steve	U.S. Forest Service	Golden Pond	KY	sbloemer@fs.fed.us
Borum	Clint	TWRA - Nashville	Nashville	TN	Clint.Borum@state.tn.us
Bowie	Jeff	USDA - NRCS	Columbia	TN	Jeff.Bowie@tn.usda.gov
Brandenburg	David	TWRA - Region IV Office	Morristown	TN	David.Brandenburg@state.tn.us
Brann	Greg	Natural Resources Conservation Service	Nashville	TN	greg.brann@tn.usda.gov
Bridges	Rachel	Tennessee State Parks	Lawrenceburg	TN	Rachel.Bridges@state.tn.us
Broach	Joy	US Army Corps of Engineers	Nashville	TN	joy.i.broach@us.army.mil
Bruton	Dowd	National Wildlife Turkey Federation	Traphill	NC	cdbrutonnwtf@wilkes.net
Buehler	Dave	U.T. - Forestry, Wildlife & Fisheries	Knoxville	TN	dbuehler@utk.edu
Byford	Jim	U.T. College of Ag & Applied Sciences	Martin	TN	jbyford@utm.edu
Carmen	Sondra	US Army Corps of Engineers	Celina	TN	sondra.f.haflin@lrn02.usace.army.mil
Cawood	Steve	Tennessee Farmers Coop	LaVergne	TN	scawood@ourcoop.com
Cirtain	Margaret	Univ. of Memphis, Dept. of Biology	Memphis	TN	mcirtain@memphis.edu
Clebsch	Meredith	Native Gardens	Greenback	TN	www.Native-Gardens.com

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