

Appendix 1

Use of early-succession fields containing native warm-season grasses and associated forbs by various wildlife species in the Mid-South region.

| Wildlife species | Nesting/ Birthing | Brooding/ Raise Young | Escape | Thermal | Foraging | Hunting/ Scavaging | Loafing/ Courtship |
|---|----------------------|--------------------------|--------|---------|----------|-----------------------|-----------------------|
| Birds | | | | | | | |
| Northern harrier <i>Circus cyaneus</i> | X | | | | | X | |
| Red-tailed hawk <i>Buteo jamaicensis</i> | | | | | | X | |
| American kestrel <i>Falco sparverius</i> | | | | | | X | |
| Wild turkey <i>Meleagris gallopavo</i> | X | X | | | X | | X |
| Northern bobwhite <i>Colinus virginianus</i> | X | X | | X | X | | X |
| Common snipe <i>Gallinago gallinago</i> | | | | | X | | X |
| American woodcock <i>Scolopax minor</i> | | | | | X | | X |
| Barn owl <i>Tyto alba</i> | | | | | | X | |
| Great horned owl <i>Bubo virginianus</i> | | | | | | X | |
| Long-eared owl <i>Asio otus</i> | | | | | | X | |
| Short-eared owl <i>Asio flammeus</i> | | | | | | X | |
| Common nighthawk <i>Chordeiles minor</i> | | | | | | X | |
| Chuck-will's-widow <i>Caprimulgus carolinensis</i> | | | | | | X | |
| Eastern kingbird <i>Tyrannus tyrannus</i> | | | | | | X | X |

| Wildlife species | Nesting/ Birthing | Brooding/ Raise Young | Escape | Thermal | Foraging | Hunting/ Scavaging | Loafing/ Courtship |
|--|----------------------|--------------------------|--------|---------|----------|-----------------------|-----------------------|
| Loggerhead shrike <i>Lanis ludovicianus</i> | | | | | | X | X |
| Horned lark <i>Eremophila alpestris</i> | X | X | | | X | | |
| Purple martin <i>Progne subis</i> | | | | | | X | |
| Northern rough-winged swallow <i>Stelgidopteryx serripennis</i> | | | | | | X | |
| Cliff swallow <i>Hirundo pyrrhonota</i> | | | | | | X | |
| Barn swallow <i>Hirundo rustica</i> | | | | | | X | |
| Sedge wren <i>Cistothorus platensis</i> | X | X | | | X | | |
| Marsh wren <i>Cistothorus palustris</i> | X | X | | | X | | |
| Eastern bluebird <i>Sialia sialis</i> | | | | | X | | |
| American Pipit <i>Anthus rubescens</i> | | | | | X | | X |
| Prairie warbler <i>Dendroica discolor</i> | | X | | | X | | X |
| Common yellowthroat <i>Geothlypis trichas</i> | | X | | | X | | X |
| Yellow-breasted chat <i>Icteria virens</i> | | X | | | X | | X |
| Blue grosbeak <i>Guiraca caerulea</i> | | X | | | X | | X |
| Indigo bunting <i>Passerina cyanea</i> | | X | | | X | | X |
| Dickcissel <i>Spiza americana</i> | X | X | | | X | | X |
| Bachman's sparrow <i>Aimophila aestivalis</i> | X | X | | | X | | X |
| Field sparrow <i>Spizella pusilla</i> | X | X | | | X | | X |
| Vesper sparrow <i>Poocetes gramineus</i> | X | X | | | X | | X |
| Savannah sparrow <i>Passerculus sandwichensis</i> | X | X | | | X | | X |

| Wildlife species | Nesting/ Birthing | Brooding/ Raise Young | Escape | Thermal | Foraging | Hunting/ Scavaging | Loafing/ Courtship |
|---|----------------------|--------------------------|--------|---------|----------|-----------------------|-----------------------|
| Swamp sparrow <i>Melospiza georgiana</i> | | | | | X | | X |
| Grasshopper sparrow <i>Ammodramus savannarum</i> | X | X | | | X | | X |
| Henslow's sparrow <i>Ammodramus henslowii</i> | X | X | | | X | | X |
| Lapland longspur <i>Calcarius lapponicus</i> | | | | | X | | X |
| Red-winged blackbird <i>Agelaius phoeniceus</i> | X | X | | | X | | X |
| Eastern meadowlark <i>Sturnella magna</i> | X | X | | | X | | X |
| American goldfinch <i>Carduelis tristis</i> | | X | | | X | | X |
| Mammals | | | | | | | |
| Opossum <i>Didelphis virginianus</i> | | | | | | X | |
| Southeastern shrew <i>Sorex longirostris</i> | X | X | X | X | | X | X |
| Eastern mole <i>Scalopus aquaticus</i> | X | X | | | | X | |
| Silver-haired bat <i>Lasionycteris noctivagans</i> | | | | | | X | |
| Big brown bat <i>Eptesicus fuscus</i> | | | | | | X | X |
| Red bat <i>Lasiurus borealis</i> | | | | | | X | |
| Hoary bat <i>Lasiurus cinereus</i> | | | | | | X | |
| Evening bat <i>Nycticeius humeralis</i> | | | | | | X | |
| Mexican freetail bat <i>Tadarida brasiliensis</i> | | | | | | X | |
| Raccoon <i>Procyon lotor</i> | | | | | | | X |
| Longtail weasel <i>Mustela frenata</i> | | | | | | X | |
| Striped skunk <i>Mephitis mephitis</i> | X | X | | | | X | |

| Wildlife species | Nesting/ Birthing | Brooding/ Raise Young | Escape | Thermal | Foraging | Hunting/ Scavaging | Loafing/ Courtship |
|--|----------------------|--------------------------|--------|---------|----------|-----------------------|-----------------------|
| Coyote <i>Canis latrans</i> | X | X | | | X | X | X |
| Red fox <i>Vulpes fulva</i> | X | X | | | X | X | |
| Gray fox <i>Urocyon cinereoargenteus</i> | | | | | | X | X |
| Groundhog <i>Marmota monax</i> | X | X | X | | X | | |
| Plains pocket gopher <i>Geomys bursarius</i> | X | X | | | X | | |
| Harvest mice <i>Reithrodontomys spp.</i> | X | X | X | X | X | | |
| White-footed mouse <i>Peromyscus leucopus</i> | X | X | X | X | X | | |
| Deer mouse <i>Peromyscus maniculatus</i> | X | X | X | X | X | | |
| Hispid cotton rat <i>Sigmodon hispidus</i> | X | X | X | X | X | | |
| Meadow vole <i>Microtus pennsylvanicus</i> | X | X | X | X | X | | X |
| Prairie vole <i>Microtus ochrogaster</i> | X | X | X | X | X | | X |
| Meadow jumping mouse <i>Zapus hudsonius</i> | X | X | X | X | X | | |
| Cottontail rabbit <i>Sylvilagus floridanus</i> | X | X | X | X | X | | X |
| White-tailed deer <i>Odocoileus virginianus</i> | X | X | X | X | X | | X |
| Reptiles and Amphibians | | | | | | | |
| Eastern box turtle <i>Terrapene carolina</i> | X | | | | X | X | |
| Fence lizard <i>Sceloporus undulatus</i> | X | | | | | X | |
| 6-lined racerunner <i>Cnemidophorus sexlineatus</i> | X | | | | | X | |

| Wildlife species | Nesting/ Birthing | Brooding/ Raise Young | Escape | Thermal | Foraging | Hunting/ Scavaging | Loafing/ Courtship |
|--|----------------------|--------------------------|--------|---------|----------|-----------------------|-----------------------|
| Ground skink <i>Scincella lateralis</i> | X | | | | | X | |
| Southeastern 5-lined skink <i>Eumeces inexpectatus</i> | X | | | | | X | |
| Slender glass lizard <i>Ophisaurus attenuatus</i> | X | | | | | X | |
| Eastern garter snake <i>Thamnophis sirtalis</i> | | | | | | X | |
| Black racer <i>Coluber constrictor</i> | | | | | | X | |
| Rat snake <i>Elaphe obsoleta</i> | | | | | | X | |
| Northern pine snake <i>Pituophis melanoleucus</i> | | | | | | X | |
| Black kingsnake <i>Lampropeltis getula</i> | | | | | | X | |
| Eastern milksnake <i>Lampropeltis triangulum</i> | | | | | | X | |
| Prairie kingsnake <i>Lampropeltis calligaster</i> | | | | | | X | |
| Mole kingsnake <i>Lampropeltis calligaster</i> | | | | | | X | |
| Northern copperhead <i>Agkistrodon contortrix</i> | | | | | | X | |
| American toad <i>Bufo americanus</i> | | | | | | X | |
| Fowler's toad <i>Bufo woodhousei</i> | | | | | | X | |
| Barking treefrog <i>Hyla gratiosa</i> | | | | | | X | X |

Note: Inclusion of species in this appendix does not imply native warm-season grasses are necessary for various life requirements, just that the species listed may use early-succession fields for the activities identified. Use of fields containing native warm-season grass may vary greatly among the species listed and is determined by many factors, such as season, size of field, structure of field (such as presence of brush), composition and juxtaposition of surrounding habitats, and management strategy (such as burning/haying regime).

Appendix 2

A brief description of USDA programs provided through the Natural Resource Conservation Service (NRCS) and Farm Service Agency (FSA).

Conservation Reserve Program (CRP) General Signup

The CRP is a voluntary program available to landowners to help improve water quality, reduce soil erosion and enhance wildlife habitat on highly erodible cropland. Under this program, landowners remove highly erodible or other environmentally sensitive land from production under contract for 10 years in exchange for annual payments and cost-share assistance to establish permanent vegetation. During a general signup, landowners have approximately 30-45 days to offer their land into the program. Offers are ranked nationwide by USDA using the Environmental Benefits Index (EBI). Higher EBI points suggest a greater chance of acceptance into the program. In CRP general signups, landowners enroll “whole” fields or large acreage. Many landowners have selected nwsq for this program and have established thousands of acres across the South. Recent changes in CRP regulations require and pay landowners to apply mid-contract practices that enhance wildlife habitat, such as strip-disking, strip herbiciding, legume interseeding and prescribed burning.

Conservation Reserve Program (CRP) Continuous Signup

Conservation buffers (filter strips, riparian forest buffers, contour grass strips and grassed waterways) and other small acreage or targeted practices are offered under a continuous signup for the CRP. This continuous signup allows landowners to enroll strips of cropland or marginal pastureland into the CRP without a competitive bidding process (like the general CRP signup). Recent bonuses and incentive payments have added an additional financial incentive for participation in continuous CRP. If land eligibility requirements are met, the eligible land can be accepted into the program immediately. Certain practices are eligible for a one-time Signing Incen-

tive Payment (SIP) of \$100 per acre plus a 40 percent Practice Incentive Payment (PIP) and/or an annual rental payment 20 percent higher than the general CRP rental payment. One of the most flexible and financially beneficial practices is CP33-Habitat Buffers for Upland Birds. This practice allows a landowner to enroll buffers 30 – 120 feet wide on one to all of their eligible cropland borders, where crop yields are generally lowest and often below “break-even” profitability. An annual rental payment is received on all acreage enrolled into CP33 during the 10-year contract, and landowners are also eligible for the SIP and PIP payments.

Environmental Quality Incentives Program (EQIP)

EQIP is a volunteer program available to all privately owned agricultural land. Landowners typically apply for EQIP funding based on an EQIP plan developed by local NRCS personnel to achieve conservation and environmental objectives. Local working groups help identify environmental concerns and objectives and conservation practices to help meet these objectives during a signup. Applications are evaluated for funding based on a state- and locally-developed ranking procedure to optimize environmental benefits. EQIP assists landowners by cost-sharing 50 – 75 percent of installation costs. Limited-resource producers and beginning farmers and ranchers may be eligible for up to 90 percent cost-share assistance to establish conservation practices. Landowners are required to maintain the conservation practice throughout the contract. Some wildlife provisions such as native grass hay establishment, native grass field borders and other wildlife practices may be eligible within EQIP; however, this may vary by state and county.

Grassland Reserve Program (GRP)

GRP was created by the Farm Security and Rural Investment Act of 2002 (Farm Bill). To be eligible, land must be in a contiguous block of 40 acres or more. Easements (30-year or permanent) or rental agreements (10- to 30-year) are available for landowners to protect grassland from urban development, conversion to crop production or any other development using an agricultural commodity that requires breaking the soil surface. Common grazing practices, haying and maintenance consistent with maintaining the grassland and forb species are permitted.

Wildlife Habitat Incentives Program (WHIP)

WHIP is a cost-share program that assists landowners with establishing wildlife habitat on private lands. Contract lengths vary from 5 – 10 years and applications are competitive with other landowners in the state. Up to

75 percent cost-share assistance is available for establishing a wide range of wildlife-friendly practices, such as establishing nwsgr, shrub hedgerows, invasive species control and other wildlife-friendly practices. Management practices, such as prescribed burning and strip-disking can also receive cost-share when included in the initial WHIP plan. No annual payments are provided for practices enrolled into WHIP. Many times landowners who do not have land that qualifies for CRP can enroll their property into WHIP; however, eligible practices may vary among states.

These are general guidelines for program information. Available programs can change upon passage of new Farm Bill legislation, and specific program practices are subject to change from state to state. For the most current information on these or other USDA programs, contact the local USDA Service Center, NRCS office, FSA office or Soil Conservation District. Below are important Web sites for more information.

<http://www.usda.gov/farmbill>

<http://www.nrcs.usda.gov/>

<http://www.fsa.usda.gov/>

Appendix 3

Calibrating sprayers

Accurate herbicide application is essential when establishing newsg and controlling undesirable weeds. Sprayer calibration involves measuring the output of solution from a spray rig for a given speed over a measured area to determine gallons per acre. This is as essential to successful establishment as selecting the proper herbicide and time and depth of planting. In general, a spray rate of 10 – 30 gallons of water per acre is recommended with a spray pressure of 20 – 40 pounds per square inch (psi).

There are many different methods for calibrating spray rigs. Whichever calibration method is used, it is important to check spray rig calibration:

- when starting a project;
- when using a different speed;
- when PTO or RPM levels change (unless spray output is powered by other sources such as a battery on smaller spray rigs);
- when output or desired volume of water changes;
- when equipment is changed (spray rig, tractor, PTO pump, spray tips, etc.);
- when sprayer pressure is adjusted.

Spray-an-acre method

This is an easy and direct method to calibrate spray rigs. The steps below outline the spray-an-acre calibration method.

1. Measure and mark the boundary for one acre (such as 300 feet X 145 feet).
2. Fill up spray rig tank or fill to a recorded mark on the tank or gauge with water only.

3. Select a gear and engine speed combination that allows a full spray rig to be driven safely and comfortably across the area to be sprayed.
4. With sprayer operating, adjust pressure to desired setting. [Note: this is usually 20 to 40 pounds per square inch (psi). Higher pressure levels tend to vaporize water and may cause drift during application. Select the larger water droplet size for spray tips and low to mid-range psi levels to avoid drift problems.]
5. Refill if needed with clean water.
6. Spray the marked area at the pre-selected gear, speed and pressure. Avoid overlaps when spraying.
7. After the marked area is completely covered, shut off sprayer and measure how many gallons it takes to refill or return to the recorded mark.
8. The number of gallons used to refill is the gallons per acre (GPA) applied.

1/128-acre method

This procedure is a popular and quick method of calibration by capturing a small amount of water over a specific straight driving distance. The steps below outline the 1/128 acre calibration method.

1. Referencing the table at right, measure and mark the appropriate distance to be sprayed. Select the straight driving distance that corresponds to the spray tip or nozzle spacing.
2. Fill spray rig with clean water.
3. Select a gear and engine speed combination that allows a full spray rig to be driven safely and comfort-

| Spray tip or nozzle spacing (inches) | Distance to time for calibration (feet) |
|--------------------------------------|---|
| 18 | 227 |
| 20 | 204 |
| 22 | 185 |
| 24 | 170 |
| 26 | 157 |
| 28 | 146 |
| 30 | 136 |
| 32 | 127 |
| 34 | 120 |
| 36 | 113 |
| 38 | 107 |
| 40 | 102 |

ably across the straight line distance after adjusting pressure to desired setting (usually 20 to 40 psi).

4. While maintaining the selected gear and keeping the engine speed (RPM) constant from step 3 (if using a PTO-driven pump), record in seconds the time required to drive or pull the spray rig through the marked distance. Do not record time from a standing start, but have the spray rig at desired speed when entering and running through the marked “distance for calibration.”
5. Repeat step 4 and average the time for two runs.
6. Return to a level stop and park spray rig while letting it run at the same engine speed (RPM) and pressure as during step 4. Using a measuring cup, measure in ounces the spray output from a single spray tip or nozzle for the same time it took to drive the measured distance in step 4.
7. Repeat step 6 several times with different spray tips and average the volume from individual spray tips or nozzles.
8. The average amount of water, measured in ounces, collected per spray tip or nozzle equals gallons per acre (GPA).

Adding the herbicide to the tank

After the spray rig has been calibrated, the amount of herbicide to be added to the clean water already in the tank must be determined. The tank should be at least half full prior to mixing in any herbicide. After the appropriate amount of herbicide and surfactant (if needed) are added, the tank should be filled with clean water to help disperse the chemical throughout the tank. Herbicides and surfactants should **not** be mixed together before pouring into spray tank. The spray tank should always be half full of water when mixing chemicals. Cloudy water from ponds, creeks or other water sources should not be used because the organic materials present may result in an ineffective application.

For broadcast applications...

- 1) Divide the full tank capacity by the gallons per acre (GPA) output to get the number of acres (A) covered by one full tank.

- 2) Multiply the herbicide rate (ounces per acre or pints per acre) by the acres (A) from one full tank.
- 3) Pour this amount of herbicide into the tank and fill the rest of the tank with clean water. Add the appropriate amount of surfactant, if needed.

Example

A landowner wants to eradicate tall fescue in a field and convert it to nwsgr. The prescription for spraying tall fescue is 2 quarts of a glyphosate herbicide with 1 quart of MSO per acre. The spray rig will hold 300 gallons. After cleaning the sprayer and filling it up, a safe speed for spraying the field was determined. A calibration distance of 204 feet was marked off in the field after determining the spray tips were 20 inches apart. It took 35 seconds to pull the spray rig through the calibration distance (204 feet). The spray rig was parked and, with the engine still running at the same speed (RPM), water from one spray tip was collected in a measuring cup for 35 seconds. Fifteen ounces were collected; thus, the output of the spray rig was 15 gallons per acre (GPA). The following calculations were made before pouring herbicide into the tank:

- 300-gallon tank divided by 15 GPA = 20 acres covered by one tank;
- 2 quarts of Roundup™ per acre X 20 acres = 40 quarts in one full tank;
- 1 quart of surfactant per 100 gallons of water = 300 gallons X 1 quart per 100 gallons = 3 quarts per full tank.

Useful Conversions:

1 square mile = 640 acres = 2.590 square kilometers
 1 acre = 4,840 square yards = 43,560 square feet = 4,047 square meters
 1 mile = 5,280 feet = 1.609 kilometers
 1 yard = 3 feet = 36 inches = 0.914 meters
 1 inch = 2.54 centimeters = 25.4 millimeters
 1 gallon = 4 quarts = 8 pints = 128 ounces = 3.785 liters
 1 pound = 16 ounces = 256 drams = 7,000 grains = 453.592 grams

Cleaning sprayers

It is important to thoroughly clean and rinse the entire spray rig, including spray nozzles and tips, before calibrating the spray rig. Residual herbicide in sprayers can cause damage to nws, as well as other desired vegetation. Some herbicides, especially the ester formulation of 2,4-D™, Banvel™, Weedmaster™, sulfonyleureas and imidazolinones are very difficult to wash out of a sprayer. Dedicating spray rigs to specific herbicides is one way to avoid serious damage to non-target vegetation. Recommendations for cleaning sprayers are provided on many herbicide labels. Household ammonia can be used to clean spray rigs as follows:

- 1) Drain spray rig in an appropriate area or container. Rinse the tank and flush hoses with clean water.
- 2) Fill the sprayer with clean water and add household ammonia (1 gallon 3 percent active ammonia product for every 100 gallons of water or 1.5 ounces of ammonia for every 10 gallons of water for smaller tanks). Flush hoses, boom and spray tips.
- 3) Shut off boom and refill the entire tank with water.
- 4) Turn on spray rig and allow water and ammonia mix to circulate for at least 15 minutes, then flush hoses, boom and spray tips.
- 5) Drain tank.
- 6) Remove spray tips and screens and clean thoroughly.
- 7) Repeat step 2.
- 8) Rinse tank, hoses, boom and spray tips thoroughly.

Sprayers should not be cleaned near creeks, wells, sinkholes, drainage areas, other water bodies or near desirable vegetation. If concentrated liquid herbicides are accidentally spilled, absorbent kitty litter should be used quickly to soak up the herbicide. The herbicide-laced litter may be broadcast in an agricultural seeder spreader on targeted vegetation at label rates.

Appendix 4

Herbicides, rates, approximate applications, cost and manufacturer information

| Primary active ingredient (%) | Trade name ¹ | Sugg. rate per acre ² | Application ³ | Manufacturer | Approx. cost | Residual soil activity | Purpose for spraying / comments ⁴ |
|--|--|----------------------------------|-------------------------------|--------------|--|------------------------|--|
| Broad-spectrum herbicide | | | | | | | |
| glyphosate | Roundup Ultra-Max (50.2); Gly-4 Plus (41); Accord (53.8); several others | 1–5 quarts | postemergence | several | \$45–140 per 2.5 gallons | No | Controls existing vegetation when preparing to plant or restore early-succession habitat; kills cool-season weeds in dormant nwsg and forbs. |
| Herbicides for native grass establishment | | | | | | | |
| imazapic (8.1) and glyphosate (21.9) | Journey | 16–32 ounces | preemergence postemergence | BASF | \$275 per 2.5 gallons (\$10–20 per acre) | Yes | Controls a variety of forbs and grasses when planting/restoring early-succession habitat, including bluestems, indiagrass and sideoats grama. |
| imazapic (23.6) | Plateau | 4–12 ounces | preemergence postemergence | BASF | \$270 per gallon (\$10–25 per acre) | Yes | Controls tall fescue, crabgrass, johnsongrass and other grasses and forbs when planting/restoring/managing early-succession habitat, including bluestems, indiagrass and sideoats grama; Plateau is available only through select government agencies. |
| sulfosulfuron (75) | OutRider | 0.75–2.0 ounces | preemergence postemergence | Monsanto | \$305 per 20 ounces (\$11–31 per acre) | Yes | Controls various forbs and grasses when planting/restoring early-succession habitat, including bluestems, indiagrass, switchgrass and sideoats grama |
| Grass-selective herbicides | | | | | | | |
| clethodim (26.4) | Select 2EC | 6–16 ounces | postemergence | Valent | \$158 per gallon (\$7–20 per acre) | No | Controls various grasses in firebreaks planted to soybeans, alfalfa, sunflowers, Brassicas and clovers. Does not harm yellow nutsedge. Also may be used to set back nwsg and allow more forbs to establish. |
| quizalofop (10.3) | Assure II | 5–12 ounces | postemergence | DuPont | \$135 per gallon (\$8–13 per acre) | No | Controls various grasses in firebreaks planted to soybeans. Also may be used to set back nwsg and allow more forbs to establish. |

| Primary active ingredient (%) | Trade name ¹ | Sugg. rate per acre ² | Application ³ | Manufacturer | Approx. cost | Residual soil activity | Purpose for spraying / comments ⁴ |
|--|---|--|--|------------------|---|------------------------|---|
| sethoxydim (13) | Poast 1.5L | 2–3 pints | postemergence | BASF | \$173 per 2.5 gallons (\$17–26 acre) | No | Controls various grasses in firebreaks planted to alfalfa, clovers and soybeans. |
| Forb-selective herbicides | | | | | | | |
| triclopyr (25); fluroxypyr (8.6) | PastureGard | 2–3 pints (herbaceous); 3–8 pints (woody) | postemergence | Dow AgroSciences | \$146 per gallon (\$37–55 per acre herbaceous; \$55–146 per acre broadcast woody control) | No | Controls various forbs in native grass hayland and pastures; no grazing restrictions on non-lactating dairy animals. |
| metsulfuron methyl (60) | Escort | 0.1 ounces (native grass) 1–3 ounces (woody) | postemergence | DuPont | \$350 per 16 ounces (\$3 per acre native grass; \$22–66 per acre for broadcast woody control) | Yes | Controls various forbs when managing native grasses, including bluestems, indiangrass, switchgrass and sideoats grama; controls various woody species. |
| metsulfuron methyl (60) | Cimarron | 0.1–1.0 ounces | preplant incorporated; preemergence; postemergence | DuPont | \$230 per 10 ounces (\$3–23 per acre) | Yes | Controls various forbs when establishing/ managing native grasses, including bluestems, indiangrass, switchgrass and sideoats grama; no haying or grazing restrictions. |
| metsulfuron methyl (60-Part A); dicamba (10.3-Part B); 2,4-D (29.6-Part B) | Cimarron Max (5 ounces of Cimarron and 2.5 gallons of Weedmaster) | (refer to label) | postemergence | DuPont | \$285 | Yes | Controls various forbs when managing native grasses, including bluestems, indiangrass, switchgrass and sideoats grama. |
| aminopyralid (40.6) | Milestone | 4–7 ounces | postemergence | Dow AgroSciences | \$93 per quart (\$12–20 per acre) | Yes | Controls forbs in grassland habitats; apply only to established grasses; no restrictions on haying or grazing following applications at labeled rates. |
| dicamba (48.2) | Banvel | 2–4 ounces for wheat, oats and rye; 8 ounces for grain sorghum; 8–16 ounces for field corn | preplant incorporated; preemergence; postemergence | Micro Flo | \$140 per 2.5 gallons (\$1–7 per acre) | Yes | Controls various forbs in fallow/old-field habitats (refer to label for rates) and in firebreaks planted to corn, wheat, oats, grain sorghum or soybeans. |
| dicamba (56.8) | Clarity | 2–4 ounces for oats, triticale, and wheat; 8 ounces for grain sorghum; 8–16 ounces for corn; | preemergence postemergence | BASF | \$238 per 2.5 gallons (\$2–12 per acre) | Yes | Controls various forbs in fallow/old-field habitats (refer to label for rates) and in firebreaks planted to corn, wheat, oats, grain sorghum or soybeans. |
| dicamba (55.0%) and diflufenzopyr (21.4%) | Overdrive | 4–8 ounces | postemergence | BASF | \$36 per pound (\$9–18 per acre) | Yes | Controls various forbs in native grass hay and pasture; no haying or grazing restrictions. |
| dicamba (12.4) and 2,4-D (35.7) | Weedmaster | 1–4 pints | postemergence | BASF | \$34 per gallon (\$5–17) | Yes | Controls various forbs in established native grasses and in firebreaks planted to wheat. |
| 2,4-D (47.2) | 2,4-D Amine | 0.5–3 pints | postemergence | several | \$37 per 2.5 gallons (\$1–6 per acre) | Yes | Controls various forbs in native grass habitats and in firebreaks planted to wheat, oats, corn and grain sorghum. |

| Primary active ingredient (%) | Trade name ¹ | Sugg. rate per acre ² | Application ³ | Manufacturer | Approx. cost | Residual soil activity | Purpose for spraying / comments ⁴ |
|---|--|---|--|------------------|--|------------------------|--|
| 2,4-DB (25.9) | Butyrac 200 | 0.7–0.9 pints for soybeans; 1–3 quarts for alfalfa, birdsfoot trefoil, alsike, ladino and red clovers | preplant incorporated; preemergence; postemergence | Agri-Star | \$37 per gallon (\$3–4 per acre for soybeans; \$9–28 per acre for other plantings) | Yes | Controls various forbs in native grass habitats. Does not harm many legumes, but will kill some, including sicklepod. Also controls various forbs in firebreaks planted to alfalfa, birdsfoot trefoil, alsike, ladino and red clovers. |
| thifensulfuron-methyl (50) | Harmony Extra | 0.3–0.6 ounces | postemergence | DuPont | \$240 per 20 ounces (\$4–7 per acre) | No | Controls various forbs in fallow/old-field habitats and in firebreaks planted to wheat or oats. |
| Selective herbicides primarily for firebreak plantings | | | | | | | |
| imazethapyr (70) | Pursuit | 3–6 ounces | preplant incorporated; preemergence; postemergence | BASF | \$538 per gallon (\$13–25 per acre) | Yes | Controls various forb and grass weeds in firebreaks planted to alfalfa, clovers, birdsfoot trefoil, lespedezas, cowpeas and soybeans; do not apply preemergence on alfalfa or clovers; Pursuit can also be applied to bluestems and switchgrass to control various problem forbs, annual grasses and yellow nutsedge. |
| pendimethalin (37.4) | Pendulum 3.3 EC; Prowl 3.3 EC Prowl H ₂ O | 2–4 pints (varies by crop and soil type) | preplant incorporated; preemergence; postemergence | BASF | \$100 per 2.5 gallons (\$10–20 per acre) \$59 per 2.5 gallons (\$6–12 per acre) | Yes | Controls various forb and grass weeds in firebreaks planted to corn, various legumes and sunflowers; do not apply preplant incorporated before planting corn; apply preplant incorporated only before planting Southern peas and sunflowers. |
| trifluralin (43) | Trifluralin 4EC; Treflan HFP | 1–2.5 pints | preplant incorporated | Dow AgroSciences | \$46 per 2.5 gallons (\$3–6 per acre) \$83 per 2.5 gallons (\$5–11 per acre) | Yes | Controls various forb and grass weeds in firebreaks planted to cowpeas, chicory, Brassicas, wheat, soybeans and sunflowers; trifluralin can be applied postemergence on alfalfa if 0.5 inch or more of rain occurs within 3 days; trifluralin does not control established weeds. |
| halosulfuron-methyl (75) | Permit | 0.6–1.3 ounces | postemergence | Gowan | \$350 per 20 ounces (\$11–23 per acre) | Yes | Controls various forbs and yellow nutsedge in firebreaks planted to field corn and grain sorghum; do not use more than 1 ounce per acre on grain sorghum. |
| S-metolachlor (82.4) | Dual II Magnum | 1–2 pints | preplant incorporated; preemergence | Syngenta | \$285 per 2.5 gallons (\$15–29 per acre) | Yes | Controls various grasses and forbs in firebreaks planted to corn, cowpeas and soybeans. |

| Primary active ingredient (%) | Trade name ¹ | Sugg. rate per acre ² | Application ³ | Manufacturer | Approx. cost | Residual soil activity | Purpose for spraying / comments ⁴ |
|--|-----------------------------------|----------------------------------|--------------------------|------------------|---|------------------------|---|
| bentazon (44) | Basagran | 1–2 pints | postemergence | BASF | \$218 per 2.5 gallons (\$11–22 per acre) | No | Controls various forbs and yellow nutsedge in firebreaks planted to corn, grain sorghum, cowpeas and soybeans; may cause yellowing or speckling in soybeans and cowpeas, but this is temporary and outgrown within 10 days. |
| Selective herbicides primarily for woody control, but also for control of various forbs and grasses | | | | | | | |
| imazapyr | Arsenal AC (53.1); Chopper (27.6) | 6–24 ounces | postemergence | BASF | \$160 per quart (\$30–120 per acre) | Yes | Controls a variety of woody competitors (see label for species); releases legumes; may kill native grasses; controls bermudagrass prior to planting native grasses. |
| triclopyr | Garlon 3-A; Triclopyr 4 EC | 1–8 quarts | postemergence | Dow AgroSciences | \$200 per 2.5 gallons (\$20–160 per acre) | No | Controls a variety of woody competitors (see label for species); kills forbs (including legumes and blackberry) and releases grasses. |

¹ Use of brand, trade or company names in this publication is for clarity and information; it does not imply approval of the product or company to the exclusion of others, which may be of similar composition or equal value. In particular, generic products commonly become available and may differ in price and percentage of active ingredient. Always be sure to read, understand and follow directions and precautions on herbicide labels before use. As herbicides, herbicide labels, and their availability and recommendations may change, it is best to consult your local Extension agent or farm supply distributor for the latest recommendations on herbicide use.

² Various crops labeled for a particular herbicide often require or tolerate different types of applications (such as pre- or postemergence) and different application rates. Application rates also may differ depending on soil texture. Always refer to herbicide labels for specific application rates for a given crop.

³ A surfactant should be added to all postemergence herbicide applications unless the herbicide already contains surfactant. Refer to the herbicide label as to which surfactant to use, mixing instructions and recommended rates.

⁴ Many herbicides have multiple uses. Read the herbicide label before use. The purposes stated in this table are for general information. In addition, there are rotation crop restrictions for many herbicides, which may preclude you from planting specific crops for a given amount of time after applying various herbicides. Refer to herbicide label for information concerning crop rotation restrictions. The majority of postemergence herbicides work best when applied to actively growing plants, often before they reach a certain size/height. Refer to herbicide label to identify optimum application effectiveness.

Appendix 5

Using no-till technology to establish nwsg

There have been many changes in agriculture during the last 50 years. One of the most significant changes has been the use of no-till planting methods. When no-till planting is mentioned, most people usually think of crops such as corn, soybeans and cotton. Though often overlooked, no-till technology is also well-suited to establish forage crops, including nwsg, for wildlife or livestock. Soil erosion in conventional row-crop production has been decreased significantly by using herbicides to kill a cover crop and planting without tillage. This same benefit is also realized when no-till planting nwsg.

Why use no-till?

Many fields in Tennessee have been planted to permanent pasture because they were too steep to conventionally plant corn or soybeans. The potential for soil erosion was so great that a perennial cover had to be used to prevent excessive soil erosion, which was inevitable on many slopes. The main advantage to no-till planting is to conserve soil and decrease erosion.

No-till planting has several other advantages. Planting is able to occur soon after rain using no-till, while the soil must be allowed to dry before disking when conventional planting is used. After planting, the soil retains moisture longer when using no-till technology because the soil is not directly exposed to the sun. This is a real consideration when planting nwsg, especially when planting later in the season (June).

Characteristics needed in no-till drills

To be successful, no-till drills must place seed at the right depth, at the right rate and in firm contact with soil. They need to do this across a wide range of soil-moisture gradients, soil types, slopes and residue cover. Listed below are some characteristics to consider when choosing or using a no-till drill.

Weight

A no-till drill needs enough weight to let coulters and seed openers penetrate firm soil, allow press wheels to close the seed furrow and keep drive wheels or coulters in good contact with the ground. Depending on soil moisture, depth of planting and the setup of the drill, this may require 300 to 600 pounds per foot of width.

Coulters

Many drills use coulters to cut through residue in front of seed-furrow openers. In general, narrow coulters less than 1 inch wide disturb less residue, require less weight and work better across a wider range of conditions than wide-fluted coulters. Either narrow-ripple or smooth-edge ripple (bubble) coulters work well. Coulters should be as close to seed furrow openers as possible for better tracking on hills. Generally, coulters should be run at the depth of seeding or slightly deeper. When planting nwsg, this is just below the ground surface. Some drills use offset double-disc openers or angled, single-disc openers instead of coulters. These drills require less weight to penetrate the soil and have fewer moving parts. Disc openers wear out quicker on these drills, and the coulters may be useful in heavy residue.

Seed furrow opener

Double- or single-disc openers give more consistent depth of seeding and handle heavy residue better than hoe or shovel openers. They are particularly better for shallow planting, such as nwsg, alfalfa and clovers.

Depth control

Seeding depth is usually controlled by the press wheels or by depth gauge wheels mounted by the seed openers. Some drills rely on coulters to set seeding depth, but this method will not give consistent results.

Press wheels

Press wheels cover the seed, firm the soil and control seeding depth on many planters. Generally, either single 2-inch press wheels or two angled, narrow press wheels in a V-shaped configuration work well on no-till drills. Single, narrow press wheels (1-inch wide) will not control depth well in soft soils and should be used only if depth is controlled by gauge wheels. Press wheels wider than 2 inches will not close the seed furrow unless they have ribs on either side of the furrow. The angled, V-shaped press wheels work well on hard ground, but may clog in heavy residue like corn stubble. Staggering the press wheel/seed opener units helps reduce clogging.

Seed metering

Most drills have internally fluted metering mechanisms that are easy to adjust and are suitable for a wide range of seeds (various species). However, special seed box attachments with an agitator or auger and picker wheels (or similar device) are necessary for bluestems and indiangrass seed that have not been de-bearded. Also, many drills have a small seed box for planting switchgrass, alfalfa or clovers.

Power requirements

Pull-type drills need five to seven horsepower per foot of width.

Tractor hydraulics

Many drills require that the tractor have external hydraulics, so two hydraulic hoses can be plugged in.

Tracking

Proper tracking, with the seed opener and press wheels following in line behind the coulter, is often a problem on hilly ground or in turns. Drills with coulters close to the openers have less problems with tracking. Wider coulters help by tilling a wider zone, but require more weight.

Maintenance and operation

Of course, it is important to follow the recommended maintenance practices for no-till drills and to be familiar with the operating procedures as described in the owner's manual. Drills should be inspected before planting and maintained as necessary. Many drills used to plant nwsg are

borrowed or rented from state wildlife agencies, Quail Unlimited chapters, or farm supply companies. The age, type and maintenance of these units vary greatly. It is critical to understand how to adjust the seeding rate, change the seeding depth, realize how the weight and ballasting system works, and know the horsepower and hydraulic requirements of the drill. Drills should be inspected before transport or use for worn, broken or missing parts. Fittings should be greased and hoses inspected for wear and to make sure they are not clogged. Before beginning to plant, coulter settings and seeding depth should be adjusted as necessary, and the drill must be calibrated. More tips on calibration are described below.

Calibrating the drill

Calibrating a drill is nothing more than determining how much seed is being released per acre at a given setting. There are several ways to calibrate a drill, depending upon make and model. Nonetheless, any drill can be calibrated using the following steps.

- 1) Set the seed flow rate for the drill according to the calibration chart guidelines.
- 2) Mark a 100-foot length to use for catching seed.
- 3) Detach the seed flow tubes from above the press wheels.
- 4) Load seed (when using bluestems and indiangrass that have not been de-bearded, use enough to seed to fill to the top of seed agitators) and pull the drill until seed begins to flow.
- 5) Tape or tie a bag onto each of the hoses and pull the drill over the 100-foot marked area.
- 6) Weigh the amount of seed released over the 100-foot area.
- 7) Seeding rate in pounds per acre can be determined by the following formula:

$$\text{Seeding rate (lb/acre)} = \frac{\text{seed released (lbs)} \times 43,560 \text{ sq ft per acre}}{100 \text{ ft} \times \text{drill width (feet)}}$$

Note: this equals the seeding rate in bulk pounds per acre, not Pure Live Seed (PLS).

When more than one seedbox is used, each one should be calibrated individually before seeding. For example, when planting nwsg for wildlife, the seedbox for nwsg must be calibrated, as well as the seedbox for small seeds if forbs are added separately from the grasses. Changing the calibration on one seedbox does not affect calibration of the other boxes.

Some drills provide instructions for calibration by raising the drive wheel with a jack and turning the drive wheel a certain number of rotations at the proper ground speed to approximate a usage distance. This is often easier than pulling the drill several times before getting the seeding rate adjusted properly.

Several factors may affect seeding rates. Humidity, seed density, purity, inert matter and debris in the seed bag, speed of travel, seedbed condition, slope, soil type and tire size may influence the seeding rate. This illustrates the importance of calibrating the drill on the site to be planted, with the seed being planted on the day planting is completed. Operator error also can affect the seeding rate significantly. Overlapping rows, leaving too wide a space between rows and not lifting the drill at row ends can impact grass density significantly.

Coulter adjustment

No-till drills vary in the method used to control coulter seeding depth. Coulter depth on some drills can be adjusted by adding or removing weights to the drill. Some drills have a hydraulic mechanism that can be raised or lowered to adjust coulter depth. A variety of mechanisms are used to adjust disc opener depth. When the drill is being calibrated for seeding rate, several furrows should be checked to determine the depth the coulter is cutting into the ground and the depth of seed placement. Generally, it is best to use only enough pressure, weight or coulter depth to ensure the coulters will turn. The final determination of seeding depth is made by checking the planting furrows when planting and measuring seed depth. If the seeds are not obvious, they are too deep or are not being planted!

Appendix 6

Approximate number of seed per pound for selected grass species

| Species | | Seed per pound |
|---------------------------------------|--------------------------------|----------------|
| Native warm-season grasses | | |
| Big bluestem | <i>Andropogon gerardii</i> | 165,000 |
| Little bluestem | <i>Schizachyrium scoparium</i> | 240,000 |
| Broomsedge bluestem | <i>Andropogon virginicus</i> | ? |
| Indiangrass | <i>Sorghastrum nutans</i> | 175,000 |
| Switchgrass | <i>Panicum virgatum</i> | 389,000 |
| Eastern gamagrass | <i>Tripsacum dactyloides</i> | 7,500 |
| Sideoats grama | <i>Bouteloua curtipendula</i> | 191,000 |
| Introduced warm-season grasses | | |
| Bahiagrass | <i>Paspalum notatum</i> | 273,000 |
| Bermudagrass (hulled) | <i>Cynodon dactylon</i> | 2,071,000 |
| Crabgrass | <i>Digitaria sanguinalis</i> | 825,000 |
| Dallisgrass | <i>Paspalum dilitatum</i> | 281,000 |
| Johnsongrass | <i>Sorghum halepense</i> | 119,000 |
| Introduced cool-season grasses | | |
| Tall fescue | <i>Festuca arundinacea</i> | 227,000 |
| Orchardgrass | <i>Dactylis glomerata</i> | 416,000 |
| Timothy | <i>Phleum pratense</i> | 1,152,000 |
| Kentucky bluegrass | <i>Poa pratensis</i> | 1,440,000 |
| Smooth bromegrass | <i>Bromus inermis</i> | 135,000 |
| Annual ryegrass | <i>Lolium multiflorum</i> | 224,000 |
| Oats | <i>Avena sativa</i> | 16,000 |
| Wheat | <i>Triticum aestivum</i> | 11,000 |
| Rye | <i>Secale cereale</i> | 18,000 |

Appendix 7

Sources of native warm-season 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 Company
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

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

Buyers are urged 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 suppliers.

Appendix 8

Glossary

annual – a plant that completes its life cycle in one year or season

auricle – an ear-shaped appendage or lobe

awn – a bristle-like appendage

axis – the elongated central supporting structure, often specifically called a rachis

backing fire – a fire set to spread into the prevailing wind, or downhill; slow-moving

basal area – the average amount of a given area occupied by the cross-sectional area of tree stems, usually expressed as square feet per acre

beard – a group of long awns

biennial – a plant that completes its life cycle in two years or seasons

blackline – preburned area (with no unburned fine fuels) adjacent to firebreak or other control line

blade – the upper expanded part of a grass leaf

bract – a reduced or modified leaf

bramble – plants from the genus *Rubus*, including the blackberries and raspberries

browse – leaves and twigs of woody plants, including those from brambles and vines, typically eaten by animals such as white-tailed deer and rabbits

bud – an aggregation of undeveloped leaves or flowers on an axis with undeveloped internodes, often enclosed by scales

buffer – strips of land maintained in permanent vegetation designed to trap pollutants, reduce water and wind erosion, and provide other environmental benefits, including wildlife habitat

bulb – a short underground stem surrounded by fleshy leaves or scales

bunchgrass – a grass that grows in a well-defined clump, as opposed to sod-forming grass that spreads by stolons or rhizomes

clump – a single plant with two to many stems arising from a branched rootstock or short rhizome

collar – the outside area of a grass leaf where the blade and sheath join

composition – a mixture of a variety of plant species

controlled burn – see prescribed fire

cool-season grasses – grasses that make their active growth during the cooler months of the year, generally September through November and March through May

covert – the area where three or more habitat types come together

culm – the flowering stem of grasses and sedges

decreaser – a plant that decreases as a result of overgrazing

disseminate – to scatter or spread seed for growth

dominant – superior to the other grasses with which a grass is associated

dormant-season burn – prescribed fire implemented during the dormant season (generally October – March for warm-season plants)

drip torch – hand-held tank holding a fuel mixture (usually 55–70 diesel; 30 – 45 gasoline) used to ignite fires by dripping flaming liquid, at an adjustable rate, onto ground litter

ecotone – the transitional zone between two vegetative communities (a.k.a. “edge”)

edge – the area where two habitat types come together

emigration – movement of animals out of a local population, typically as a result of dispersal

entire – a leaf margin without teeth, lobes or divisions

fallow – describes an area previously planted but since left to respond to successional growth

firebreak – a natural (creek, road) or artificial (disked strip) discontinuity of fuels (grass, leaf litter) used to contain/control fire and limit the area burned

flame height – the vertical distance from the ground to the upper limits of the flame

flame length – the distance from the base of the flame to the flame tip, usually at an angle as wind directs the fire

flanking fire – a fire set to spread at right angles to the prevailing wind

forage – leaves and stems of herbaceous plants typically eaten by various animals

forb – a broad-leaved herbaceous plant (as opposed to grasses, rushes, sedges and ferns or woody plants)

germination – the percentage of seed that is capable of producing healthy plants when placed in a suitable environment.

glumes – the pair of bracts at the base of a grass spikelet

growing-season burn – prescribed fire implemented during the growing season (generally April – September for warm-season plants)

hard seed – the percentage of seed that is viable, but will not germinate immediately due to a hard or waxy seed coat

heading fire – a fire set to spread with the prevailing wind, or uphill; generally fast-moving

herb – a vascular plant without a woody stem

hydric – wet

immigration – movement of animals into a local population, typically as a result of dispersal

increaser – a plant that increases as a result of grazing

inert material – the percentage of sticks, stems, leaves, broken seed, sand and other such material mixed with the desired seed in the bag

inflorescence – the seedhead or flowering part of a plant

internode – that part of the grass stem between two nodes or joints

interspersion – refers to the number of habitat changes and amount of edge created over a management area

inundate – to cover with water (flood)

invader – a non-native (exotic) plant that spreads in an area where it is not native

juxtaposition – refers to the placement (proximity) of habitat types

keel – the sharp fold at the back of a compressed sheath, blade, glume or lemma

lemma – the bract of a spikelet above the pair of glumes

ligule – the thin, membranous, hairy or ridgelike appendage or projection on the inside (base) of the leaf where the blade and sheath join

litter – represents dead natural fuels on the ground, including leaves, needles, sticks, limbs, grass, etc.

membrane – a thin, soft, pliable structure serving as a covering or lining

mesic – moist

midrib – the central vein of a leaf

node – the joint of a grass stem that normally bears one or more leaves

noxious weed seed – the number of undesirable (potentially invasive) seed present per pound of desired seed

palatability – indicated by the preference an animal shows for feeding on a particular plant

panicle – a seedhead (inflorescence) with a main axis and subdivided branches; may be open or compact and spikelike

pedicel – the stalk or stem of a spikelet or single flower in a cluster

peduncle – stalk of a flower cluster or of a solitary flower when that flower is the only member of an inflorescence

perennial – a plant that produces aboveground parts from the same root system for at least three years or growing seasons

petiole – the stalk of a leaf blade

prescribed fire – controlled application of fire under specified environmental conditions that allows the fire to be managed at a desired intensity within a confined area to meet predetermined vegetation management objectives

pure live seed – the percentage of seed that is capable of germinating soon after planting in a suitable environment

raceme – an elongated seedhead in which the spikelets are pedicelled on a rachis

rachis – the axis of a spike or raceme (an axis bearing flowers or leaflets)

rhizome – an underground horizontal stem with nodes (usually producing roots), buds and scale-like leaves

ring fire – a fire set by igniting the entire perimeter of an area, allowing the fire to converge in the center

rootstock – subterranean stem; rhizome

rosette – a cluster of radiating basal leaves

scabrous – rough or gritty feeling to the touch

scale – the reduced leaves at the base of a shoot (especially said of those rudimentary leaves on a rhizome)

seedbank – the collection of seed occurring naturally in the soil

seedstalk – the stem on which a grass seedhead develops

senescent – dead or dying vegetation; often used to refer to deciduous leaves in the fall and winter, or dead grass from the previous growing season

serrate – with sharp teeth pointing forward

sessile – without a stalk (petiole or pedicel)

sheath – the lower part of a grass leaf that encloses the stem

shoot – individual stem and leaf growth

spathe – a large bract enclosing or surrounding an inflorescence (flower)

spike – an unbranched, elongated seedhead in which the spikelets (flowers) are sessile on a rachis

spikelet – a flower; the basic unit of a grass seedhead, consisting of one or more florets and a pair of glumes

stolon – a propagative, horizontal, shoot, stem or runner that is usually aboveground, rooting at the apex

strip-heading fire – fire set by a series of strips ignited upwind of a firebreak or blackline intended to burn with the wind into the firebreak or backing fire

succession – the orderly progression through time of changes in community composition, usually described in terms of plant life

terminal – at the tip

tuber – a fleshy enlarged portion of a rhizome or stolon with only vestigial (rudimentary) scales

warm-season grasses – grasses that make their active growth during late spring and summer

winter annual – an annual plant vegetatively persistent through the winter, flowering and fruiting in late winter or spring

xeric – dry

Appendix 9

Suggested reading and references for those interested in native warm-season grass management for early-successional wildlife and forages

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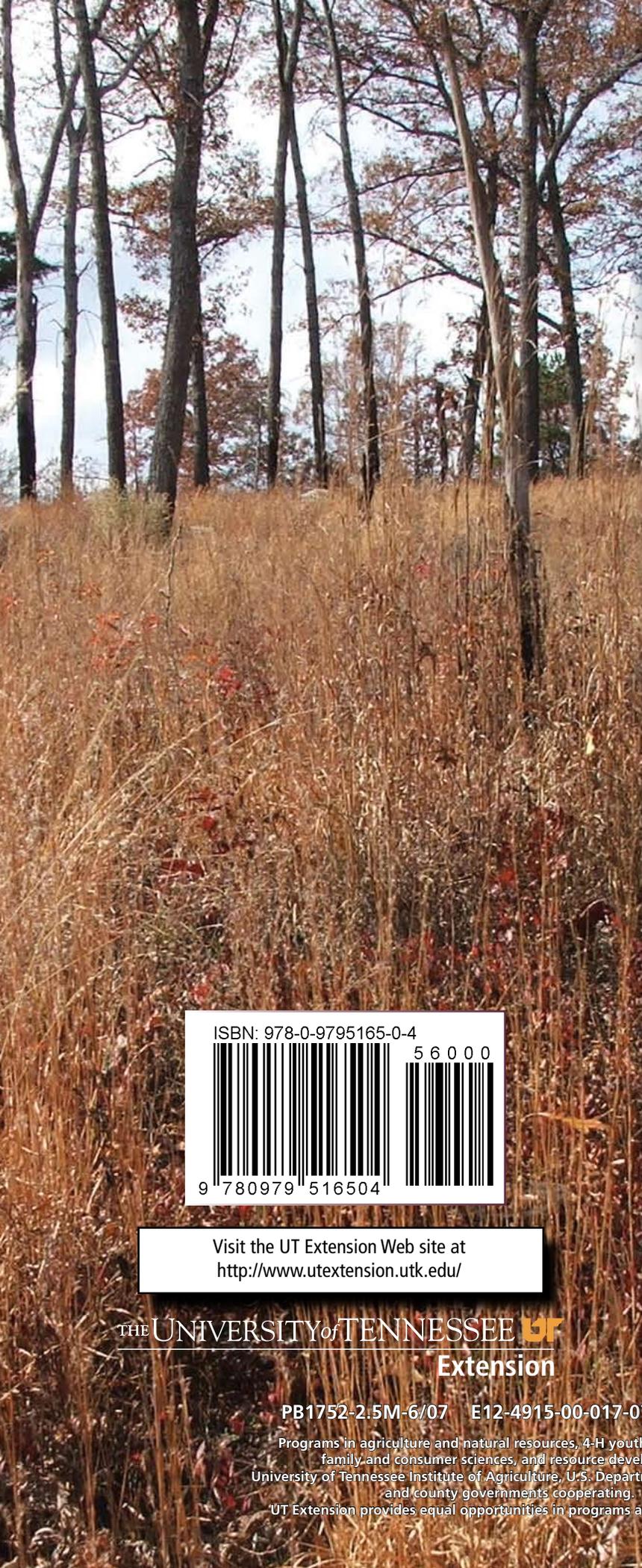
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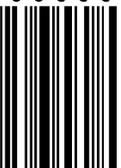
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