Mississippi Planting Guide

United States Department of Agriculture
Natural Resources Conservation Service

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I N T R O D U C T I O N

The third edition of the Mississippi Planting Guide is a publication containing plant guides on various types of plant materials used or have potential for use in resource conservation programs in Mississippi. It was prepared by the USDA-Natural Resources Conservation Service (NRCS) Jamie L. Whitten Plant Materials Center, Coffeeville, MS and Ecological Sciences, Jackson, MS.

Each plant guide contains a brief plant description; conservation use; soil adaptation; zone of adaptation in Mississippi; recommended plant varieties or sources; and cultural specifications for establishment and management. Appendices are included to provide general assistance with herbaceous and woody planting operations.

The Mississippi Planting Guide is divided into six sections - ***Grass and Grass-like***; ***Legumes***; ***Trees and Shrubs***; ***Wetland Plants***; ***Wildflowers and Miscellaneous Forbs*** and ***Coastal Plants***. Plant materials chosen for these sections have been tested for adaptation and performance by the Mississippi Agricultural and Forestry Experiment Stations, NRCS plant materials program, and from plant performance testing in adjoining states where soils and climate are similar to Mississippi. Plant materials in each section are listed in alphabetical order by common name. Similar common names were grouped to assist the user with locating and distinguishing them from others with similar names (e.g., bermudagrass, common and bermudagrass, hybrid).

Plant guides for soybean, corn, grain sorghum, and small grains were specifically developed for wildlife habitat management and do not provide the necessary information for commercial production. For information on commercial production practices for these and other row crops, contact the Mississippi Cooperative Extension Service.

Specific nomenclature follows the **PLANTS** database, which is the accepted authority for NRCS use. Several scientific names may be different than those with which the reader is familiar.

Section I. Grass and Grass-like

BAHIAGRASS (*Paspalum notatum*)

Description: A deep-rooted, sod-forming, warm-season perennial grass introduced from South America.

Uses: Erosion control, grazing, hay, wildlife, waterways and field borders. Wild turkey often strip mature seedheads which are excellent source of protein. Pastures harbor insect populations which are utilized by young turkey poults.

Soil adaptation: Suited for moist soils except highly alkaline, and extremely wet soils. Best suited to the light textured soils.

MS zone of adaptation: Zones 2, 3, and south half of Zone 1.

Varieties: Pensacola, Argentine, Tifton 9 (Zone 3 only).

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Requires a clean, firm seedbed. Prepare seedbed by disking and harrowing.

Planting rate: 15-25 lbs/acre. Cover seed ¼ inch deep.

Planting time: March 1 to May 31 or September-October 1. If fall seeding is performed on sloping land or land prone to erosion, plant in combination with wheat, oats or ryegrass.

Fertility requirements: Apply according to soil test recommendations or planting objective. In lieu of a soil test apply 400 lbs of 13-13-13/acre in spring or when a stand is evident. It may take two years to achieve a stand of bahiagrass. For maintenance fertilizer with legume mixture, apply 200 lbs/acre of 0-20-20 or similar analysis annually in the fall. Apply N in spring and summer as needed. In absence of a legume apply from 50-150 lbs N/acre, 40-60 lbs P_2O_5/acre, and 40-60 lbs K_2O/acre.

pH requirement: 5.5-7.0.

Companion plants: Crimson clover, white clover, ball clover, wild winter peas, annual lespedeza, and sericea.

Management: Do not graze during the establishment year. Graze and mow only to control competitive grasses and weeds until a complete sod is formed. Cut for hay just before seedheads are formed or immediately after seeds are harvested. Do not graze below three inches during the growing season. When legumes are established in combination with bahiagrass, allow the legume seed to mature to insure reseeding. Graze closely or cut bahiagrass in September to allow germination of reseeding legumes.

Seed production: Direct combine when about one-half of the seedheads are mature. Seed yields range from 200 to 300 lbs/acre. Dry seed immediately after harvesting by spreading seed not more than 8 inches deep and stir at least once a day to prevent heating. Store in a cool place.

Environmental concerns: Bahiagrass can be invasive in bermudagrass pastures and other pasture seedings. Spreads from rhizomes and seed.

BERMUDAGRASS, **COMMON** (*Cynodon dactylon*)

Description: An introduced, warm-season, sod forming perennial grass with both underground and above ground stems. Leaf blades are narrow, 1 to 4 inches long. Seed stalks have 4 or 5 spikelets, 1 to 1½ inches long. Seed is small and grayish to yellowish in color.

Uses: Grazing, hay and erosion control. Do not plant bermudagrass where quail management is an objective of the land manager.

Soil adaptation: Most soils except those that are wet or deep sands. Best suited to medium or high fertility soils.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Seed or sprigs.

Planting time: March - May.

Planting rate: Seed - 5 lbs/acre hulled seed. Cover lightly with cultipacker or roller. Sprigs - Plant sprigs or sod 15 to 18 inches apart in rows 3 feet apart.

Seedbed preparation: Requires a clean, firm seedbed.

Fertility requirements: Use soil test recommendations for optimum production. In lieu of a soil test apply 400 lbs/acre of 13-13-13 at time of planting. For maintenance, apply 70 lbs N, 40 lbs P_2O_5 and 40 lbs K_2O.

pH requirement: 5.5-7.0. Apply according to soil test not to exceed 2 tons/acre. In lieu of a soil test, apply 1 ton/acre of agricultural lime on acid soils.

Companion plants: Crimson clover, wild winter peas, vetch, ball clover, white clover, annual lespedeza, and arrowleaf clover. Works well in combination with bahiagrass for erosion control on critical areas plantings and conservation structures (grassed waterways and earthen dams).

Management: Do not graze or clip until a good sod is established, except to reduce competition. Allow plants to attain a growth of 6 inches at least once during the growing-season. Clip or graze close in the fall to insure volunteer stands of reseeding winter legumes. Allow legumes to mature seed.

Environmental concerns: Bermudagrass can become invasive and spread into cropland and other cultivated land. Spreads primarily from stolons.

BERMUDAGRASS, HYBRID (*Cynodon dactylon*)

Description: An introduced, deep-rooted, warm-season, sod-forming perennial grass. It begins growth early in the spring and continues until frost. It does not produce viable seed. The grass has underground jointed stems (rhizomes) and leafy stems (stolons) that grow rapidly on the surface to lengths of 4 to 5 feet or more.

Uses: Grazing, hay, silage, and erosion control. Do not plant bermudagrass where quail management is an objective of the land manager.

Soil adaptation: Best adapted to deep, well-drained soils.

MS zone of adaptation: Zones 1, 2, and 3 (Coastal and Tifton 44); Zone 2 and 3 (Alicia, Sumerall 007). Zone 3 (Tifton 78).

Varieties: Coastal, Tifton 44, Tifton 78, Sumerall 007, Alicia.

Cultural Specifications

Method of establishment: Vegetative cuttings and sprigs.

Seedbed preparation: Requires a good, firm seedbed free of other perennial grasses.

Planting time: March - June when soil moisture is adequate.

Planting rate: Plant sprigs 18 to 24 inches apart in rows 3 to 4 feet apart. Planting may also be done with fresh clippings broadcast uniformly over the land, then disked into soil and firmed with a cultipacker. Plant 20 bu of sprigs (rows) or 40 bu of green clippings/acre (broadcast).

Fertility requirements: For optimum hay and grazing production fertilize according to soil test recommendations. In lieu of a soil test apply 400 lbs/acre of 13-13-13 at planting time. For maintenance, apply 70-150 lbs N, 40-80 lbs P_2O_5 and 40-80 lbs K_2O.

pH requirement: 6.0-7.0 Apply according to soil test not to exceed 2 tons/acre. In lieu of a soil test, apply 1 ton/acre of agricultural lime on acid soils.

Companion plants: White clover, crimson clover, wild winter peas, red clover, annual lespedeza.

Management: Do not graze or clip until a good sod is established, except to reduce competition. Competition from other plants may be controlled by herbicides. Mowing or close grazing in the fall is necessary to insure volunteer stand of reseeding winter legumes. Cut for hay or silage when grass is 12 to 15 inches high.

Environmental concerns: Bermudagrass can become invasive and spread into cropland and other cultivated land. Spreads primarily from stolons.

BLUESTEM, BIG (*Andropogon gerardii*)

Description: A native, warm-season perennial tall grass often reaching heights of 8 feet. Big bluestem grows in large clump and is extremely leafy, and palatable to livestock.

Uses: Field borders and buffer strips for wildlife cover and erosion control, and in mixtures with other native warm season grasses, legumes and forbs.

Soil adaptation: Well-drained, fertile soils. It performs well on most soils except those that are very droughty or poorly drained.

MS zone of adaptation: Zone 1.

Cultivar: Kaw, Earl (Earl has not been tested in Mississippi but may have potential for North Mississippi).

Cultural Specifications

See Appendix C for *Management Tips for Planting Native Grasses*.

Planting rate: Rate depends on the objective of the planting. Rates are presented below. See Appendix B for *Planting Native Grasses Using the Pure Live Seed Method.*

Pasture or critical area plantings - 10 PLS lbs/acre drilled or 12 PLS lbs/acre broadcast.

Wildlife plantings (monocultures) - 5.5 PLS lbs/acre.

Mixtures with native warm season grasses for wildlife - See Appendix D for *Recommended Seeding Mixtures for WHIP*

Fertility requirements: Apply P_2O_5 and K_2O to bring soil up to a medium level according to soil test. In lieu of a soil test, apply 300 lbs/acre of 0-20-20 or equivalent analysis. Since big bluestem is slow to establish, **AVOID APPLYING NITROGEN UNTIL A GOOD STAND IS EVIDENT**. Fertilize with 50 lbs of N.

Weed control: Use 2, 4-D to control broadleaf weeds when big bluestem reaches the four leaf stage (follow the label rate). Do not spray 2, 4-D if a legume or forb is included in the mixture. Use Plateau® for crabgrass control in wildlife mixtures. There are several legumes and forbs that are beneficial to wildlife that Plateau® will not harm (read the label before applying). Do not apply Plateau® if switchgrass is used in the mixture. **Plateau® is not labeled for pasture plantings**.

An alternative weed control measure is to mow the planting in mid to late summer to reduce grassy weed competition. Adjust mower to avoid clipping the grass seedlings. Avoid clipping lower than 5 inches and after September 1.

pH requirement: 6.0-7.0.

Residue Management

Removal of previous year's growth will allow quicker green up and spring regrowth. Residue can be managed with fire or clipping. If burning is desired, use a prescribed burn plan prepared by the Mississippi Forestry Commission. Burn before the grass greens up in the spring. Big bluestem is burned in late February at the PMC. If clipping is performed, clip to a 10-12 inch height in March.

BLUESTEM, CAUCASIAN (*Bothriochloa caucasica*)

Description: A perennial, warm season grass native to Asia. It has an erect growth habit, very fine stems and is leafy. Caucasian bluestem is deep-rooted and drought tolerant. Pure stands tend to thicken and eliminate competition from weeds and annual grass.

Uses: Warm season forage and erosion control.

Soil adaptation: Neutral clay loam to sandy loam soils. It does not persist well on highly alkaline soils though initial growth may be good.

MS zone of adaptation: Zone 1.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: A clean and firm seedbed is necessary.

Planting time: April 15 - May 1.

Planting depth: ¼ to ½ inch.

Planting rate: 3-5 lbs pure live seed (PLS)/acre (Refer to Appendix B for information on using PLS). Ordinary grain drills do not work well because of the fluffy, trashy nature of the seed. A drill with a fluffy seed box provide the best results. A fertilizer distributor of the "E Z Flow" type has been used. Cultipacking or rolling after seeding is recommended.

Fertility requirements: Apply P_2O_5 and K_2O according to soil test results at planting time. Avoid applying nitrogen until the seedlings are at least 2 or 3 inches high. Apply N at 60 lbs/acre for moderate production.

Weed control during establishment: Use 2, 4-D to control broadleaf weeds when the grass reaches the four leaf stage (follow the label rate). Mowing is recommended to reduce grassy weed competition. Adjust rotary mower to prevent mowing seedlings too close, and avoid mowing after September 1.

Weed control after establishment: 2, 4-D and mowing management.

pH requirements: 6.0-7.0.

Management

Restrict traffic and livestock during establishment. All sites should be allowed to become established the first year prior to any grazing. Once grazing is started, do not graze lower than 4 to 6 inches.

Residue Management

Removal of previous year's growth will allow for quicker green up and spring regrowth. Residue can be managed with fire or clipping. If burning is desired, use a prescribed burn plan prepared by the Mississippi Forestry Commission. Burn before the plant begin to green up in the spring. If clipping is performed, clip the grass to a 4 to 6 inch height in March.

BLUESTEM, **LITTLE** (*Schizachyrium scoparium*)

Description: A native, warm-season perennial bunch grass that grows to heights of 2 to 4 feet. In the southeastern states, little bluestem is often mistaken for broomsedge bluestem because of similarities in height, color and growth form.

Uses: Erosion control, wildlife cover and as component in native warm season grass mixtures.

Soil adaptation: Prefers deep, well-drained, fertile soils, but will perform satisfactory on droughty soils.

MS zone of adaptation: Zones 1.

Cultivar: Aldous.(Aldous has not been extensively tested in Mississippi).

Cultural Specifications

See Appendix C for *Management Tips for Planting Native Grasses*.

Planting rate: Rate depends on the objective of the planting. Planting rates are presented below. See Appendix B for *Planting Native Grasses Using the Pure Live Seed Method.*

Pasture or critical area plantings - 10 PLS lbs/acre drilled or 12 PLS lbs/acre broadcast.

Wildlife plantings (monocultures) - 5.0 PLS lbs/acre.

Mixtures with native warm season grasses for wildlife - See Appendix D for *Recommended Seeding Mixtures for WHIP*

Fertility requirements: Apply P_2O_5 and K_2O to bring soil up to a medium level according to soil test. In lieu of a soil test, apply 300 lbs/acre of 0-20-20 or equivalent analysis. Since little bluestem and other native grasses are slow to establish, **AVOID APPLYING NITROGEN UNTIL A GOOD STAND IS EVIDENT**. Fertilize plantings with 50 lbs of N.

Weed control: Use 2,4-D to control broadleaf weeds when little bluestem reaches the four leaf stage (follow the label rate). Do not spray 2, 4-D if a legume or forb is included in the mixture. Use Plateau® for crabgrass control in wildlife plantings. There are several legumes and forbs that are beneficial to wildlife that Plateau® will not harm (read the label before applying). Do not apply Plateau® if switchgrass is used in the mixture. **Plateau® is not labeled for pasture plantings**.

An alternative weed control measure is to mow the planting in mid to late summer to reduce grassy weed competition. Adjust mower to avoid clipping the grass seedlings. Avoid clipping lower than 5 inches and after September 1.

pH requirement: 6.0-7.0.

Residue Management

Removal of previous year's growth will allow quicker green up and spring regrowth. Residue can be managed with fire or clipping. If burning is desired, use a prescribed burn plan established by the Mississippi Forestry Commission. Burn before the grass greens up in the spring. Little bluestem is burned in late February at the PMC. If clipping is performed, clip to a 10-12 inch height in March.

CARPETGRASS (*Axonopus fissifolius*)

Description: A creeping, turf-forming perennial grass that was introduced into the U.S. from Central America and the West Indies.

Uses: Recreational area seedings, ground cover and erosion control on lawns, playgrounds, camping areas, and golf courses.

Soil adaptation: Performs well on wet, acid, sandy and sandy-loam soil where moisture is near the surface most of the year. Volunteers readily on many lowland areas where climatically adapted and mowing is performed.

MS zone of adaptation: Zone 2 and 3.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Requires a clean, firm seedbed. Prepare seedbed by disking and harrowing.

Planting rate: 15 to 25 lbs/acre broadcast.

Planting depth: Do not plant the seed deeper than ¼ inch. Cultipack after planting.

Planting time: April-May.

Fertility requirements: Use soil test recommendations or apply 250-300 lbs/acre of 13-13-13.

pH requirement: 5.5 -6.5.

CORN (*Zea mays*)

Description: A warm-season annual; excellent wildlife food.

Uses: Choice food of many wildlife species including quail, dove, deer, turkey, squirrel, raccoon, ducks, non-game birds, and geese. Raccoon depredation may be heavy in bottomland areas. Makes excellent feed for livestock and high energy silage.

Soil adaptation: Performs best on well-drained soils. Poorly drained sites will not allow timely planting and will reduce yields and increase competition from weeds. Moderately well-drained sites can be chosen if flooding is desired for ducks.

MS zone of adaptation: Zones 1, 2, and 3.

Varieties: Varieties are chosen according to purpose of use. Consult with local county agent for variety selection. For wildlife, varieties that resist worms and produce heavy ears close to the ground are good choices.

Yields: Average for Mississippi is 65 to 100 bushels. Silage yields vary from 10 to 15 tons.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Well prepared seedbed or no-till into a legume, small grain, or old residues. Plant in 30 to 40 inch rows.

Planting time: March 15 - April 25 depending upon location in Mississippi.

Planting rate: Plant 16,000 to 20,000 seeds/acre which is equivalent to 12-17 lb.

Fertility requirements: Use soil test recommendations, or use 300-400 lbs/acre of 13-13-13, or similar analysis. Apply an additional 60 to 90 lbs of N/acre 30 days after emergence.

pH requirement: 6.0-7.0.

Combination plantings: Other plants that can be used with corn for wildlife are: browntop millet, Florida beggarweed, field peas, soybeans, and winter legumes (overseeded after corn maturity between September 1 and October 15). If flooding is planned, do not use winter legumes. Also note that browntop millet may tend to be a weed problem in later crop production areas.

Wildlife Considerations

Harvest by ducks: Enough will probably fall naturally in a flooded condition to provide complete, prolonged use. Rapid deterioration is reduced if allowed to fall naturally. About 50 percent would be lost in 90 days if on the ground or under water.

For geese: Mechanical harvest will allow enough grain for geese to utilize on dry land adjacent to water areas.

For doves and quail: Leave some standing around edges or harvest mechanically to distribute grain.

For deer: Leave standing in patches around edge of fields.

For squirrel: Leave standing in patches adjacent to wooded areas.

DALLISGRASS (*Paspalum dilatatum*)

Description: A long-lived perennial grass introduced from South America. It grows in bunches 2 to 4 feet high, but forms a sod under grazing. The leaves are numerous near the ground but few on the stem. It is a highly palatable grazing crop.

Uses: Hay, grazing, wildlife.

Soil adaptation: Best suited to fertile, moist, heavy, well-drained to moderately well-drained soils. It will survive periodic flooding.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Prepare a firm seedbed by breaking, disking, and harrowing.

Planting time: February through May. If planted in a mixture with a legume, plant from September 1 through October.

Planting rate: 15 PLS (pure live seed)/ acre (Refer to Appendix B for planting on a PLS basis). Cover about ½ inch deep.

Fertility requirements: Apply according to soil test or apply 400 lbs of 13-13-13/acre, or equivalent analysis, at planting time. For maintenance, apply 50 lbs N, 40 lbs P_2O_5 and 40 lb K_2O/acre annually.

pH requirement: 5.5-6.5. Apply agricultural lime according to soil test not to exceed 2 tons/acre. In lieu of a soil test apply 1 ton/acre of agricultural lime.

Companion plants: White clover, annual lespedeza and wild winter peas.

Management: When the grass makes seed, growth stops; therefore, do not allow seedheads to form until fall. To control ergot, mow or graze frequently.

Seed production: Combine when most of the seed are ripe. There are two methods of harvesting: direct combining, or cut with mower, allow to dry, then use combine with pick-up attachment.

Environmental concerns: Seed is susceptible to an ergot which can be toxic to livestock. Cutting the grass prior to seedhead emergence will control ergot.

EASTERN GAMAGRASS (*Tripsacum dactyloides)*

Description: A native, warm-season perennial bunchgrass capable of producing substantial yields and quality with proper fertility and management. It grows 5 to 9 feet tall and leaf blades range from 12 to 24 inches long; 3/8 to ½ inch wide.

Uses: Warm-season forage, erosion control, conservation buffers.

Soil adaptation: Moist, well-drained soils.

MS zone of adaptation: Zone 1, 2 and 3.

Cultivar: Jackson.

Cultural Specifications

Method of establishment: Seed. Request stratified seed from the seed dealer for spring plantings.

Seedbed preparation: A clean, **firm** seedbed is very critical in obtaining a good stand.

Planting time: Plant non-stratified seed from September-October and stratified seed from February to April.

Planting rate: 10 lbs/acre PLS (Refer to Appendix B for *Planting Native Grasses Using the Pure Live Seed Method*). A grain drill or corn planter works well since seed are similar in size to corn. **DO NOT BROADCAST SEED.**

Weed control: Mow to remove competition. If planted in rows cultivate after the seedlings are 4 to 6 inches. If mowing is performed, adjust rotary mower to avoid damaging newly established seedlings. Apply 2, 4-D at the four leaf stage.

Fertility requirements: Begin fertilizing in mid to late April or when plants begin actively growing. Use soil test recommendations to bring P and K to a medium level. In lieu of a soil test, apply 300 lbs/acre of 0-20-20 or a similar analysis. **DO NOT APPLY MORE THAN 10 LBS OF NITROGEN UNTIL A GOOD STAND IS EVIDENT.** This may exclude the use of N in the establishment year. In succeeding years for hay, apply 60 lbs N and K/acre after each cutting.

pH requirement: 6.0-7.5.

Management

Do not be discouraged if less than 25% of the seed germinate the first year; the remainder will usually germinate the following spring. Most producers have gotten excellent stands the first year, if stratified seed is planted in the spring.

First Year: Gamagrass is usually not grazed or hayed the first year due to slow establishment. In some cases, stands can be lightly hayed.

Hay Production: For hay, cut on 45 day intervals following the first application on N and K in April. Because of spring moisture potential and fertility level, the first cutting of hay may need to be taken before 45 days. If this is the case, cut in the boot stage (before seedheads emerge) for best quality hay. Use 45 day intervals for subsequent cuttings. Adjust mower to leave a stubble height of 6 inches. Allow 45 days of regrowth before first frost.

EGYPTIAN WHEAT

Description: Not a true wheat, but a member of the Sorghum family. Plants are leafy and have forage value. Seedheads, which are high in protein are large, creamy white and brittle, but not too hard. Seed shatters freely when mature.

Uses: Excellent food and cover for quail, dove, duck and turkey.

Soil Adaptation: Moderate to well-drained soils.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specification

Method of establishment: Seed.

Seedbed preparation: A clean, firm seedbed should be prepared by disking and harrowing.

Planting time: April - June.

Planting rate: 5-8 lbs/acre drilled or 15-20 lbs/acre broadcast. Plant seed 1-1½ inches.

Fertility requirements: Use soil test recommendations or apply 400 lbs/acre of 13-13-13.

pH requirement: 6.0-7.0.

GRAIN SORGHUM (*Sorghum vulgare*)

Description: An annual grain crop.

Uses: Livestock and poultry feed, silage or hay, wildlife, and soil cover and management. Most grain sorghums are choice food of quail, doves, ducks, geese, and turkey. Deer seldom graze sorghums.

Varieties: Varieties are classified as bird-resistant (high tannin content that decreases as crop ripens) and non-bird-resistant (chosen for silage and potentially a better choice for wildlife purposes).

Wildlife varieties: Kafir, Hegair, milo, and small game food sorghums (dwarf ranging in height from 18 to 30 inches).

Soil adaptation: Grain sorghum is adapted to a wide range of soils. Soils best adapted are deep, well-drained, but yields can be obtained on heavy clay to clay loams, shallow soils, and soils not well-drained. Acceptable soil pH is 5.5 to 6.5.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Seed. Use a conventional grain drill on a prepared seedbed or no-till into legumes, small grains, or old residues. For wildlife, broadcasting is acceptable.

Seedbed preparation: A clean, firm seedbed is necessary.

Planting time: April 15 - May 15.

Planting rates: Rates vary from 8 to 10 lbs/acre assuming the seed has an 80% germination rate and a 75% emergence rate. Cover seed about 1 inch deep. Plant in rows of 36 to 40 inch spacing for best results.

Fertility requirement: Use a soil test for accurate determination and adjust for desired results. Soil tests are normally based on average yields. Nitrogen rates of 50 to 200 lbs/acre are used depending on desired yields. Phosphate requirements range from 30 to 50 lbs/acre and potash from 60 to 100 lbs/acre.

Pest control: Control weeds by cultivation or herbicides. Control insects and diseases by variety selection, rotations, and/or chemicals. If bird control is a problem, choose a bird resistant variety. Seedling diseases can be reduced with seed treatments or in row application of granular fungicides.

Harvesting: Silage - Medium dough to hard dough stage; Seed - Hard dough stage when moisture content ranges from 15 to 20%.

INDIANGRASS (*Sorghastrum nutans*)

Description: A native, warm-season perennial grass. It occurs over much of the Southeast. It usually grows 3 to 4 feet high. Leaves are long, narrow, bluish-green, and waxy.

Uses: Erosion control, conservation buffers, wildlife cover and in mixtures with other native warm season grasses, legumes and forbs.

Soil adaptation: Well-drained, fertile soils. It performs well on most soils except those that are very droughty or poorly drained.

MS zone of adaptation: Zones 1 and 2.

Varieties: Lometa.

Cultural Specifications

See Appendix C for *Management Tips for Planting Native Grasses*.

Planting rate: Rate depends on the objective of the planting. Rates are presented below. See Appendix B for *Planting Native Grasses Using the Pure Live Seed Method.*

> Pasture or critical area plantings - 8 PLS lbs/acre drilled or 10 PLS lbs/acre broadcast.
>
> Wildlife plantings (monoculture) - 4.5 PLS lbs/acre.
>
> Mixtures with native warm season grasses for wildlife - See Appendix D for *Recommended Seeding Mixtures for WHIP*

Fertility requirements: Apply P_2O_5 and K_2O to bring soil up to a medium level according to soil test. In lieu of a soil test, apply 300 lbs/acre of 0-20-20 or equivalent analysis. Since indiangrass and other native grasses are slow to establish, **AVOID APPLYING NITROGEN UNTIL A GOOD STAND IS EVIDENT**. Fertilize with 50 lbs of N.

Weed control: Use 2, 4-D to control broadleaf weeds when indiangrass reaches the four leaf stage (follow the label rate). Do not spray 2, 4-D if a legume or forb is included in the mixture. Use Plateau® for crabgrass control in wildlife plantings. There are several legumes and forbs that are beneficial to wildlife that Plateau® will not harm (read the label before applying). Do not apply Plateau® if switchgrass is used in the mixture. **Plateau® is not labeled for pasture plantings**.

An alternative weed control measure is to mow the planting in mid to late summer to reduce grassy weed competition. Adjust mower to avoid clipping the grass seedlings. Avoid clipping lower than 5 inches and after September 1.

pH requirement: 5.5-7.0

Residue Management

Removal of previous year's growth will allow quicker green up and spring regrowth. Residue can be managed with fire or clipping. If burning is desired, use a prescribed burn plan established by the Mississippi Forestry Commission. Burn before the grass greens up in the spring. Indiangrass is burned in late February at the PMC. If clipping is performed, clip the grass to a 10-12 inch height in March.

JOHNSONGRASS (*Sorghum halepense*)

Description: An introduced, warm-season perennial grass that spreads by deep-rooted, vigorous rootstock. Stems, leaves, and seedheads resemble that of sudangrass.

Uses: Grazing, hay, silage, or erosion control.

Soil adaptation: Adapted to heavy soils, especially the prairie soils. Primarily a rich land crop, but grows well where moisture is abundant. It is also suited to most all bottomland soils that are well-drained. Not suited for infertile, sandy soils.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Requires smooth, firm seedbed.

Planting time: April - May.

Planting rate: 20 PLS (pure live seed) lbs/acre (Refer to Appendix B on using PLS). Cover ½ inch deep.

Fertility requirements: Follow soil test recommendations or apply 400 lbs/acre of 13-13-13 at planting time. Apply annual applications of 68 lbs N/acre in split applications, 40 lbs P_2O_5, and 40 lbs K_2O as needed.

pH requirement: 5.5 - 7.5.

Companion plants: Red clover, crimson clover, wild winter peas and sericea.

Management: Do not overgraze. Renovate every 2nd or 3rd year. Begin grazing when plants are 18 inches high. Allow to grow to maturity each year. Cut for hay or silage in the boot stage.

Seed production: Combine when seed are in stiff dough stage or before they begin shattering. Seed yields range from 200-500 lbs/acre. Seed should be dried immediately after combining and stored in a cool place.

Environmental concern: Major weed in cultivated cropland and along roadsides. Spreads from rhizomes and seed. Johnsongrass has a small amount of prussic acid which may cause death to livestock if harvested or grazed while the plant is under stress from drought or frost.

MILLET, BROWNTOP (*Brachiaria ramosa*)

Description: An annual, panic grass native to India, that grows 2 to 3 feet high, producing a yellowish-brown, open panicle seedhead. Its early growth is rapid and matures seed in 60 days.

Uses: Temporary conservation cover; seed is a choice food of game birds (bobwhite, doves, ducks, wild turkey), and non-game birds; forage makes excellent hay and grazing; commercial seed crop.

Soil adaptation: Almost any upland soil or bottomland soil with a water table 4 inches or more below the surface during July-September.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Prepare a firm seedbed by disking. A light disking prior to seeding is beneficial for controlling weeds.

Seeding rate: 15 lbs/acre drilled or broadcast 25 lbs/acre.

Seeding date: (1) For duck fields; June-July. (2) For dove fields; 60 to 90 days before hunting season. (3) For commercial seed, hay or grazing; May-June.

Fertility requirements: Moderate to good. Use 13-13-13 or similar analysis at 400 lbs/acre. Extra N will usually reduce seed yield, but increase hay yield.

pH requirements: 5.5 to 6.5.

Cultivation: None for broadcast or drilled planting; clean cultivation for row plantings (especially for doves).

Yields per acre: 2000 lbs/acre of dry matter when cut at seed maturity; 1500 lbs/acre or more of seed with good management.

Wildlife Considerations

Size of plantings for wildlife: ¼ acre for quails; 2 acres or more for doves; 5 acres or more for ducks; 1 acre for wild turkeys. Management for ducks: Flood in the fall, usually two weeks before season opens. Leave flooded until ducks migrate north in the spring. Depth of flooding, 2 to 15 inches.

MILLET, JAPANESE (*Echinochloa frumentacea*)

Description: An introduced, annual, reseeding grass that is a close relative of barnyard grass, but produces much heavier seed yields. The number of seed per pound is about 145,000.

Uses: Seed is one of the choice foods of gadwall, mallard, wood duck, teal, and widgeon and is also utilized by several non-game birds.

Soil adaptation: Grows on wet sites that will not grow browntop millet. This plant, like barnyard grass, will not germinate under water but will germinate on exposed mud and will tolerate shallow flooding during growth.

MS zone of adaptation: Zones 1, 2, and 3.

Varieties: Chiwapa. This variety takes 120 days to mature. It is useful on areas where draw down conditions are favorable for planting early in the season. Most varieties matures within 80-90 days.

Cultural Specifications

Method of establishment: Broadcast seed on exposed mud flats or disk dry land and broadcast seed.

Seedbed Preparation: Draw water level to expose mud flats or prepare a clean, firm seedbed by disking and harrowing.

Planting time: For Chiwapa May-June; early maturing varieties, June -July.

Planting rate: 25 lbs/acre broadcast, or 15 lbs/acre drilled.

Fertility requirements: Moderate. Apply 13-13-13, or similar fertilizer, at rates of 100 to 200 lbs/acre. Do not fertilize when seed is broadcast on exposed mud.

Natural reseeding: This millet will reseed under certain conditions although for assured stands do not depend on natural reseeding alone.

Wildlife Considerations

Management for ducks: Flood in the fall, usually 2 weeks before date of open season, and leave flooded until ducks migrate north in the spring. Depth of flooding is 2 to 15 inches. It also has value for fishery habitat.

MILLET, PROSO (*Panicum miliaceum*)

Description: An annual, panic grass native to central Asia. Growth is rapid and produces seed in 60-70 days. Seed is the largest of the millets. There are approximately 80,000 seeds/lb. Proso millet is tolerant of dry conditions.

Uses: Seed is a choice food of both game and non-game birds and waterfowl. It is often used alone or in a mixture with other small grains in wildlife food plots. Proso millet is not grown for forage since other millets are more desirable for this purpose.

Soil adaptation: Almost any soil except those with excessive moisture during the growing-season.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: A well prepared seedbed is required for best results. A light disking just before planting is helpful for controlling sprouted weeds.

Seeding time: May and June. For dove fields the crop should be planted 60-80 days before hunting season.

Seeding rate: 20-35 lbs/acre drilled or 10-12 lbs/acre in 2 to 3 rows. Row planting is best for dove fields.

pH requirement: 5.5-6.5. Lime application should be based on soil tests.

Fertility requirements: Apply 13-13-13, or similar fertilizer, at 200-300 lbs/acre.

Cultivation: None for drilled or broadcast planting. Clean cultivation for row planting.

Yield per acre: Forage - 1 to 1.5 tons/acre; Seed - 1000-1500 lbs/acre.

REDTOP (*Agrostis gigantea*)

Description: An introduced, cool season perennial grass with a creeping, turf-forming growth habit. Stems are slender and the leaves are about ¼ inch wide.

Uses: critical areas erosion control plantings.

Soil adaptation: Best suited to deep, wet to moderately wet loam soils.

MS zone of adaptation: Zone 1 and 2.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Requires a clean, firm seedbed. Prepare seedbed by disking and harrowing.

Planting rate: 6-8 lbs/acre broadcast.

Planting depth: Do not plant the seed deeper than ¼ inch. Cultipack after planting.

Planting time: September-October.

Fertility requirements: Use soil test recommendations or apply 250-300 lbs/acre of 13-13-13.

pH requirement: 5.5 - 6.5.

RYEGRASS (*Lolium perenne* ssp. *multiflorum*)

Description: An introduced, densely growing, cool-season annual grass. It is highly competitive and sometimes crowds out other plants in early spring. Makes rapid growth in March and April.

Uses: Erosion control, soil improvement, grazing, hay and wildlife. Heavily used by deer and turkey.

Soil adaptation: Adapted to all soils in Mississippi except wet soils and deep sands. Grows best on medium to high fertility soils.

Varieties: Gulf, Jackson, Marshall. Marshall is more cold tolerant.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Prepare a clean, smooth, firm seedbed.

Planting time: September - November.

Planting rate: Broadcast or drill 25-40 lbs/acre. Cover seed lightly (½ to 1 inch) and firm soil.

pH requirement: 6.0-7.0. Adjust soil pH according to soil test. In lieu of soil test, apply 1 to 2 tons/acre of agricultural lime.

Fertility requirements: Apply fertilizer according to soil test or apply 400 lbs/acre of 13-13-13 at planting time. Apply 60 lbs N during the growing-season in split applications.

Companion plants: Wild winter peas, crimson clover, and white clover.

Management: Start grazing when plants are 3 to 4 inches high and will not pull up. Maintain a good cover on the land. Cut for hay during blooming stage.

Seed production: Ryegrass matures seed in late May and June. Seed can be harvested by direct combining. Seed production in Mississippi is hampered by a rust.

SMALL GRAIN

Wheat (*Triticum aestivum*), **Oats** (*Avena sativa*),
Rye (*Secale cereale*), **Barley** (*Hordeum vulgare*)

Description: cool-season annuals that are adapted throughout Mississippi for forage and/or grain production.

Uses: In addition to using small grains for grain or forage, they are a choice food for many wildlife species such as quail, deer, dove and turkey. Many non-game birds utilize the seed when available. These plants also aid in concentrating deer for harvest or viewing. It can also be used as a nurse crop on sloping landscape when establishing permanent cover. The most cold tolerant of the small grains is rye followed by barley, wheat and oats in that order.

Soil adaptation: Small grains are adapted to most soil types throughout the state. Avoid wet, poorly drained, heavy soils of the Delta and wet bottomland areas in the hills.

MS zone of adaptation: Zones 1, 2, and 3.

Varieties: Variety trials are conducted each year by MAFES. Information is available from your county agent or other extension representatives.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Prepare a clean, firm seedbed.

Planting time: September - October throughout the state.

Planting rate: Plant 120 lbs/acre for all small grains when seedbeds are conventionally prepared (4 bushels for oats; 2 bushels for barley, wheat and rye).

Fertility requirements: Use soil test results for accurate determination or 400 lbs/acre of 13-13-13. Additional N should be added in February or March. Amount will depend on use.

pH requirement: 6.0-7.0. Apply agricultural lime according to soil test recommendation not to exceed 2 tons/acre.

SWITCHGRASS (*Panicum virgatum*)

Description: A native, warm-season perennial grass. It occurs over much of the Southeast. It usually grows 3 to 5 feet high. Leaves are ¼ to ½ inch wide and green to bluish-green in color. It has heavy vigorous roots and underground stems. Stalks are relatively stiff causing it to stand up well even after maturity.

Uses: Warm-season grazing and hay production, conservation buffers, shoreline stabilization, wildlife food and cover. It is often planted in mixes with other warm season native grasses. Seeds are readily eaten by quail and other game birds.

Soil Adaptation: Prefers deep, well-drained, moist, fertile soils. Performs well on most soils except those that are very droughty or very poorly drained. It will produce better growth and cover on droughty, infertile, soils than most of the introduced grasses because of its drought tolerance and low to medium fertility requirements.

Varieties: Alamo, Kanlow.

Cultural Specifications

See Appendix C for *Management Tips for Planting Native Grasses*.

Planting rate: Rate depends on the objective of the planting. Rates are presented below. See Appendix B for *Planting Native Grasses Using the Pure Live Seed Method.*

Pasture or critical area plantings - 8 PLS lbs/acre drilled or 10 PLS lbs/acre broadcast.

Wildlife plantings (monoculture) - 4.5 PLS lbs/acre.

Mixtures with native warm season grasses for wildlife - See Appendix D for *Recommended Seeding Mixtures for WHIP*

Fertility requirements: Apply P_2O_5 and K_2O to bring soil up to a medium level according to soil test. In lieu of a soil test, apply 300 lbs/acre of 0-20-20 or equivalent analysis. Since switchgrass and other native grasses are slow to establish, **AVOID APPLYING NITROGEN UNTIL A GOOD STAND IS EVIDENT**. Fertilize plantings with 50 lbs of N.

Weed control: Use 2, 4-D to control broadleaf weeds when switchgrass reaches the four leaf stage (follow the label rate). Do not spray 2, 4-D if a legume or forb is included in the mixture.

An alternative weed control measure is to mow the planting in mid to late summer to reduce grassy weed competition. Adjust mower to avoid clipping the grass seedlings. Avoid clipping lower than 5 inches and after September 1.

pH requirement: 5.5-7.5.

Residue Management

Removal of previous year's growth will allow quicker green up and spring regrowth. Residue can be managed with fire or clipping. If burning is desired, use a prescribed burn plan established by the Mississippi Forestry Commission. Burn before the grass greens up in the spring. Switchgrass is burned in late February at the PMC. If clipping is performed, clip to a 10-12 inch height in March.

Forage Management

First year: Usually, switchgrass is not grazed or hayed the first year because it is slow to make a sufficient stand. Good stands can be grazed or hayed in late summer of the first year (August), but do not graze closer than 8 inches.

Grazing subsequent years: Begin rotation grazing when switchgrass leaves are 12-16 inches in height, graze down to 8 inches stubble height rapidly, then remove the animals to allow regrowth to 12-16 inches before reintroducing the livestock. Continuous grazing is not recommended unless a 10-16 inch stubble height is maintained. In late summer do not graze closer than 8 inches to allow regrowth before frost in the fall. Dormant plants can be grazed at any time, but the protein may be less than 5%.

Hay management in subsequent years: For hay, mow switchgrass when the leaf height is 18-24 inches. Plants should be cut before heading out (boot stage) for best quality hay. Cut the switchgrass to a 6 to 8 inch stubble height. Allow regrowth before frost in the fall. Dormant plants can be grazed or mowed for hay or bedding at any time, but the protein will be less than 5%. For hay and seed production in the same year, cut the switchgrass to an 8 to 10 inch stubble height by June 1. Allow the plants to regrow, and harvest seed in late fall.

TALL FESCUE (*Lolium arundinaceum*)

Description: An introduced, deep-rooted, strong-tufted, cool-season perennial grass with erect, smooth stems 3 to 4 feet high. The numerous, dark-green leaves are broad and flat.

Uses: Grazing, waterways, permanent fire lanes, and field borders. It is also used on dams and steep road banks to control erosion. If wildlife is an objective of the land manager, do not plant fescue.

Soil adaptation: Adapted to a wide variety of soils and soil conditions, but performs best on deep, moist, fertile soils. Not adapted to deep, sandy soils.

MS zone of adaptation: Zones 1 and 2.

Varieties: Kentucky 31 and Georgia 5.

Cultural Specifications

Method of establishment: Seeding.

Seedbed preparation: Prepare a smooth, firm seedbed.

Planting time: September - November.

Planting rate: 20 lbs/acre. Increase rate to 30 lbs/acre if the area is eroded and droughty. Cover ½ inch deep and firm with a cultipacker.

pH requirement: 6.5-7.5. Apply lime according to a soil test or as needed to maintain desirable pH or meet the requirements of the adapted legumes used.

Fertility requirements: Follow soil test results. If soil test is not available, apply 400 lbs/acre of 13-13-13 at planting time. For maintenance, apply 60 lbs N/acre annually in split applications during growing-season. Apply annual applications of 60 lbs P_2O_5 and 60 lbs K_2O/acre in the fall or as needed.

Companion plants: White clover, wild winter peas, vetch, and red clover.

Management: Tall fescue withstands heavy grazing, but furnishes little grazing during hot weather. When this is the case, it should not be grazed. If kept grazed reasonably close, the quality of grazing is improved. If seed production is desired, remove cattle in early April.

Seed production: Direct combine when seedheads are ripe enough to begin shattering. Seed yields range from 200 to 300 lbs/acre. Seed must be dry before cleaning.

Environmental concerns: Its aggressiveness tends to crowd out legumes and other plants on good soils.

WEEPING LOVEGRASS (*Eragrostis curvula*)

Description: A warm season perennial bunchgrass introduced from Africa.

Uses: Erosion control on dams, roadsides, terrace outlets and other critical areas.

Soil adaptation: Performs satisfactorily on well-drained soils, but prefers sandy loams. Like most grasses, it responds to fertility, but will grow on soils of low fertility much better than most grasses.

MS zone of adaptation: Zones 1, 2, 3.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: A firm seedbed with sufficient loose soil to give a light seed covering after planting.

Planting rate: 5 lbs/acre. Cover seed ¼-½ inch deep.

Planting time: March-May.

Fertility requirements: Apply according to soil test recommendations. In lieu of a soil test apply 400 lbs of 13-13-13/acre when a stand is evident. A maintenance fertilizer is usually not needed.

pH requirement: 5.5-6.5.

Companion plants: Annual lespedeza and weeping lovegrass mixture is useful for stabilizing critical areas.

Section II. Legumes

A. Herbaceous and Woody Species

ALFALFA (*Medicago sativa*)

Description: An introduced, deep-rooted perennial legume. Grows during cool and warm-seasons. Grows 20 to 36 inches high, and has fine stems, and short, leafy branches from the crown.

Uses: Erosion control, soil improvement in conservation cropping system, and hay and grazing. Utilized by deer and turkey.

Soil adaptation: Requires deep, fertile, well-drained soils. Not suited for poorly drained soils, or soils with shallow hardpans. Also, not adapted to excessively drained, coarse-textured soils.

MS zone of adaptation: Zone 1

Varieties: Apollo, DK135, Alfagraze, Cimmeron (blackbelt region).

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Break land in June or July and fallow until time to plant. Prepare a smooth, firm seedbed by disking and harrowing. Firm with a cultipacker before and after planting for best results.

Planting rate: 15 lbs/acre of inoculated seed and cover lightly (¼ to ½ inch) immediately after planting.

Planting time: September 1 - October 15.

Fertilizer requirement: Fertilize according to soil test for optimum production, or apply 600 lbs/acre of 0-20-20 or similar analysis and 10 lbs of boron/acre when seedbed is prepared. For maintenance, apply a 0-15-30, or similar analysis, at 500 lbs/acre after first cutting each spring.

pH requirement: 6.5-7.0.

Companion plants: Grows best alone.

Management

For hay - Cut when about 25% of plants are in bloom or when new shoots are 1 to 2 inches high. Do not cut closer than 3 inches to ground. Last cutting should be made early enough to allow plants to make at least 8 inches growth before killing frost.

For grazing - Allow plants to make 6 inches of growth before grazing begins. Regulate grazing to maintain at least 4 inch stubble height. Plants should be allowed to reach hay stage at least once per season to maintain stand.

BLACK MEDIC (*Medicago lupulina*)

Description: An annual, reseeding legume native to the Mediterranean region that germinates in the fall and makes primary growth in late winter and spring. It resembles hop clover, but is coarser and longer-lived.

Uses: Grazing and soil improvement.

Soil adaptation: Performs best on Black land prairie soil, but will grow on other heavy soils that have been limed.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Seed.

Fertility requirements: Apply fertilizer according to soil test. If soil test is not available, apply 60 lbs P_2O_5 and 30 lbs K_2O/acre at planting time.

pH requirement: 6.0-7.0.

Planting time: September 1 - October 30.

Planting rate: 10 lbs/acre if seeded alone. Plant 5 to 10 lbs/acre when planted in pasture mixtures. Broadcast seed with a whirlwind type seeder or plant with a drill. Use medic or alfalfa inoculant.

Seedbed preparation: Disk or break the land in advance of planting date to allow ground to settle. Disk or harrow to pulverize seedbed before planting.

Companion plants: Grows well in combination with small grains and perennial grasses such as dallisgrass, johnsongrass, and bermudagrass. If used in a pasture mixture, other plants should be established before seeding black medic because of its vigorous growth.

Management: Black medic occurs naturally on most alkaline soils in the Black Belt. It will make vigorous growth if phosphate is applied. To insure reseeding, allow it to mature seed.

Seed production: Combine seed when mature by direct combining or windrow when seedheads begin to turn brown.

COWPEAS (*Vigna unguiculata*)

Description: An annual summer legume native to central Africa.

Varieties: Reseeding varieties are Thorsby cream, Tory and Wilcox. Varieties which remain sound in the field into early winter are Clay, Combine, Iron and Red Ripper.

Uses: (1) Cowpeas are a choice food for bobwhite and wild turkey, but are only fair for doves. Young plants are choice deer forage. Deer often destroy the plantings. (2) Cowpeas are grown as a hay crop for livestock and as a soil improvement crop, but are not used extensively for either of these purposes. (3) Black-eyed and white varieties are grown for human food.

Soil adaptation: Adapted to a wide range of upland soils, from sandy loams to heavier clays.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Seed the non-reseeding varieties every year. Disk in early April to promote volunteer stands of reseeding varieties.

Seedbed preparation: Prepare a clean, firm seedbed.

Planting time: From May to July (maturing in 80 to 180 days, depending on variety and date of planting).

Planting rate: 15 lbs/acre in rows, or 45 to 60 lbs/acre broadcast. Where broadcasting method is used, cover the seed with 1 inch of soil following seeding. Inoculate the seed prior to planting.

Fertility requirements: Low to moderate (200 lbs/acre of 0-20-20).

pH requirement: 5.5-7.0.

Seed Yields per acre: 10 to 40 bu/acre.

Wildlife Considerations

Other wildlife food sources are more economical and dependable for doves and turkeys. Plantings of ¼ - ½ acre are sufficient for quail and may be mixed with browntop millet. Larger plantings are required when deer are present. Seed for quail or other bird species may be limited where a high deer population exists.

FLORIDA BEGGARWEED (*Desmodium* sp.)

Description: A short lived perennial legume from tropical America, but performs like an annual in the U.S. It usually grows 4 to 8 feet high in cultivated ground. Recognized by its small, jointed seedpods with hooked hairs that cause it to cling to clothing. There are approximately 200,000 seeds per pound.

Uses: Seed is a choice food of bobwhite quail. Seed is sometimes interseeded in corn rows for added wildlife benefits.

Soil adaptation: Grows on well-drained to moderately drained sandy loam soils. It is suitable in the Coastal Plains from southeastern North Carolina to Texas.

MS zone of adaptation: Zones 2 and 3.

Varieties: None. Seed are not always readily available. Seed production is mainly in Georgia, Alabama and northern Florida.

Cultural Specifications

Method of establishment: Seed.

Planting rate: Broadcast 10 to 15 lbs/acre of scarified (hulled) seed.

Planting time: April-May on a lightly prepared seedbed. Will volunteer annually following cultivation or soil disturbance, if allowed to mature seed each year.

Fertility requirements: Fertilize the cultivated crop (corn) in a normal manner, or use 5-10-15 or similar analysis at 300-500 lbs/acre if growing beggarweed alone.

pH requirement: 5.5-6.5.

Methods of maintenance: Allow seed crop to mature and remain on the ground until spring. Prepare a normal seedbed in spring and continue crop rotation, or harrow to form a fresh seedbed. Seed do not ordinarily remain viable in the soil more than one season.

JOINTVETCH (*Aeschynomene* sp.)

Description: An upright, summer annual legume 6 feet tall. Stems are well branched and moderately leafy. Leaves are compound and have 25 to 60 leaflets measuring 3 inches long, and are sensitive to light and touch. Flowers are yellow with dark lines and appear as loose clusters.

Uses: Grazing and hay production. Foliage is grazed by deer, and the seed are eaten by quail, dove and turkey. It can also be used as a component of fresh water wetland reclamation plantings.

Soil adaptation: Performs well on moderately drained soils, and on poorly drained sites. It is not adapted to droughty or deep sandy soils. Best suited for South Mississippi

MS zone of adaptation: Zone 3.

Cultural Specifications

Method of establishment: Seed. Excellent volunteer stands may be obtained by disking areas that had successful stands and matured seed the previous year. Seedbed preparation: Soil should be well prepared by plowing, disking, and harrowing or cultipacking.

Planting time: March 15 - June 15.

Planting rate: Broadcast seed at a rate of 10 (dehulled) to 20 (in the hull) lbs/acre. Inoculate seed before broadcasting and cultipack after planting. Plant seed ½ to 1 inch deep.

pH requirement: 5.5-6.5.

Fertility requirements: Use soil test recommendations or apply 300 lbs of 0-10-20, or similar analysis, at planting time and as a maintenance fertilizer in succeeding years. Land newly cultivated from the native condition and with a known low phosphorus level, apply 120 lbs/acre of P_2O_5 and K_2O prior to germination.

Management: Initiate grazing when plants are 18-24 inches and graze or cut to 5 inch stubble height. To insure a volunteer crop, grazing must cease after October 1, to allow blooming, seed set, and seed maturation. After seed maturation, graze to use forage before November 1 when forage value decreases. Volunteering following a seed crop can be encouraged and a stand secured by disking or chopping the area in early to mid-spring of succeeding years. Graze the area until volunteer seed germinates to reduce weed competition. Resume grazing when plants are 18 inches. If deer population is high, it may be difficult to get a volunteer stand.

LESPEDEZAS, ANNUAL (K*ummerowia* sp.)
(Common, Kobe, Korean)

Description: Kobe and common lespedezas are common names of *Kummerowia striata*; Korean is the common name of *Kummerowia stipulacea*. All are introduced annual legumes with strong reseeding characteristics.

Uses: Planted in a mixture with grasses for livestock grazing and hay; commercial seed and wildlife. They are a choice food of quail, but only fair for doves and turkeys. Other birds usually do not eat lespedeza seed. Deer graze them sparingly.

Soil adaptation: These lespedezas are adapted to most Mississippi soils except wet soils and deep sands.

MS zone of adaptation: Common and Kobe - Zones 1, 2, and 3; Korean - Zones 1 and 2.

Cultural Specifications

Methods of establishment: Seed, broadcast, or lightly disk the area where previous years' crop was grown. Control burning and overseeding on an established small grain are also useful establishment methods. It is not practical to be used with small grains that will be heavily fertilized with N.

Seedbed preparation: Prepare a clean, firm seedbed by breaking, disking and harrowing. Allow to settle before seeding.

Fertility requirement: Follow soil test results. In lieu of a soil test, apply 300 lbs/acre of 0-20-20 or similar analysis.

pH requirement: 5.0 - 6.5. On soils with a pH of 4.0 - 4.5, agricultural lime should be added to increase growth.

Planting time: March-April or 2 to 4 weeks prior to the date of the last spring frost.

Planting rate: 30 lbs/acre planted alone or 15 lbs/acre when planted in a mixture. Cover seed lightly. Inoculate the seed prior to planting.

Yield per acre: Seed yields range from 100 to 400 lbs/acre, averaging about 200 lb. Hay yield ranges from 1 to 3 tons/acre.

Wildlife Considerations: Size of plantings for bobwhite quail range from ¼ to ½ acre.

LESPEDEZA, SERICEA (*Lespedeza cuneata*)

Description: An introduced, deep rooted, upright, warm-season perennial legume. Stems become woody and coarse as plant matures.

Uses: Soil improvement plant for low fertility soil; steep land to be retired to permanent vegetation; forage.

Soil adaptation: All soils in Mississippi except alkaline soils, wet soils and deep, infertile sands. Grows best on loams and heavy soils.

MS zone of adaptation: Zones 1, 2, and 3.

Varieties: Serala, Interstate. AU-Lotan and AU-Donnelly (low tanin levels for grazing), Common.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Prepare a clean, firm seedbed by breaking, disking and harrowing. Allow to settle before seeding.

Planting time: March - April.

Planting rate: 30 lbs/acre of scarified seed and prior to planting inoculate the seed. Cover seeds lightly (¼ inch). Firm soil before and after seeding.

Fertilizer requirement: Use soil test recommendations. In lieu of a soil test, apply 300 lbs/acre of 0-20-20, or similar analysis, at planting time and annually as a maintenance fertilizer.

pH requirement: 5.5-7.0. Apply lime to maintain a pH of 5.5 to 6.0.

Management: Graze sericea lightly the first year. Do not cut for hay the first growing-season. Graze or mow to prevent plants from becoming too coarse. Cut for hay when plants are 10-12 inches high. Do not cut more than twice a year. Do not mow after August 15.

Seed production: Produces 200 to 400 lbs of seeds per acre. Seeds can be harvested by direct combining. Take early cutting of hay, then allow plants to mature seeds. Delay harvesting until late fall or near frost.

LESPEDEZA, SHRUB (*Lespedeza* sp.)

Description: Perennial, leguminous shrub that grow to heights of 5 to 8 feet. Common species are *bicolor* and *thunbergii* lespedezas. *Bicolor* and *thunbergii* stems remain alive above ground.

Uses: Seeds are choice food of quail, but are seldom eaten by any other birds. 'Amquail' and 'Attaway'shrub lespedeza are good choices for food and cover for quail. 'Amquail' has some resistance to deer browse. Shrub lespedezas are readily eaten by domestic livestock and deer; thus, protection from browsing is recommended.

Soil adaptation: Well-drained, but not on deep sands.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Direct seed or planting one-year-old or older seedlings.

Seedbed preparation: For direct seeding, a clean, firm seedbed is needed. If transplanting, remove surface litter from an area one foot in diameter for each plant, or disk the area and plant into the loose soil.

Seeding time: March - April; Avoid planting after May 15.

Planting time: Transplants may be planted from November to March. Avoid planting after April 1.

Planting Rate/Spacing :

For 36 inch rows: Plant scarified and inoculated seed on a well prepared seedbed at a rate of 10 lbs/acre for bicolor. One lb of 'Amquail' seed should be planted in 6 rows, 3 feet apart by 330 feet long. Planting depth for these lespedezas is ¼ to ½ inch.

Broadcast: 12-15 lbs/acre for bicolor.

Seedlings: Plant 18 to 24 inches apart in rows spaced to fit cultivating equipment (usually 36 to 42 inches). Wider spacing is not suitable, as bicolor cannot maintain a satisfactory stand unless it shades the ground thoroughly after reaching its mature growth.

Fertility requirement: Apply 400 lbs/acre of 0-20-20 or similar analysis when planting on field borders or other depleted areas; 250 lbs/acre in woodland areas.

Seed harvest: Seed are harvested commercially by combine as soon as most are ripe to avoid shattering. Spread the combined seed thinly to dry, or have it dried in a commercial dryer. The seed should be hulled and scarified before it is sold.

Environmental Concern: Burning increases spread.

PARTRIDGE PEA (*Chamaecrista fasciculata*)

Description: A native, warm-season annual legume with fern-like leaves and yellow flowers. Flat, black seeds are produced in pods which pop open as they mature, scattering widely. This plant is common along roadsides, idle land, ditch banks, and semi-open woodland. It averages 2 feet tall but may exceed 4 feet on better soil.

Uses: Seeds are a choice food of quail. They are particularly important for these birds because the seed will remain in a sound condition throughout the winter and early spring.

Soil adaptation: Grows naturally on practically all soils throughout Mississippi.

MS zone of adaptation: Zones 1, 2, and 3.

Varieties: Common (southern sources), Lark selection.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Prepare a clean, firm seedbed.

Planting time: February - May. Avoid planting after May 15.

Planting rate: Broadcast inoculated seed at 6 lbs/acre or broadcast 4 lbs/acre when planted in a mixture with other plants. Cultipack after planting. Seed may be broadcast "on the rough" following controlled burning in February with moderate success.

Fertility requirements: Partridge peas will grow on low fertility soils but will respond well to fertilizer. Apply 200-300 lbs/acre of 0-20-20 or similar analysis.

pH requirement: 5.5-7.0.

Management: Natural or planted stands of partridge peas usually reseed and do well for 1 to 3 years but will gradually disappear without maintenance. Soil disturbance to remove old grass, weeds and brush is necessary. Partridge peas respond well to controlled fire. Areas should be burned in February for best results. Disking will also keep stands in good condition and is probably the better method in areas where heavy stands of broomsedge occur. Disking should be done in late February or early March.

Wildlife Considerations

Plant partridge peas in strips along field edges, fence rows, ditch banks, odd idle areas, selected patches around fields, and fire lane access roads.

SOYBEAN (*Glycine max*)

Description: An annual summer legume. Plant height ranges from 25 to 50 inches. Seeds average 2800 to 7000 per pound with weight being 60 lbs/bu. Yields range from 20 to 40 bu/acre and 1 to 3 tons of dry matter/acre.

Uses: Field crop for the production of oil, beans, and soybean by-products, grazing forage and hay, wildlife food and soil improvement. Seed and vegetative parts are excellent food choices for quail, ducks, turkey, rabbits, and deer.

Soil adaptation: Widely adapted to well-drained and moderately well-drained, medium to heavier textured soils.

MS zone of adaptation: Zones 1, 2, and 3.

Varieties: There are hundreds of varieties that have been tested in Mississippi that range in maturity from mid-September to late October. Consult your county agent for the best variety for your area and use.

Cultural Specifications

Method of establishment: Seed in 20-40 inch rows; broadcast or drilled (6-10 inch row spacing). No-till into wheat stubble or old crop residues. Plant on a clean, firm seedbed and cover seed to about 1 inch. Inoculate seed with proper soybean inoculant.

Seedbed preparation: Prepare a clean, firm seedbed.

Planting time: April - June.

Seeding rate: Seed 30 to 60 lbs/acre of inoculated seed. Seeding rates depend upon method of planting, row spacing, purpose, and variety. Planting dates depend upon location and maturity date.

pH requirement: 6.0-7.0. If soil pH is below 6.0, lime with at least 1 ton/acre of agricultural lime.

Fertility requirements: Use soil test recommendations for best production. In lieu of a soil test, fertilize with 30 lb P_2O_5 and 60 lb K_2O/acre.

Wildlife Considerations

Choose a later maturing variety and leave plants standing. If producing seed, leave some around field edges and allow some loss during harvest. Seed deteriorates rapidly after flooding (within 30 days).

SOYBEAN, WILDLIFE (*Glycine soja*)

Description: A viney, annual legume native to Asia. Excessive seed shattering has limited combine yields to about 200 lbs/acre. Because of their climbing and twinning habit, reseeding soybeans are grown with corn or sorghum to facilitate harvesting. Seed are particularly attractive to quail.

Uses: Wildlife food and cover, soil improvement, and hay.

Soil adaptation: Adapted to moderately well-drained soils of average or better.

MS zone of adaptation: Zones 1, 2, and 3.

Fertility. Not adapted to deep sands.

Varieties: Quail haven.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Prepare a good seedbed by disking and harrowing 2 or 3 weeks in advance of planting time.

Planting time: April 15 to June 1.

Planting rate: Inoculate seed prior to planting. Plant 6-8 lbs/acre in 36 to 42 inch rows with a corn planter; 20-25 lbs/acre broadcast or drill. Cover seed about 1 inch deep.

Fertility requirements: Apply 250-300 lbs/acre of 0-20-20, or similar fertilizer, at planting time.

pH requirement: 6.0-7.0.

Wildlife Considerations

Management: Forage is palatable to livestock and deer; therefore, plantings made for wildlife use should be protected from grazing. Row plantings should be cultivated once or twice to control weeds. A typical wildlife planting is ¼ to ½ acre. To improve volunteer stands, disk the field in early spring. Apply 250 to 300 lbs/acre of 0-20-20 fertilizer or similar analysis annually, or as needed to maintain satisfactory production. Plantings made in areas with heavy deer populations seldom succeed. It is not always necessary to disk the planting in the spring to get volunteering. In some cases there is ample seed remaining for volunteering, and many are covered by natural means. Where seed supply is severely depleted by wildlife utilization or close combining, a light, early spring disking will help to secure a stand. Quail haven can also be planted with corn for added wildlife benefits.

Managing for Seed Production

For seed production, select one of the following recommendations: (1) Plant 6-8 seed per foot alone in 3 to 4 rows, or plant wildlife soybeans in every third or fourth row in a corn or milo planting. (2) Mix by volume ¼ reseeding soybeans with ¾ corn, or 1/3 reseeding soybeans and 2/3 milo and plant together in rows. Wildlife soybean seedlings are fast growing and vigorous. However, at least one cultivation to release the soybean from the first flush of summer weeds is very helpful. First year seed crops may be harvested. Sufficient seed will be lost to assure successful volunteering.

VETCH (*Vicia* sp.)

Description: Introduced, annual, winter legumes. Makes best growth in late winter and early spring. Following are the more common vetches grown in Mississippi:

Hairy vetch: (*Vicia villosa*) is most hardy and most widely grown vetch in Mississippi.

Big Flower: (*Vicia grandiflora*) reseeds well. Has a conspicuous cream-colored or pale-yellow flower and usually in pairs.

Uses: Winter cover crop in cropping systems; planted in a mixture with a small grain for hay and grazing and seed production. Vetch is readily eaten by deer and turkey in the spring as new growth emerges.

Soil adaptation: Adapted to all well-drained, medium to fertile soils in the state.

MS zone of adaptation: Zones 1, 2, and 3.

Varieties: Americus, AU early cover, Common.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Prepare a clean, firm seedbed.

Planting time: September - October.

Planting rate: Hairy, common, and bigflower vetch broadcast at 30 lbs/acre. Seed should be inoculated prior to planting and cover with ½ inch of soil. No-till drill may be used to plant vetch in a grass sod.

Fertility requirements: Apply fertilizer according to soil test or apply 300 lbs/acre of 0-20-20, or similar analysis, at planting time and annually as a maintenance fertilizer. Vetch following highly fertilized row crops will not usually require additional fertilizer.

pH requirements: 5.5-7.0.

Companion plants: Small grains, ryegrass and perennial grasses.

Management: Start grazing when plants are 4 to 5 inches high. If used for a cover crop, control grazing to provide good ground cover with adequate growth to be turned under for green manure. Cut for hay when plants are blooming. Allow seed to mature, if a volunteer crop is desired.

Seed production: Seeds can be combined direct when matured, or prior to maturity, cut and windrow, then thresh. Seed yields range from 150 to 300 lbs/acre. Seed should be dried and stored in a cool place.

WILD WINTER PEA (*Lathyrus hirsutus*)

Description: An annual, reseeding winter legume introduced from Europe that resembles sweet peas. Seeds are rough. Grows to a height of 3 feet. Makes rapid growth in late winter and early spring. Matures seed in June. Also known as caley peas, singletary peas or rough winter peas.

Uses: Grown in combination with grasses to stimulate plant growth, ground cover, forage production, cash seed crop, and in a conservation cropping system. Readily eaten by deer, turkey and other wildlife. It can also be planted to provide some overhead cover for ground finding wildlife.

Soil adaptation: Best suited to heavier soils of medium to high fertility. Not adapted to light, sandy soils.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Prepare a clean, firm seedbed.

Planting time: September - October.

Planting rate: Broadcast 30 lbs/acre of scarified and inoculated seed. Cover seeds ¼ inch deep. A no-till drill can also be used to interseed wild winter peas in a grass sod.

Fertility requirements: Apply phosphorus and potash according to soil test. Mississippi Agricultural and Forestry Experiment Station recommends applying fertilizer at planting time. If soil test recommendations are not available, apply 300 lbs/acre of 0-20-20, or similar analysis, at planting time, and annually as a maintenance fertilizer.

pH requirement: 6.0-7.0. Use a soil test recommendation or apply 1 to 2 tons/acre of agricultural lime on acid soils. Repeat lime application every 5 years or as needed to maintain a soil pH of 6.0.

Companion plants: bahiagrass, bermudagrass, dallisgrass, or tall fescue.

Management: Wild winter peas are usually ready to graze in late January. Do not graze after plants begin to bloom. Wild winter peas are toxic to cattle if grazed during blooming and seeding stage. Allow peas to mature seed every 2 or 3 years to insure reseeding. Remove excessive growth of grass in September to facilitate germination of peas.

Seed production: Wild winter peas produce viable seed that can be harvested by direct combining. Seed yields ranges from 300 to 400 lbs/acre.

Section II. Legumes

B. Clovers

ALYCECLOVER (*Alysicarpus vaginalis*)

Description: A summer annual legume native to tropical Asia. It has an erect growth habit and grows to a height of 12 to 24 inches. Alyceclover has thin stems, round leaves, and pink flowers.

Uses: Pasture, hay, soil improvement, and wildlife. Alyceclover maintains quality well into late summer, thus, providing deer a quality diet necessary for antler development.

Soil adaptation: Well-drained, sandy soils. Also performs well on moderately well-drained, silty loams and sandy loam soils.

MS zone of adaptation: Zone 3.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Prepare a clean, firm seedbed.

Planting time: May 15 - June 15.

Planting rate: Inoculate seed before planting. Broadcast 20 lbs/acre or drill 15 lbs/acre.

Fertility requirements: Use soil test recommendations, or in lieu of a soil test, apply 200 lbs/acre of 0-20-20 or similar analysis.

pH requirement: 5.5-6.5.

Management

Begin grazing when plants are 12 to 15 inches. Hay should be cut at 18-24 inches. A second cutting is possible under favorable growing conditions.

Wildlife Considerations

For maximum wildlife benefits, protect from domestic livestock.

ARROWLEAF CLOVER (*Trifolium vesiculosum*)

Description: An introduced, upright cool-season reseeding annual legume that grows to a height of 40 to 50 inches under good conditions. Seeds germinate in the fall, but grow slowly during the winter. Leaflets are large, rounded at the base and pointed at the tip. Some leaflets have white, V-shaped markings. Blossoms are arranged in a cluster or head up to 2 inches long. Initially, the blossoms are white to pinkish, turning brown when mature.

Uses: Hay, grazing, seed production, soil improvement, and wildlife. Deer and turkey readily feed on this clover which often persists well into early summer.

Soil adaptation: It is suited to a wide range of soil conditions from well to moderately well-drained. It is not suited to light textured, droughty soil of low fertility or to poorly drained, wet soils.

MS zone of adaptation: Zones 1, 2, and 3.

Varieties: Amclo, Yuchi, Meechee (order of maturity; Yuchi--early; Amclo--intermediate; Meechee--late).

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Prepare a smooth, clean seedbed. Firm with a cultipacker before and after planting. Cover seed ¼ to ½ inch deep. Arrowleaf clover may also be planted in an established summer perennial grass sod by light disking or with a no-till drill. Interseeding into a grass sod should be delayed until about the first frost date.

Planting time: September 1 - October 15.

Planting rate: Drill 10 lbs/acre or broadcast 15 lbs/acre of inoculated seed.

Fertility requirements: Follow soil test recommendations or apply 300 lbs/acre of 0-20-20 or similar analysis at planting time, and annually (August or September) as a maintenance fertilizer.

pH requirement: 6.0-6.5.

Companion plants: Summer, perennial grasses and small grains or ryegrass.

Management

Start grazing when plants are 5 to 6 inches tall. Maintain a minimum top growth of 3 to 4 inches during growing-season. For commercial seed production, exclude livestock or do not cut for hay after May 1. For reseeding, allow plants to attain a minimum height of 12-15 inches in early July to mature seed. For hay, cut in early bloom stage. When 'Meechee' is grown with summer perennial grasses, graze or cut surplus growth of grass to 2 inches by October 1.

Seed production: Seeds may be harvested by direct combining. Seed yields ranged from 200 to 300 lbs/acre.

Environmental concerns: Because of its hard seed characteristic, arrowleaf clover may reseed for several years without planting. Therefore, it may become a weed problem for future plantings on the site. Soil disturbance encourages reseeding.

BALL CLOVER (*Trifolium nigrescens*)

Description: A rapid growing, heavy seeding, cool-season annual legume introduced from Turkey is similar in appearance to white clover. It has a decumbent growth habit.

Uses: Hay, grazing, wildlife, and soil improvement. Does well in grazing systems with bahiagrass. When properly grazed, these pastures provide excellent summer brood range for turkey.

Soil adaptation: Adapted to a wide range of soils. It is better adapted to wetter and lighter textured soils than crimson clover. Will grow on less fertile soils than white clover.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Prepare a smooth, clean seedbed. Allow seedbed to settle before planting. Firm before and after planting with a cultipacker for best results. Ball clover can be established into stand of perennial grass with a no-till drill. Other methods include lightly disking the sod and broadcast seed or use a grain drill when adequate soil moisture is available.

Planting rate: 3 lbs/acre of inoculated seed and cover ¼ to ½ deep.

Planting time: September 1 - October 15.

Fertility requirements: Apply 300 lbs/acre of 0-20-20 or similar analysis at planting time. On soils of low fertility apply 25 lbs N/acre at planting time. Apply the above fertilizer rates annually for maintenance.

pH requirement: 5.5-6.5.

Companion plants: Ball clover grows well on perennial grass sod such as common bermudagrass or bahiagrass.

Management: Start grazing when plants are large enough not to pull up or be damaged by trampling. Allow ball clover to mature a crop of seed each year to insure reseeding. It requires close management to mature a crop while not damaging the grass sod. Cut or graze excess growth of grass in September to allow clover to germinate.

Environmental concern: Ball clover is a dense growing clover that may suppress the growth of desirable perennial plants if not sufficiently grazed or clipped in mid to early spring.

BERSEEM CLOVER (*Trifolium alexandrinum*)

Description: An introduced, cool-season annual legume that resembles alfalfa. It grows erect to a height of 2 feet or more. Stems are hollow. Flowers are white, and form small heads. Produces a high quality forage.

Uses: Pasture, hay, erosion control, and wildlife.

Soil adaptation: Performs best on loam soils of central and South Mississippi. Well suited for the Black Belt area.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Plant on a well prepared seedbed.

Planting time: September 1 - October 1.

Planting rate: Broadcast at 20 lbs/acre or drill at 10 to 15 lbs/acre. Inoculate seed prior to planting.

Fertility requirements: Use soil test recommendations or apply 300 lbs/acre of 0-20-20 or similar analysis. Boron will be needed for sustainable production.

pH requirement: 6.0-7.5.

Management

Begin grazing when plants are 10 inches, and graze to a stubble height of 3 to 4 inches. Use a rotational grazing system.

BUR CLOVER AND BUTTON CLOVER (*Medicago* sp.)

Description: An introduced, winter annual reseeding legume with a spreading growth habit. Some species have coiled spring pods; others produce seed in spineless buttonlike pods. The leaves are trifoliate and the flowers are yellow.

Uses: Grazing, soil improvement, and cover crop.

Soil adaptation: Spotted or southern bur clover is best adapted to well-drained, fertile, loamy soils. Button clover does best on moderately, well-drained, heavy soils.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Prepare a firm seedbed.

Planting rate: Drill or broadcast 10-15 lbs/acre of hulled seed, and cover ¼ to ½ inch deep. Inoculate seed with the proper inoculant.

Planting time: September 15 - October 31.

Fertility requirements: Use soil test recommendations or apply 300 lbs/acre of 0-20-20.

pH requirement: 5.5-6.5.

Management

Grazing - Begin controlling grazing when plants are 4 inches high and continue until June. Maintain a minimum height of 2 inches of top growth.

Seed Production - Discontinue grazing in early to mid April. This should allow the clover ample time to produce a seed crop. Seed can be direct combined.

Soil Improvement - For maximum benefits in a conservation cropping system, grazing should be excluded about April 1. Allow seed to mature for reseeding first year after planting and about every third year thereafter. Other years plow or disk into the soil when the clover nears maturity.

Wildlife Considerations

Wildlife Deer and Turkey - For maximum benefits exclude grazing by domestic livestock.

CRIMSON CLOVER (*Trifolium incarnatum*)

Description: An upright, introduced, annual legume that grows as high as 3 feet under good conditions. Roots may penetrate to a depth equal to the plants' height.

Uses: Grazing, wildlife, cover crop, soil improvement.

Soil adaptation: Best adapted to fertile, well-drained soils. However, it has a wide range of soil adaptations.

MS zone of adaptation: Zones 1, 2, and 3.

Varieties: Autauga, Chief, Dixie, Tibbee, AU sunrise

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: A clean, firm seedbed is essential.

Planting time: September 1 - October 15.

Planting rate: Broadcast or drill 20 lbs/acre of inoculated seed.

Fertility requirements: Use soil test recommendations or apply 0-20-20 at a rate of 300 lbs/acre at planting time and annually as a maintenance fertilizer.

pH requirement: 5.5-7.0.

Management

Begin grazing when plants are 6 inches. Limit grazing during late growing-season to allow plants to mature seeds. When planted with ryegrass or small grains, allow clover to make seed, then follow with a summer crop, such as grain sorghum or soybeans. Graze or mow excessive growth of perennial summer grasses in the fall to insure volunteer stands. Crimson clover seldom reseeds where there is a heavy cover of summer forage remaining on the land.

Seed production: Combine seed direct when majority of seedheads will strip. Seed may also be harvested by mowing, windrowing, and combining. Seed yields of 150 to 300 lbs/acre are common.

Environmental concerns: Crimson clover serves as a host for tobacco bud worms. Planting it as a cover crop may increase pest population.

RED CLOVER (*Trifolium pratense*)

Description: Biennial cool-season legume introduced from Europe with a medium to tall growth habit. Grows well with upright type grasses. Requires high fertility. Has a characteristic red bloom.

Uses: Hay, grazing and ground cover in the winter, spring and early summer. Can be used in conservation cropping systems for soil improvement. Utilized by deer and turkey.

Soil adaptation: Grows best on fertile, moderately well-drained, neutral soils with high organic matter. Poorly adapted to light, sandy soils. Grows extremely well on most prairie soils.

MS zone of adaptation: Zones 1, 2, and 3.

Variety: Kenland, Redland, Atlas, Orbit.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Break land in June or July and fallow until time to plant.

Planting time: September - October 15.

Planting rate: Drill 8 lbs/acre or broadcast 12 lbs/acre of inoculated seed. Plant at a depth of ¼ inch. Cover seed lightly with harrow or cultipacker.

Fertility requirements: Follow soil test recommendations. In lieu of a soil test apply 300 lbs/acre of 0-20-20, or similar analysis, at planting time. For maintenance fertilizer, apply 200-300 lbs/ acre of 0-20-20 or similar analysis.

pH requirement: 6.0-7.5

Companion plants: Red clover grows best alone. Can be grown with tall fescue or dallisgrass.

Management

Begin grazing when plants are 5 to 6 inches high. Do not graze closer than 3 inches. Cut for hay when seedheads begin turning brown. Allow seed to mature once each year to maintain stand.

ROSE CLOVER (*Trifolium hirtum*)

Description: An introduced, annual winter legume with good reseeding ability. It grows to a height of 18 inches and has rose-colored flowers.

Uses: Pasture, soil improvement, erosion control.

Soil Adaptation: Adapted to moderately, well-drained soils.

MS zone of adaptation: Zones 1 and 2.

Varieties: Overton R18.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Prepare a good, firm seedbed. Rose clover can also be interseeded into an established sod.

Planting time: September 1 - October 15.

Planting rate: Broadcast or drill 15-20 lbs/acre of inoculated. Plant seed approximately ¼ inch deep.

Fertility requirements: Follow soil test recommendations. In lieu of a soil test, apply 300 lbs/acre of 0-20-20 or similar analysis. Rose clover is tolerant to low fertility soils.

pH requirement: 6.0-7.0.

Management

Seed production - Discontinue grazing in April. Seed can be direct combined, or cut and wind-rowed, then combined.

Grazing - Can be grazed continuously until maturity, but livestock must be removed by mid-April if natural reseeding is desired.

SUBTERRANEAN CLOVER (*Trifolium subterraneum*)

Description: An introduced, annual cool-season legume. Sub-clover has a growing-season similar to crimson but not as long as arrowleaf. It has the ability to tolerate close grazing and is more shade tolerant than other clovers. Seed are produced near or just beneath the soil surface. It can be planted in combination with warm-season perennial grasses, cool-season annuals, or alone.

Uses: Livestock grazing, seed production, soil improvement, ground cover for fire lanes and following logging operations, and wildlife.

Soil adaptation: Recent tests have shown that sub-clover is best adapted to well-drained, sandy loam or clay soils.

MS zone of adaptation: Zones 1, 2, and 3.

Varieties: Mt. Barker, Woogenellup, Tallarook, Nangella, and Meterora.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: A clean, firm seedbed should be prepared.

Planting time: August 15 - October 15.

Planting rate: Broadcast 20 lbs/acre on a well prepared seedbed or over seed in a permanent sod and lightly disk. Also, if interseeding into a permanent sod use a no-till drill. Inoculate seed prior to planting.

pH requirement: 6.0-7.0.

Fertility requirements: Take soil tests annually, but if not available, apply 300 lbs/acre of 0-20-20 and 10 lbs/acre boron annually in the fall.

Yields: Seed yield studies have not been done in Mississippi because few landowners are involved in the seed business plus weather and pest situations are not conducive for economical seed production. Dry matter yields have ranged from 3800 to 5800 lbs/acre.

Wildlife Considerations

Excellent plant for turkey, quail, and deer. In mixtures with cool-season annuals, it would improve usage of area due to cover and plant diversity. Sub-clover does well planted under open stands of timber. In such areas, burn the litter first, then broadcast the seed and fertilizer.

SWEETCLOVER (*Melilotus* sp.)

Description: There are two warm-season biennials, white (*Melilotus alba*) and yellow (*Melilotus officinalis*) sometimes planted in Mississippi. Sweetclover and alfalfa are closely related and have similar lime requirements, but sweet clover is shorter-lived, makes coarser growth and thrives on lower fertility level soils. All sweet clovers contain a bitter substance with a vanilla-like odor called "coumarin". Spoiled sweet clover hay is very harmful to livestock. Biennial sweet clover does not bloom the first year after planting. Growth starts the second year in February or March from buds that remain alive below the surface of the ground. It is a deep-rooted, drought resistant plant that grows on lime soils too poor to support other plants.

Uses: Biennial white is especially good for planting on eroded areas for pre-treatment and soil improvement.

Soil adaptation: Adapted to alkaline soils of the Black Belt area and other heavy soils that have been heavily limed.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Break and disk land in advance of planting and allow to settle into a smooth, firm seedbed.

Fertility requirements: Use soil test results or apply 300 lbs/acre of 0-20-20 or similar analysis at planting time and annually as a maintenance fertilizer. Inoculate seed prior to planting.

pH requirement: 6.5-7.5.

Planting time: September - October 1.

Planting rate: 15 lbs/acre of inoculated seed and cover lightly.

Companion plants: Small grains; also grows well alone.

Management

Start grazing when plants are well established. Cut for hay about the time plants begin blooming. Do not graze or cut for hay when planted on badly eroded land. Cut and allow to remain on land as a mulch.

WHITE CLOVER (*Trifolium repens*)

Description: A long-lived perennial legume that originated in the eastern or Asia Minor region. It performs well in most locations in Mississippi as a cool-season annual. It is shallow-rooted and spreads by creeping branches (stolons) which root at the nodes, and by seeds. Flowers are white and arranged in clusters or heads.

Uses: Grown in combination with grasses and winter annuals (ryegrass, oats) to increase the quantity and quality of forage and extend grazing periods. Some varieties have excellent wildlife value for white-tailed deer and wild turkey.

Soil adaptation: White clover is adapted to a wide range of soils including wet and hard pan soils. It is best suited to fertile, moist bottom or second bottom clay or loam soils. Not adapted to light textured, droughty, upland soils of medium to low fertility or extremely wet soils.

MS zone of adaptation: Zone 3 (LA-S1), Zones 1 and 2 (Regal, Osceola, Titan).

Varieties: LA-S1, Regal, Osceola, Titan.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Prepare a clean, smooth, firm seedbed and allow to settle before planting. If interseeding into an established grass sod, disk lightly or plant with a no-till drill.

Planting time: September 1 - October 15. If interseeding into an established grass sod, delay planting until October.

Planting rate: 3 lbs/acre of inoculated seed. Do not cover more than ¼ inch.

Fertility requirements: Follow soil tests results. In lieu of a soil test apply 400 lbs/acre of 0-20-20, or similar analysis, at planting time. Annual applications of 200 lbs/acre of 0-20-20 should be made in August or September.

pH requirement: 5.5-7.0.

Companion plants: dallisgrass, bermudagrass, bahiagrass, and tall fescue. Osceola and regal ladino varieties are popular choices for planting in food plots for white-tailed deer.

Section III. Trees and Shrubs

AMERICAN BEAUTYBERRY (*Callicarpa americana*)

Description: A small, native shrub with light gray bark up to 10 feet with an average spread of 4 feet. Multi-branched with many supple stems arising from the base. Light green leaves, with a rough texture and serrate margins. Tight clusters of small, greenish, yellow flowers are borne in the leaf axil, later developing into showy clusters of bright purple berries encircling the stem, forming a ball. It performs best in shaded areas.

Uses: Food and cover for wildlife and landscape beautification. Berries are eaten by many kinds of birds and small mammals. It is an excellent plant for developing backyard wildlife habitat.

Soil adaptation: Adapted to a wide range of soils, but will not grow on hot, dry, rocky hills.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Seedlings.

Seedbed preparation: Remove the surface litter from an area one foot in diameter for each plant.

Plant spacing: 5 to 6 feet apart. If used for screening purposes, a closer plant spacing (4 feet apart) is recommended.

Planting time: November 15 - March 15.

Fertility requirements: Spread a handful of 10-10-10 fertilizer in the bottom of the hole designated for the seedling and cover with 2 to 3 inches of soil. Place the seedling in the hole (make sure the roots do not touch the fertilizer) and firm soil after planting.

pH requirements: 5.0-6.0.

Management

If used for wildlife and erosion control, no management is required. If used as an accent plant in the landscape, it should be cut back to the base each winter to encourage more compact growth, flowers, and fruit.

Harvesting/Planting Seed: Following harvesting, pulp should be removed from the seed and sown in the fall. No seed treatment is necessary. Seed should be stored in sealed container at 40° F.

AUTUMN OLIVE (*Elaeagnus umbellata*)

Description: An introduced, deciduous shrub that grows up to 18 feet tall and has numerous stems with branches that spread out about as wide as it is tall. It has dark-green leaves with silvery undersides. It produces an abundance of small, yellow, sweet flowers each spring and a heavy crop of berries that ripen throughout August and September. Berries range in color from yellow to dark-red and are from 1/8 to 1/4 inch in diameter.

Uses: Soil protection, beautification, wildlife food and cover. Berries are eaten by many kinds of birds. Turkey readily eat the red berries in the early fall.

Soil adaptation: Well-drained or moderately well-drained soils.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Seedlings.

Seedbed preparation: It is best to prepare land by plowing and disking; however, individual holes may be prepared if brush or other perennial competition (such as sod) is not a factor. The hole must be large enough to accommodate the plant roots without crowding. This means the hole will have to be 4 to 6 inches larger in diameter and 4 to 6 inches deeper than the actual plant root measurements. Do not allow roots to dry out before planting. After planting, firm soil around seedlings.

Planting time: November 15 to March 15.

Planting rate: In contour rows or block plantings, space plants 6 to 8 feet apart. Avoid planting under overhanging branches along tree lines. Watering each plant after planting greatly increases chance of survival. A mulch of sawdust or pine straw reduces summer competition and conserves moisture.

Fertility requirements: Do not broadcast fertilizer. Fertilize individual plants with 8-8-8, 6-12-12 or similar fertilizer. Mix in a single handful of fertilizer in the bottom of the hole, cover with fresh soil, and then plant the seedling.

Management

Do not allow plantings to be buried in grass or weeds for the first two years. Cultivate as needed. If leaves appear yellowish and growth is slow, apply about a handful of a complete fertilizer during the summer. Mark each seedling location with a stake to protect them from being disked or mowed.

Environmental concerns: Autumn olive has an invasive nature and is considered by many as noxious weed. Spreads by seed.

BLACK CHERRY (*Prunus serotina*)

Description: A native, deciduous tree with alternate, finely, toothed leaves 2 to 5 inches long. On young trees, the bark is smooth, but on older trees it is rough and broken into thick irregular plates. The fruit, almost black when ripe, has a single stone in which the seed is enclosed. Black cherry usually occur as scattered individuals in fence rows, upland hardwood stands, on old terraces, and around home sites.

Uses: The fruit is a choice summer food of squirrels, and several non-game birds (bluebirds, cardinal, blue jay, Baltimore oriole, red-eyed vireo, mockingbird, brown thrasher, wood thrush and most woodpeckers). Fruit is also used to make jelly.

Soil adaptation: Adapted to most upland sites including light textured soils; grows best on deep, well-drained soils in sunny locations free from frost pockets.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Seedlings. It can be propagated from seed planted in late winter, and covered ½ inch deep.

Seedbed preparation: Similar to any other tree planting operation where transplanting methods are used. If propagation is from seed, prepare a firm seedbed.

Planting date: November 15 - March 15.

Fertility requirements: Spread a handful of 10-10-10 fertilizer in the bottom of the hole designated for the seedling and cover with 2 to 3 inches of soil. Place the seedling in the hole (make sure the roots do not touch the fertilizer) and firm soil after planting.

pH requirement: 5.5-6.5.

Wildlife Considerations

Only 4 or 5 trees, medium to large size, are needed to feed the birds and squirrels that are resident on tracts of 5 to 10 acres (one per acre is liberal). If webs of caterpillars develop in the trees in late winter, the webs will need to be destroyed before spring. This will protect the blooms, leaves, and cherries from these insects.

CHINQUAPIN (*Castanea pumila*)

Description: A small tree, 15-20 feet tall, with an irregular growth form. Leaves are similar to those of chestnut, but are smaller. Nuts are enclosed in a spiny burs about 1 inch in diameter. They are an excellent source of food for wildlife during fall and winter.

Uses: Landscape beautification and wildlife food. Nuts are eaten by deer, turkey, quail, song birds and squirrel.

Soil adaptation: Performs well on most soil textures except heavy clay. Best growth is on well-drained soils and in full or partial shade.

MS zone of adaptation: Zones 1 and 2.

Varieties: Golden.

Cultural Specifications

Method of establishment: Seed or seedling.

Seedbed preparation: Similar to any other tree planting operation.

Planting time: Seed in November at a depth of 1 inch. Transplant one-year-old seedlings in February-March. To conserve moisture and reduce weeds, mulch around seedlings with sawdust, wood chips, pine needles, or straw.

Plant spacing: For maximum nut production transplant seedlings 8 feet apart on a site receiving 50% sunlight.

Fertility requirements: Spread a handful of 10-10-10 fertilizer in the bottom of the hole designated for the seedling and cover with 2 to 3 inches of soil. Place the seedling in the hole (make sure the roots do not touch the fertilizer) and firm soil after planting.

pH requirement: 5.5-6.5.

Note: A blight that kills chestnut trees will severely damage chinquapins. There are reports of resprouts from the old stump.

DECIDUOUS HOLLY OR POSSUMHAW (*Ilex decidua*)

Description: A large, native shrub usually growing 12 to 18 feet tall at maturity. It has attractive green oblong leaves 2 to 3 inches long that drop in late fall or early winter. Produces an abundance of bright red berries that mature in late fall and hang on the branches until late winter or early spring.

Uses: Wildlife food, erosion control and beautification. In addition, it has use as a wildlife food plant.

Site adaptation: It is adapted to most well and moderately well drained soils with a good moisture supply.

MS zone of adaptation: Zone 1, 2, and 3.

Cultural Specifications

Method of establishment: Transplant seedlings in holes large enough to accommodate the roots without crowding. This usually requires a hole 4 to 6 inches larger in depth and diameter than the root measurement.

Seedbed preparation: Same as any other tree or shrub planting operation.

Plant spacing and seeding rates: Transplant seedlings 6 to 8 feet apart or as desired for beautification.

Planting time: January through February.

Fertilizer requirement: Spread a handful of 10-10-10 fertilizer in the bottom of the hole designated for the seedling and cover with 2 to 3 inches of soil. Place the seedling in the hole (make sure the roots do not touch the fertilizer) and firm soil after planting.

pH requirement: 5.0-6.0.

Harvesting/Planting Seed: Following harvesting, pulp should be removed from the seed and sown in the fall. Seed not planted should be stored in sealed container at 40° F. It may take more than 2 year for the seed to germinate and produce a seedling.

FLOWERING DOGWOOD (*Cornus florida*)

Description: A native, shrub-like tree found growing throughout Mississippi. Leaves are opposite one another and from 3 to 6 inches long. The deeply ridged and broken bark resembles alligator hide. The chief characteristic is the four large, showy, deeply notched bracts which surround a cluster of inconspicuous perfect flowers.

Uses: The fruit is choice fall and winter food of gray and fox squirrels, bobwhite, cedar waxwing, cardinal, flicker, mockingbird, robin, wild turkey, and woodpeckers. Leaves and twigs are choice food for the white-tailed deer.

Site adaptation: Adapted to most upland sites but grows best on rich, well-drained soils on middle and lower slopes.

MS zone of adaptation: Zones 1, 2, and 3.

Varieties: Consult with local nursery growers in the area.

Cultural Specifications

Method of establishment: Transplants and from seed planted ½ inch in late winter.

Seedbed preparation: Same as any other tree or shrub planting operation.

Plant spacing: 8 to 10 feet apart.

Planting time: Transplant seedlings in December to March.

Fertilizer requirement: Spread a handful of 13-13-13 fertilizer in the bottom of the hole designated for the seedling and cover with 2 to 3 inches of soil. Place the seedling in the hole (make sure the roots do not touch the fertilizer) and firm soil after planting.

pH requirement: 5.0-6.0.

Management

In tree harvest or timber stand improvement operations specify that 5 or 6 dogwoods per acre be left in the forest for esthetic purposes and as a food tree for squirrels, turkeys, deer, and non-game birds. Leave all dogwoods along highways and roads. Grows best in a mixed stand as an understory tree.

GEORGETOWN HAWTHORN (*Crataegus* sp.)

Description: A native, spiny deciduous shrub or small tree growing to heights of 18 feet. Produces small fruit that are approximately, ¼ to ½ inch in diameter.

Uses: Beautification, forest riparian buffers, hedgerow plantings for wildlife food and cover. Seed is used by cardinals, mockingbirds, woodpeckers, turkey, and squirrels.

Soil adaptation: Adapted to most upland sites, but grows best on fertile, well drained soils.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Seedlings. Plant in full sun.

Seedbed preparation: Similar to any other tree planting operation where transplanting methods are used.

Planting date: November 15 - March 15.

Fertility requirements: : Spread a handful of 10-10-10 fertilizer in the bottom of the hole designated for the seedling and cover with 2 to 3 inches of soil. Place the seedling in the hole (make sure the roots do not touch the fertilizer) and firm soil after planting.

pH requirement: 5.5-6.5.

Plant spacing: Space plant 10 feet apart.

Planting time: Plant during the dormant season - December through early March.

Management

Apply ½ lb fertilizer/plant the second year and gradually increase the amount as the plant grows. Control weed competition.

SAWTOOTH OAK (*Quercus acutissima*)

Description: An introduced, large round-headed tree to 70 feet, with chestnut-like foliage. Acorns are large, ranging from 5/8 to 1¼ inch by 3/8 to 3/4 inch. There are approximately 40 to 80 acorns/lb when freshly fallen. Its growth is rapid and produces acorns earlier than some species of oaks. Sawtooth oak acorns are commonly undamaged by insects or diseases.

Uses: Wildlife habitat-improvement, particularly for squirrel and deer, and landscape enhancement in residential and recreational areas.

Soil adaptation: Adapted to a wide variety of soils, but performs best on well-drained land classes. It is not recommended for wet soils. Plants will stand intermittent flooding without damage in the dormant season but not in the growing-season.

MS zone of adaptation: Zones 1, 2, and 3.

Varieties: Gobbler and southern sources.

Cultural Specifications

Method of establishment: Seed or one-year-old nursery-grown seedlings. Acorns must be harvested soon after falling, planted immediately, or stored in such a way that they neither heat nor dry out. A rodent repellant is essential in using acorns.

Seedbed preparation: Similar to any other tree planting operation.

Seeding time: Fall and early winter for acorns. Winter for seedlings.

Seeding rate: Mature trees will need 40-50 feet spacing for good production. Closer spacing of seedlings provides assurance of a stand from which the surplus can be removed, as in a woodland thinning operation.

Fertility requirements: A complete fertilizer will stimulate growth. It should not be used, however, until the second season after seeding or planting.

Management

Fertilize annually until acorn bearing begins. Remove all under story competition and adjacent trees to within 6 feet of the nearest branches.

SMOOTH SUMAC *(Rhus glabra)*

Description: A native shrub 3 to 15 feet tall with a trunk up to 6 inches in diameter. Leaves are compound with 11 to 31 leaflets. Leaflets are long with pointed tips and a rounded base. Leaf color varies from pale to deep green on individual plants. Spreads from rhizomes forming colonies.

Uses: Beautification along roadsides and on critical areas.

Site adaptation: Adapted to any moderately deep well drained soil. It is not recommended for planting on cut banks but could be used on fills or in open areas with undisturbed soils.

MS zone of adaptation: Zones 1, 2, and 3.

Varieties: Check with local nurseries

Cultural Specifications

Method of establishment: Seedlings. Seedlings should be planted in holes large enough to accommodate the roots without crowding. This usually requires a hole 4 to 6 inches larger in diameter and 4 to 6 inches deeper than the actual root measurements.

Seedbed preparation: Same as any other tree and shrub planting operation.

Plant spacing and seeding rates: 4 x 4 foot spacing.

Planting time: January through February.

Fertilizer requirement: Spread a handful of 13-13-13 fertilizer in the bottom of the hole dug for the seedling, and cover with 2 to 3 inches of soil. Place the seedling in the hole (make sure the roots do not touch the fertilizer) and firm soil after planting.

pH requirement: 5.5 to 6.5.

WILD PLUM (*Prunus* sp.)

Description: A native, small shrubby plant seldom reaching 10 feet in height. A white to pinkish bloom appears in March. Fruit is varicolored, deep yellow to bright red and ripens from June through September.

Uses: Riparian buffers and hedgerows for wildlife food and cover, erosion control, landscape beautification.

Soil adaptation: Adapted to a wide range of soils, but performs best on well-drained soils.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Seed or root sprouts.

Seedbed preparation: Remove the surface litter from an area one foot in diameter for each plant.

Planting time: Seed in April-May. Transplant root sprouts in late fall.

Plant spacing: Plant in compact groups on 2 to 3 foot centers.

Fertility requirements: Spread a handful of 13-13-13 fertilizer in the bottom of the hole dug for the seedling, and cover with 2 to 3 inches of soil. Place the seedling in the hole (make sure the roots do not touch the fertilizer) and firm soil after planting.

Harvesting: Fruit can be gathered when mature and flesh removed by hand or machine. Clean seed should be dried and stored in a cool, preferably dark, container.

Wildlife Considerations

Plant clusters of wild plum to provide mid story on the edges of fence rows, hedgerows, riparian buffers and openings in pine plantations.

Section IV. Wetland Plants

CREEPING BURHEAD (*Echinodorus cordifolius*)

Description: A native, short-lived perennial aquatic plant. Leaves are broadly heart shaped, 2-7 inches long and almost as wide. Flowering shoot can reach 3 feet or more in length; scapes are upright when young, often drooping and rooting at the tips to produce new plantlets. Numerous whorls of flowers with white petals and greenish centers are located along the scape. Flowering begins in June and continues until frost. Fruiting heads are round, burlike clusters of small brown seeds.

Uses: Ornamental gardens, constructed wetlands.

Soil adaptation: Wet areas with high organic matter.

MS zone of adaptation: Zone 1 and 2 (Delta region).

Source: Leflore.

Cultural Specifications

Method of establishment: Transplants.

Planting time: Can be planted year-round, but spring and fall planting will be less stressful on the plant.

Plant spacing: 2-3 feet. Maintain water level at 1 to 2 inches until the plants become established.

Fertility requirements: a light application of a complete fertilizer may be applied to aid in establishment. In a constructed wetland, sewage effluent should not be allowed into the pond until the plants are fully established.

Management

Established plants will tolerate water depths up to one foot during the growing season, with greater depths acceptable when the plants are dormant. If the growing site is infertile, the plants will respond to two to three light applications of a complete fertilizer during the growing season. Burning or mowing is not recommended.

MAIDENCANE (*Panicum hemitomon*)

Description: A native, warm-season perennial grass that is adapted to wet areas of the southeastern states. It has extensive creeping rhizomes that produce numerous sterile shoots with many overlapping leaves that grow up to 30 inches. Seed stem is about 3 feet tall, producing little or no seed. Leaf blades are about 6 to 12 inches long and ¼ to ½ inches wide. They are somewhat stiff and grow in an almost vertical position. This plant is very palatable to livestock and can be destroyed by grazing. All plantings should be protected from grazing animals.

Uses: Controlling erosion on toe slopes of stream channels; preventing erosion along shorelines of ponds and small reservoirs and constructed wetlands.

Adaptation: Maidencane is adapted to shallow ponds or other moist soil areas along streams or around lakes or in fresh water marsh. On a lake shoreline, it will grow down into the water about 18 inches and up the bank about 3 feet. This grass occurs from New Jersey south to Florida and west through Tennessee to Texas.

MS zone of adaptation: Zones 1, 2, and 3.

Varieties: Halifax.

Cultural Specifications

Method of establishment: Rhizomes (sprigs). Plant in a shallow furrow and cover about 2 inches deep. Sprigs should always be planted in damp soil.

Seedbed preparation: No seedbed is required when planting channel toe slopes or shoreline areas.

Planting time: May and June.

Planting Rate: Plant one sprig/ft within and between rows. A minimum of 2 rows is needed for shoreline and stream bank protection.

Fertility requirements: For establishment, broadcast 5 lbs/acre of 13-13-13 fertilizer or its equivalent/100 feet of planted row.

POWDERY THALIA (*Thalia dealbata*)

Description: A native, rhizomatous, herbaceous perennial aquatic plant with bluish, glaucous coating on leaves, flower stalks, and flowers. The 3-4 foot tall leaves arise from the base of the plant and have similar shape to those of a *canna*, with a stout petiole and a large, elongated leaf blade. The attractive purple to bluish flower clusters are produced at the top of a stalk extending 2-3 feet above the foliage. Flowers are produced from late May to September with fruit maturing throughout the summer.

Uses: Constructed wetlands, wetland restoration and enhancement. Ducks utilize the seed as a food source.

Soil adaptation: Wet soils containing a high level of organic matter.

MS zone of adaptation: Zone 1, 2 and 3.

Source: Indian bayou.

Cultural Specifications

Method of establishment: Transplants. Planting pieces should consist of a 4-6 inch section of rhizome with several growing points.

Planting time: Can be done year-round in the southeastern states.

Plant spacing: Plant rhizomes one inch deep on a 2 foot spacing. Water level should be kept at about 1-2 inches until the plants become established and should never be allowed to cover to cover the entire shoot of a non-dormant plants.

Fertility requirements: A light rate of a complete fertilizer will encourage growth. In a constructed wetland, sewage effluent should not be allowed into the pond until the plants are fully established.

Management

During the dormant season, old flower stalks and dead foliage can be removed, but leave a long enough section of the leaf petiole so the cut end remains above the water level. Fertilizer should be applied in light amounts throughout the growing season rather than in large amounts at one time. If less frequent applications are desirable, a higher rate of a slow release fertilizer formulation can be used. High rates of phosphorus will encourage unsightly growth of algae. In constructed wetlands, the level of nutrients applied in the sewage effluent may be sufficient to maintain acceptable growth.

SMARTWEEDS (*Polygonum* spp.)

Description: A herbaceous wetland plant. There are two annual species and four or more perennial species common to the Southeast. Smartweeds have a peppery taste which limits grazing of its forage and seedheads. Seed deteriorates very slowly on wet soil or under water, and remains viable for many years.

Uses: A choice food of most wild ducks. The seed is also eaten by several non-game birds such as blackbirds and sparrows, but winter flooding will save the seed for ducks.

Soil adaptation: Wet bottomlands, rice fields, swamp and marsh soils, poorly drained fields in cultivation and around field edges and in shallow ponds.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Principally by natural reseeding. Almost all bottomlands subject to annual overflow have ample smartweed seeds in the soil. Disk to establish stands by natural reseeding when areas dry.

Wildlife Considerations

Management for ducks: Flood in the fall and leave flooded until the ducks migrate north in the spring. Old stems should be disked into the soil, or removed by fire, every second or third year to keep feeding condition attractive.

WOOLGRASS (*Scripus cyperinus*)

Description: A native, clump-forming perennial with short rhizomes. Grass-like basal leaves are up to 4.5 feet in length and arch outwards from the base of the plant like a fountain. Flowering stems are 4-6 feet tall, leafy and somewhat course. The dense inflorescence contains numerous pale green flowers that become brown and wooly as the seed matures. Flowering begins in June and seed matures by September.

Uses: Constructed wetlands, wetland restoration and enhancement, and stabilization of shoreline around lakes and ponds.

Soil adaptation: Grows best in areas ranging from wet soil to water 4 inches deep. Will not tolerate long periods of inundation during the growing season. Well established plants have fairly good drought tolerance.

MS zone of adaptation: Zone 1, 2, and 3.

Source: Leaf River.

Cultural Specifications

Method of establishment: Transplants. Planting pieces should consist of a healthy shoot, a small section of rhizome and a mass of roots.

Planting time: Year round in the southeastern states.

Plant spacing: 1 ft. apart for solid stands.

Fertility requirements: Once the plants begin growth, apply a light application of a complete fertilizer to aid in establishment. In a constructed wetland, sewage effluent should not be allowed into the pond until the plants are fully established.

Management

Requires very little care. Fertilization is not recommended unless the growing site is extremely infertile. Removal of the dead seed stalks improves appearance, but is not necessary.

Section V. Wildflowers and Misc. Forbs

BLACK-EYED SUSAN (*Rudbeckia hirta*)

Description: An annual or short-lived perennial, native herb. It has hairy, ovate to lance-shaped leaves and stems which are scratchy to the touch. The yellow flower heads may be up to 3 inches in diameter and have purplish to black centers. It typically flowers from June to July. Fall germinating seedlings and perenniating plants overwinter as a low-growing rosette of leaves.

Uses: This plant is used mainly for landscape beautification. It has potential for use in cultivated, garden situations, in naturalized prairie or meadow plantings, and along roadsides.

Site adaptation: Black-eyed susan prefers full sun, but can be grown in light shade. On sites that are heavily shaded, plants produce few flowers and become tall and leggy. It is adapted many soil types, but prefers a well-drained soil. It generally will not persist on poorly drained sites. When growing on rich soils, high in organic matter, plants produce rank growth and are subject to wind or rain damage.

MS zone of adaptation: Zone 1, 2, and 3.

Cultural Specifications

Method of establishment: Seed or transplanted seedlings.

Planting time: Seed can be sown almost any time during the growing season, but late summer planting (August-September) often produces the largest stands. Transplants are generally planted in the spring, after all danger of frost is past.

Seedbed preparation: A firm seedbed is required. Seed may be planted into a closely mowed, chemically-killed, or burned sod area with a light disking or harrowing that scratches the soil surface. A thick layer of plant residue on the soil surface will interfere with seed germination. Light disking to incorporate ash residue is essential on burned areas or else seed germination may be delayed or inhibited. When seed is sown on a clean-tilled site, cultipacking the soil before planting is recommended.

Planting rate and method: Broadcast or shallowly drill 1-2 grams (3/4 tablespoon) seed per 100 square feet (1-2 lbs/acre). Seed should be placed close to the soil surface. Cultipacking after planting will ensure good seed to soil contact. Seed germination usually occurs by fall, but occasionally may be delayed until spring. Spring germinating plants do not begin flowering until later than normal and generally continue flowering until frost.

Greenhouse production: Seed should be planted indoors or in a cold frame in late winter. The potting medium should be sterile and well-drained. The seed should be only lightly covered and the medium kept moist, but not wet, until germination. After germination allow the surface of the soil to dry between waterings to prevent seedling rot. Transplant the seedlings into larger containers when they have 3-4 true leaves. A weekly application of a soluble complete fertilizer is recommended. Seedlings are ready to plant on the growing site 8-10 weeks after sowing. Prior to planting, seedlings should be hardened-off by placing them outdoors in a shady location for approximately one week.

Fertilizer requirement: Apply according to soil test recommendations. If not available, a rate of 3.5-5.5 oz per 100 square feet (100-150 lbs/acre) of 13-13-13 should be applied after the seedlings are established and annually thereafter.

Companion plants: Black-eyed susan is usually found growing in mixed stands with many different types of plants. Some suggested companion plants are: clasping coneflower, lance-leaf coreopsis, butterfly milkweed, purple coneflower, gaillardia, and ox-eye daisy. Grasses will be a major component of most naturalized and roadbank plantings.

Management

Mowing: If necessary, plants can be mowed in the spring before stem elongation begins in April. Later mowings should be delayed until the plants have set seed in late July to early August. This summer mowing often encourages some plants in the stand to produce a second flush of flowers, and flowering will continue sporadically until frost. A fall mowing in early November is also recommended.

Seed production: Seed will begin to mature about a month after flowering when they turn dark gray in color. However, harvest will be easier if delayed until the fruiting head (cone) becomes loose and the color turns to dark gray. At this stage, the seed easily shakes free from the cone. Seed can be collected by hand or large areas can be harvested with a conventional combine.

BUR MARIGOLD OR BEGGAR TICKS (*Bidens aristosa*)

Description: An upright, annual native herb (1-5 feet tall) with a tap root. The alternate leaves are pinnately or bipinnately dissected, with each segment lanceolate and toothed or lobed on the margin. Plants produce numerous solitary flower heads held on long stalks from September to October; each head is 1-2 inches across and bright yellow with a yellow center. Seeds are dark brown, flattened, and have two prongs that project from one end.

Uses: This plant is used mainly for landscape beautification. It has potential for use in cultivated, garden situations, in naturalized prairie or meadow plantings, and along roadsides.

Site adaptation: Bur marigold grows and flowers best in full sun, but is also adapted to partial shade. Plants are often found growing in open shade along the edge of a woodland. It is adapted to most soil types, except for very sandy soils. Natural stands are generally found on moist sites such as in ditches, marshes, and wet meadows.

MS zone of adaptation: Zone 1, 2 and 3.

Cultural Specifications

Method of establishment: Seed.

Planting time: Seed should be planted from August to October. The seed will not germinate until the following spring, but it requires exposure to cool, moist conditions during the winter.

Seedbed preparation: A firm seedbed is required. Bur marigold germinates best on a clean tilled site that has been firmed with a roller or finishing harrow before planting. Seed can also be planted into a closely mowed, chemically-killed, or burned sod area with a light disking or harrowing that scratches the soil surface. A thick layer of plant residue on the soil surface can interfere with seed germination.

Planting rate and method: Broadcast or shallowly drill 4-6 grams (5 tablespoon) seed per 100 square feet (4-6 lbs/acre). Planting depth should range from at the surface to one-quarter of an inch deep. Cultipacking after planting will ensure good seed to soil contact.

Fertilizer requirement: Apply according to soil test recommendations. If not available, a rate of 3.5-5.5 oz per 100 square feet (100-150 lbs/acre) of 13-13-13 should be applied after the seedlings are established and annually thereafter.

Companion plants: Bur marigold is not competitive with many perennial grass species and should not be planted in an area with a dense stand of existing vegetation. On favorable sites, it may become too tall and provide excessive shade for some smaller wildflowers. Some species that may be suitable for planting with bur marigold are cardinal flower, swamp rose mallow, calliopsis, and mistflower.

Management

Disking: Natural or planted stands of bur marigold usually reseed heavily for two to three years but will gradually decline without maintenance. A light to medium disking will help control perennial weeds and promote bur marigold germination. Disking should be done in mid to late November.

Mowing: If necessary, plants can be mowed in the spring before stem elongation begins in April. Stands that are not disked should not be mowed again until after seed set in early November.

Seed production: Seeds mature fairly quickly after the flowers fade when seed color changes from light green to dark brown. They will fall from the head fairly easily at this time, so harvest should not be delayed. Seed can be harvested by hand or with a conventional combine. The seed loses viability fairly quickly during storage and should be planted within one to two years of collection.

CALLIOPSIS OR PLAINS COREOPSIS (*Coreopsis tinctoria*)

Description: An annual, native forb which usually germinates in late summer or fall and overwinters as a rosette (round, low growing group of leaves). The stems begin growing upward and branching in April, reaching a height of up to 4 feet. The opposite leaves are deeply divided, with the upper leaf segments being very narrow. The flowering heads are numerous, 1-2 inches in diameter, and are yellow with a red-brown center. They begin opening in May and continue flowering through July.

Uses: This plant is used mainly for landscape beautification. It has potential for use in cultivated, garden situations, in naturalized prairie or meadow plantings, and along roadsides. Calliopsis was introduced into Mississippi from the Western states, but it is not aggressive and should not become a problem weed.

Site adaptation: Calliopsis is adapted to many soil types. It grows best on a well-drained soil, but will not tolerate a very dry site. Natural stands are generally found on bottomland areas with ample moisture. It grows best in full sun, but will tolerate light shade.

MS zone of adaptation: Zone 1, 2 and 3.

Cultural Specifications

Method of establishment: Seed.

Planting time: August to September.

Seedbed preparation: A firm seedbed is required. Calliopsis germinates best on a clean tilled site that has been firmed with a roller or finishing harrow before planting. Seed can also be planted into a closely mowed, chemically-killed, or burned sod area with a light disking or harrowing that scratches the soil surface. A layer of plant residue on the soil surface can interfere with seed germination.

Planting rate and method: 1-2 grams (1¼ tablespoon) per 100 square feet (1-2 lbs/acre) broadcast or shallowly drilled. Seed should be placed close to the soil surface. Cultipacking after planting will ensure good seed to soil contact. Seed will germinate soon after planting and remain as a rosette throughout the winter.

Fertilizer requirement: Plant growth and seed production are greatly improved by fertilization. Apply according to soil test recommendations. If not available, a rate of 3.5-5.5 oz per 100 square feet (100-150 lbs/acre) of 13-13-13 should be applied in the spring before flowering.

Companion plants: Calliopsis is well suited for growing with a wide variety of wildflowers and grasses and is recommended for roadbank seed planting mixtures in Mississippi. Some suggested companion wildflowers are clasping coneflower, black-eyed susan, ox-eye daisy, four-o'clocks, scarlet sage, cosmos, and purple coneflower.

Management

Disking: Stands will reseed prolifically for several years, but will gradually decline without soil disturbance. Every two to three years, the site should be disked to control perennial weeds and promote calliopsis germination. August is the best month to perform this operation.

Mowing: If necessary, plants can be mowed in the spring before stem elongation begins in April. Stands that are not disked should be mowed in August, and a fall mowing in early November is also recommended.

Seed production: Seed matures fairly quickly after the flowers fade. Mature seed is crescent-shaped, dark brown to black in color and will be surrounded by reddish bracts that eventually spread to release the seed. Seed can be harvested by hand or with a conventional combine. Combines can easily thrash the seed from the surrounding bracts before seed would be released naturally, therefore, an earlier harvest date is recommended to prevent seed losses.

Environmental Concern: Invades abandon cropland or idle lands but can be control with a broad spectrum herbicide and disking. Spread is by seed.

CLASPING CONEFLOWER (*Dracopis amplexicaulis*).

Description: An annual, native herb with elongated, bluish, glaucous leaves that generally clasp around the stem at the base. The flower heads are similar to those of black-eyed susans, but they are smaller (mostly 1-2 inches in diameter). The yellow outer "petals" droop as the flowers mature, and the cylindrical black center (receptacle) is elongated up to 2 inches in length. Flowering begins in June.

Uses: This plant is used mainly for landscape beautification. It has potential for use in cultivated, garden situations, in naturalized prairie or meadow plantings, and along roadsides.

Site adaptation: It is adapted to many soil types, but it generally prefers a moist site. Natural stands are usually found on bottomland areas with a fairly rich soil and ample moisture. It prefers full sun and will not persist in a shaded location.

MS zone of adaptation: Zone 1, 2 and 3 (except extreme southern counties).

Cultural Specifications

Method of establishment: Seed.

Planting time: August to September.

Seedbed preparation: A firm seedbed is required. Clasping coneflower germinates best on a clean tilled site that has been firmed with a roller or finishing harrow before planting. Seed can also be planted into a closely mowed, chemically-killed, or burned sod area with a light disking or harrowing that scratches the soil surface. A layer of plant residue on the soil will interfere with seed germination.

Planting rate and method: 2-3 grams (1 tablespoon) per 100 square feet (2-3 lbs/acre) broadcast or shallowly drilled. Seed should be placed close to the soil surface. Cultipacking after planting will ensure good seed to soil contact. Seed will germinate soon after planting and remain as a small, nondescript plant over the winter months.

Fertilizer requirement: Plant growth and seed production are greatly improved by fertilization. Fertilizer should be applied in the spring prior to flowering. Apply according to soil test recommendations. If not available, a rate of 3.5-5.5 oz per 100 square feet (100-150 lbs/acre) of 13-13-13 is adequate for most plantings. For seed production, increase the fertilizer rate to 9 oz per 100 square feet (250 lb/acre).

Companion plants: Clasping coneflower is well suited to growing with a wide variety of wildflowers and grasses. Some suggested companion wildflowers are calliopsis, black-eyed susan, gayfeather, purple coneflower, scarlet sage, cosmos, toadflax, and ox-eye daisy.

Management

Disking: Stands will reseed prolifically for several years, but will gradually decline without soil disturbance. Every two to three years, the site should be disked to control perennial weeds and promote clasping coneflower germination. August is the best month to perform this operation.

Mowing: If necessary, plants can be mowed in the spring before stem elongation begins in April. Stands that are not disked should be mowed in August, and a fall mowing in early November is also recommended.

Seed production: Seed matures fairly quickly after flowering. Mature seed is dark gray in color and similar to those of black-eyed susan. Seed should not be harvested until the receptacle appears brown and wooly with loose flower parts. At this stage, the seed easily shakes free from the receptacle. Harvesting must be completed quickly to prevent seed losses. Seed can be harvested by hand or with a conventional combine.

LANCE-LEAF COREOPSIS (*Coreopsis lanceolata*)

Description: A clump-forming, perennial native herb with short rhizomes. Leaves may or may not be hairy; basal leaves are pinnately divided with each division elliptic, and the upper leaves are entire and also elliptic. The flower heads are borne singularly or in small groups on upright stems from April to June. They are 1-2 inches in diameter and yellow with a yellow center. The seed are dark brown, winged, and curved to almost semi-circular.

Uses: This plant is used mainly for landscape beautification. It has potential for use in cultivated, garden situations, in naturalized prairie or meadow plantings, and along roadsides.

Site adaptation: Lance-leaf coreopsis prefers full sun, but will tolerate light shade. On sites that are heavily shaded, plants produce fewer flowers and the stems grow taller. It can grow on many soil types, but prefers a well-drained soil. Natural stands are often found on dry, infertile sites.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Seed or transplanted seedlings.

Planting time: Can be seeded almost any time during the growing season, but summer planting (July-September) often produces the largest stands. Transplants are planted in the spring after all danger of frost is past.

Seedbed preparation: A firm seedbed is required. Seed may be planted into a closely mowed, chemically-killed, or burned sod area with a light disking or harrowing that scratches the soil surface. When seed is sown onto a clean-tilled site, cultipacking the soil before planting is recommended. A thick layer of plant residue on the soil surface may interfere with seed germination.

Planting rate and method: Broadcast or shallowly drill 5-7 grams of seed per 100 square feet (5-7 lbs/acre). Planting depth should range from at the soil surface to one-eighth inch deep. Cultipacking after planting is recommended. Seed germination should occur by fall, and the plants will remain as a low-growing rosette throughout the winter.

Greenhouse production: Seed should be planted in a greenhouse or cold frame in late winter. The potting medium should be sterile and well-drained. The seed should be lightly covered and the medium kept moist, but not wet, until germination. Lance-leaf coreopsis will produce a high percentage of filled, viable seed, so they should germinate rapidly in high numbers. After germination allow the surface of the soil to dry slightly between waterings. Transplant the seedlings into larger containers when they have 2-3 true leaves; the seedlings are fairly sturdy, which makes them easy to handle during transplanting. A weekly application of a soluble complete fertilizer is recommended. Seedlings can be planted in the field about one month after transplanting. They should be hardened-off by placing them outdoors in a shady location about a week prior to planting.

Fertilizer requirement: Apply according to soil test recommendations. If not available, a rate of 3.5-5.5 oz per 100 square feet (100-150 lbs/acre) of 13-13-13 should be applied after the seedlings are established and annually thereafter.

Companion plants: Lance-leaf coreopsis grows well when planted with perennial lawn grasses and is highly suited for roadside plantings. Some suggested companion wildflowers are lyre-leaf sage, black-eyed susan, toadflax, ox-eye daisy, blue-eyed grass, purple coneflower, bachelor's button, gaillardia, and butterfly milkweed.

Management

Mowing: The initial mowing should be delayed until mid to late May (after seed set). Lance-leaf coreopsis can tolerate regular mowing during the summer and fall. However, if the plants are allowed to regrow after the initial mowing, they will usually flower sporadically throughout the summer. A fall mowing is recommended.

Seed production: Seed will begin to mature about a month after flowering. The bracts surrounding the seed darken and they begin to spread to release the seed. When completely open, the seed falls easily from the head, and will be lost if not collected quickly. Seed can be collected by hand or large areas can be harvested with a combine.

LYRE-LEAF SAGE (*Salvia lyrata*)

Description: A native, perennial herb with quadrangular flowering stems extending upright from a basal rosette of leaves. The basal leaves are elongated, elliptic, dark green to slightly purplish, and are often lobed or dissected. The light blue to violet flowers are clustered at the top of the stem. Flowering occurs from April to May or June. The seeds are round, dark brown, and held loosely in a cup-like structure.

Uses: This plant is used mainly for landscape beautification. It has potential for use in cultivated, garden situations, in naturalized prairie or meadow plantings, and along roadsides.

Site adaptation: Lyre-leaf sage can grow in full sun and light to medium shade. Native stands are found on roadsides, and in fields and open woodlands. It will grow on many types of soil.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Seed.

Planting time: Lyre-leaf sage can be planted almost any time during the growing season, but late summer planting (August-September) often produces the largest stands.

Seedbed preparation: A firm seedbed is required. Seed may be planted into a closely mowed, chemically-killed, or burned sod area with a light disking or harrowing that scratches the soil surface. When seed is sown on a clean-tilled site, cultipacking the soil before planting is recommended. A thick layer of plant residue on the soil surface can interfere with seed germination.

Planting rate and method: Broadcast or shallowly drill 4-6 grams (1 ½ tablespoon) of seed per 100 square feet (4-6 lbs/acre). Planting depth should range from at the soil surface to one-eighth inch deep. Cultipacking after planting is recommended. Seed germination should occur by fall, and the plants will remain as a small, low-growing rosette throughout the winter. Often it takes two or three years for lyre-leaf sage to produce a dense stand on the planting site.

Fertilizer requirement: Apply according to soil test recommendations. If not available, a rate of 3.5-5.5 oz per 100 square feet (100-150 lbs/acre) of 13-13-13 should be applied after the seedlings are established and annually thereafter.

Companion plants: Lyre-leaf sage grows well with most perennial lawn grasses and it is highly suited for roadside plantings. Some suggested companion wildflowers are lance-leaf coreopsis, black-eyed susan, blue-eyed grass, toadflax, ox-eye daisy, purple coneflower, bachelor's button, and butterfly milkweed.

Management

Mowing: Because of its low-growing nature, mowing to limit competition from other plants is crucial to maintain a stand of lyre-leaf sage. The initial mowing should be delayed until mid to late May (after seed matures). Plants can tolerate regular close mowing during the summer and fall. If allowed to regrow after the initial mowing, plants often produce additional seed during the summer, but showy flowers will not be produced. However, on sites where competing vegetation provides dense cover, stands should be mowed regularly, because the small amount of additional seed produced during the summer will not justify the detrimental effects on the lyre-leaf sage stand. Fall mowing is always recommended.

Seed production: Seed will begin to mature about a month after flowering. The seed are clearly visible in the surrounding cup-like structure, and are mature when the color changes from green to dark brown. When mature, they fall easily when the stalk is shaken or rubbed. Seed can be collected by hand or large areas can be harvested with a conventional combine.

MEADOW BEAUTY (*Rhexia mariana*)

Description: A native, upright (up to 2.5 feet), hairy perennial that frequently spreads to form large colonies. The opposite leaves are elongated, three-nerved, with toothed margins. The pink to lavender or occasionally white flowers are produced from May to October in small clusters near the top of the plant. Each flower is 1-2 inches in diameter and contains 4 petals; the yellow to orange anthers in the center are elongated and curved downwards. The tiny tan to brownish seed are held in a reddish urn-shaped capsule.

Uses: This plant is used mainly for landscape beautification. It has potential for use in cultivated, garden situations, in naturalized prairie or meadow plantings, and along roadsides.

Site adaptation: Meadow beauty grows best in a sunny exposure. It is adapted to heavy textured and to highly organic soils. Natural stands are usually found on moist to wet sites such as in ditches, marshes, and wet meadows.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Seed or transplanted seedlings.

Planting time: Seed can be sown in the field from August to October. Seed is usually sown in the greenhouse or cold frame in late winter to produce transplants for spring planting.

Seedbed preparation: A clean, firm seedbed is essential. The site should be treated with a herbicide to control vegetation, tilled, cultipacked once or twice, and allowed to settle thoroughly before sowing.

Planting rate and method: Broadcast 0.5-1 grams (1 tablespoon) seed per 100 square feet (0.5-1 lbs/acre). The seed can be mixed with sand or rice hulls to increase volume so that it will be easier to spread uniformly over the planting site. The seed must remain on the soil surface because it is easily smothered when buried in the soil. Heavy rains after planting may cause the seed to be buried or washed from the site.

Greenhouse production: Seed should be sown in flats or pots in a well-drained, sterile growing medium. The seed should remain close to the surface of the growing medium; however, a thin layer of sand or sphagnum moss on top of the medium may help prevent damping-off. The seedlings should germinate within 1-2 weeks. Young plants require regular irrigation to prevent drying. Weekly applications of a soluble complete fertilizer are recommended. The seedlings are very delicate and should be transplanted in small clumps in order to disturb the roots as little as possible. Individual plants can be separated from the clump and planted in the field about six to eight weeks after transplanting. Prior to planting, seedlings should be hardened-off by placing them outdoors in a shady location for approximately one week.

Fertilizer requirement: Apply according to soil test recommendations. If not available, a rate of 3.5-5.5 oz per 100 square feet (100-150 lbs/acre) of 13-13-13 should be applied after the seedlings are established and annually thereafter.

Companion plants: Meadow beauty can be grown with many grasses and wildflowers that also prefer a moist, sunny area. Some suggested companion wildflowers are clasping coneflower, calliopsis, lyre-leaf sage, scarlet sage, cosmos, cardinal flower, ox-eye daisy, swamp sunflower, and bur marigold.

Management

Mowing: If necessary, stands can be mowed in the spring before stem elongation begins. Later mowings should be delayed until the plants have set seed in late September to October.

Seed production: The capsules will become dry and brittle in early to mid October. Break open a few of the capsules to inspect the seed; if they are yellow tan to brown, then the seed is mature and ready to harvest. Seed can be collected by hand or larger areas can be harvested with a combine. Hand-collected seed can be cleaned by drying the capsules, crushing them, and screening to remove trash.

MISTFLOWER OR WILD AGERATUM (*Eupatorium coelestinum*)

Description: An erect, rhizomatous, native perennial 3 feet tall and often forming colonies. The opposite leaves are ovate, hairy, and have toothed margins. The small flower heads, produced from July to October, are clustered at the top of the plant. They are powder blue to violet and fluffy in appearance, similar to Ageratums used as garden bedding plants. The tiny seed are black, elongated, and have long white hairs attached to one end.

Uses: This plant is used mainly for landscape beautification. It has potential for use in cultivated, garden situations, in naturalized prairie or meadow plantings, and along roadsides.

Site adaptation: Mistflower is adapted to most soil types, but is especially suited to heavy textured and to highly organic soils. Natural stands are found on moist to wet sites, such as low woods, wet meadows, and ditches. It grows best in full sun, but will tolerate light shade.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Seed or transplanted seedlings.

Planting time: Seed should be planted in the field from September to October. Transplants are usually grown from seed sown in the greenhouse or cold frame in late winter.

Seedbed preparation: A clean, firm seedbed is essential. The site should be treated with a herbicide to control existing vegetation, tilled, cultipacked once or twice, and allowed to settle thoroughly before sowing.

Planting rate and method: Broadcast 0.5-0.75 gram seed per 100 square feet (0.5-0.75 lbs/acre). Bulk sowing rates usually need to be increased to allow for low purity values. The seed can be mixed with sand or rice hulls to increase volume so that it will be easier to spread uniformly over the planting site. Seed must remain on the soil surface because they are easily smothered when buried in the soil. The seed will not germinate until the following spring, but will benefit from the cool, moist winter environment.

Greenhouse production: Seed should be sown in flats or pots in a well-drained, sterile growing medium. The seed should be planted on the surface of the medium. Seedlings can be transplanted about 5-8 weeks after sowing. Young plants should be kept constantly moist and weekly applications of a soluble complete fertilizer are recommended. Plant in the field after all danger of frost is past. Prior to planting, seedlings should be hardened-off by placing them outdoors in a shady location for approximately one week.

Fertilizer requirement: Apply according to soil test recommendations. If not available, a rate of 3.5-5.5 oz per 100 square feet (100-150 lbs/acre) of 13-13-13 should be applied after the seedlings are established and annually thereafter.

Companion plants: Mistflower can be grown with many grasses and wildflowers that also prefer a moist site. Some suggested companion wildflowers are swamp rose mallow, scarlet sage, cardinal flower, clasping coneflower, calliopsis, ox-eye daisy, swamp sunflower, meadow beauty, and bur marigold.

Management

Mowing: Stands can be mowed in the spring and early summer. Later mowings should be delayed until the plants have set seed in late October to early November.

Seed production: The seed matures 2-3 weeks after the flowers fade. The flower head will turn gray to brown and the seed will strip easily from the receptacle. Plants generally produce only a small percentage of viable seed; faulty seed will be thin and shriveled. Seed can be collected by hand cutting the clusters from the plant, or mechanically, with a combine or seed stripper. Mechanically harvested seed is difficult to clean because the small size and the attached fluffy hairs make air separation impossible.

SUNFLOWER (*Helianthus annuus*)

Description: A stout, erect annual, 5 to 20 feet tall with rough hairy stems. Sunflowers are cultivated extensively in Russia, India, and Egypt. Commercial production in the United States is centered in Kansas, Missouri, and the Ohio Valley.

Uses: Seed is used for oil, human food, and feed for livestock. It is also a choice food for many species of songbirds, wild turkey, and particularly doves.

Soil adaptation: A well-drained, productive soil is best; however, sunflower is adapted to a rather wide range of soils and soil conditions.

MS zone of adaptation: Zones 1, 2, and 3.

Varieties: From evaluations made at the Jamie Whitten Plant Materials Center, Mammoth Russian was shown to be the highest yielding variety. Seed yields range from 2400 to 3000 lbs/acre. Consult local county agent for varieties adapted to your area.

Cultural Specifications

Method of establishment: Seed.

Seedbed preparation: Prepare a firm seedbed as for cotton or corn.

Planting time: April - May.

Planting rate: 10 to 15 lbs/acre in 36 to 42 inch rows using a corn planter with an 8 inch spacing within the row. Cover seed about 1 inch deep.

Fertility requirements: Apply 400 lbs/acre of 13-13-13, or similar fertilizer, at time of planting.

Management

Cultivate two to three times. If seed production is desired, harvest before seed are completely ripe to avoid excessive shattering. Dry the seed after threshing before storing.

Wildlife Considerations

For dove shooting, use the recommendations listed below.

1. Prepare land to permit planting around May 1 to insure that the crop is ready for the first dove season.

2. Prepare land as for any other crop and incorporate Treflan (trifluralin) at the rate of 1.0 to 2.5 pints per acre depending on soil type (check label) and fertilize with 13-13-13 at the rate of 300 pounds per acre.

3. Plant any of the oil-type varieties on 38 to 40 inch rows at a rate to give one plant for each foot of row.

4. Cultivate as needed and apply sufficient N at the first cultivation to bring total N up to 80-100 lbs/acre. The field should be free of weeds and grasses when sunflowers mature so that doves can find the seed.

5. Leave sunflowers standing to provide cover for hunters and to extend the life of the crop. Normally, starlings and blackbirds feeding on mature seedheads, will shatter enough seed to attract doves.

6. Check the field as the hunting season approaches and shred part of it if starlings and blackbirds are not shattering enough seed to attract doves.

WOOLY CROTON (*Croton capitatus*)

Description: A native, annual reseeding forb. Two to three seeds are borne in a round capsule. Number of seed per pound is approximately 21,000.

Uses: Seed is a choice food of quail and doves. Domestic livestock and deer do not eat this plant; therefore, the major use is for quail or doves where domestic livestock or deer would destroy other foods.

Soil adaptation: Adapted to most soils except those that are extremely wet.

MS zone of adaptation: Zones 1, 2, and 3.

Cultural Specifications

Method of establishment: Principally by natural reseeding. For quail, establish a strip 10 to 15 feet wide around a field next to brushy cover. Plants can be confined to the strip by mowing the field once or twice during the season. For doves, allow fields to develop.

Soil disturbance is required for stands to reseed. Trampling from heavy grazing, where it occurs, is ordinarily enough to provide the disturbance required. However, where no grazing is practiced, disking in early spring must be used.

Section VI. Coastal Plants

BEACH SUNFLOWER (*Helianthus debilis*)

Description: A low-growing, native, herbaceous perennial plant. Leaves alternate along the stem and are deep green on both upper and lower surfaces. Leaves are broad wedge-like to heart-shaped and approximately 5-8 cm long. Flowers are daisy-like composite, bright yellow, and approximately 7 cm across. The plant is broadly branched along the short stems. Many branches are decumbent or horizontal. The plant spreads readily by ground stolon-like runners.

Uses: Beach sunflower is used to stabilize the back dune areas of coastal sand dunes. It acts as a perennial in southern Florida and as a reseeding annual throughout central Florida.

Varieties: Flora Sun.

Climatic adaptation: Zone 3 (coastal dunes).

Cultural Specifications

Method of establishment: Transplants.

Site preparation: Generally none required.

Planting time: May and June.

Planting and Spacing: Plant soil and root mass ½ to 1 inch below prevailing soil surface in rows on a 1 to 2.5 foot spacing. Offset plants in rows to deter wind erosion.

Irrigation: Adequate water may be necessary to insure survival of the planting. The plant should dictate when water is needed by visible stress signs.

Fertilizer: Place one ounce of Osmocote* 0-14-14 in the hole with each plant or broadcast 100-150 of 10-5-10/acre two to three weeks after planting. Broadcast 10-5-10 or equivalent at the rate of 150-200 lbs/acre annually in mid-summer.

**Other commercial fertilizers of the same analysis and with a slow release formulation may also be used.*

BITTER PANICUM (*Panicum amarum*)

Description: A native, perennial, warm season grass growing to a height of 7 feet with a growth habit ranging from erect to prostrate. The leaves are ¼ to ½ inch wide, 7 to 20 inches long, smooth without hair, and bluish in color. This robust grass spreads slowly from short, strong rhizomes, forming open clumps. Small quantities of poor quality seed are produced on compact panicles 6 to 12 inches long and 2 to 4 inches wide.

Uses: The principal use is in coastal dune erosion control and it may have a role in stabilizing other dry, sterile areas such as roadsides and minespoils.

Site adaptation: Bitter panicum is adapted to very dry sterile sites. It can withstand periods of extended drought. This grass is adapted to well drained to excessively drained, moderately coarse-textured and coarse textured soils.

MS zone of adaptation: Zone 3 (coastal area).

Varieties: Northpa and Fourchon source.

Cultural Specifications

Method of establishment: Potted and bare root plants are available commercially. Freshly dug bare root tillers, rooted stem cuttings, and unrooted stem cuttings can also be obtained from vigorous stands.

Site preparation: Generally none required.

Plant spacing: Plant potted and bare root material in a grid pattern 2 feet apart in 2 to 3 foot staggered rows. Plant stem cuttings three to a hole 2 feet apart in 2 to 3 foot staggered rows. Place plants 4 to 10 inches, or deeper, in moist soil. Plant stem cuttings at a 45-degree angle, deep enough to bury several nodes and leaving the top 6 to 10 inches of stem exposed.

Planting time: Late fall with stem cuttings; late winter or early spring with potted plants; late spring with young tillers.

Fertilizer requirement: Place one ounce of slow release fertilizer such as **Osmocote* in each hole as material is planted, or apply 200 to 300 pounds of 10-10-10 per acre 3 to 4 weeks after planting. Apply this same rate annually in June and repeat in August, until the stand fills in the spacing.

**Other commercial fertilizers of the same analysis and with a slow release formulation may also be used.*

COASTAL PANICGRASS (*Panicum amarum var. amarulum*)

Description: A strong, perennial, short rhizomatous, salt-spray tolerant grass with numerous medium textured, erect stems 3 to 7 feet or more in height. Produces moderate to abundant numbers of medium textured bluish-green leaves 3/4 to 1 inch wide by 12 to 20 inches long. Radial lateral spread is 4 to 8 inches annually. Seedheads 4 to 8 feet in height are produced in late July through August or September. The seed is eagerly sought by doves and quail. Volunteer seedlings occasionally occur when the soil is undisturbed.

Uses: Coastal panicgrass is used primarily in coastal dune stabilization, but has shown promise in vegetating other droughty, sterile areas such as sandpits and minespoils.

Site adaptation: Grows best on light-textured, sandy to silty loam soils.

MS zone of adaptation: Zone 3.

Varieties: Atlantic.

Cultural Specifications

Method of establishment: Freshly dug bare root tillers (sprigs) or seed are available commercially.

Seedbed preparation: The soil should be plowed, disked, and packed. Bare soil can be broadcast seeded followed by harrowing or light disking to cover the seed. Vegetative plantings into bare soil can be made using a shovel or dibble.

Plant spacing and seeding rates: Tillers (sprigs) should be planted in rows 6 to 8 feet apart and spaced about 18 inches apart in the rows. About 5,000 tillers per acre are required for this type of planting. Use 10 to 15 lbs/acre drilled or 20 lbs/acre broadcast. Seed at 1 to 3 inches depth. Plant tillers so the roots are well distributed in moist soil and the crowns are covered with 1/2 to 1 inch soil. Pack firmly.

Planting time: Plantings should be made November 1 to March 1 or June 1 to September 1.

Fertilizer and management requirement: Fertilize winter plantings at planting time. Apply 400 pounds of 10-10-10/acre or equivalent, plus minor elements, in the spring. Repeat this fertilization in mid to late summer. For summer plantings, place one ounce of slow release fertilizer such as **Osmocote* in each hole as material is planted, or apply 200 to 300 lbs/acre of 10-10-10 3 to 4 weeks after planting. Apply the same rate and kind June 1 through 15 and August 1 through 15, annually, until the stand fills in the spacing. Minimize foot traffic and remove debris from planting.

**Other commercial fertilizers of the same analysis and with a slow release formulation may also be used.*

CORDGRASS, MARSHHAY (*Spartina patens*)

Description: A native, perennial, warm season with erect stems, mostly less than 40 inches tall. It spreads by long slender rhizomes. Leaves are less than 1/8-inch wide and are sometimes flat, but usually roll inward from the edges with the upper surface inside. There are 2 to 7 spikes on the seedhead. These 3/4-to 2-inch spikes are born against or away from the stem.

Uses: Marshhay cordgrass is used for coastal erosion control in back dune areas, along tidal river banks, and on salt marshes above the high tide line. Inland uses include stabilizing waterways, gullies, roadsides, and minespoil and saline oil seep areas. The 'salt hay' is used as a mulch and fed to cattle.

Site adaptation: Salt marshes and sandy meadows from Quebec, Canada, to Florida and Texas, and saline marshes inland from New York to Michigan.

MS zone of adaptation: Zone 3.

Varieties: Flageo, Sharp.

Cultural Specifications

Method of establishment: Potted plants or bare root stock are available commercially and from vigorous stands. Use transplants that have 5 to 10 stems each.

Site preparation: None required, but removal of trash on tidal areas will prevent burial of plants.

Plant spacing: Place plants 12 to 24 inches apart, depending on severity of site. Plant 4 to 8 inches, or deeper, in moist soil.

Planting time: Late winter and early spring.

Fertilizer requirement: On critical area plantings, place one ounce of slow release fertilizer such as **Osmocote* per plant at planting, or apply 200 to 300 pounds of 10-10-10/acre (or similar analysis) several weeks after planting. Apply 200 to 300 pounds of 10-10-10 per acre annually in June until the stand fills in the spacing. Do not fertilize rangeland plantings.

Management

Minimize foot traffic and remove debris from plantings.

**Other commercial fertilizers of the same analysis and with a slow release formulation may also be used.*

CORDGRASS, SMOOTH (*Spartina alterniflora*)

Description: A native, stout, perennial with scaly, deeply buried rhizomes. Abundant in colonies at tidally-inundated shores of brackish to hyper-saline bays and river deltas. Stems are 3-4 feet tall, slender or coarse, stiffly erect and smooth. Leaves are smooth to slightly rough to the touch and about 2-2.5 feet long; blades ½ inches wide with overlapping glabrous sheaths.

Uses: Shoreline erosion control, and establishing salt marshes.

Site adaptation: 0 to 35 ppt salinity range. Water depth ranges from 0 to +12 inches. It grows between mean high tide and mean low tide in areas with narrow tidal ranges and from mean high tide to mean sea level in locations with broader tidal fluctuations.

MS zone of adaptation : Zone 3 (coastal areas).

Varieties: Vermilion.

Cultural Specifications

Method of establishment: Transplants. Use a dibble bar or similar tool; insert plant stems to a depth of 6 inches; pack soil firmly around the plant.

Water depth at planting: Wet soil is necessary but water does not need to be standing. Care must be taken to determine the elevation of planting sites. Tides and substrates should be observed. Smooth cordgrass grows at elevations ranging from mean high tide and above. Plant at an excessively low elevation will result in failure through drowning and/or uprooting where wave energy is high.

Plant spacing: 2-10 feet apart. Spacing will depend on how quickly complete coverage is needed.

Planting time: February to June along the Gulf coast.

Fertility requirements: Fertilization is recommended for all plantings. Surface applications of two parts, by weight, ammonium sulfate or ammonium nitrate to 1 part treble superphosphate is applied to seeded fields at 200 lbs/acre in June or July of the first growing season. In areas planted to seedlings, divisions or containerized plants, surface applications of 2 parts, by weight, ammonium sulfate or ammonium nitrate to 1 part treble superphosphate is applied to planted fields at 200 lbs/acre at planting time and again in June. A side dress of 1 oz. of a slow release fertilizer per plant may be used in lieu of a June fertilizer application.

Care and treatment of vegetative stock: Keep vegetative stock moist before and after transplanting to minimize planting shock. If the plants have been growing in or irrigated with fresh water or with water of a much lower salinity than the purposed planting site, they should be hardened to near the salinity of the planting site. Consult with the nursery grower where the plants were purchased to determine how they were grown.

SEA OATS *(Uniola paniculata)*

Description: Perennial, erect, rhizomatous, colonizing grasses native to the coastal sands and dunes of Florida and the southeastern United States. This grass forms in dense, rather stiff bunches 40 to 60 inches tall and 30 to 120 inches in diameter. Leaves are less than 1/2-inch in width, 16 to 28 inches long, and are usually flat. Leaves are rolled or involute on drying. Panicles of the seedhead are 8 to 12 inches long with numerous spikelets less than 1-inch long, each having 8 to 15 florets. Very little to no seed is produced by most seedheads and is readily eaten by birds. Only rarely is reproduction by natural germination of seed observed. Lateral spread and colony increase is accomplished by moderate to strong rhizome development.

Uses: Critical area stabilization of saline coastal sands and sand dunes.

Site adaptation: Sand dunes from southern Virginia to Florida and Texas.

Climatic adaptation: Zone 3 (coastal area).

Cultural Specifications

Method of establishment: Potted plants and bare root stock are available commercially and from vigorous stands. Use transplants with a minimum 30-inch stem height.

Site preparation: Generally none required.

Plant Spacing: Place plants 12 to 36 inches apart, depending on the pot size and severity of the site. Use 18-inch spacing for an average site using 2- to 4-inch pots. Place plants 8 to 12 inches, or deeper, in moist soil.

Planting time: Late winter to early spring.

Fertilizer requirement: Place one ounce of slow release fertilizer such as **Osmocote* in each hole as material is planted, or apply 200 to 300 lbs of 10-10-10/acre 3 to 4 weeks after planting. To maintain and/or develop the stand, apply 200 to 300 lbs of 10-10-10 (or equivalent)/acre annually June 1 to June 15 and repeated August 1 to August 15.

Management

Minimize foot traffic and remove debris from planting.

**Other commercial fertilizers of the same analysis and with a slow release formulation may also be used*.

Appendices

A.1.

SOIL SAMPLING INSTRUCTIONS FOR TESTING SOIL

Soil tests can be only as accurate as the samples on which they are made. Proper collection of soil samples is extremely important. Chemical tests of poorly taken samples may actually be misleading.

1. **Soil sampling plan**. Prepare a farm map to include boundaries of each field. Give each field a permanent number. A soil map from the USDA-Natural Resources Conservation Service is ideal for this use. Keep this map and all soil test reports for long-term record. Plan to sample each field at 3 to 5 year intervals depending on cropping system.

2. **Sample only uniform areas**. Soils that are different in color, slope, crop, degree of erosion, and past fertilizer or lime treatment should be sampled separately if the area is large enough to be fertilized separately. Small, abnormal spots in the field should be sampled separately or ignored. Avoid sampling in the fertilizer band of row crops, in slight depressions or small eroded areas.

3. **The sample should be taken from all over the area**. Soil from a single place cannot adequately represent the soil in an area. Take soil sample from 10 to 15 different places in the field, lawn or garden. Sample to a depth of 6 inches for cultivated land or gardens; 4 inches for permanent sods such as bermudagrass, bahiagrass, or lawn turfs. Remove the litter from the surface and use a shovel, soil auger, or soil sampling tube to obtain a sample for testing. Place the soil in a **CLEAN** bucket or container, mix thoroughly and take out approximately one pint.

4. **Soil information sheet and shipment**. Take your soil sample(s) to your local county agent and they will assist you with filling out a soil sample information sheet and shipment.

A.2.

PLANTING NATIVE GRASSES USING THE PURE LIVE SEED METHOD

Native grass seed lots vary widely in quality and price with lots containing various amounts of inert material, weed seeds and grass seeds that will not grow. To account for the variability in seed lots, the pure live seed (PLS) method of planting was developed to insure correct seeding rates. Since only live seeds of the desired crop are of value, the amount of other material in a seed lot must be accounted for in the seeding rate. Seed sold by bulk pounds (lbs/acre) may not consider the quality of the seed being sold.

To calculate the pure live seed in a lot of seed simply use the following formula.

$$\frac{\%\text{Purity} \times \%\text{Germination}}{100} = \text{Pure Live Seed (PLS)}$$

It is important to plant seed with the highest purity percentage. This reduces the amount of detrimental materials, i.e., other crop or weed seed which will compete with grass seedlings during establishment. The other factor to consider when calculating PLS is germination percentage. Germination percentage is calculated by the number of seed which will produce a viable seedling in germination tests divided by the total number of seed tested. All of this information can be found on a seed tag (see example) that is attached to the bag of seed.

Sample Seed Tag from *XYZ Seed Company*

Kind: Switchgrass	**Purity: 99.98%**	Weed Seed: 0.00%
Lot: SSG 1-98	Other Crop: 0.01%	Bulk Wt: 50 lbs
Test Date: 12/98	Inert: 0.01%	**Germination: 88.00%**
Origin: Native grass USA	Noxious Weed Seed: 0	Hard Seed: 5.00%
Net Wet. 44 (lbs PLS)	Dormant Seed: 0.00%	

To plant 10 pls pounds of switchgrass from the *XYZ Seed Company*, first calculate the %PLS:

$$\frac{99.98\%\ (\text{Purity}) \times 88.00\%\ (\text{Germination})}{100} = 87.98\%\ \text{PLS}$$

Then:

$$\frac{10\ \text{pls (Desired Rate)}}{87.98\%\ (\text{PLS})} \times 100 = 11.36\ \text{lbs of bulk seed to plant 10 pls/acre.}$$

A helpful reference chart for determining the number of bulk pounds needed to plant a lot of seed with a specified %purity and %germination is included on the next page.

A.2. Con't.

To use this chart, simply cross reference the % Germination down to the corresponding % Purity. Using the *XYZ Seed Company* example from the previous page, 88% would round to 90% Germination and 92.30% would round to 90% purity. Multiply the desired PLS (10 lbs) by the number from the table (1.3). 13 lbs of seed from the *XYZ Seed Company* would be needed to plant 10 pls lbs per acre.

	% Germination																		
% Purity	**100**	**95**	**90**	**85**	**80**	**75**	**70**	**65**	**60**	**55**	**50**	**45**	**40**	**35**	**30**	**25**	**20**	**15**	**10**
100	1.0	1.1	1.2	1.2	1.3	1.4	1.5	1.6	1.7	1.9	2.0	2.3	2.5	2.9	3.4	4.0	5.0	6.7	10.0
95	1.1	1.2	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.0	2.2	2.4	2.7	3.1	3.6	4.3	5.3	7.1	10.6
90	1.2	1.2	1.3	1.4	1.4	1.5	1.6	1.8	1.9	2.1	2.3	2.5	2.8	3.2	3.8	4.5	5.6	7.5	11.2
85	1.2	1.3	1.4	1.4	1.5	1.6	1.7	1.9	2.0	2.2	2.4	2.7	3.0	3.4	4.0	4.8	5.9	7.9	11.8
80	1.3	1.4	1.4	1.5	1.6	1.7	1.8	2.0	2.1	2.3	2.5	2.8	3.2	3.6	4.2	5.0	6.3	8.4	12.5
75	1.4	1.5	1.5	1.6	1.7	1.8	2.0	2.1	2.3	2.5	2.7	3.0	3.4	3.9	4.5	5.4	6.7	8.9	13.4
70	1.5	1.6	1.6	1.7	1.8	2.0	2.1	2.2	2.4	2.6	2.9	3.2	3.6	4.1	4.8	5.8	7.2	9.6	14.3
65	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.4	2.6	2.8	3.1	3.5	3.9	4.4	5.2	6.2	7.7	10.3	15.4
60	1.7	1.8	1.9	2.0	2.1	2.2	2.4	2.6	2.8	3.1	3.4	3.8	4.2	4.8	5.6	6.7	8.4	11.2	16.7
55	1.9	2.0	2.1	2.2	2.3	2.5	2.6	2.8	3.1	3.4	3.7	4.1	4.6	5.2	6.1	7.3	9.1	12.2	18.2
50	2.0	2.2	2.3	2.4	2.5	2.7	2.9	3.1	3.4	3.7	4.0	4.5	5.0	5.8	6.7	8.0	10.0	13.4	20.0
45	2.3	2.4	2.5	2.7	2.8	3.0	3.2	3.5	3.8	4.1	4.5	5.0	5.6	6.4	7.5	8.9	11.2	14.9	22.3
40	2.5	2.7	2.8	3.0	3.2	3.4	3.6	3.9	4.2	4.6	5.0	5.6	6.3	7.2	8.4	10.0	12.5	16.7	25.0
35	2.9	3.1	3.2	3.4	3.6	3.9	4.1	4.4	4.8	5.7	5.8	6.4	7.2	8.2	9.6	11.5	14.3	19.1	28.6
30	3.4	3.6	3.8	4.0	4.2	4.5	4.8	5.2	5.6	6.1	6.7	7.5	8.4	9.6	11.2	13.4	16.7	22.3	33.4
25	4.0	4.3	4.5	4.8	5.0	5.4	5.8	6.2	6.7	7.3	8.0	8.9	10.0	11.5	13.4	16.0	20.0	26.7	40.0
20	5.0	5.3	5.6	5.9	6.3	6.7	7.2	7.7	8.4	9.1	10.0	11.2	12.5	14.3	16.7	20.0	25.0	33.4	50.0
15	6.7	7.1	7.5	7.9	8.4	8.9	9.6	10.3	11.2	12.2	13.4	14.9	16.7	19.1	22.3	26.7	33.4	44.5	66.7
10	10.0	10.6	11.2	11.8	12.5	13.4	14.3	15.4	16.7	18.2	20.0	22.3	25.0	28.6	33.4	40.0	50.0	66.7	100.0

A.3.

MANAGEMENT TIPS FOR PLANTING NATIVE GRASSES

Seedbed Preparation

Loose uneven seedbeds are a major cause of poor stands. Your shoes or boots should not sink more than ½ inch into a properly prepared seedbed. Seeding depth is critical in establishing native grasses and legumes. Seeds sown on the surface without coverage or greater than ½ inch deep have little chance of developing into seedlings. Cultipacking the seedbed before and after planting is recommended on all soils except the blackland prarie soils where cultipacking after planting is recommended.

Establishment Method

Native grasses can be propagated from seed. Planting rates are based on pure live seed (PLS) lb/acre and **NOT** bulk lb/acre. Failing to recognize PLS when calculating seeding rates will jeopardize the planting. For more information on planting native grasses based on PLS refer to Appendix B.

Cultipack seeders or press-wheel drills with depth bands are ideal to achieve proper seed placement. Fluffy seed will not flow through a conventional drill like smooth seed grasses such as switchgrass because appendages surrounding the fluffy seed cause it to pack together inside the tubes and not flow freely. Therefore, drills equipped with a fluffy seed box are required.

Successful seedings can be achieved by broadcast seeding on a firm seedbed and rolling or cultipacking after seeding. Mixing fluffy seed with a carrier such as sand or fertilizer (P and K) helps facilitate broadcast seeding. Even with a carrier, planting fluffy seed by broadcast method is difficult. Hand operated broadcast seeders have been designed and engineered for planting fluffy grass seeders.

Planting Time

Warm season native grasses should be planted in April or May. A good rule of thumb is to plant the seed before the last frost. Avoid planting after May 1 because moisture and possible weed competition may delay stand establishment. Weed competition can be minimized with properly applied, labeled herbicides or mowing management.

Fertilizer

Warm season native grasses can be productive on low fertility soils, but fertilization will increase plant vigor. Follow soil test recommendations for applying P, K, and lime. Incorporate lime into the soil in the fall to allow it time to adjust pH to 6.0 before planting in the spring. Incorporate P and K into the soil at planting time. Apply nitrogen when a stand is evident.

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Weed Control

Herbicides such as Plateau® and 2, 4-D can be used to control annual grassy and broadleaf weeds. Herbicide selection will depend on whether native grasses were seeded alone or in combination with legumes and forbs, and the target weed species. If a mixture of native grasses were seeded without legumes or forbs, apply 2, 4-D when the grass seedlings reaches the four leaf stage. However, if the native grass mixture includes legumes or forbs do not spray with 2, 4-D. Plateau® may be used where native grasses were seeded in a mix with certain legumes and forbs. As with all herbicides, follow the label for mixing and applying. Failure to follow the label may result in damage to the planting.

Mowing management can be used as an optional weed control measure during the establishment year. Mowing in mid-summer to a height just above the grass seedlings will help reduce weed competition and encourage seedling growth. Mowing can be achieved with a bush hog.

Spring burning can be used to control winter weeds and promotes rapid regrowth. Burning should be performed when the grass begins to recover from winter dormancy. Contact appropriate state or federal agencies for assistance with preparing burn plans or burning.

A.4.

RECOMMENDED SEEDING MIXTURES FOR WHIP

North of Interstate 20

Species	PLS/Ac[1]
Alamo Switchgrass	2.25
Lometa Indiangrass	1.0
Aldous LittleBluestem	0.5
Partridge Pea	1.0*
Total Mix	**4.75**

Species	PLS/Ac
Lometa Indiangrass	2.25
Alamo Switchgrass	1.0
Kaw Big Bluestem	0.5
Partridge Pea	1.0*
Total Mix	**4.75**

Species	PLS/Ac
Kaw Big Bluestem	2.75
Lometa Indiangrass	1.0
Alamo Switchgrass	0.5
Partridge Pea	1.0*
Total Mix	**5.25**

Alamo Switchgrass	2.25
Lometa Indiangrass	1.0
Aldous LittleBluestem	0.5
Kobe Lespedeza	3.0
Total Mix	**6.75**

Alamo Switchgrass	2.25
Lometa Indiangrass	1.0
Partridge Pea	0.5*
Kobe Lespedeza	1.5*
Total Mix	**5.25**

Alamo Switchgrass	2.25
Kaw Big Bluestem	1
Lometa Indiangrass	0.5
Partridge Pea	0.5*
Kobe Lespedeza	1.5*
Total Mix	**5.75**

Alamo Switchgrass	1.0
Lometa Indiangrass	1.0
Kaw Big Bluestem	1.0
Aldous Little Bluestem	1.0
Partridge Pea	0.5*
Kobe Lespedeza	1.5*
Total Mix	**6.0**

[1] Pounds of Pure Live Seed (pls) planted per acre.

* Seeding Rates for Partridge Pea and Kobe Lespedeza are listed in pounds per acre not pls

South of Interstate 20

Species	PLS/Ac
Alamo Switchgrass	2.25
Lometa Indiangrass	1.0
Kobe Lespedeza	1.5
Partridge Pea	0.5*
Total Mix	**5.25**

Species	PLS/Ac
Lometa Indiangrass	2.25
Alamo Switchgrass	1.0
Partridge Pea	0.5*
Kobe Lespedeza	1.5
Total Mix	**5.25**

A.5.

GENERAL NOTES ON PLANTING WILDFLOWERS

Wildflowers can add beauty to the landscape throughout the year. Many of these plants have desirable ornamental features in addition to their flowers, such as showy fruit and interesting foliage colors or textures. The variety of wildflowers that have potential for use in Mississippi is quite large and includes annuals, biennials, and perennials. Perennial plants may require several years to develop a stand and reach their full potential. True biennials will not flower until the second year after planting. Several commonly used wildflowers are native to Mississippi, while others have been introduced into the state from other locations. Native wildflowers are well adapted to the local growing conditions. Many introduced wildflowers are also well adapted, however, those with an aggressive growth habit should be avoided or their use limited.

Wildflowers can be used in small-scale plantings, such as home flower gardens, and in large-scale plantings, such as along roadsides, in parks, meadows or prairies. When planted in gardens, wildflowers are handled as a normal bedding plant. In most larger plantings, these plants will be planted in combination with or into established lawn grasses. Because most wildflowers can be planted with minimal soil disturbance, they can be used to improve the appearance of the site without causing soil erosion.

Large-scale plantings can be planned to provide a show during a certain period of the year or to provide a progression of flowers and colors throughout the growing season. Wildflowers will have greater visual impact when large masses of one species are flowering together, rather than when a few individuals are scattered among many other plants. However, mixes, consisting of several species, can prevent planting failures by ensuring the presence of some wildflowers on the site. Another alternative is to divide the site into several smaller sites for planting masses of one or two species with similar flowering intervals. The combination of these patches can extend the flowering period of the entire planting site and each patch can be managed separately for the species used.

When using mixes of wildflowers, it is inevitable that some plant succession will occur. Certain species will be better adapted to the site or to conditions of a portion of the site and will replace other species that are less suited. Each plant species has specific tolerances to environmental conditions, such as soil types, moisture, light levels, etc. Because most of these species have not been studied thoroughly, many of their tolerances are not known. The best approach to siting these plants is to observe natural stands of the desired species and to plant in areas with similar conditions or attempt to recreate those conditions on the planting site.

Another factor to consider when developing a wildflower mix is the characteristics of the plants themselves. Taller species will tend to shade and crowd out smaller species in the mix. Conflicting flowering and fruiting times can also provide management problems. For proper growth and regeneration, these plants must be allowed to complete their life cycles, thereby restricting the scheduling of mowing and other maintenance activities. However, properly timed mowing or burning, and in some cases disking or other soil disturbance, are critical to prevent growth of undesirable weeds and allow germination of the wildflower seed. Although a mix of

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Species that provides color or interest from early spring to late fall would be desirable, in practice it is difficult to maintain such a planting in a presentable condition without adversely affecting one or more species in the mix. Even with proper maintenance, replanting at some future date may be unavoidable. Plant succession, competition, possible insect or disease damage, and other stresses will likely lead to an eventual decline of the wildflower stand. This should not be a reason to avoid planting these plants. For large planting areas, the savings in mowing costs compared to a conventional turf will generally pay for the cost of replanting. In addition, the beauty and interest that wildflowers provide is priceless.

Further information on identification and growing of wildflowers can be found in the following publications:

References:

Phillips, H. R. 1985. Growing and propagating wild flowers. Univ. of North Carolina Press, Chapel Hill.

Timme, S. L. 1989. Wildflowers of Mississippi. Univ. Press of Mississippi, Jackson.

Grabowski, J. M. 1995. Planting and maintenance of wildflowers and native grasses in the midsouth. Technical Note No. 3, USDA, Natural Resources Conservation Service, Coffeeville, MS.

A.6.

CALIBRATING SEEDERS*

To calibrate any seeding machine, two things must be known: 1) area covered, and 2) amount of seed used.

Seeding rate (SR) = $\frac{\text{S (amount of seed)}}{\text{A (area covered in acres)}}$ A = $\frac{\text{(area covered in square feet)}}{\text{43, 560 (square ft in 1 acre)}}$

1 lb = 16oz = 454 grams

1. Area covered.

Drill to determine area covered

1. measure seeding width of machine used
2. a) measure distance around the drive wheel or sprocket and turn a given number of times
   b) pull the machine at a desired seeding speed for some measured distance

2. Amount of seed used.
   Place some type of collection device or container at seed outlet(s) collect and weigh seed

Examples:

1. A drill with a 7 foot wide seeding width is pulled 100 feet with 0.25 lb of seed dispensed. What is the seeding rate?

   A = $\frac{7 \times 100}{43,560}$ = 0.016 SR = $\frac{S = 0.25}{A = 0.016}$ = 15.6 lbs/acre

2. A cyclone seeder with a 12 foot seeding width dispenses 0.12 lb of seed in 100 feet. Calculate the seeding rate.

   SR = S/A

   A = $\frac{12 \times 100}{43,560}$ = 0.028 SR = $\frac{S = 0.12}{A = 0.028}$ = 4.3 lbs/acre

3. 3 lb of seed were placed in a spinner (cyclone) seeder with a 12 foot seeding width. Seed was sufficient to cover a distance of 1,000 feet. What is the seeding rate?

   SR = S/A

   A = $\frac{12 \times 1,000}{43,560}$ = 0.28 SR = $\frac{3}{0.28}$ = 10.7 lbs/acre

* Ball, D. M., C. S. Hoveland, and G. D. Lacefield. 1991. Southern forages. Potash and Phosphate Institute, Atlanta, GA.

A.7.

HOW TO PLANT BARE ROOT WOODY SEEDLINGS

Bareroot tree or shrub seedlings are grown in nursery beds and lifted after one to two growing seasons. They are shipped without soil surrounding the root system, however, the roots may be packed in a moist medium such as sphagnum moss or coated in a gel to prevent drying. When you receive your shipment of bareroot seedlings, you should check the root systems and water them if necessary.

Seedlings should be stored at 40-50°F and planted as soon as possible (within 10 days is ideal). The best planting dates for bareroot seedlings are from November to March. It is critical to keep the roots moist during the planting operation. An easy way to do this is to keep the plants covered and to carry no more seedlings than can be planted in 10 minutes.

Seedlings can be planted with tree planting bars. The planting hole should be large enough to fully accommodate the root system. Seedlings should be planted at the same depth to slightly deeper than they were planted in the nursery. You can determine the appropriate depth by observing the slight color change where the soil level was in the nursery. It is important to fully close the planting hole without leaving air pockets that will allow the roots to desiccate.

A.8.

NUMBER OF SEEDS PER POUND OF VARIOUS HERBACEOUS AND WOODY SPECIES

Common Name	Scientific Name	Approx. # of Seed/lb
Alfalfa	*Medicago sativa*	227,000
Alyceclover	*Alysicarpus vaginalis*	301,000
Arrowleaf clover	*Trifolium vesiculosum*	400,000
Autumn Olive	*Elaeagnus umbellata*	22,000
Bahiagrass	*Paspalum notatum*	273,000
Ball clover	*Trifolium nigrescens*	1,000,000
Barley	*Hordeum vulgare*	13,000
Bermudagrass, common (hulled)	*Cynodon dactylon*	2,071,000
Berseem clover	*Trifolium alexandrinum*	207,000
Big flower vetch	*Vicia grandiflora*	32,000
Black-eyed susan	*Rudbeckia hirta*	1,700,000
Black cherry	*Prunus serotina*	3,000
Black medic	*Medicago lupulina*	266,000
Bluestem, big	*Andropogon gerardii*	150,000
Bluestem, caucasian	*Bothriochloa caucasica*	1,000,000
Bluestem, little	*Schizachyrium scoparium*	300,000
Bur clover (hulled)	*Medicago arabica*	250,000
Bur marigold	*Bidens aristosa*	125,000
Button clover	*Medicago orbicularis*	153,000
Calliopsis	*Coreopsis tinctoria*	1,400,000
Carpetgrass	*Axonopus fissifolius*	1,200,000
Clasping coneflower	*Dracopis amplexicaulis*	796,000
Corn	*Zea mays*	1,400
Cowpeas	*Vigna unguiculata*	3,600
Crimson clover	*Trifolium incarnatum*	150,000
Dallisgrass	*Paspalum dilatatum*	281,000
Deciduous holly	*Ilex decidua*	1,500
Eastern gamagrass	*Tripsacum dactyloides*	4,000-7,200
Florida beggerweed	*Desmodium sp.*	75,000
Flowering dogwood	*Cornus florida*	4,500
Grain sorghum	*Sorghum bicolor*	13,000-20,000
Hairy vetch	*Vicia villosa*	16,000
Indiangrass	*Sorghastrum nutans*	200,000
Johnsongrass	*Sorghum halepense*	130,000
Jointvetch (unhulled; hulled)	*Aeschynomene* sp.	75,000-150,000
Lance leaf coreopsis	*Coreopsis lanceolata*	220,000

Lespedeza, kobe	*Kummerowia striata*	185,000
Lespedeza, Korean	*Kummerowia stipulaceae*	240,000
Lespedeza, sericea (hulled)	*Lespedeza cuneata*	250,000
Lespedeza, shrub	*Lespedeza bicolor*	85,000
Lespedeza, shrub	*Lespedeza thunbergii*	65,000

A.8. Con't.

NUMBER OF SEEDS PER POUND OF VARIOUS HERBACEOUS AND WOODY SPECIES

Common Name	**Scientific Name**	**Approx. # of Seed/lb**
(Con't)		
Lyre-leaf sage	*Salvia lyrata*	330,000
Millet, browntop	*Brachiaris ramosa*	142,000
Millet, Japanese	*Echinochloa frumentacea*	143,000
Millet, Proso	*Panicum miliaceum*	80,000
Mistflower or wild ageratum	*Eupatorium coelestinum*	2,500,000
Oats	*Avena sativa*	16,000
Partridgepea	*Chamaecrista fasciculata*	50,000
Red clover	*Trifolium pratense*	272,000
Redtop	*Agrostis gigantea*	5,100,000
Rose clover	*Trifolium hirtum*	164,000
Rye	*Secale cereale*	18,000
Ryegrass	*Lolium perenne* ssp. *multiflorum*	330,000
Sawtooth oak	*Quercus acutissima*	70-90
Smooth sumac	*Rhus glabra*	50,000
Soybean	*Glycine max*	4,500
Soybean, wildlife	*Glycine soja*	10,000
Subterranean clover	*Trifolium subterraneum*	54,000
Sunflower	*Helianthus annuus*	3,000-9,000
Sweetclover, white	*Melilotus alba*	259,000
Sweetclover, yellow	*Melilotus officinalis*	250,000
Switchgrass	*Panicum virgatum*	389,000
Tall fescue	*Lolium arundinaceum*	227,000
Thalia, powdery	*Thalia dealbata*	12,275
Weeping lovegrass	*Eragrostis curvula*	1,500,000
wheat	*Triticum aestivum.*	12,000-20,000
White clover	*Trifolium repens*	768,000
Wild plum	*Prunus*	1,050
Wild winter pea	*Lathyrus hirsutus*	18,000

References:

Ball, D. M., C. S. Hoveland, and G. D. Lacefield. 1991. Southern forages. Potash and Phosphate Institute, Atlanta, GA.

Grabowski, J. M. 1995. Planting and maintenance of wildflowers and native grasses in the midsouth. Technical Note No. 3, USDA, Natural Resources Conservation Service, Coffeeville, MS.

Martin, J. H., W. H. Leonard and D. L. Stamps. 1976. Principals of Field Crop Production, 3rd ed. Macmillian Publishing Co., Inc., NY.

A.9.

LEGUME INOCULATION

Legume inoculation is the process of introducing commercially prepared rhizobia bacteria into the soil. This can be achieved by applying the inoculant to the seed prior to planting. One commonly used method in the Southeast is presented below. When using this method, avoid applying too much sticking solution because it may prevent the seed from flowing easily through the planting equipment. The problem can be eliminated by mixing additional seed or a small quantity of a very finely-ground agricultural lime.

Inoculation Process

Step 1. Place seed in a tub or similar open-topped container.

Step 2. Slightly dampen the seed with a syrup/water mixture, or a commercial sticker solution. Stir seed thoroughly to insure all seed are damp.

Step 3. Add inoculant and stir thoroughly to evenly distribute.

Handling Considerations

- Make sure that the expiration date on the bag of inoculant has not expired. Legume inoculants are perishable.
- Store inoculants or inoculated seed in a cool, dry place. High temperatures kill the legume bacteria.
- Do not mix inoculated seed with fertilize or pesticides during the planting operation. Fertilizer salts and chemicals can kill the legume bacteria.
- There are several different legume inoculants and failure to select the proper one will jeopardize the planting (see next page for a list of leguminous species and recommended inoculants).

Checking For Effective Nodulation

Approximately 30-40 days after planting is an ideal time to check nodulation (formation of nodules on the roots). Carefully dig up the plant so as not to destroy the nodules and wash the roots in a bucket of water. To determine effective nodulation use the following general criteria:

- Check to see if nodule, or small knots, appear on the roots. In soybeans, nodules will cluster around the tape root.
- Cut open the nodule. A pink to red color indicates potential for effective nitrogen fixation.

It is important to mention that these criteria are general guidelines and location, size, shape and number varies greatly between legume species.

References:

Ball, D. M., C. S. Hoveland, and G. D. Lacefield. 1991. Southern forages. Potash and Phosphate Institute, Atlanta, GA.

Legumes, Inoculation and Nitrogen Fixation: Understanding the Relationship. Nitragin Co., Inc. Milwaukee, WI.

A.9. Con't.

RHIZOBIA INOCULANTS FOR VARIOUS LEGUMINOUS SPECIES

Common Name	Scientific Name	Inoculant Code
Alfalfa	*Medicago sativa*	A
Alyce clover	*Alysicarpus vaginalis*	EL
Arrowleaf clover	*Trifolium vesiculosum*	O
Ball clover	*Trifolium nigrescens*	B
Berseem clover	*Trifolium alexandrinum*	R
Black medic	*Medicago lupulina*	N
Bur clover	*Medicago arabica*	N
Button clover	*Medicago orbicularis*	N
Cowpeas	*Vigna unguiculata*	EL
Crimson clover	*Trifolium incarnatum*	R
Jointvetch	*Aeschynomene sp.*	EL
Lespedeza, common	*Kummerowia striata*	EL
Lespedeza, kobe	*Kummerowia stipulacea*	EL
Lespedeza, sericea	*Lespedeza cuneata*	EL
Lespedeza, bicolor (shrub)	*Lespedeza bicolor*	EL
Lespedeza, thunberg (shrub)	*Lespedeza thunbergi*	EL
Partridgepea	*Chamaecrista fasciculata*	EL
Red clover	*Trifolium pratense*	B
Rose clover	*Trifolium hirtum*	WR
Soybean	*Glycine max*	S
Soybean, wildlife	*Glycine soja*	S
Subterranean clover	*Trifolium subterraneum*	WR
Sweetclover, white	*Melilotus alba*	A
Sweetclover, yellow	*Melilotus officinalis*	A
Hairy vetch	*Vicia villosa*	C
Big flower vetch	*Vicia grandiflora*	C
White clover	*Trifolium repens*	B
Wild winter pea	*Lathyrus hirsutus*	C

Inoculants listed on this page can be purchased from most farm supply stores. To use the above chart, identify the legume specie then select the recommended inoculant from the **Inoculant**

Code column. For example, if partridgepea is the identified legume then the recommended inoculant would be EL.

Amount of inoculant to purchase depends on seed size:

a. small seeded legumes - package size of 3.5 oz. will treat up to 50 lb of seed.
b. large seeded legumes - package size of 6.7 oz. will treat up to 100 lb of seed.

Reference:

Smith R. S. S. Thome, R Randall. 1988. Rhizobia inoculants for various leguminous species. Tech. Bull. 102., Lipha Tech, Milwaukee, WI

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ESTABLISHMENT AND MAINTENANCE OF PLANTS IN A CONSTRUCTED WETLAND

The USDA-Natural Resources Conservation Service (NRCS) can provide assistance with design and construction of a constructed wetland (CW) system to treat agricultural and municipal waste water and urban storm water runoff (Conservation Practice Code 656). For more information on CW systems contact the USDA-NRCS. They can be found in the telephone directory under U.S. Government.

Once the construction phase is completed, several factors must be considered for the CW to function properly including but not limited to selection of plant materials, establishment and maintenance of the plants during and after planting.

Plant Materials

Constructed wetland should be planted with rooted emergent wetland plants obtained from local nurseries. It is acceptable to secure plants from other states with similar growing conditions. Caution should be taken in purchasing wetland plants from northern or western wetland plant nurseries for a CW project in the Southeast. Plants from outside the region will likely not be adapted and performance will be poor. Contact the USDA-NRCS Jamie L. Whitten Plant Materials Center (662-675-2588), Coffeeville, MS for a listing of local or Southeast regional wetland plant vendors. Listed below are several plant materials that have been used in constructed wetlands and their maximum depth tolerance at maturity. Also presented is recommended plant spacing. Using the minimum spacing will help prevent weed invasion and suppress weed growth. The maximum spacing requires less plants but bare in mind that weeds can be a problem in these systems. This is only a partial list and not intended to provide all plants that may be used in a CW system.

Common Name	Scientific Name	Maximum Depth	Minimum Plant Spacing	Maximum Plant Spacing
'Restorer' giant bulrush	*Schoenoplectus californicus*	12"	4'x 4'	2'x 2'
'Halifax' maidencane	*Panicum hemitomon*	12"-18"	3'x 3'	2'x 2'

'Wetlander' giant cutgrass	*Zizaniopsis miliacea*	12"	6'x 6'	3'x 3'
Arrowhead	*Sagittaria latifolia*	8"-15"	3'x 3'	1'x 1'
Softstem bulrush	*Schoenoplectus tabernaemontani*	12"	3'x 3'	1'x 1'
Pickerelweed	*Pontedaria cordata*	8"-15"	3'x 3'	2'x 2'
Indian Bayou Source Powdery Thalia	*Thalia dealbata*	24"	3'x 3'	2'x 2'

When purchasing plugs or transplants try to get a size that is large enough for ease of planting and allow rapid establishment. A plug or transplant 2"x 2"x 6"in size has been shown to have a good root system and adequate above ground biomass for rapid establishment. Transplanting small plugs or seedlings generally results in slow establishment and the plants have difficulties

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competing with weeds and require more water management to ensure that they are not overtopped. If plants are dug from the wild, avoid washing all of the soil from the roots. Leave approximately 30-40% of the soil from the original wetland roots. In order to reduce weed invasion, avoid collecting plants from areas with problem weed species. Before digging any plants from local or wild sources, contact the Bureau of Plant Industry to determine if a permit is required.

Establishment

There needs to be enough slope built into the CW design to prevent short circuiting the treatment process. Areas that retain too much water or too little water should be corrected. Release water into the bottom of the CW to saturate the soil profile and allow the soil to settle before planning. Wetland plants can be planted using the following methods:

Water Planting Method: Fill the CW with 2-4 inches of water. Holes for the plants can be dug by hand. Once the transplants or bareroot seedlings have been planted, firm the soil tightly around them to prevent floating.

Dry Planting Method: The CW can be planted dry and then water added immediately afterwards. Bring the water level up gradually to acclimate plants. A dibble bar or shovel can be used for this type of planting operation.

Tree Planter Method: This method is used when planting large CW. Release water into the CW and then allow it to dry enough for a tractor to drive on it. A tractor drawn tree planter can be used to plant transplants or plugs.

- Time of planting is a critical factor for survival. Transplants or plugs should be planted from early April to late June in Mississippi. Planting after these dates is not recommended, as rooted emergent wetland plants need the remainder of the growing season to build root reserves necessary to survive the winter.

- Fertilizer application is usually not necessary because the wetland plugs or transplants can grow in almost any type of soil. Furthermore, enough nutrients from the water will generally

supply enough nutrients for plant growth. Spreading fertilizer in the bottom of the CW before planting will cause a rapid flush of weeds that can compete with wetland plants and therefore is not recommended.

Once the plants have been planted, proper water depth and fluctuating water level are critical factors for plant survival during the first year of planting. The following are guidelines for improving the plant performance during and after planting.

- Newly established plants lack extensive root, stem and leaf aerenchymous material that transport oxygen to the roots so that the plant can breath in anaerobic soil. Thus, care must be taken to avoid drowning the plants by raising the water level over them.

- Fluctuating water levels have been shown to be beneficial for young or newly planted plants because it stimulates spreading.

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If the *Water Planting Method* is used, allow the standing water to evaporate down to saturation with no standing water before allowing more water into the CW. This may take 1 to 2 weeks depending on climate, maximum daily temperatures and soil characteristics.

If the *Dry Method or Tree Planting Method* is used, fill the CW with 2-4 inches of water immediately after planting. Allow the soil to reach saturation with no standing water before allowing more water into the CW.

- It is important that at least a 1/4 to 1/3 of the plant remain above the waterline during filling of the CW as outlined above. Leaving this amount of plant material above the waterline allows it to breath. However, it should be emphasized that constantly stressing the plants by inundation will cause major die back.

Other Options For Fluctuating Water Levels

- Watering frequency is based on numerous factors including soil, climate, evaporation transpiration rate and daily maximum temperatures. Water levels should be increased to a 2-3 inch level and drained down naturally for the first month after planting.

- During the second month, increase the water level to about 6-8 inches.

- During the third month, increase the filled level to about 10-12 inches.

Maintenance

- Weed growth is a major problem in CW. As mentioned earlier, maintaining a monoculture planting is extremely difficult unless maintenance and time are not critical. Hand pulling is the best weed control method. Water levels can be manipulated to control prolific growth and spread of weeds. For example, cattail (*Typha* spp.) can be controlled by deep flooding for several weeks after the stems have been cut. Spot treatment of weeds with labeled

herbicides is also an option. Consult with the Mississippi Cooperative Extension Service for approved herbicides and application methods.

- Another serious problem is wildlife damage. Beaver, muskrats, and nutria can destroy newly planted wetland plants in a matter of a few days. Muskrats dig holes in the levees and in some cases cause blowouts. The best control method is trapping. Contact your local county agent for assistance with other control methods.

References:

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Hoag, J. C. 1998. Guidelines for planting, establishment and maintenance of constructed wetland systems. Riparian/Wetland Information Series No. 12, USDA-NRCS, Plant Materials Center, Aberdeen, ID. 4 pp.

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USDA, SCS. 1994. Species guides for wetland plantings in the southeast United States. 1st ed. April, 1994.