NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

FORAGE AND BIOMASS PLANTING

(Ac.)

Code 512

DEFINITION

Establishing adapted and/or compatible species, varieties, or cultivars of herbaceous species suitable for pasture, hay, or biomass production.

PURPOSE

- Improve or maintain livestock nutrition and/or health.
- Provide or increase forage supply during periods of low forage production.
- Reduce soil erosion.
- Improve soil and water quality.
- Produce feedstock for biofuel or energy production.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies all lands suitable to the establishment of annual, biennial or perennial species for forage or biomass production. This practice does not apply to the establishment of annually planted and harvested food, fiber, or oilseed crops.

CRITERIA

General Criteria Applicable to All Purposes

Select plant species and their cultivars based on:

Climatic conditions, such as annual precipitation and its distribution, growing season length, temperature extremes and the USDA Plant Hardiness Zone.

Soil condition and landscape position attributes such as; pH, available water holding capacity, aspect, slope, drainage class, fertility level, salinity, depth, flooding and ponding, and levels of phytotoxic elements that may be present.

Resistance to disease and insects common to the site or location.

APPENDIX 1 of this standard use seed mixtures in Appendix 1 – Table 1 (seed Mixtures and Rates per Acre)

WV FOTG Reference, Penn State Agronomy Guide – Recommended Forage Mixtures and Seeding Rates (Table 1.8-5) at: http://agguide.agronomy.psu.edu/cm/sec8/table1-8-5.cfm

WV FOTG Reference, Virginia Cooperative Extension Agronomy Handbook – Part II Forage Crops (pages 33 and 4) at: http://pubs.ext.vt.edu/424/424-100/PDF_part2.pdf

WV FOTG Reference, WVU Extension Service Fact Sheet – Foragers Adapted to the Northeast at: http://www.caf.wvu.edu/~forage/foragelstcenter.htm

Use Soil Treatment – Appendix 1 – Table 2 of this standard.

Follow recommendations for planting rates, methods and dates obtained from the plant materials program, land grant and research institutions, extension agencies, or agency field trials.

Specified seeding/plant material rates and date of planting shall be consistent with documented guidance in Appendix 1 – Table 1 of this standard or an approved WV FOTG Reference.

Seeding rates will be calculated on a pure live seed (PLS) basis.

Plant at a depth appropriate for the seed size or plant material, while assuring uniform contact with soil.

Prepare the site to provide a medium that does not restrict plant emergence.

Plant when soil moisture is adequate for germination and establishment.

All seed and planting materials will meet state quality standards.

Do not plant federal, state, or local noxious species.

Apply all plant nutrients and/or soil amendments for establishment purposes according to a current soil test. Application rates, methods and dates are obtained from the plant materials program, land grant and research institutions, extension agencies, or agency field trials.

When planting legumes, use pre-inoculated seed or inoculate with the proper viable strain of Rhizobia immediately before planting.

Exclude livestock until the plants are well established. ***See Access Control (code 472).***

Select forage species based on the intended use, level of management, realistic yield estimates, maturity stage, and compatibility with other species. Verify plant adaptation to the area prior to planting.

Provide a firm, weed free seedbed that ensures seed will contact soil moisture uniformly, facilitate seedling emergence, and provide a medium that does not restrict or allow roots to become dry.

Cool Season Grasses and Methods of Seeding

Frost Seeding

Frost seeding to establish legumes in pasture or hayland will follow the procedure in Appendix 2 – West Virginia University Extension Service Fact Sheet – Frost and

Walk-in Clover Seedings.

(http://www.caf.wvu.edu/~forage/5312.htm)

Conventional Tillage

Plowing and disking should be done deep enough to kill all existing vegetation and to incorporate lime and fertilizer into the top 4 – 6 inches of soil. Any existing rills and gullies should be eliminated and a firm seedbed prepared. The surface should be reasonably smooth, free of ridges, rocks, and other obstructions.

The seeding may be done with a drill, cultipacker-seeder, cyclone seeder, hydroseeder, or other suitable equipment. The seed should be covered a depth of ¼ to ½ inches in a firm seed bed. A roller or cultipacker will ensure a good seed to soil contact.

No – Till

When stands are to be established by no-till seeding methods, the following requirements must be met:

Eliminate competitive vegetation by heavy grazing, mowing and/or herbicides.

When pure stands of alfalfa are planted, competitive growth must be well controlled.

Undesirable species should be controlled by applying a suitable herbicide at least two weeks before the seeding date. Insecticides should be applied to control potential insect infestations. (Consult the West Virginia University Extension Service to determine the best pesticide

combination and application time.) This is especially needed when pure stands of alfalfa are seeded.

Seed must be placed in firm contact with the mineral soil at a depth of ¼ to ½ inches.

Depth control bands or other controls should be used to ensure proper placement of seed. Packer wheels are essential.

Time of Seeding Cool Season Species
March 15 – April 15
August 15 – September 15

Seed Requirements

All seed and materials shall be labeled and meet state seed quality law standards. (WV Code – Chapter 19, Article 16)

Legume seed shall be inoculated with the proper, viable rhizobia before planting. FOTG Reference – Penn State Agronomy Fact Sheet 11 - Inoculation of Forage and Grain Legumes

http://cropsoil.psu.edu/extension/facts/agronomy-facts-11

Warm Season Grasses and Methods of

Seeding

Warn season grass seed requires a cool, moist period prior to germination. This process is known as a stratification period. Most seed may be purchased already stratified. Check with the supplier to determine if any seed will require stratification or specific storage methods prior to planting.

Unstratified seed may be planted in the fall (November 15 – March 1). However, this method is not recommended due to the low success rates, low germination and additional length of time required to establish the stand.

Warm season grasses are measured and usually sold in lbs/acre of Pure Live Seed (PLS). Warm season grasses usually have a lower germination rate than cool season species; therefore, it is essential when purchasing and planting warm season grasses that the quantities of seed will be based on PLS.

Warm season grass establishment in pasture or hayland will follow the procedure in Appendix 3 – Penn State University Extension Service Agronomy Fact Sheet – Warm Season Grasses.

http://cropsoil.psu.edu/extension/facts/agfact29.pdf

Conventional Tillage

If using conventional methods, the seedbed should be prepared by disking and/or plowing to a depth of 3 inches. After disking, make at least one pass over the field using a cultipacker to firm the seedbed. Make sure that the seedbed is dry and firm to ensure proper planting depth. Saturated soils should not be cultipacked or planted to avoid getting seed too deep.

Seed may be broadcast if accomplished in a uniform manner. No more than ⅓ of the seed should be visible on the soil surface. Seeding depth should never exceed ¼ inch. A roller or cultipacker should be used to ensure good seed to soil contact.

No – Till

When stands are to be established by no-till seeding methods, the following requirements must be met:

Eliminate competitive vegetation by heavy grazing, mowing and/or herbicides. (Consult the West Virginia University Extension Service to determine the best pesticide combination and application time.) When pure stands of warm season grasses are planted, competitive growth must be well controlled.

Undesirable species should be controlled by applying a suitable herbicide* in the fall after the area is grazed or mowed to a very low height. A second herbicide application should be planned where dense fescue or

orchard grass stands exist. This application should occur just prior to planting and after any regrowth of surviving vegetation to a height of 4 to 6 inches. All herbicide applications should be performed when vegetation is actively growing.

Smooth seeded species like switchgrass may be planted using a conventional drill.

Species such as little bluestem, big bluestem and Indiangrass require a specialized no-till drill or a modified conventional drill that contains a fluff box. Specialized drills have seed boxes with dividers, agitators and oversized drop tubes and may be adjusted for shallow planting depths.

Regardless of the planting method used, seeding depth should never exceed ¼ inch.

Time of Seeding Warm Season Species

April 1 – May 15

Seed Requirements

All seed and materials shall be labeled and meet state seed quality law standards. (WV Code – Chapter 19, Article 16)

Additional Criteria for Improving or Maintaining Livestock Nutrition and/or Health

Establish forage species that are most capable of meeting the desired level of nutrition (quantity and quality) for the kind and class of livestock to be fed.

Forage species planted as mixtures will exhibit similar palatability to avoid selective grazing.

Additional Criteria for Providing or Increasing Forage Supply During Periods of Low Forage Production

Select plants that will help meet livestock forage demand during times that normal farm/ranch forage production are not adequate.

Forage species selected for establishment shall fulfill a recognized dietary deficiency within the year long forage management program.

Forage species selected for establishment shall fulfill a recognized dietary deficiency within the year long forage management program.

Additional Criteria for Reducing Erosion and Improving Water Quality.

Ground cover and root mass need to be sufficient to protect the soil from wind and water erosion.

Additional Criteria for Producing Feedstocks for Biofuel or Energy Production

Select plants that provide adequate kinds and amount of plant materials needed.

CONSIDERATIONS

In areas where animals congregate consider establishing persistent species that can tolerate close grazing and trampling.

Where wildlife and pollinator concerns exist, consider plant selection by using ***the WV Wildlife Habitat Evaluation Technique (WVWHET) and/or the WV Pollinator Handbook to aid in selecting plant species and providing for other requirements necessary to achieve the desired objective.***

Consider adding various species of legumes and plants that are beneficial to pollinating insects.

Where air quality concerns exist consider using site preparation and planting techniques that will minimize airborne particulate matter generation and transport.

Where carbon sequestration is a goal, select deep-rooted perennial species that will increase underground carbon storage.

During and upon stand establishment planning and application of the following conservation practices should be considered as applicable;

Forage and Biomass Harvest (511), Herbaceous Weed Control (315), Nutrient Management (590), and Prescribed Grazing (528).

PLANS AND SPECIFICATIONS

Prepare plans and specifications for the establishment planting for each site or management unit according to the Criteria, Considerations, and Operations and Maintenance described in this standard. Record them on a site specific job sheet or in the narrative of a conservation plan.

The following elements will be addressed in the plan to meet the intended purpose:

- ***Location and Acreage***
- Site Preparation
- ***Lime and*** Fertilizer Application (if applicable)
- Seedbed/Planting Bed Preparation
- Methods of Seeding/Planting
- Time of Seeding/Planting
- ***Seed Mixture***
- Type of legume inoculant used (if applicable)
- Seed/Plant Source
- Seed Analysis
- Rates of Seeding/Planting
- ***Method of Weed Control***
- ***Target Animal Species***
- Supplemental Water for Plant Establishment (if applicable)
- Protection of Plantings (if applicable)
- ***CPA-52 or other appropriate environmental evaluation***
- ***Operation and Maintenance Requirements***

OPERATION AND MAINTENANCE

Inspect and calibrate equipment prior to use. Continually monitor during planting to insure proper rate, distribution and depth of planting material is maintained.

Monitor new plantings for water stress. Depending on the severity of drought, water stress may require reducing weeds, early harvest of any companion crops, irrigating when possible, or replanting failed stands.

Invasion by undesirable plants shall be controlled by cutting, using selective herbicide, or by grazing management by manipulating livestock type, stocking rates, density, and duration of stay.

Insects and diseases shall be controlled when an infestation threatens survival.

Evaluate forage stands each season or as needed to determine management inputs needed to achieve the desired purpose(s).

REFERENCES

Ball, D.M., C.S. Hoveland, and G.D.Lacefield, 2007. Southern Forages,4th Ed. International Plant Nutrition Institute, Norcross, GA.

Barnes, R.F., D.A. Miller, and C.J. Nelson. 1995. Forages, The Science of Grassland Agriculture, 5th Ed. Iowa State University Press, Ames

United States Department of Agriculture, Natural Resources Conservation Service. 1997. National Range and Pasture handbook. Washington, DC.

USDA, NRCS. 2008. The PLANTS Database (http://plants.usda.gov, 08October 2008). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

USDA, NRCS. 2009. Technical Note 3. Planting and Managing Switchgrass as a Biomass Energy Crop.

Penn State Agronomy Guide

http://agguide.agronomy.psu.edu/

Virginia Cooperative Extension Agronomy Handbook http://pubs.ext.vt.edu/424/424-100/424-100.html

WV State Code – Chapter 19 (agriculture)
http://www.legis.state.wv.us/

West Virginia University Extension Service Fact sheet – Frost and Walk-in Clover Seedlings
http://www.caf.wvu.edu/~Forage/foragelstcenter.htm

TABLE 1					
SEED MIXTURES AND RATES PER ACRE					
1.	Red Clover	8 lbs.	17.	White Clover	2 lbs.
	Timothy	4 lbs.		Orchardgrass	5 lbs.
				Kentucky Bluegrass	5 lbs.
2.	Alsike Clover	4 lbs.			
	Timothy	4 lbs.	18.	Switchgrass	8 lbs.**
3.	Red Clover	4 lbs.	19.	Big Bluestem	8 lbs.**
	Alsike Clover	2 lbs.			
	Orchard Grass	4 lbs.	20.	Caucasian Bluestem	6 lbs.**
4.	Alfalfa	10 lbs.	21.	Bermudagrass	20 bu./ac.
	Orchardgrass	4 lbs.			
			22.	Red Clover	4 lbs.
5.	Alfalfa	10 lbs.		Ladino Clover	1 lb.
	Timothy	4 lbs.			
			23.	Birdsfoot Trefoil	6 lbs.
6.	Orchardgrass	10 lbs.			
			24.	Orchardgrass	4 lbs.
7.	Alfalfa	10 lbs.		Bluegrass	9 lbs.
				Timothy	2 lbs.
8.	Birdsfoot Trefoil	8 lbs.		Ladino Clover	1 lb.
	Timothy	4 lbs.			
			25.	Orchardgrass	6 lbs.
9.	~~Reed Canary Grass~~	~~xxxxx~~		Bluegrass	10 lbs.
				Ladino Clover	1 lb.
10.	Birdsfoot Trefoil	8 lbs.			
	Orchardgrass	6 lbs.	26.	Bluegrass	8 lbs.
				Timothy	5 lbs.
11.	Birdsfoot Trefoil	8 lbs.		Ladino Clover	1 lb.
	Tall Fescue	8 lbs.*			
			27.	Bluegrass	6 lbs.
12.	Ladino Clover	2 lbs.		Smooth Bromegrass	4 lbs.
	Tall Fescue	10 lbs.*		Ladino Clover	1 lb.
				Red Clover	2 lbs.
13.	Tall Fescue	15 lbs.*			
			28.	Bluegrass	6 lbs.
14.	Ladino Clover	2 lbs.		Smooth Bromegrass	4 lbs.
	Orchardgrass	8 lbs.		Timothy	2 lbs.
				Birdsfoot Trefoil	6 lbs.
15.	Ladino Clover	2 lbs.			
			29.	Bluegrass	8 lbs.
16.	Orchardgrass	6 lbs.		Smooth Bromegrass	4 lbs.
	Bluegrass	4 lbs.		Timothy	4 lbs.
	Tall Fescue	3 lbs.			
	Ladino Clover	1 lb.	30.	Timothy	8 lbs.
	Timothy	2 lbs.		Ladino Clover	2 lbs.
				Red Clover	1 lb.

TABLE 2
SOIL TREATMENT

Lime
Lime requirements should be based on a soil test. Lime will be applied to correct pH within the range for each species as follows:
Alfalfa and Birdsfoot trefoil 6.5 – 7.0
All other legumes, smooth bromegrass, bermudagrass, reed canarygrass, orchardgrass, switchgrass, big bluestem, and Caucasian bluestem 6.0 – 7.0
Fertilizer
Apply fertilizer based on results of soil tests made by West Virginia University, other land grant institutions, or competent private laboratories. For general recommendations in the absence of a soil test, use information contained in current Field Office Technical Guide Reference – "The Agronomy Guide, Pennsylvania" or the NRCS Plants Data Base (http://plants.usda.gov) Fact Sheets.

Note: Bold italics has been added to the national standard by WV.

FROST SEEDING PASTURE AND HAY LAND
APPENDIX 2