

# FORAGE AND BIOMASS PLANTING

(Acre)  
Code 512

Natural Resources Conservation Service  
Conservation Practice Standard

## I. Definition

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

## II. Purposes

This practice may be applied as part of a conservation management system to accomplish one or more of the following purposes.

- Improve yield and plant longevity by providing guidance for selection and establishment of adapted and compatible plant varieties, species, and cultivars.
- 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.

## III. Conditions Where Practice Applies

This practice applies to 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 grain, fiber, or oilseed crops.

## IV. Federal, Tribal, State, and Local Laws

Users of this standard should be aware of potentially applicable federal, tribal, state and local laws, rules, regulations or permit requirements governing pasture and hayland planting. This standard does not contain the text of federal, tribal, state, or local laws.

## V. Criteria

### A. General Criteria Applicable to All Purposes Stated Above

#### 1. Specie Selection and Seed Quality

Plant species and their varieties shall be selected based upon the following:

- Climatic conditions, such as annual precipitation and its distribution, growing season length, temperature extremes, and the USDA Plant Hardiness Zones.
- Soil condition and position attributes such as pH, available water holding capacity, aspect, slope, drainage class, fertility level, depth, potential for flooding and ponding, and levels of phytotoxic elements that may be present.
- Individual plant resistance to disease and insects common to the site or location.
- Select forage species based on the intended use, level of management, realistic yield estimates, maturity timeline, growth characteristics, and compatibility with other species. Verify plant adaptation to the area prior to planting.

Plant species identified as restricted or prohibited by law shall not be established when using this practice standard.

*Certified Seed*<sup>1</sup> shall be used, and seeding rates will be based on *Pure Live Seed (PLS)*. Seed tag information such as purity and germination and any computations to adjust seeding rates must be submitted to document actual seeding rates. *Actual adjusted seeding rates* will be based on the equivalent

of 100 percent PLS, determined by multiplying the percent purity by the percent germination.

*Untested* introduced and native grass and forb seed are not approved for planting.

When certified seed is unavailable or difficult to locate, *non-certified seed* can be used, after the seed has been tested for varietal purity, germination, and other mechanical qualities, such as inert matter and other crop or weed seeds.

All pasture and hayland seeding rates will be given in pounds of Pure Live Seed (PLS) and minimum seeds per square foot. If more than 20 percent of the legume seed is hard seed, increase the seeding rate for legumes by the percentage of hard seed.

Legume seed shall be inoculated immediately prior to planting. Rhizobia inoculant shall be specific to the legume seeded. When more than one legume species is used, each species will be inoculated separately.

## 2. Seeding Periods

The specific date that provides the best chance for success will vary from south to north and from year to year with prevailing moisture and temperature conditions. Late summer seeding is generally riskier than spring seeding. Planting at either end of the allowable range is riskier than the middle of the range. Refer to Figure 1 for planting zones and Tables 1 and 2 for planting dates.

Seeding outside of the recommended dates must be approved by the Area Resource Conservationist, State Grazing Specialist, or State Agronomist.

*Frost seeding* periods statewide range from mid February to early March depending on the year. For details regarding frost seeding criteria and techniques, refer to Wisconsin Agronomy Technical Note 5, Establishing and Maintaining Native Grasses, Forbs, and Legumes; and Wisconsin Agronomy Technical Note 6, Establishing and Maintaining Introduced Grasses and Legumes.

## 3. Nutrient and Soil Amendment Requirements

Soil fertility and pH levels will be amended to satisfy the needs of the plant species to be established. Fertilizer and lime recommendations will be determined by a soil test, and all nutrients will be applied following Wisconsin NRCS Field Office Technical Guide (WI FOTG), Section IV Standard 590, Nutrient Management.

For establishment of native species, the use of soil amendments is not required.

## 4. Seedbed Preparation

Prior to planting into cropland fields, verify that herbicides previously applied to the site will not “carry over” and damage the new seeding.

Plant when soil moisture is adequate for germination and establishment.

Site preparation shall be adequate to assure weed suppression.

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

Planting equipment type, use, and timing shall be appropriate for the site conditions, soil characteristics, and type of seeds (size, etc.) selected to assure uniform placement and germination.

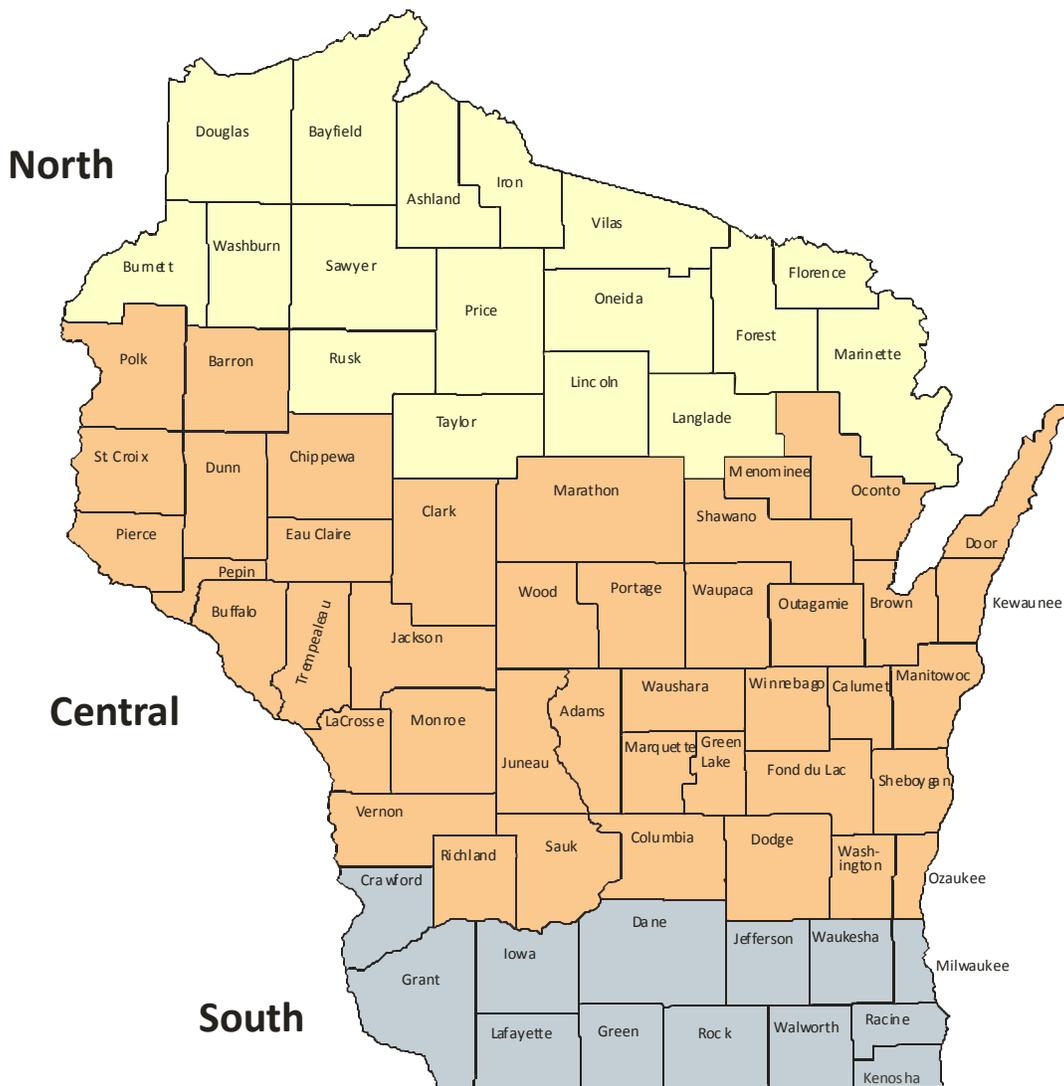
Refer to Wisconsin Agronomy Technical Notes 5 and 6, Establishing and Maintaining Introduced Grasses and Legumes for detailed guidance on seedbed preparation.

## 5. Temporary Cover and Companion Crop

Temporary cover and companion crops are vital practices utilized to support the establishment of herbaceous plantings. Use depends on the site conditions, method of planting, and seed mixture. Temporary cover and companion crops suppress weed growth and limit soil erosion during the establishment period.

For further details regarding temporary cover and companion crop recommendations, refer to Wisconsin Agronomy Technical Notes 5 and 6.

**Figure 1**



**Table 1**  
**Perennial Introduced Grasses and Legumes**  
 (See Figure 1)

	Spring	Late Summer
North	5/1 - 6/15	7/15 - 8/10
Central	4/15 - 6/1	8/1 - 8/21
South	4/1 - 5/15	8/7 - 8/29

**Table 2**  
**Perennial Native Warm Season Grasses**  
 (See Figure 1)

	Spring Seeding	Fall Dormant Seeding
North	Thaw - 7/15	10/8 - Freeze up
Central	Thaw - 6/30	10/15 - Freeze up
South	Thaw - 6/30	10/20 - Freeze up

Refer to Section V.A.2. for frost seeding recommendations

## B. Criteria for Seed Mixture Development

### 1. General Guidelines for Mixture Development

- a. Based on the predominant soil type, find the appropriate *forage suitability group* in Section II of the Wisconsin NRCS Field Office Technical Guide.
- b. Identify species that are suited to the planting sites pasture and hayland forage suitability group and use only those species.
- c. Species planned for pasture or hayland should be compatible with the planned management of the entire operating unit. Select species that provide high quality forage for grazing or hay as appropriate.
- d. Warm-season grasses and cool-season grasses shall not be mixed for pasture, biomass or hayland use.
- e. Seeding rates are based on seeds per square foot of Pure Live Seeds. Refer to Table 4 for common species and seeding rates. Species not listed in Wisconsin Agronomy Technical Notes 5 or 6 must be approved in advance by the State Agronomist or State Grazing Specialist.
- f. Any seeding mixture developed outside of standard mixtures listed in Wisconsin Agronomy Technical Note 6 and this standard must be approved by the State Grazing Specialist or State Agronomist.

### 2. Pasture and Hayland Plantings

- a. For pasture plantings, mixtures will have at least 1 grass and 1 legume. The mixture will be at least 50 percent grass seeds per square foot, and the total mix will have at least 60 seeds per square foot.
- b. For hayland establishment, mixtures and single specie plantings may be used as long as the total seeding rate is at least 60 seeds per square foot.
- c. For pasture and hayland purposes, warm-season grasses will be established

in stands of single species to facilitate uniform forage maturity.

Required minimum seeds per square foot by specie is as follows:

- Big Bluestem: 42
- Indiangrass: 44
- Switchgrass: 63

- d. For biomass plantings, species will be selected to produce uniform fuel characteristics related to size, weight, and moisture after processing. Switchgrass is the only specie currently approved for biomass production. The minimum planting rate is 60 seeds per square foot. Refer to Wisconsin Agronomy Technical Note 5 for recommended varieties.

### 3. Variety Selection

#### a. Introduced Grasses and Legumes

Refer to University of Wisconsin Extension Publication A1525, "Perennial Forage Crop Variety Update for Wisconsin."

#### b. Native Warm Season Grasses

Refer to Wisconsin Agronomy Technical Note 5 for recommended varieties for pasture and hayland and biomass plantings.

### 4. Seeding Rates

#### a. Full Seeding (Conventional and No-Till Planting)

Refer to Table 3 of this standard and Wisconsin Agronomy Technical Notes 5 and 6 for standard seed mixtures.

#### b. Interseeding

Seed at one-half the rate of the recommended pure stand rate as specified in Table 4 for existing pastures and haylands. Seeds per square foot will vary according to specie(s) interseeded.

Refer to Wisconsin Agronomy Technical Notes 5 and 6 for guidance

- regarding the interseeding of grasses, forbs, and legumes into existing vegetation.
- c. **Dormant and Frost Seeding**
- To renovate existing pastures, frost seeding shall only be used to interseed legumes. Seeding rate will be two thirds of the Pure Stand Rate shown in Table 4. Seeds per square foot for legumes will vary according to specie.
- Dormant and frost seeding can be used when seeding big bluestem, Indiangrass, and switchgrass for pasture and hayland plantings, and biofuel production. For dormant and frost seeding, increase the seeding rate by 15 percent.
- C. Additional Criteria for Improving or Maintaining Livestock Nutrition and/or Health**
- Use forage species that will meet the desired level of nutrition (quantity and quality) for the kind and class of the livestock to be fed.
- Forage species planted as mixtures will exhibit similar palatability to avoid selective grazing.
- D. 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.
- Select plants that stockpile well, i.e., produce well and maintain nutritional quality into late fall and winter.
- E. Additional Criteria for Reducing Erosion and Improving Water Quality**
- Select plant species that provide the amount of ground cover and root mass needed to protect the soil from wind and water erosion as determined by site conditions.
- The potential for soil erosion during the establishment of a forage or biomass planting shall be assessed. Identified soil erosion resource concerns shall be addressed in the planting plan.
- F. Additional Criteria for Producing Feedstocks for Biofuel or Energy Production**
- Select plants that provide an adequate volume per acre of plant materials.
- Select perennial warm season biomass crops or annual crops that will produce non-fragile biomass.
- Select biomass crops that will sequester carbon in the soil.
- Select biomass crops that require minimum maintenance and fertilizer inputs.
- Determine sustainable residue removal rates and evaluate soil quality impacts of residue removal for long term sustainability using the RUSLE2 and WEPS.
- VI. Considerations**
- A. Consider reseeding erosive fields in small plots, alternating strips established on the contour over a period of years, or the use of no-till planting. Use the current approved erosion prediction tools to evaluate the erosion risk for each establishment alternative.
- B. In areas where animals congregate, consider establishing persistent species that can tolerate close grazing and trampling.
- C. Consider the potential hazard of bloat when pasture mixtures are dominated by legumes.
- D. Consider the benefits of proper management of existing stands of forage which will increase pasture production rather than reseeding or interseeding. Longevity and persistence will be increased by rotational grazing systems that provide plant recovery periods and discourage selective grazing. See WI FOTG Standard 528, Prescribed Grazing.
- E. Where wildlife and pollinator habitat concerns exist, consider using an approved habitat evaluation procedure for plant selection.
- F. Where air quality concerns exist, consider using site preparation and planting techniques that will minimize dust generation and transport.
- G. Where carbon sequestration is a goal, select deep-rooted perennial species that will increase underground carbon storage.

- H. Seed counts per square foot above the recommended minimums may result in excessive competition and poor establishment of some species. It is strongly suggested that seed count minimums not exceed 25 percent of the minimum seeds per square foot for grasses.
- I. When planning biomass plantings, consider the kinds and amount of plant materials as defined by the target market or end user.
- J. During and after stand establishment, planning and application of the following conservation practices should be considered as applicable: Forage Harvest Management (511), Herbaceous Weed Control (315), Nutrient Management (590), and Prescribed Grazing (528).
- K. Consider implementing WI FOTG Standards 595, Integrated Pest Management; 315, Herbaceous Weed Control; and 314, Brush Management, to reduce the environmental, animal, and human impacts of *noxious* and *invasive* weeds.

## VII. Plans and Specifications

Prepare plans and specifications for each site or management unit according to the Criteria, Considerations, and Operations and Maintenance described in this standard.

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

- site preparation,
- fertilizer application (if applicable),
- seedbed preparation,
- methods of seeding/planting,
- time of seeding/planting,
- selection of species,
- type of legume inoculant used (if applicable),
- seed germination test results,
- seeding rate (adjusted based on PLS calculations),
- supplemental water for plant establishment (if applicable),
- protection of plantings (if applicable),
- weed control activities during the establishment period.

Specifications shall be recorded using Wisconsin Job Sheets 134, How to Establish and Maintain Introduced Grasses and Legumes; and 135, How to Establish and Maintain Native Grasses, Forbs, and Legumes.

## VIII. Operation and Maintenance

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

The growth of desired seedlings shall be monitored and evaluated during the establishment period.

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.

New seedlings shall not be grazed or harvested until plants have established sufficient root systems to withstand traffic and to recover from removal of top growth.

Mowing or herbicide applications shall be used as necessary to control competitive weeds. Mowing should be done when introduced grasses reach 6-8 inches tall and before the weeds develop matured seed. The residue from mowing shall be uniformly distributed or removed as necessary to avoid smothering the new seedlings. Native warm season grasses should be mowed no lower than 7 inches.

## IX. References

University of Wisconsin Extension Publication A1525, Perennial Forage Crop Variety Update for Wisconsin.

University of Wisconsin Extension Publication A3529, Wisconsin Pastures for Profit.

Forage Management in the North, Smith, D., 1981.

USDA, NRCS Wisconsin Field Office Technical Guide (FOTG), Section IV, Practice Standards and Specifications.

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

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, IA.

USDA, NRCS, 1997. National Range and Pasture Handbook. Washington, DC.

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

USDA, NRCS, Wisconsin Agronomy Technical Note 5, Establishing and Maintaining Native Grasses, Forbs, and Legumes.

USDA, NRCS, Wisconsin Agronomy Technical Note 6, Establishing and Maintaining Introduced Grasses and Legumes.

USDA, NRCS, Wisconsin Job Sheet 134, How to Establish and Maintain Introduced Grasses and Legumes.

USDA, NRCS, Wisconsin Job Sheet 135, How to Establish and Maintain Native Grasses, Forbs, and Legumes.

## X. Definitions

*Actual Adjusted Seeding Rates (V.A.1.)* – an increase in seeds per square foot or pounds per acre, when the PLS is less than 100 percent.

*Certified Seed (V.A.1.)* – Seed that meets the standards established by the designated official seed certifying agency for the purpose of ensuring species/variety, species/variety purity and mechanical quality. The Wisconsin Crop Improvement Association is the official seed certifying agency for Wisconsin.

*Forage Suitability Group(s) (V.B.1.a.)* – Pasture and hayland interpretation reports that provide users with

forage production guidance for soils and climate conditions present in a specific area of interest.

*Frost Seeding (V.A.2.)* – Broadcast seeding in February to mid-March during the active freezing and thaw cycle onto existing herbaceous stands or onto seedbeds prepared the previous fall.

*Invasive weeds (VI.K.)* – Non-native species that have the ability to spread rapidly and overwhelm other plants, causing economic and environmental harm, or harm to human and animal health.

*Non-Certified Seed (V.A.1.)* – Seed that is grown, processed, tested and labeled for species/variety and mechanical quality factors, but is not certified by an official seed certifying agency.

*Noxious weeds (VI.K.)* – A plant that has been designated by a county, state, or national agricultural authorities as one that is injurious to agricultural and horticultural crops, natural habitats, human, and or livestock if left uncontrolled. Most noxious weeds are introduced species.

*Pure Live Seed (PLS) (V.A.1)* – PLS is a means of expressing seed quality, based on the percentage of seed in a seed lot that is both pure and viable. PLS is calculated by multiplying the percentage of total viable seed (germination + hard seed + dormant seed) by the percentage of pure seed divided by 100.

*Untested Seed (V.A.1.)* – Seed that has no assurances of testing for species/variety and mechanical quality, i.e., species/variety purity, inert matter, other crop or weed seeds and germination potential. Untested seed legally cannot be labeled.

**Table 3  
Forage and Hayland Planting Recommendations**

Forage Suitability Group	Seed Calculator Code <sup>1</sup>	Species	Lbs. PLS per Acre	Seeds per Square Foot
<b>Hay Crop</b>				
Group 1: Low water holding capacity, seasonal high water table.	512-H1	Red Clover Tall Fescue Timothy	6 6 1	38 31 28
Group 2: Low water holding capacity, 0 to 12 percent slopes.	512-H2	Alfalfa	12	60
	512-H3	Alfalfa Smooth Bromegrass	10 4	50 12
Group 3: Low water holding capacity, greater than 12 percent slopes.	512-H3	Alfalfa Smooth Bromegrass	10 4	50 12
Group 4: Moderate water holding capacity, seasonal high water table.	512-H4	Alsike Clover Tall Fescue Timothy	3 6 1	47 31 28
Group 5: Moderate water holding capacity, less than 12 percent slopes.	512-H3	Alfalfa Smooth Bromegrass	10 4	50 12
Group 6: Moderate water holding capacity, greater than 12 percent slopes.	512-H3	Alfalfa Smooth Bromegrass	10 4	50 12
Group 7: High water holding capacity, seasonal high water table.	512-H4	Alsike Clover Tall Fescue Timothy	3 6 1	47 31 28
Group 8: High water holding capacity, less than 12 percent slopes.	512-H5	Alfalfa Timothy	8 2	40 56
Group 9: High water holding capacity, greater than 12 percent slopes.	512-H6	Alfalfa Smooth Bromegrass Timothy	8 4 1	40 12 28
Groups 1-9 For biofuel production, it is recommended that fields be harvested once per year, in the fall. Harvesting two to three weeks after the first frost will allow the plant to recycle nutrients and likely reduce future fertilization and drying costs.  Switchgrass should be planted in the spring after soil temperatures reach 60°F. Planting in a firm, well prepared seedbed should be done at a depth of ¼ inch. No-till planting after soybeans rather than corn is better, due to smoother terrain. Switchgrass should not be cut or grazed during the seeding year unless weed density is high or growth is exceptional.	512-H7	Switchgrass varieties: Blackwell Cave-in-Rock Pathfinder Sunburst	7 lbs/acre 7 lbs/acre 7 lbs/acre 7 lbs/acre	63
	512-H8	Big Bluestem	11 lbs/acre	42
	512-H9	Indiangrass	10 lbs/acre	44
Group 10: Organic soils, wetlands, ledge outcrop.	---	Planting not feasible.	---	---

Refer to Wisconsin Agronomy Technical Notes 5 and 6 for companion crop recommendations.

Forage Suitability Group	Seed Calculator Code <sup>1</sup>	Species	Lbs. PLS per Acre	Seeds per Square Foot
<b>Rotation and Permanent Pastures</b>				
Group 1: Low water holding capacity, seasonal high water table.	512-PP1	Alsike Clover Meadow Fescue	2 6	31 31
	512-PP1A	Alsike Clover Orchardgrass	2 3	31 45
	512-PP1B	Alsike Clover Timothy	2 1.5	31 42
Groups 2: Low water holding capacity, 0 to 12 percent slopes.	512-PP2	Alfalfa Smooth Bromegrass Orchardgrass	6 4 4	30 12 60
Group 3: Low water holding capacity, greater than 12 percent slopes.	512-PP2	Alfalfa Smooth Bromegrass Orchardgrass	6 4 4	30 12 60
Group 4: Moderate water holding capacity, seasonal high water table.	512-PP4	Alsike Clover Meadow Fescue Timothy	2 6 1	31 31 28
	512-PP4B	Birdsfoot Trefoil Meadow Fescue Timothy	3 6 1	26 31 28
Group 5: Moderate water holding capacity, less than 12 percent slopes.	512-PP5	Red Clover White Ladino Clover Orchardgrass Meadow Fescue	5 1 3 6	32 20 45 31
	512-PP5B	Red Clover White Ladino Clover Festulolium Meadow Fescue	5 1 7 6	32 20 36 31
Group 6: Moderate water holding capacity, greater than 12 percent slopes.	512-PP6	Red Clover Orchardgrass Smooth Bromegrass	5 4 4	32 60 12
Group 7: High water holding capacity, seasonal high water table.	512-PP7	Alsike Clover Meadow Fescue Timothy Redtop	2 6 1 1	31 31 28 115
	512-PP7B	Birdsfoot Trefoil Meadow Fescue Timothy Redtop	3 6 1 1	26 31 28 115
Group 8: High water holding capacity, less than 12 percent slopes.	512-PP8	White Ladino Clover Orchardgrass Meadow Fescue	1 3 6	20 45 31
	512-PP8B	White Ladino Clover Festulolium Meadow Fescue	1 7 6	20 36 31
Group 9: High water holding capacity, greater than 12 percent slopes.	512-PP9	Red Clover Orchardgrass Meadow Fescue	5 3 6	32 45 31
Group 10: Organic soils, wetlands, ledge outcrop.	---	Planting not feasible.	---	---

Refer to Wisconsin Agronomy Technical Notes 5 and 6 for companion crop recommendations.

Forage Suitability Group	Seed Calculator Code <sup>1</sup>	Species	Lbs. PLS per Acre	Seeds per Square Foot
<b>Pasture for Horses/Sheep</b>				
Groups 1, 4, 7: Seasonal high water table.	512-PHS1	Kentucky Bluegrass Meadow Fescue White Ladino Clover	4 4 1	200 21 20
	512-PSH1A	Kentucky Bluegrass Meadow Fescue Birdsfoot Trefoil	4 4 3	200 21 26
Groups 5, 6, 7, & 8: Moderate to high water holding capacity.	512-PHS2	Kentucky Bluegrass Festulolium White Ladino Clover	2 7 1	100 36 20
	512-PHS2A	Kentucky Bluegrass Perennial Ryegrass White Ladino Clover	2 7 1	100 36 20
Groups 2 & 3: Low water holding capacity.	512-PHS3	Alfalfa Orchardgrass	6 3	30 45
<b>Pasture for Hogs</b>				
		Alfalfa OR Red clover Forage Rape OR Oats OR Sudangrass OR Hybrid Pearl Millet	12 10 25 35 2 bu/ac	60 63 --- --- ---
<b>Summer Annuals for Supplemental Forage</b>				
		Hybrid Pearl Millet Winter rye (fall planted) Forage Rape Forage Turnips and Swedes Rape and Kale	25 1½ - 2 bu/ac 4 bu/ac 1½-2 lbs./ac 4 lbs./ac	--- --- --- --- ---

<sup>1</sup>These codes represent the mixtures used in the Wisconsin Seed Calculator.

Refer to Wisconsin Agronomy Technical Notes 5 and 6 for companion crop recommendations.

**Table 4**  
**Common Plants and Recommended Seeding Rates**

Common Name	Scientific Name	Moisture Regime	Forage Suitability Groups	Single Species Seeding Rate (PLS) Lbs./Ac.	Seeds/Lb.	Seeds/Ft <sup>2</sup> /Lb./Ac.
<b>Introduced Grasses</b>						
Chewings Red Fescue	Festuca rubra L. ssp. Fallax	D, DM, M	2-3, 5, 6, 8, 9	5	350,000	8
Creeping Red Fescue	Festuca rubra	DM, M, WM	1, 4-9	5	350,000	8
Festulolium*	Festuca x Lolium*	DM, M, WM	1-9	12	227,000	5.2
Italian or Annual Ryegrass	Lolium perenne L. ssp. multiflorum	DM, M, WM	1, 4-9	20	227,000	5.2
Kentucky Bluegrass	Poa pratensis	D, DM, M, WM, W	1-9	8	2,177,000	50
Meadow Fescue	Schedonorus pratensis	DM, M, WM	1, 4-9	12	227,000	5.2
Orchard Grass*	Dactylis glomerata L.*	D, DM, M, WM	1-9	10	653,000	15
Perennial Ryegrass	Lolium perenne	DM, M, WM	1, 4-9	20	227,000	5.2
Redtop	Agrostis gigantea	M, WM, W	1, 4, 7	4	4,990,000	114.5
Smooth Bromegrass*	Bromus inermis*	D, DM, M, WM	1-9	20	136,000	3.1
Tall Fescue*	Schedonorus arundinaceus*	D, DM, M, WM	1-9	12	227,000	5.2
Timothy*	Phleum pratense*	DM, M, WM, W	1, 4-9	8	1,230,000	28.2
<b>Introduced Legumes</b>						
Alfalfa*	Medicago sativa*	D, DM, M	2-3, 5, 6, 8, 9	12	219,000	5.0
Alsike Clover	Trifolium hybridum	M, WM, W	1, 4, 5, 7, 8, 9	3	680,000	15.6
Birdsfoot Trefoil*	Lotus corniculatus*	DM, M, WM, W	1, 4-9	7	375,000	8.6
Red Clover*	Trifolium pratense*	DM, M, WM	1-9	10	275,000	6.3
White Ladino Clover*	Trifolium repens*	DM, M, WM	1, 4, 5, 7, 8, 9	3	871,650	20
<b>Native Grasses</b>						
Big Bluestem*	Andropogon gerardii*	D, DM, M, WM	1-9	11	165,000	3.8
Indian Grass*	Sorghastrum nutans*	D, DM, M, WM, W	1-9	10	192,000	4.4
Switchgrass*	Panicum virgatum*	D, DM, M, WM, W	1-9	7	389,000	8.9

\*Species with an asterisk can be seeded individually at the recommended pure stand rates based on Pure Live Seeds (PLS).

Refer to Wisconsin Agronomy Technical Note 6 for the Forage Suitability Group (FSG) descriptions.

Seeds per square foot for a particular specie can be calculated by multiplying the number of seeds per pound of specie by the rate of the specie in pound(s) per acre divided by 43,560 square feet. Refer to Table 3 for the number of seeds per pound of a particular specie.

**Table 5**  
**Recommended Varieties of Warm-Season Grass for pasture and hayland**  
 (See Figure 1)

Specie	Variety	Area of Adaptability
Big Bluestem	Bison	North
	Bonilla	Central
	Champ	South
	Pawnee	South
	Rountree	Central & South
Indiangrass	Holt	Central & South
	Rumsey	South
	Tomahawk	North
Switchgrass	Blackwell	South
	Cave-in-Rock	South
	Dacotah	North
	Forestburg	Central
	Nebraska 28	Central
	Pathfinder	South
	Sunburst	Central
	Trailblazer	South

**Table 6**  
**Biomass Planting Recommendations**

Forage Suitability Group	Species	Lbs. PLS/Acre	Seeds per Square Foot
<b>Biomass/Biofuel</b>			
Group: 1-9	Switchgrass Varieties:		
	Blackwell	7	63
	Cave-in-Rock	7	
	Pathfinder	7	
	Sunburst	7	

Refer to Wisconsin Agronomy Technical Notes 5 and 6 for companion crop recommendations.