

## Appendix – A (Forage Production and Erosion Control)

This practice guide contains information for planning and applying herbaceous vegetative cover according to multiple NRCS Conservation Practices in Ohio. Use this guide to develop implementation requirements to apply the planned practice in accordance with the criteria listed in the standard that addresses the applicable resource concerns. The table below (Table 1) is a guide to help the planner use this document. Use Table 1 to look up the appropriate table containing seeding rates and planting dates by practice and practice purpose.

**Table 1: Document Name and table number; containing seeding dates, seeding rates and seeding depths; for herbaceous vegetative establishing conservation practices.**

Conservation Practice	Practice Purpose	Document	Table
Conservation Cover (327)	Enhance wildlife habitat	Appendix – A (Wildlife Habitat)	
	Enhance pollinator & beneficial habitat	Appendix – A (Wildlife Habitat)	
	All other purposes	Appendix – A (Forage & Erosion)	Table 14
Contour Buffer Strip (322)	All purposes	Appendix – A (Forage & Erosion)	Table 13
Critical Area Planting (342)	All purposes	Appendix – A (Forage & Erosion)	Table 15
Cross Wind Trap Strips (589c)	All purposes	Appendix – A (Forage & Erosion)	Table 16
Field Border (386)	Enhance wildlife habitat	Appendix – A (Wildlife Habitat)	
	Enhance pollinator & beneficial habitat	Appendix – A (Wildlife Habitat)	
	All other purposes	Appendix – A (Forage & Erosion)	Table 14
Filter Strip (393)	All purposes	Appendix – A (Forage & Erosion)	Table 16
Forage and Biomass Planting (512)	All purposes	Appendix – A (Forage & Erosion)	Table 13
Herbaceous Wind Barriers (603)	All purposes	Appendix – A (Forage & Erosion)	Table 16
Riparian Herbaceous Cover (390)	All purposes	Appendix – A (Wildlife Habitat)	
Vegetative Barrier (601)	All purposes	Appendix – A (Forage & Erosion)	Table 16
Vegetative Treatment Area (635)	All purposes	Appendix – A (Forage & Erosion)	Table 16
Mulching (484)	All purposes	Appendix – A (Forage & Erosion)	Table 17

## Stand Establishment:

Establishing a good stand is critical for perennial vegetation and requires attention to detail for success. Begin by selecting species adapted to soils where they will be grown. Plan well ahead of time so corrective lime applications have time to neutralize soil acidity, and soil fertility deficiencies can be corrected. Ohio Conservation Practice Standard Nutrient Management (590) should be used on lands where plant nutrients and soil amendments are applied.

The method of establishment can also have a dramatic effect on the success of the practice. Planting early within the recommended planting date window and at the proper seeding depth and rate with good soil seed contact will reduce the risk of poor and slow establishment. When selecting the seeding method, one should consider the advantages and disadvantages of each available method before implementation. Drilling, harrow seeding and broadcast seeding before light tillage (rotary harrows, vertical tillage) will result in greater soil/seed contact and improved depth control. Although these methods generally result in improved seed emergence they can be time consuming. Broadcast seeding on the soil surface are options to implement vegetation establishment. However, these methods can have reduced emergence as a result of poor soil/seed contact. For this document all seeding rates are assumed to be seeded with some seed depth control; if a method is used that does not have seed depth control such as broadcast seeding a 20% increase in the seeding rate should be included to account for increased risk of poor emergence. Table 2 below describes general information on field preparation and planting of perennial vegetation. For establishing Warm Season Grass by broadcasting see Table 3 and 4. With this guidance a site-specific plan should be developed based on the soil conditions and actual tillage implements available.

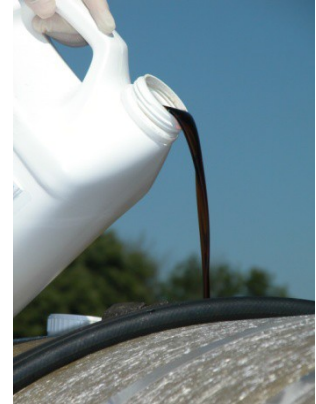
Planting dates listed throughout this document are based on typical site conditions and weather patterns. When implementing any of the plantings described in this document planting dates may be extended 2 weeks beyond the date range listed based on a site-specific evaluation of the site and the local weather conditions at the time. Documentation of the site-specific conditions that were the bases of the extension will be included in the conservation 6 notes.



## Herbicide Persistence:

With the increased awareness of herbicide resistance and other problematic weeds many herbicide programs are including long lasting residual herbicides. Herbicides applied to the previous crop can have an effect on the establishment of perennial vegetation. These types of herbicides may affect stand establishment and growth of sensitive species.

There are two major factors in determining the potential carryover injury. First of all; how long does the herbicide last or persist in the soil assuming that it has soil activity. Several factors influence the rate of dissipation such as rainfall, soil texture and soil pH, etc., however, most guidelines generally are for “normal” conditions (e.g. not severe drought or abnormally wet seasons). Secondly, species sensitivity can play a role if only a small amount of residue is necessary to cause injury and the herbicide persists. Quite often, small seeded legumes like the clovers and small seeded grasses are very sensitive to some herbicides.



When establishing perennial vegetation careful consideration should be given to herbicides used in the past and specie selection. Producers should consult CCAs, private crop consultants and/or herbicide retailers in making these important decisions. Producers should always follow herbicide label recommendations and restrictions. Refer to herbicide label, and current OSU Extension Weed Control Guide (Bulletin 789) for more information on crop rotation restrictions.



**Table 2: Perennial vegetation establishment field preparation and planting guide.**

<b>Ground Cover Prior to Planting</b>	<b>Seedbed Preparation and Seeding (Assumes a smooth soil surface)</b>	<b>Timing</b>	<b>Comments</b>
<b>Row Crop</b>  <b>No-till Seeding Method</b>	1) Use a labeled nonselective burndown herbicide to control existing vegetation.	At least two weeks prior to seeding	Follow all label directions when applying herbicides.
	2) Apply the necessary lime and fertilizer	Prior to seeding or through the drill at seeding.	
	3) Plant using a drill designed for no-till seeding.	Use seeding date listed in appropriate table below	Calibrate the drill. Use a drill designed for no-till seeding. Warm season grasses will require a WSG drill
<b>Existing Sod</b>  <b>No-till Seeding Method</b>	1) Spray sod with a nonselective burndown herbicide in fall of the previous year. If perennial broadleaves are a concern add a selective broadleaf herbicide to the nonselective burndown herbicide	Mid-September to Early October of Previous year	Spray while vegetation is still actively growing.
	2) Apply the second application of nonselective burndown herbicide.	At least one week before seeding.	Follow all label when applying herbicides.
	3) Apply the necessary lime and fertilizer	Prior to seeding or through the drill at seeding.	
	4) Plant using a drill designed for no-till seeding.	Use seeding date listed in appropriate table below	Calibrate the drill. Use a drill designed for no-till seeding. Warm season grasses will require a WSG drill
<b>Row Crop, Small Grain, Existing Sod</b>  <b>Conventional Seeding Method</b>	1) Till and level ground if needed using: <ul style="list-style-type: none"> <li>• Plow, Chisel and/or</li> <li>• Light Disk and/or</li> <li>• Field Cultivator (or similar tool)</li> </ul>	Initial tillage (plow, chisel, disk) should begin at least a month prior to seeding.  Wait 2 weeks between initial tillage and final seedbed preparation	To allow weed seeds to germinate and be killed by final seedbed preparation.
	2) Apply the necessary lime and fertilizer	After initial tillage but before seedbed preparation.	
	3) Culti-pack to firm seedbed	Prior to Seeding	A firm seedbed is important when seeding grasses and legumes.
	4) Apply nonselective burndown herbicide if needed to control perennial weeds.	At least one week before seeding.	Follow all label when applying herbicides.
	5) Plant using a drill with press wheels designed for the type of seed being used. (Culti-pack after seeding if broadcasting seed or drill is not equipped with press wheels).	Use seeding date listed in appropriate table below	Calibrate the drill and seed ¼ inch deep.  Warm season grasses will require a WSG drill.

**Table 3: Field preparation for establishing Warm Season Grass by broadcasting the seed.**

<b>Ground Cover Prior to Planting</b>	<b>Seedbed Preparation and Seeding (Assumes a smooth soil surface)</b>	<b>Timing</b>	<b>Comments</b>	
<b>Bare ground or Soybean Stubble</b>	1) Till and level ground if needed using: <ul style="list-style-type: none"> <li>• Plow, Chisel and/or</li> <li>• Light Disk and/or</li> <li>• Field Cultivator (or similar tool)</li> </ul>	Between April 1 <sup>st</sup> and June 1 <sup>st</sup> .	Soil should be firm enough that your footprint is no deeper than ½ inch.	
	2) Culti-pack to firm seedbed			
	3) Broadcast WSG/Forb seed			
	4) Culti-pack again for seed to soil contact.	Prior to WSG emergence	See Broadcasting Methods below (Table 3)	
	5) Apply a selective herbicide that can be tolerated by the WSG planted if needed.			
	6) Control weed competition.			
		May-September		
<b>Corn or Wheat Stubble</b>	1) Bale wheat straw or corn fodder	After harvest of crop	Soil should be firm enough that your footprint is no deeper than ½ inch.	
	2) Till and level ground if needed using: <ul style="list-style-type: none"> <li>• Plow, Chisel and/or</li> <li>• Light Disk and/or</li> <li>• Field Cultivator (or similar tool)</li> </ul>	Between April 1 <sup>st</sup> and June 1 <sup>st</sup>		
	3) Culti-pack to firm seedbed			
	4) Broadcast WSG/Forb seed			
	5) Culti-pack again for seed to soil contact.	Prior to WSG emergence		See Broadcasting Methods below (Table 3)
	6) Apply a selective herbicide that can be tolerated by the WSG planted if needed.			
	7) Control weed competition.			
		May-September		
<b>Grassland or Pastureland</b>	1) Spray cool season grass or pasture with nonselective burndown herbicide in fall of the previous year	September of Previous year	Spray while grass is still actively growing.	
	2) If field is not highly erodible, prepare the field using a primary tillage implement to destroy old sod.	Between April 1 <sup>st</sup> and June 1 <sup>st</sup> .	Soil should be firm enough that your footprint is no deeper than ½ inch.	
	3) Level ground using: <ul style="list-style-type: none"> <li>• Light Disk and/or</li> <li>• Field Cultivator (or similar tool)</li> </ul>			
	4) Culti-pack to firm seedbed			
	5) Broadcast WSG/Forb seed			
	6) Culti-pack again for seed to soil contact.	Prior to WSG emergence	See Broadcasting Methods below (Table 3)	
	7) Apply a selective herbicide that can be tolerated by the WSG planted if needed.			
	8) Control weed competition.			
		May-September		

## Broadcasting Warm Season Grass:

Depending on the kind of seed, broadcasting warm season grass seed can be challenging. Hard seed like Switchgrass or Eastern Gamagrass are easy to broadcast with a spinner broadcast spreader. Bearded fluffy seeds such as Big Bluestem, Little Bluestem, and Indiangrass are much more challenging. Table 4 intended to identify some methods for broadcasting these seeds uniformly across the field. The seedbed must be properly prepared for a broadcast seeding. See Table 3; Field preparation for broadcasting Warm Season Grass for more information on field preparation.

**Table 4. Broadcast methods for seeding of Warm Season Grasses.**

Broadcast Equipment	Method	Hints /Tips
<p><b>Commercial Fertilizer Truck or Fertilizer Spreader</b></p>	<p>Have fertilizer dealer mix WSG seed with carrier:</p> <ul style="list-style-type: none"> <li>• Lime at a rate of 500 lbs / acre</li> </ul> <p style="text-align: center;"><b>Or</b></p> <ul style="list-style-type: none"> <li>• Potash Fertilizer at a rate of 200 lbs / acre.</li> </ul> <p><b>DO NOT USE NITROGEN FERTILIZER!</b></p> <p>Some producers have the fertilizer dealer also mix water with potash fertilizer at a rate of 5 gallons per ton of fertilizer to help the WSG seed stick to the fertilizer pellets.</p>	<p>Can be used to seed large acreage.</p> <p>The WSG will not broadcast as far as the carriers. You must overlap to ensure even coverage.</p> <p>Nitrogen fertilizer will stimulate cool season grasses and weeds.</p> <p>If water is used in the mix, the WSG seed should be carried with the fertilizer pellets and overlapping should not be as important. Broadcast immediately so that the water/fertilizer do not dry and cake.</p>
<p><b>Spinner Type Seeder with Agitator</b></p>	<p>Spinner type seeders with multiple vanes and a spreading disk can throw bearded seed 8-12 feet without a carrier. The bearded seed will lock together the smaller legumes and fine seed. (See tips to ensure even coverage)</p> <p style="text-align: center;"><b>Or</b></p> <p>Have seed dealer mix the WSG with carrier:</p> <ul style="list-style-type: none"> <li>• Cracked wheat or oats at a rate of 1 bu/acre</li> </ul> <p style="text-align: center;"><b>Or</b></p> <ul style="list-style-type: none"> <li>• 50 lbs of pelletized lime per acre</li> </ul>	<p>Can be used to seed medium to large acreage.</p> <p>Calibrate seeder by adding one acre of seed to the seeder and plant a 206' x 206' area. Adjust seed flow settings accordingly.</p> <p>Cracked wheat will not germinate</p> <p>One tip is to cut the seeding rate in half and go over the seeding area twice in opposite directions.</p>
<p><b>Conventional Cyclone Seeder or WSG Hand Broadcaster</b></p>	<p>Use debarbed seed with a conventional Cyclone type seeder.</p> <p style="text-align: center;"><b>Or</b></p> <p>Hand WSG broadcast seeders are specially designed with picker wheels at the base of the box to help pull the seed down into the spinner.</p>	<p>Limited to small to medium size acreage You must overlap to ensure even coverage. One tip is to cut the seeding rate in half and go over the seeding area twice in opposite directions.</p>

## Seed Quality:

The quality of seed used in conservation practices can have a dramatic effect on the success of the practice. The seeding rates used in this document assumes the seed used is all viable. All rates listed in this document are listed as Pure Live Seed (PLS). This PLS rate must be adjusted to account for the quality of seed being used. Additionally, NRCS is committed to preventing the spread of noxious, invasive and herbicide resistant weed species. Therefore, all seed used in conservation practices must have a seed tag or be tested for seed quality and percent weed seed prior to use.

Use seed from a reputable vendor that is registered with the Ohio Department of Agriculture (ODA). Be sure that the purchased seed is labeled according to ODA regulations and the Ohio Revised Code. Seed tags should contain at a minimum, the lot number, the kind and variety of seed, the percent of pure seed, the percent germination, the percent dormant or hard seed and the name and amount of noxious weeds contained in the mix. This information is necessary to calculate the Pure Live Seed (PLS) and the appropriate seeding rate.

If there is any question about the quality of seed or if the seed is not labeled properly, it should be returned to the vendor or it can be sampled and tested by:

Ohio Department of Agriculture  
Division of Plant Industry – Grain,  
Feed and Seed Section 8995 E.  
Main Street  
Reynoldsburg, Ohio 43068  
614-728-6410



## Calculating Pure Live Seed (PLS) and Seeding Rates:

Almost all seed has some non-viable as well as “hard” or dormant seed. Seeding rates should be adjusted to compensate for the seed that will not germinate. Warm season grasses are usually purchased on a Pure Live Seed basis. This means that if you purchase 50 lbs of PLS, you will probably get shipped a bag containing more than 50 lbs of material. PLS is calculated as follows:

### **% PLS= % Pure Seed x (% Germination+ % Dormant seed)**

For example: If you ordered 50lbs of pure live big bluestem seed and the seed tag states:

<b>Lot number 745-HG</b>	
Kind	Big Bluestem
Pure Seed	99.0%
Germination	72%
Dormant (Hard) Seed	10%
Weed Seed	.5%
Noxious Weed Seed	0.0%

#### **PLS Calculation:**

% PLS= % Pure Seed [99] x (% Germination [72] + % Dormant seed [10])

% PLS= [.99] x ([.72] + [.10])

% PLS= .99 x .82

% PLS= .81

Or Pure Live Seed = 81 %

50 lbs PLS divided by .81 = 61.2 lbs

Your “50 lb” bag of big bluestem seed should weigh 61.2 lbs as shipped.

### **Seeding Rate Adjustment for PLS:**

If the recommended seeding rate is 6 lbs/acre of PLS you need to adjust your actual rate planted:

6 lbs PLS/acre divided by .81 (% PLS) = 7.4 lbs/acre.

One would need to plant 7.4 lbs/acre of the seed in the bag to get 6 lbs/acre of pure live big bluestem seed. The material in the bag should cover 8.3 acres.



## Liming:

Proper soil pH and fertility are essential for herbaceous vegetative establishment and optimum forage production. Take a soil test to determine soil pH and nutrient status at least six months before seeding. Applications of fertilizer and/or liming material shall be made in accordance with the Ohio Nutrient Management Standard (Code 590). With conventional tillage plantings, soil samples should be taken to an 8-inch depth and lime should be incorporated and mixed well in the soil at least six months before seeding. If more than 4 tons per acre are required, half the amount should be incorporated deeply and the other half incorporated lightly into the top 2 inches. If low rates of lime are recommended or if a split application is not possible, the lime should be worked into the surface rather than plowed down. This assures a proper pH in the surface soil where seedling roots develop and where nodulation begins in legumes. See Table 5 for topsoil pH levels for forages in Ohio. Soil pH should be corrected by applications of lime when topsoil pH falls 0.3 units below the recommended level.

**Table 5: Topsoil pH levels for forages on Mineral Soils in Ohio.**

	Subsoil pH less than 6	Subsoil pH greater than 6
<b>Alfalfa</b>	6.8	6.5
<b>Other Forages</b>	6.5	6.0
<b>Establishing Non-Harvested Herbaceous Vegetative Cover</b>	5.5-6.0	5.5-6.0



## Phosphorus and Potassium:

Corrective applications of phosphorus and potassium should be applied prior to seeding regardless of the seeding method used; however, fertilizer applications incorporated ahead of seeding are more efficient than similar rates not incorporated. This is especially true for phosphorus and for no-till seedings. Phosphorus and potassium fertilizer recommendations for forages are provided in Tables 6 and 7.

**Table 6: Phosphorus (P<sub>2</sub>O<sub>5</sub>) Recommendations for Pure Grass Forage and Legume-Grass Stands. Includes Maintenance Plus Four-Year Buildup to the Critical Level Where Needed.**

Soil Test P	Pure Grass Stands Hay and Silage Yield Potential (ton/ac)			Pasture	Establishing Non-Harvested Herbaceous Vegetative Cover <sup>1</sup>
	4	6	8	4	
ppm (lb/ac)	-----lb P <sub>2</sub> O <sub>5</sub> per ac -----				
5 (10)	100	135	140	100	50
10 (20)	75	110	115	40	25
15-30 (30-60)	50	85	90	0	0
35 (70)	25	45	45	0	0
40 (80)	0	0	0	0	0

Soil Test P	Forage Legume or Legume-Grass Mixtures Hay and Silage Yield Potential (ton/ac)			Pasture	Establishing Non-Harvested Herbaceous Vegetative Cover <sup>1</sup>
	4	6	8	4	
ppm (lb/ac)	-----lb P <sub>2</sub> O <sub>5</sub> per ac -----				
10 (20)	130	160	190	100	60
15 (30)	100	135	160	40	30
20 (40)	75	110	135	0	0
25-40 (50-80)	50	85	110	0	0
45 (90)	25	45	50	0	0
50 (100)	0	0	0	0	0

1. Phosphorus recommendations for establishing non-harvested herbaceous vegetative cover are starter recommendations. When establishing warm season grasses and a phosphorous application is needed make the application at least six months before seeding if the source of phosphorous contains nitrogen. If the application of phosphorus cannot be made six months before seeding additional precautions to control cool season grass will be needed.

**Table 7: Potassium (K<sub>2</sub>O) Recommendations for Forage Stands. Includes Maintenance Plus Four-Year Buildup to the Critical Level Where Needed.**

Soil Test K ppm (lb/ac)	Hay and Silage Yield Potential (ton/ac)			Pasture	Establishing Non-Harvested Herbaceous Vegetative Cover <sup>1</sup>
	4	6	8	4	
	-----lb K <sub>2</sub> O per ac -----				
	----- CEC 10 meq/100 g -----				
75 (150)	260	300	300	120	100
100-130 (200-260)	220	300	300	20	20
140 (280)	40	60	80	0	0
150 (300)	0	0	0	0	0

	----- CEC 20 meq/100 g -----				
100 (200)	270	300	300	120	100
125-155 (250-310)	220	300	300	20	20
165 (330)	40	60	80	0	0
175 (350)	0	0	0	0	0

	----- CEC 30 meq/100 g -----				
125 (250)	280	300	300	120	100
150-180 (300-360)	220	300	300	20	20
190 (380)	40	60	80	0	0
200 (400)	0	0	0	0	0

1. Potassium recommendations for establishing non-harvested herbaceous vegetative cover are starter recommendations.

### Without Soil Test:

When herbaceous vegetation is used to protect earth moving/structural practices from soil erosion, vegetation stand establishment can be critical. In some cases, instillation of these practices prevents representative soil sampling prior to herbaceous vegetative planting. For example, the instillation of a grass waterway can prevent soil sampling before the instillation of critical area planting. In this case use Table 8 for Phosphors and Potassium recommendations without a soil test.

**Table 8: Phosphors and Potassium recommendations without a soil test result.**

	lbs/ac <sup>1</sup>
Phosphors (P <sub>2</sub> O <sub>5</sub> )	30 to 60
Potassium (K <sub>2</sub> O)	30 to 100

1. Use lower rates on sites with topsoil or you would expect to be moderate to high in fertility. Use higher rates on highly eroded or low fertility sites away from streams.

## Nitrogen:

Applications of nitrogen may also be needed to establish and maintain herbaceous growth. Not only at planting (starter applications) but additional nitrogen applications may be needed to maintain yield and quality of forage production. Before making applications of nitrogen careful considerations should be made on nitrogen source and placement to reduce loss risk. Nitrogen fertilizer recommendations for both starter application and applications in proceeding years are provided in Tables 8 and 9.

**Table 8: Nitrogen recommendation at planting (starter) for both forage and non-harvested herbaceous vegetative cover.**

	Nitrogen Recommendation (Lb/ac)
Cool Season Grass	30
Cool Season Grass legume mixes	20
Warm Season Grass and/or mixes	0

**Table 9: Annual nitrogen recommendation after the establishment for both forage production.**

	Hay and Silage Yield Potential (ton/ac)			Pasture
	4	6	8	4
	----- Annual N rate (lb/ac) <sup>1</sup> -----			
Grass, less than 20% legumes	100	140	180	50
Grass legume mix, 20%-35% legumes	50	90	130	25
Grass legume mix, greater than 35% legumes	0	0	0	0

1. Make split applications of N in early spring and after first harvest.

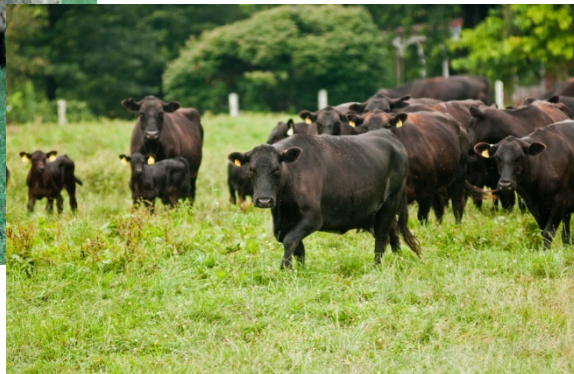
## Legume Inoculation:

Legume seed must be inoculated with the proper nitrogen-fixing bacteria prior to seeding to assure good nodulation. Inoculation is especially important when seeding legumes in soils where they have not been grown for several years. Because not all legume species are colonized by the same strains of nitrogen-fixing bacteria, be sure to purchase the proper type of inoculum for the legume to be planted. Verify the inoculant expiration date and make sure it was stored in a cool, dry place. Seed suppliers may distribute pre-inoculated seed, check the expiration date and reinoculate if necessary. The seed should be slightly damp and sticky before adding the inoculant. This can be accomplished with a syrup/water mixture, a commercial sticker solution or soft drink. Protect inoculants and inoculated seed from sun and heat as much as possible and plant soon after inoculation.

## Forage and Biomass Planting (512) and Contour Buffer Strip (322):

Forage grass, legume and forb performance varies depending on environmental conditions. No single forage type or variety is best in all environments. The adaptation of a species is determined greatly by its tolerance to the site, soil, and use. When selecting a forage species, or several species for use in a seed mixture, first consider their appropriateness for the intended use (pasture, hay, etc.). Other factors that affect the suitability of a forage species are soil drainage, nutrient requirements, harvest intensity, and planned utilization (harvest vs grazed). Review tables 10 and 11 to determine appropriate forage species to include in the planned planting. Review Table 12 for a listing of perennial forage species to different soil fertility classes and methods of utilization.

When planning Ohio CPS Forage and Biomass Planting (512) or Contour Buffer Strip (322) planting dates and seeding rates will be in accordance with Table 13. Use proportional seeding rates to determine the correct rate of each component of the mixture. Any combination of species can be used if it meets the needs of the plan, is well suited to the site, is well suited to the intended use and has a proportional seeding rate of at least 100%. When inter-seeding legumes into an existing grass stand use a proportional seeding rate of at least 50%. Also note that all seeding rates listed in table 13 are pure live seed rates (PLS) and must be corrected for seed quality before implementing. Also, note that seeding rates are to be increased by 20% if the method of seeding does not result in good soil seed contact. For example, if the planned method involves a broadcast seeding with no additional activities to improve soil seed contact increase the PLS by 20%.



**Table 10: Agronomic Adaptation and Characteristics of Grasses and Legumes.**  
(Source OSU Bulletin 472 - Ohio Agronomy Guide 15th Edition)

Plant Species	Minimum Adequate Drainage <sup>1</sup>	Tolerance to pH < 6.0	Adequate Soil Fertility	Drought Tolerance	Persistence	Seedling Vigor
<b>Cool-Season Growth</b>						
<b>Non-Legumes</b>						
<b>Fescue, Tall<sup>2,3</sup></b>	SPD	High	Medium	Medium	High	High
<b>Festulolium</b>	SPD	Medium	Medium to High	Low	Low	Very High
<b>Garrison Creeping Foxtail</b>	VPD	High	Medium to High	High	High	Low
<b>Kentucky Bluegrass</b>	SPD	Medium	Medium	Low	High	Low
<b>Meadow Fescue</b>	PD	Medium	Low to Medium	Medium	High	Medium
<b>Orchardgrass</b>	SPD	Medium	Medium	Medium	Medium	High
<b>Perennial Ryegrass</b>	SPD	Medium	Medium to High	Low	Low	Very High
<b>Reed Canarygrass<sup>2,3</sup></b>	VPD	High	Medium to High	High	High	Low
<b>Smooth Bromegrass</b>	MWD	Medium	High	High	High	Medium
<b>Timothy</b>	SPD	Medium	Medium	Low	High	Low
<b>Forage Chicory</b>	MWD	Medium	Medium to High	High	Medium	High
<b>Legumes</b>						
<b>Alfalfa</b>	WD	Low	Medium to High	High	High	High
<b>Alsike Clover</b>	PD	High	Low to Medium	Low	Low	Low
<b>Birdsfoot Trefoil</b>	SPD	High	Medium	Medium	Medium	Low
<b>Kura Clover</b>	PD	Medium	Medium	Medium	High	Low
<b>Red Clover</b>	SPD	Medium	Medium	Medium	Low	High
<b>White Clover, Ladino</b>	PD	Medium	Medium	Low	High	Low
<b>White Clover, Dutch</b>	PD	Medium	Medium	Low	High	Low
<b>Warm-Season Growth</b>						
<b>Non-Legumes</b>						
<b>Big Bluestem</b>	MWD	High	Low to Medium	Excellent	High	Very Low
<b>Little Bluestem</b>	MWD	High	Low to Medium	Excellent	High	Very Low
<b>Caucasian Bluestem</b>	MWD	High	Low to Medium	Excellent	High	Very Low
<b>Eastern Gamagrass</b>	PD	High	Low to Medium	Excellent	High	Very Low
<b>Indiangrass</b>	MWD	High	Low to Medium	Excellent	High	Very Low
<b>Switchgrass</b>	SPD	High	Low to Medium	High	High	Very Low
<b>Legumes</b>						
<b>Lespedeza, Sericea<sup>2</sup></b>	SPD	High	Low to Medium	High	High	Medium

1. Minimum drainage required for acceptable growth:  
WD = well drained; MWD = moderately well drained; SPD = somewhat poorly drained; PD = poorly drained;  
VPD = very poorly drained.
2. Invasive without proper management.
3. Consider planting low alkaloid varieties or endophyte free or endophyte friendly varieties.

**Table 11: Suitability of Perennial Forages to Different Management and Growth Characteristics. (Source OSU Bulletin 472 - Ohio Agronomy Guide 15th Edition)**

Plant Species	Frequent, Close Grazing <sup>1</sup>	Rotational Grazing <sup>1</sup>	Stored Feed <sup>1</sup>	Periods of Primary Production	Growth Habit
<b>Cool-Season Growth</b>					
Non-Legumes					
Fescue, Tall <sup>2,3</sup>	NR	HS	HS	Spring, Summer, Fall	Variable <sup>4</sup>
Festulolium	NR	HS	HS	Spring, Early Summer, Fall	Bunch
Garrison Creeping Foxtail	S	HS	HS	Spring, Summer, Fall	Open sod
Kentucky Bluegrass	HS	HS	S	Early Spring, Late Fall	Dense Sod
Meadow Fescue	NR	HS	HS	Early Spring & Late Fall	Bunch
Orchardgrass	NR	HS	HS	Spring, Summer, Fall	Bunch
Perennial Ryegrass	NR	HS	S	Spring & Fall	Bunch
Reed Canarygrass <sup>2,3</sup>	NR	HS	HS	Spring, Summer, Fall	Open sod
Smooth Bromegrass	NR	S	HS	Spring, Summer, Fall	Open sod
Timothy	NR	S	HS	Late Spring & Fall	Bunch
Forage Chicory	NR	HS	NR	Spring & Summer	Bunch
Legumes					
Alfalfa	NR	S	HS	Spring, Summer, Early Fall	Bunch
Alsike Clover	NR	S	S	Spring, Early Summer, Fall	Spreading
Birdsfoot Trefoil	NR	HS	HS	Spring, Summer, Early Fall	Low Bunch
Kura Clover	S	HS	NR	Spring, Early Summer, Early Fall	Spreading
Red Clover	NR	S	NR	Spring, Summer, Early Fall	Bunch
White Clover, Ladino	NR	HS	S	Spring, Early Summer, Fall	Spreading
White Clover, Dutch	HS	HS	NR	Spring, Fall	Spreading
<b>Warm-Season Growth</b>					
Non-Legumes					
Big Bluestem	NR	HS	HS	Summer	Bunch
Little Bluestem	NR	HS	HS	Summer	Bunch
Caucasian Bluestem	NR	S	S	Summer	Bunch
Eastern Gamagrass	NR	HS	S	Summer	Bunch
Indiangrass	NR	HS	HS	Summer	Bunch
Switchgrass	NR	HS	HS	Summer	Bunch
Legumes					
Lespedeza, Sericea <sup>2</sup>	S	HS	S	Summer	Bunch

1. Relative suitability      HS=highly suitable      S= suitable      NR=not recommended
2. Invasive without proper management
3. Consider planting low alkaloid varieties or endophyte free or endophyte friendly varieties
4. Under lax cutting, tall fescue has bunchy growth; under frequent cutting or grazing, it forms a sod.

**Table 12: Suitability of Perennial Forage Species to Different Soil Fertility Classes and Methods of Utilization.**  
 (Source OSU Bulletin 472 - Ohio Agronomy Guide 15th Edition)

### Medium to High Fertility Soils, for Hay and Silage

Legume	Alfalfa, Birdsfoot Trefoil, Red Clover
CSG <sup>1</sup>	Festulolium, Meadow Fescue, Orchardgrass, Perennial Ryegrass, Reed Canarygrass, Smooth Brome, Tall Fescue, Timothy
WSG <sup>2</sup>	Switchgrass, Big Bluestem, Indiangrass

### Medium to High Fertility Soils, for Pasture Production

Legume	Alfalfa, Alsike Clover, Birdsfoot Trefoil, Red Clover, White Clover
CSG	Festulolium, Kentucky Bluegrass, Meadow Fescue, Orchardgrass, Perennial Ryegrass, Reed Canarygrass, Smooth Bromegrass, Tall Fescue, Timothy
WSG	Switchgrass, Big Bluestem, Indiangrass, Eastern Gamagrass

### Low to Medium Soils, for Hay and Silage

Legume	Red Clover, Alsike Clover, Birdsfoot Trefoil
CSG	Meadow Fescue, Orchardgrass, Tall Fescue, Timothy
WSG	Switchgrass, Big Bluestem, Indiangrass

### Low to Medium Fertility Soils, for Pasture Production

Legume	Alsike Clover, Birdsfoot Trefoil, White Clover
CSG	Kentucky Bluegrass, Meadow Fescue, Orchardgrass, Tall Fescue
WSG	Switchgrass, Big Bluestem, Indiangrass

1 CSG = Cool Season Grass

2 WSG = Warm Season Grass



**Table 13. Forage and Biomass Planting (512) and Contour Buffer Strip (322) seeding dates, seeding rates and seeding depths.**

Plant Species	Pure Live Seeding Rate (lb/ac)					Seeding depth (in) <sup>1</sup>	Seeding Dates <sup>2</sup>	
	Pure Stand	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$		Northern	Southern
<b>Cool Season Growth<sup>3</sup></b>								
<b>Non-Legumes</b>								
<b>Fescue, Tall</b> <sup>5,6</sup> <i>(Lolium arundinaceum)</i>	15	11	8	5	4	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-15	3-1 to 4-20 or 8-1 to 9-15
<b>Festulolium</b> <i>(x Festulolium Asch. &amp; Graebn)</i>	25	19	13	8	6	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-15	3-1 to 4-20 or 8-1 to 9-15
<b>Garrison Creeping Foxtail</b> <i>(Alopecurus arundinaceu)</i>	6	5	3	2	1.5	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-15	3-1 to 4-20 or 8-1 to 9-15
<b>Kentucky Bluegrass</b> <i>(Poa pratensis)</i>	10	7.5	5	3.3	2.5	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-15	3-1 to 4-20 or 8-1 to 9-15
<b>Meadow Fescue</b> <i>(Schedonorus pratensis)</i>	16	12	8	5	4	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-15	3-1 to 4-20 or 8-1 to 9-15
<b>Orchardgrass</b> <i>(Dactylis glomerate)</i>	10	7.5	5	3.3	2.5	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-15	3-1 to 4-20 or 8-1 to 9-15
<b>Perennial Ryegrass</b> <i>(Lolium perenne L.)</i>	24	18	12	8	6	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-15	3-1 to 4-20 or 8-1 to 9-15
<b>Reed Canarygrass</b> <sup>5,6</sup> <i>(Phalaris arundinacea)</i>	10	7.5	5	3.3	2.5	$\frac{1}{4}$ in	3-15 to 5-1	3-1 to 4-20
<b>Smooth Bromegrass</b> <i>(Bromus inermis)</i>	16	12	8	5	4	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-25	3-1 to 4-20 or 8-1 to 9-25
<b>Timothy</b> <i>(Phleum pretense)</i>	8	6	4	3	2	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-15	3-1 to 4-20 or 8-1 to 9-15
<b>Forage Chicory</b> <i>(Cichorium intybus)</i>	6	5	3	2	1.5	$\frac{1}{4}$ in	4-1 to 5-1 to 8-1 to 8-20	3-15 to 4-20 or 8-1 to 8-30

Plant Species	Pure Live Seeding Rate (lb/ac)					Seeding depth (in) <sup>1</sup>	Seeding Dates <sup>2</sup>	
	Pure Stand	¾	½	⅓	¼		Northern	Southern
<b>Legumes</b>								
<b>Alfalfa</b> <i>(Medicago sativa)</i>	15	11	7	5	4	¼ in	4-1 to 5-1 or 8-1 to 8-15	3-20 to 4-25 or 8-1 to 8-30
<b>Alsike Clover</b> <i>(Trifolium hybridum)</i>	9	7	4.5	3	2	¼ in	2-1 to 5-1 or 7-20 to 8-30	2-1 to 4-25 or 8-1 to 9-15
<b>Birdsfoot trefoil</b> <i>(Lotus corniculatus)</i>	9	7	4.5	3	2	¼ in	4-1 to 5-1	3-20 to 4-25
<b>Kura clover</b> <i>(Trifolium ambiguum)</i>	6	4.5	3	2	1.5	¼ in	4-1 to 5-1	3-20 to 4-25
<b>Red Clover</b> <i>(Trifolium pretense)</i>	11	8	5	4	3	¼ in	2-1 to 5-1 or 7-20 to 8-30	2-1 to 4-25 or 8-1 to 9-15
<b>White Clover, Ladino</b> <i>(Trifolium repens)</i>	5	4	2.5	1.5	1	¼ in	2-1 to 5-1 or 7-20 to 8-30	2-1 to 4-25 or 8-1 to 9-15
<b>White Clover, Dutch</b> <i>(Trifolium repens)</i>	5	4	2.5	1.5	1	¼ in	2-1 to 5-1 or 7-20 to 8-30	2-1 to 4-25 or 8-1 to 9-15
<b>Warm Season Growth<sup>4</sup></b>								
<b>Non-Legumes</b>								
<b>Big Bluestem</b> ( <i>Andropogon gerardii</i> )	12	9	6	4	3	¼ in	4-1 to 6-1	4-1 to 6-1
<b>Little Bluestem</b> ( <i>Schizachyrium scoparium</i> )	10	7.5	5	3.3	2.5	¼ in	4-1 to 6-1	4-1 to 6-1
<b>Caucasian bluestem</b> ( <i>Bothriochloa bladhii</i> )	2	1.5	1	0.7	0.5	¼ in	4-1 to 6-1	4-1 to 6-1
<b>Eastern Gamagrass</b> ( <i>Tripsacum dactyloides</i> )	9	7	4.5	3	2	½ in	4-1 to 6-1	4-1 to 6-1
<b>Indiangrass</b> ( <i>Sorghastrum nutans</i> )	12	9	6	4	3	¼ in	4-1 to 6-1	4-1 to 6-1
<b>Switchgrass</b> ( <i>Panicum virgatum</i> )	9	7	4.5	3	2	¼ in	4-1 to 6-1	4-1 to 6-1
<b>Legumes</b>								
<b>Lespedeza, sericea</b> ( <i>Lespedeza cuneate</i> )	20	15	10	6.7	5	¼ in	4-1 to 6-1	4-1 to 6-1

Plant Species	Pure Live Seeding Rate (lb/ac)					Seeding depth (in) <sup>1</sup>	Seeding Dates <sup>2</sup>	
	Pure Stand	¾	½	⅓	¼		Northern	Southern
<b>Annuals</b>								
<b>Non-Legumes</b>								
<b>Annual Rye Grass</b> <i>(Lolium multiflorum)</i>	24	18	12	8	6	½ in	8-1 to 9-20 or 3-15 to 5-1	8-1 to 9-30 or 3-1 to 4-20
<b>Oats</b> <i>(Avena sativa)</i>	87	65	44	29	22	1 in	8-1 to 9-20 or 3-15 to 4-30	8-1 to 9-30 or 3-1 to 4-15
<b>Spelt</b> <i>(Triticum aestivum var. spelta)</i>	109	82	55	36	27	1 in	9-22 to 10-22	9-30 to 11-1
<b>Winter Rye</b> <i>(Secale cereale)</i>	109	82	55	36	27	1 in	8-1 to 11-1	8-15 to 11-15
<b>Winter Triticale</b> ( <i>× Triticosecale</i> )	109	82	55	36	27	1 in	9-22 to 10-22	9-30 to 11-1
<b>Winter Wheat</b> <i>(Triticum aestivum)</i> <sup>7</sup>	109	82	55	36	27	1 in	9-22 to 10-22	9-30 to 11-1
<b>Rapeseed/Canola/Kale</b> <i>(Brassica napus)</i>	7	NR	NR	NR	NR	¼ in	8-1 to 9-15 or 3-15 to 4-30	8-15 to 9-30 or 3-1 to 4-15
<b>Radish</b> <i>(Raphanus sativus)</i>	11	NR	NR	NR	NR	¼ in	8-1 to 9-15 or 3-15 to 4-30	8-15 to 9-30 or 3-1 to 4-15
<b>Turnip</b> <i>(Brassica rapa)</i>	7	NR	NR	NR	NR	¼ in	8-1 to 9-15 or 3-15 to 4-30	8-15 to 9-30 or 3-1 to 4-15
<b>Pearl Millet</b> <i>(Pennisetum Glaucum)</i>	20	NR	NR	NR	NR	¼ in	5-15 to 7-20	5-1 to 7-30
<b>Japanese Millet</b> <i>(Echinochloa frumentacea)</i>	24	NR	NR	NR	NR	¼ in	5-15 to 7-20	5-1 to 7-30
<b>Sorghum, Forage</b> <i>(Sorghum moench)</i>	12	NR	NR	NR	NR	¼ in	5-15 to 7-20	5-1 to 7-30
<b>Sorghum-Sudangrass</b> <i>(Sorghum bicolor x S. Sudanese)</i>	30	NR	NR	NR	NR	¼ in	5-15 to 7-20	5-1 to 7-30
<b>Sudangrass</b> <i>(Sorghum bicolor)</i>	22	NR	NR	NR	NR	¼ in	5-15 to 7-20	5-1 to 7-30

1. Planting depth is critical for successful establishment. Many failures result from planting too deeply.
2. Northern Ohio = Generally North of I70 - Southern Ohio = South of I70
3. For cool season species dormant seeding can be planned between Dec 1 to Mar 14; interceding clovers into existing grass stands are recommended from Feb to early Mar.
4. For warm season species dormant seeding can be planned between Nov 1 to Mar 14.
5. Invasive without proper management.
6. Consider planting low alkaloid varieties or endophyte free or endophyte friendly varieties.
7. Do not plant until after the Hessian fly free date: Varies from Sept 22 in Northern Ohio to Oct 5 in Southern Ohio. See the Ohio Agronomy Guide for specific date.

## Conservation Cover (327) and Field Borders (386):

When planning to implement conservation practices to establish permanent vegetation to address erosion concerns, consider that grass, legume and forb performance varies depending on environmental conditions. No single plant is best in all environments.

The adaptation of a species is determined greatly by its tolerance to the site, and soil.

When selecting several species for use in a seed mixture, consider their appropriateness for soil drainage, nutrient requirement, and level of management.

When seeding Conservation Cover (327) or Field Borders (386) to land where erosion is the primary concern (EI>8, escarpment areas or HEL) be sure to use at least one sod forming grass such as Kentucky Bluegrass or Red Top in the seeding mix.

When planning Ohio CPS Conservation Cover (327) or Field Borders (386), planting dates and seeding rates will be in accordance with Table 14 if the purpose is soil erosion. If purposes include wildlife habitat development use tables included in Appendix A (Wildlife Habitat Enhancement). Use proportional seeding rates to determine the correct rate of each component of the mixture. Any combination of species can be used if it meets the needs of the plan, is well suited to the site, and has a proportional seeding rate of at least 100%. All seeding rates listed in table 14 are pure live seed rates (PLS) and must be corrected for seed quality before implementing. Also, note that seeding rates are to be increased by 20% if the method of seeding does not result in good soil seed contact. For example, if the planned method involves a broadcast seeding with no additional activities to improve soil seed contact increase the PLS by 20%.



**Table 14. Conservation Cover (327) and Field Borders (386) seeding dates, seeding rates and seeding depths when erosion is the primary concern.**

Plant Species <sup>1</sup>	Pure Live Seeding Rate (lb/ac)					Seeding depth (in) <sup>3</sup>	Seeding Dates <sup>4,5</sup>	
	Pure Stand	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$ <sup>2</sup>		Northern	Southern
<b>Non-Legumes</b>								
<b>Garrison Creeping Foxtail</b> <i>(Alopecurus arundinaceu)</i>	NR <sup>6</sup>	5	3	2	1.5	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-15	3-1 to 4-20 or 8-1 to 9-15
<b>Kentucky Bluegrass</b> <i>(Poa pratensis)</i>	NR	7.5	5	3.3	2.5	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-15	3-1 to 4-20 or 8-1 to 9-15
<b>Orchardgrass</b> <i>(Dactylis glomerate)</i>	NR	7.5	5	3.3	2.5	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-15	3-1 to 4-20 or 8-1 to 9-15
<b>Perennial Ryegrass</b> <i>(Lolium perenne L.)</i>	NR	18	12	8	6	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-15	3-1 to 4-20 or 8-1 to 9-15
<b>Red Top</b> <i>(Agrostis gigantean)</i>	NR	3	2	1.5	1	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-15	3-1 to 4-20 or 8-1 to 9-15
<b>Timothy</b> <i>(Phleum pretense)</i>	NR	4.5	3	2	1.5	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-15	3-1 to 4-20 or 8-1 to 9-15
<b>Canada Wild Rye</b> <i>(Elymus canadensis)</i>	NR	3.8	2.5	1.7	1.2	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-15	3-1 to 4-20 or 8-1 to 9-15
<b>Virginia Wild Rye</b> <i>(Elymus virginicus)</i>	NR	3.8	2.5	1.7	1.2	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-15	3-1 to 4-20 or 8-1 to 9-15
<b>Big Bluestem</b> <i>(Andropogon gerardii)</i>	NR	9	6	4	3	$\frac{1}{4}$ in	4-1 to 6-1	4-1 to 6-1
<b>Little Bluestem</b> <i>(Schizachyrium scoparium)</i>	NR	5.3	3.5	2.3	1.8	$\frac{1}{4}$ in	4-1 to 6-1	4-1 to 6-1
<b>Eastern Gamagrass</b> <i>(Tripsacum dactyloides)</i>	NR	7	4.5	3	2	$\frac{1}{2}$ in	4-1 to 6-1	4-1 to 6-1
<b>Indiangrass</b> <i>(Sorghastrum nutans)</i>	NR	7.5	5	3.5	2.5	$\frac{1}{4}$ in	4-1 to 6-1	4-1 to 6-1
<b>Switchgrass</b> <i>(Panicum virgatum)</i>	NR	3.8	2.5	1.7	1.2	$\frac{1}{4}$ in	4-1 to 6-1	4-1 to 6-1
<b>Sideoats Grama</b> <i>(Bouteloua curtipendula)</i>	NR	7	4.5	2.3	1.8	$\frac{1}{4}$ in	4-1 to 6-1	4-1 to 6-1

Plant Species <sup>1</sup>	Pure Live Seeding Rate (lb/ac)					Seeding depth (in) <sup>3</sup>	Seeding Dates <sup>4, 5</sup>	
	Pure Stand	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$ <sup>2</sup>		Northern	Southern
<b>Legumes</b>								
<b>Alfalfa</b> ( <i>Medicago sativa</i> )	NR	NR	4	2.5	2	$\frac{1}{4}$ in	4-1 to 5-1 or 8-1 to 8-15	3-20 to 4-25 or 8-1 to 8-30
<b>Alsike Clover</b> ( <i>Trifolium hybridum</i> )	NR	NR	2.3	1.5	1	$\frac{1}{4}$ in	2-1 to 5-1 or 7-20 to 8-30	2-1 to 4-25 or 8-1 to 9-15
<b>Winter Pea</b> ( <i>Pisum sativum</i> )	NR	NR	20	13	10	1 to 1 $\frac{1}{2}$ in	3-10 to 4-30 or 8-1 to 9-15	3-1 to 4-20 or 8-1 to 10-1
<b>Birdsfoot Trefoil</b> ( <i>Lotus corniculatus</i> )	NR	NR	3	2	1.5	$\frac{1}{4}$ in	4-1 to 5-1	3-20 to 4-25
<b>Crimson Clover</b> ( <i>Trifolium incarnatum</i> )	NR	NR	7.5	5	4	$\frac{1}{4}$ in	6-15 to 9-15	6-1 to 9-30
<b>Korean Clover</b> ( <i>Kummerowia stipulacea</i> )	NR	NR	7.5	5	4	$\frac{1}{4}$ in	4-1 to 5-1	3-20 to 4-25
<b>Kura Clover</b> ( <i>Trifolium ambiguum</i> )	NR	NR	3	2	1.5	$\frac{1}{4}$ in	4-1 to 5-1	3-20 to 4-25
<b>Red Clover</b> ( <i>Trifolium pratense</i> )	NR	NR	4	2.5	2	$\frac{1}{4}$ in	2-1 to 5-1 or 7-20 to 8-30	2-1 to 4-25 or 8-1 to 9-15
<b>White Clover, Ladino</b> ( <i>Trifolium repens</i> )	NR	NR	1.5	1	.75	$\frac{1}{4}$ in	2-1 to 5-1 or 7-20 to 8-30	2-1 to 4-25 or 8-1 to 9-15

1. When seeding conservation cover to land where erosion is the primary concern (EI>8, escarpment areas or HEL) be sure to use at least one sod forming grass such as Kentucky Bluegrass or Red Top in the seeding mix.
2. Do not seed below  $\frac{1}{4}$  rate.
3. Planting depth is critical for successful establishment. Many failures result from planting too deeply.
4. Northern Ohio = Generally North of I70 - Southern Ohio = South of I70
5. For cool season species dormant seeding can be planned between Dec 1 to Mar 14. For warm season species dormant seeding can be planned between Nov 1 to Mar 14.
6. NR=not recommended.

## Critical Area Planting (342):

Critical area planting (342) is used to establish permanent vegetation on sites that have, or are expected to have, high erosion rates, and on sites that have conditions that prevent the establishment of vegetation with normal seeding/planting methods. To overcome these difficulties seeding rates are increased by 5 to 10 times the rate of a more typical seeding. When planning Ohio CPS Critical Area Planting (342) or Critical Area Planting (342) associated with Grassed Waterway (412) planting dates and seeding rates will be in accordance with Table 15. Small variations within the seeding rates listed within the planned mix are acceptable so long as the mix includes all the listed species and the total proportion of the seed mixture is 100% or more. All seeding rates listed in table 15 are pure live seed rates (PLS) and must be corrected for seed quality before implementing. Also, note that seeding rates are to be increased by 20% if the method of seeding does not result in good soil seed contact. For example, if the planned method involves a broadcast seeding with no additional activities to improve soil seed contact increase the PLS by 20%.



**Table 15. Critical Area Planting (342) including Critical Area Planting associated with Grassed Waterway (412) seeding dates and seeding rates.**

Plant Species	Pure Live Seeding Rate (lb/ac)	Percentage of the Mix	Seeding Dates <sup>1</sup>		
			Northern	Southern	Dormant Seeding
<b>Mix 1: Multipurpose AgLand</b>					
Turf Type Fescue	40	47	3-15 to 5-31 or 8-1 to 9-15	3-15 to 5-31 or 8-1 to 9-15	12-1 to 3-14
Kentucky Bluegrass	20	23			
Perennial Ryegrass	25	30			
<i>85 (lb/ac) total PLS rate</i>					
<b>Mix 2: Next to Residential Area, Low Retardance, Quick Cover</b>					
Kentucky Bluegrass	15	41	3-15 to 5-31 or 8-1 to 9-15	3-15 to 5-31 or 8-1 to 9-15	12-1 to 3-14
Creeping Red Fescue	16.5	27			
Annual Ryegrass	1.5	2			
Perennial Ryegrass	19	30			
<i>52 (lb/ac) total PLS rate</i>					
<b>Mix 3: Wildlife Secondary Land Use</b>					
Kentucky Bluegrass	11	18	3-15 to 5-31 or 8-1 to 9-15	3-15 to 5-31 or 8-1 to 9-15	12-1 to 3-14
Orchardgrass	22.5	37			
Annual Ryegrass	1.5	10			
Perennial Ryegrass	19	31			
Red Clover	2	4			
<i>56 (lb/ac) total PLS rate</i>					
<b>Mix 4: Multipurpose AgLand</b>					
Tall Fescue	40	47	3-15 to 5-31 or 8-1 to 9-15	3-15 to 5-31 or 8-1 to 9-15	12-1 to 3-14
Kentucky Bluegrass	20	23			
Perennial Ryegrass	25	30			
<i>85 (lb/ac) total PLS rate</i>					
<b>Temporary Seeding Options <sup>2</sup></b>					
Oats	128	100	3-1 to 8/1		
Oats + Sudangrass	64 40	50 50	6/1 to 8/1		
Cereal Rye	50-100	100	3/1 to 11/1		

1. Seeding of perennials may be considered from Jun 1 thru Jul 31 if the area is mulched with an erosion control blanket; timely watering may be needed during this period. Seedings may also be considered between Sep 16 and Oct 15 if an additional 30 lb/ac of cereal rye and mulching with an erosion control blanket. Both periods however are considered “outside the seeding window” and will need to be evaluated for adequate establishment prior to final approval. Seeding between Oct 15 and Dec 1 is not recommended.
2. Temporary seeding should be considered when a site is in the need of protection outside the seeding window.



## **Filter Strip (393), Vegetative Barriers (601), Vegetative Treatment Area (635), Cross Wind Trap Strips (589c) and Herbaceous Wind Barriers (603):**

Filter Strip (393), Vegetative Barriers (601), Vegetative Treatment Area (635), Cross Wind Trap Strips (589c) and Herbaceous Wind Barriers (603) are conservation practices designed to trap and/or treat soil and other compounds from leaving the field. Grass and legume performance vary depending on environmental conditions. No single plant is best in all environments. The adaptation of a species is determined greatly by its tolerance to the site, and soil. When selecting several species for use in a seed mixture, consider their appropriateness for soil drainage, and level of management. When planning any of the practices listed above use planting dates and seeding rates in accordance with Table 16. Use proportional seeding rates to determine the correct rate of each component of the mixture. Any combination of species can be used if it meets the needs of the plan, is well suited to the site, and has a proportional seeding rate of at least 100%. All seeding rates listed in table 16 are pure live seed rates (PLS) and must be corrected for seed quality before implementing. Also, note that seeding rates are to be increased by 20% if the method of seeding does not result in good soil seed contact. For example, if the planned method involves a broadcast seeding with no additional activities to improve soil seed contact increase the PLS by 20%.



**Table 16. Filter Strip (393), Vegetative Barriers (601), Vegetative Treatment Area (635), Cross Wind Trap Strips (589c) and Herbaceous Wind Barriers (603) seeding dates and seeding rates.**

Plant Species	Pure Live Seeding Rate (lb/ac)					Seeding depth (in) <sup>2</sup>	Seeding Dates <sup>3,4</sup>	
	Pure Stand	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$ <sup>1</sup>		Northern	Southern
<b>Non-Legumes</b>								
<b>Fescue, Tall</b> <sup>5,6,8</sup> <i>(Lolium arundinaceum)</i>	15	11	8	5	4	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-15	3-1 to 4-20 or 8-1 to 9-15
<b>Festulolium</b> <sup>7</sup> <i>(xFestulolium Asch. &amp; Graebn)</i>	25	19	13	8	6	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-15	3-1 to 4-20 or 8-1 to 9-15
<b>Garrison Creeping Foxtail</b> <sup>8</sup> <i>(Alopecurus arundinaceu)</i>	NR <sup>6</sup>	5	3	2	1.5	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-15	3-1 to 4-20 or 8-1 to 9-15
<b>Kentucky Bluegrass</b> <sup>7</sup> <i>(Poa pratensis)</i>	NR	7.5	5	3.3	2.5	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-15	3-1 to 4-20 or 8-1 to 9-15
<b>Orchardgrass</b> <i>(Dactylis glomerate)</i>	NR	7.5	5	3.3	2.5	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-15	3-1 to 4-20 or 8-1 to 9-15
<b>Perennial Ryegrass</b> <sup>7</sup> <i>(Lolium perenne L.)</i>	NR	18	12	8	6	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-15	3-1 to 4-20 or 8-1 to 9-15
<b>Reed Canarygrass</b> <sup>5,6,8</sup> <i>(Phalaris arundinacea)</i>	10	7.5	5	3.3	2.5	$\frac{1}{4}$ in	3-15 to 5-1	3-1 to 4-20
<b>Smooth Bromegrass</b> <i>(Bromus inermis)</i>	16	12	8	5	4	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-25	3-1 to 4-20 or 8-1 to 9-25
<b>Timothy</b> <i>(Phleum pretense)</i>	NR	4.5	3	2	1.5	$\frac{1}{4}$ in	3-15 to 5-1 or 8-1 to 9-15	3-1 to 4-20 or 8-1 to 9-15
<b>Big Bluestem</b> ( <i>Andropogon gerardii</i> )	NR	9	6	4	3	$\frac{1}{4}$ in	4-1 to 6-1	4-1 to 6-1
<b>Little Bluestem</b> ( <i>Schizachyrium scoparium</i> )	NR	5.3	3.5	2.3	1.8	$\frac{1}{4}$ in	4-1 to 6-1	4-1 to 6-1
<b>Eastern Gamagrass</b> <sup>8</sup> ( <i>Tripsacum dactyloides</i> )	NR	7	4.5	3	2	$\frac{1}{2}$ in	4-1 to 6-1	4-1 to 6-1
<b>Indiangrass</b> ( <i>Sorghastrum nutans</i> )	NR	7.5	5	3.5	2.5	$\frac{1}{4}$ in	4-1 to 6-1	4-1 to 6-1
<b>Switchgrass</b> <sup>8</sup> ( <i>Panicum virgatum</i> )	NR	3.8	2.5	1.7	1.2	$\frac{1}{4}$ in	4-1 to 6-1	4-1 to 6-1

Plant Species	Pure Live Seeding Rate (lb/ac)					Seeding depth (in) <sup>2</sup>	Seeding Dates <sup>3,4</sup>	
	Pure Stand	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$ <sup>1</sup>		Northern	Southern
<b>Legumes</b>								
<b>Alfalfa</b> <i>(Medicago sativa)</i>	NR	NR	8	5	4	$\frac{1}{4}$ in	4-1 to 5-1 or 8-1 to 8-15	3-20 to 4-25 or 8-1 to 8-30
<b>Alsike Clover</b> <i>(Trifolium hybridum)</i>	NR	NR	5	3	2	$\frac{1}{4}$ in	2-1 to 5-1 or 7-20 to 8-30	2-1 to 4-25 or 8-1 to 9-15
<b>Red Clover</b> <i>(Trifolium pretense)</i>	NR	NR	6	4	3	$\frac{1}{4}$ in	2-1 to 5-1 or 7-20 to 8-30	2-1 to 4-25 or 8-1 to 9-15
<b>White Clover, Ladino</b> <i>(Trifolium repens)</i>	NR	NR	3	2	1	$\frac{1}{4}$ in	2-1 to 5-1 or 7-20 to 8-30	2-1 to 4-25 or 8-1 to 9-15
<b>White Clover, Dutch</b> <i>(Trifolium repens)</i>	NR	NR	3	2	1	$\frac{1}{4}$ in	2-1 to 5-1 or 7-20 to 8-30	2-1 to 4-25 or 8-1 to 9-15

1. Do not seed below  $\frac{1}{4}$  rate.
2. Planting depth is critical for successful establishment. Many failures result from planting too deeply.
3. Northern Ohio = Generally North of I70 - Southern Ohio = South of I70
4. For cool season species dormant seeding can be planned between Dec 1 to Mar 14. For warm season species dormant seeding can be planned between Nov 1 to Mar 14.
5. Invasive without proper management.
6. Consider planting low alkaloid varieties or endophyte free or endophyte friendly varieties.
7. Should only be used in mixes with 3 or more grasses.
8. Tolerates wet conditions, and well suited for Vegetative Treatment Area (635).

## Mulching (484):

Mulching (484) is often used in combination with practices that are establishing herbaceous vegetation. Protecting soils subject to erosion, improving soil moisture and improving plant productivity are all conservation objectives that can be achieved with mulching. Applying the correct rate with the needed anchoring can be critical to establishing herbaceous vegetation. Table 17 provides general information that should be used when using Mulching (484) associated with establishing herbaceous vegetation on land subject to erosion during stand establishment.

**Table 17: Mulching (484) associated with establishing herbaceous vegetation on land subject to erosion.**

Erosion Potential <sup>1</sup>	Moisture Conservation Need <sup>2</sup>	Mulching Material	Application Rate		% Cover	Anchoring Methods
			Per 1000ft <sup>2</sup>	Per Acre		
Slight	Normal	Grass Hay or Cereal Grain Straw	85-95 lbs 2-3 bales	1.75-2 tons 90-100 bales	70-80	<ul style="list-style-type: none"> <li>• Mulch anchoring tool</li> <li>• Disk</li> <li>• Wood cellulose fiber</li> <li>• Asphalt spray</li> <li>• Tackifiers</li> <li>• Polypropylene plastic netting.</li> </ul>
High	Normal		100-120 lbs 3-4 bales	2-2.5 tons 100-125 bales	80-90	
High	High		130-150 lbs 4-5 bales	2.75-3 tons 130-150 bales	95-100	

1. Erosion potential is slight if slope is less than 6% and in non-concentrated flow areas; high if slope is greater than 6% or in concentrated flow areas.
2. Moisture conservation need is normal if planting is well within the normal planting dates; high if outside or near the planting date window.

## Nurse Crops:

A nurse crop is an annual crop used to assist in establishment of a perennial crop. The widest use of nurse crops is in the establishment of legumes such as alfalfa, or clover. Occasionally nurse crops are used for establishment of perennial grasses. Consider using nurse crops when implementing any of the herbaceous vegetative establishing conservation practices and an additional fast-growing annual will benefit the resource being treated. Nurse crops can reduce weed pressure, reduce erosion, and reduce sunlight from reaching tender seedlings. The nurse crop should be planted at the same time and the same planting depth as the perennial crop. The nurse crop should be harvested for grain, straw, hay, grazed or mowed after the perennial crop is established and no longer benefits from its protection. See table below (Table 18) for a listing of possible nurse crops, rates and planting dates used in Ohio.

**Table 18: Nurse crop seeding dates and seeding rates.**

Plant Species	Seeding Rate (lb/ac)	Seeding Dates <sup>1</sup>
<b>Oats</b> ( <i>Avena sativa</i> ) <sup>2</sup>	35	Late summer, Fall and Spring
<b>Winter Triticale</b> ( <i>x Triticosecale</i> ) <sup>2</sup>	50	Fall and Spring
<b>Winter Rye</b> ( <i>Secale cereale</i> ) <sup>2</sup>	50	Late summer and Fall
<b>Pearl Millet</b> ( <i>Pennisetum Glaucum</i> ) <sup>3</sup>	10	Late Spring and Summer

1= Nurse crops are to be planted with in the seeding dates of the perennial crop

2=Use cool season annuals when planting cool season perennials

3=Use warm season annuals when planting warm season perennials



## References

- Maximizing the Value of Pasture for Horses (ID-167); Purdue University  
<https://www.agry.purdue.edu/ext/forages/publications/id-167.htm>
- Ohio NRCS Field Office Technical Guide (FOTG), Section IV, Conservation Practice Standard Conservation Cover (327), <https://efotg.sc.egov.usda.gov/#/>
- Ohio NRCS Field Office Technical Guide (FOTG), Section IV, Conservation Practice Standard Contour Buffer Strip (322), <https://efotg.sc.egov.usda.gov/#/>
- Ohio NRCS Field Office Technical Guide (FOTG), Section IV, Conservation Practice Standard Critical Area Planting (342), <https://efotg.sc.egov.usda.gov/#/>
- Ohio NRCS Field Office Technical Guide (FOTG), Section IV, Conservation Practice Standard Cross Wind Trap Strips (589c), <https://efotg.sc.egov.usda.gov/#/>
- Ohio NRCS Field Office Technical Guide (FOTG), Section IV, Conservation Practice Standard Field Border (386), <https://efotg.sc.egov.usda.gov/#/>
- Ohio NRCS Field Office Technical Guide (FOTG), Section IV, Conservation Practice Standard Filter Strip (393), <https://efotg.sc.egov.usda.gov/#/>
- Ohio NRCS Field Office Technical Guide (FOTG), Section IV, Conservation Practice Standard Forage and Biomass Planting (512), <https://efotg.sc.egov.usda.gov/#/>
- Ohio NRCS Field Office Technical Guide (FOTG), Section IV, Conservation Practice Standard Herbaceous Wind Barriers (603), <https://efotg.sc.egov.usda.gov/#/>
- Ohio NRCS Field Office Technical Guide (FOTG), Section IV, Conservation Practice Standard Riparian Herbaceous Cover (390), <https://efotg.sc.egov.usda.gov/#/>
- Ohio NRCS Field Office Technical Guide (FOTG), Section IV, Conservation Practice Standard Vegetative Barrier (601), <https://efotg.sc.egov.usda.gov/#/>
- Ohio NRCS Field Office Technical Guide (FOTG), Section IV, Conservation Practice Standard Vegetative Treatment Area (635), <https://efotg.sc.egov.usda.gov/#/>
- Ohio NRCS Field Office Technical Guide (FOTG), Section IV, Conservation Practice Standard Mulching (484), <https://efotg.sc.egov.usda.gov/#/>
- OSU Bulletin 472 - Ohio Agronomy Guide 14th Edition;  
<http://static1.1.sqspcdn.com/static/f/891472/12243214/1305569584193/OSUE+2005+Ohio+Agronomy+Guide+14th+Edition.pdf?token=f6FIZAw1fn%2F67ubY4%2FJyw3OZVnw%3D>
- USDA NRCS Plants Database website; <http://plants.usda.gov/java/>