

TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE

OKLAHOMA

NATURAL RESOURCES CONSERVATION SERVICE

PLANT MATERIALS TECHNICAL NOTE OK-21

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TO: All Offices

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This Technical Note provides guidance for planners, producers and consultants to develop vegetation planting recommendations for conservation planning in Oklahoma. This Technical Note has been developed to combine all vegetation practice specifications for species selection, varieties, seeding dates, rates, and establishment practices such as seedbed preparation, soil amendments, planting methods and management during establishment.

Conservation planting recommendations developed in accordance with this Technical Note will meet Criteria for the Oklahoma Conservation Practice Standards listed below.

- Forage and Biomass Planting (512)
- Range Planting (550)
- Critical Area Planting (342)
- All other practices which refer to those listed above.

All plant species and their varieties have been selected based upon:

- Input from Plant Materials Centers, Oklahoma State University and ARS professionals.
- Climatic conditions, such as annual rainfall, seasonal rainfall patterns, growing season length, humidity levels, 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, salinity, depth, flooding and ponding, and levels of toxic elements that may be present. Soil testing may be needed to assist with identifying and addressing adaptability concerns.
- Resistance to disease and insects common to the site or location.
- Compatibility with other species and selected cultivars as to rate of establishment and growth habit when seeded together as a mixture.
- Capability of the plant material(s) to achieve the desired purpose(s)

Tables 1 and 2 contain approved Oklahoma Planting specifications

Seedbed Preparation

Prepare seedbeds by any method that will result in a friable, smooth, firm seedbed without excessive competitive cover, herbicide residue carryover and without compaction layers (plowpan or hardpan). Refer to the Oklahoma NRCS Deep Tillage (324) standard for guidance on eliminating compaction layers. The seedbed is considered firm when you can walk on it without sinking more than ½ inch (sole of shoe).

When erosion is not a concern, conventional tillage resulting in a clean tilled, smooth seedbed can be used. Firming of the seedbed may be needed after tillage operations by rolling or cultipacking prior to planting.

Dead Litter cover crops shall be used when erosion is a concern. Refer to the Oklahoma NRCS Cover Crop (340) standard for guidance on establishing and managing cover crops for grass plantings.

Seedbeds with minimal or no tillage can be used where cover crops are needed, where erosion is of concern or to reduce evaporation in arid areas. Planting into previous crop residues (primarily wheat, rye and oats) may cause difficulty for some seedlings to establish, due to an allelopathic effect and termination at proper growth stage will be needed. Chemicals can be used without additional tillage to suppress existing vegetation and leave mulch to seed

into. If residues are heavy, remove some by grazing or baling or use shredding shortly after harvest to put more of it in contact with the soil surface to speed decomposition. Additional weed control may be required to suppress weedy competition.

Reseeding areas not previously cropped may require additional seedbed preparation to provide a smooth, firm seedbed, especially following brush management or debris removal. This does not include conversion of rangelands to pasture. If existing vegetative cover consists primarily of highly competitive and/or potentially allelopathic grasses such as silver bluestem, broomsedge bluestem, tall dropseed, sand dropseed, threeawn, fescue, or undesired introduced yellow bluestems, the area should be plowed and seeded to a noncompetitive cover for a minimum of two consecutive years prior to seeding. Refer to the Oklahoma NRCS Cover Crop (340) standard for establishing and managing noncompetitive cover crops. Prescribed burning of the vegetative cover is also a tool to prevent allelopathic problems. See the Oklahoma NRCS Prescribed Burning (338) standard.

Where existing vegetative cover is not highly competitive or when planting new compatible species into existing pastures, the existing stand may need to be weakened prior to planting. This can be accomplished by burning, herbicides, grazing, mowing or some combination of these during the growing season.

Planting Methods

Planting methods will be selected that plant to the proper depth ensuring seed or planting material will contact soil moisture uniformly and be firmed around the seed or planting material.

Native grasses and other fluffy grass seed will be seeded with a grass drill equipped with double disc or coulter furrow openers with depth bands and press wheels, cultipacker, or drag chains. Seed should be planted $\frac{1}{8}$ to $\frac{1}{2}$ inch deep.

Free flowing grass seed (i.e. wheatgrasses, fescue) can be seeded with a small grain drill with appropriate press wheels provided seeding depth and placement can be maintained. Seed should be planted $\frac{1}{8}$ to $\frac{1}{2}$ inch deep with row spacing's not to exceed 12 inches.

Legumes and species with small seed should be planted through a legume seed box or other drill equipped to handle small seeds.

Drills used to plant into cover (no-till) shall have the capability to ensure proper placement of the seed into the soil and firming of soil after placement.

Broadcast seeding will only be used in fields with prepared (tilled) seedbeds. Cultipacking, rolling, light disking with disks pulled straight, drag chains or other suitable method to insure good seed contact with soil is generally needed and preferred following broadcast seeding.

Sprigging of bermudagrass will be done with traditional sprigging equipment into a tilled seedbed. No-till sprigging is an option when erosion is of concern. Special no-till equipment will be required. Sprigs shall be place 1 - 3 inches deep with row spacing not to exceed 40 inches for pasture plantings and 24 inches for critical area plantings. Sprigs shall be well distributed in rows and not more than 18 inches apart.

Overseeding cool-season grasses or legumes into established cover will require the existing cover to be grazed or mowed to a 1-2 inch height. Drilling is required for overseeding grasses; however legumes may be drilled or broadcast seeded.

Hydro seeding is an option for sites where typical planting methods are not practical (i.e. steep slopes where equipment cannot be safely operated. Hydro seeding options and plans will only be developed by the State Office. Contact the State Resource Conservationist for assistance.

Seed Quality and Definitions

All seed and planting materials shall meet state quality standards. All seed analyses will be conducted in accordance with the Oklahoma Seed Law and Rules which specify the kind and amount of weed seed permitted, the requirements for a current analysis report and labeling of all seed to show its purity, germination, date of last germination test, and weed content. The germination test used to determine PLS is valid for 9 months after the end of the month the test was made so long as the seed remains in Oklahoma. When seed is purchased and shipped

across state lines, the germination test is valid for 5 months after the end of the month the test was made, according to Federal Seed Law.

If the seed is to be planted later than the current seed test, a new germination test shall be obtained.

Pure Live Seed (PLS) Determination

Compute %PLS using the following formula:
$$\frac{(\% \text{ Germination} + \% \text{ Firm seed}) \times \text{Purity}}{100}$$

This information can be found on the seed tag. If % firm seed is not listed, use % hard or dormant seed. Tetrazolium (TZ) tests are not acceptable for PLS determinations.

Select plants that according to federal, state, or local regulations are not considered noxious species.

If needed, legume seed shall be inoculated with the proper species of viable Rhizobia before planting.

Seeding Mixtures

In order to compute seeding rates for mixtures, decrease the given Full Seeding Rate for individual species proportional to the percentage of the species desired in the mix. Example:

SPECIES	FULL SEEDING RATE	% OF MIX	LBS PLS / AC
little bluestem	3.0	25	0.75
Indiangrass	6.0	25	1.5
sideoats grama	4.5	30	1.35
switchgrass	3.0	10	0.3
Illinois bundleflower	10.0	10	1.0
	TOTAL	100	

Fertilizer and soil amendments (Tables 3-7)

Recommendations shall be based on results from a current soil analysis for plant available N, P, K and pH. Conducting a soil analysis for native grass plantings is not required when converting a current cropland field to native grass and will only be conducted in the following situations:

1. When the field(s) has not been cropped within the past year
2. or if the planner suspects fertility/pH issues
3. or if there is local knowledge or historical evidence that fertility issues may occur.

Nitrogen will be assumed to be zero (0) if the test is older than 60 days. All grass plantings done under the Oklahoma NRCS Critical Area Planting (342) standard will have a fertilizer application of 40 lbs/ac N, 40 lbs/ac P₂O₅, and 40 lbs/ac K₂O.

Available fertilizer blends may make it difficult to apply fertilizer to meet specific recommendations. Applications of inorganic/commercial nutrients will be considered adequate when:

- The applied rate is no more than 10% below or 10 pounds less, whichever is greater, than the recommended application rate.
- The applied rate of either N or P₂O₅ does not exceed 50 lbs/ac of the recommended application rate.

Fertilizer applications for grass establishment shall be done in a timely manner that allows the grass to utilize nutrients for quicker establishment, to minimize weed populations, and to avoid loss of fertilizer from the crop zone. When nitrogen is required for grass plantings, the application shall be made between March 1 and June 30 for warm season species and September 1 through November 15 for fall planted cool season species or March 1 through April 30 for spring planted cool season species. Phosphorus and potassium applications may be made at the same dates as above or incorporated at the last tillage for seedbed preparation prior to planting. Lime applications will be incorporated into the soil prior to planting grass.

Recommendations for establishment may be different than a recommendation for production. Local experience, soil analysis and production goals should be used to determine fertilizer needs after grasses are established.

Management During Establishment

Unless grazing is needed to control competing grasses and weeds, do not graze until plants reach the minimum height listed in the Oklahoma NRCS Prescribed Grazing (528) standard.

During the establishment period, excessive amounts of competitive weedy plants or re-growth of volunteer cover crops (generally, when 3 weeds per square foot or a 50% canopy) should be controlled by the following methods:

1. Herbicides. Chemicals used must be federally and locally registered and must be applied in accordance with authorized registered uses, directions on label and other federal or state policies and requirements.

2. Mowing. Weeds should be mowed when they reach a height of 6 to 8 inches. Mowing should be above the height of seeded plants. Mowing should not be done when daily maximum air temperature exceeds 95 degrees and the humidity is below 30% to prevent dehydration of the young plants. Generally, mowing should not be done after July 15.

3. Grazing. High density grazing by livestock may be used to control annual grasses and forbs. This method will not be used later than July 15, except when abnormal summer moisture promotes excessive weed production. High density grazing will not be used when the soil is wet and hoof action will damage young plants.

When ***planting on terraced land***, a technical determination should be made concerning terrace removal prior to seeding. Terraces should be removed if:

- low places are allowing water to concentrate, preventing plant establishment,
- it is anticipated that future livestock trails will cause concentrated flow and excessive erosion,
- leaving them in place will cause poor water distribution or erosion,
- litter dams can cause overtopping,
- water starvation will have a significant impact on the seeded species below the terraces, or
- livestock are anticipated to concentrate on terraces because of higher soil fertility causing damage from spot grazing.

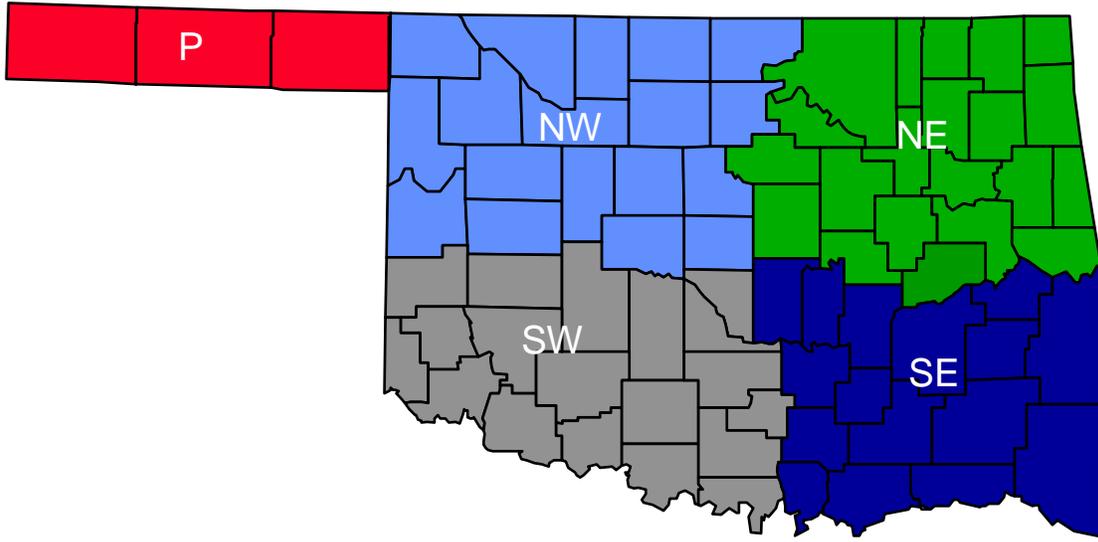
Appendix 1, Criteria for Determining Stand Establishment, will be used to determine when a satisfactory stand has been established.

PLANS AND SPECIFICATIONS

Specifications for vegetation establishment shall be prepared for each site or management unit according to the Criteria and Considerations described in each specific standard, and shall be recorded on specification sheets, job sheets, in narrative statements in the conservation plan, or other acceptable documentation.

Specifications to be included in the conservation plan are species and variety, planting dates and rates of planting (tables 1 and 2), planting method, required seedbed condition and preparation methods, cover crop requirements, management during establishment and other information essential to the planting. Job sheets can be used to transfer the technology. Vegetative Data Worksheet, ECS-Worksheet--4 is available for planning and certification.

MAP OF OKLAHOMA PLANTING ZONES



OKLAHOMA VEGETATION PLANTING SPECIFICATIONS

Table 1 - Grasses

(Descriptions: I - introduced, N - native, A - annual, P - perennial, W - warm season, C - cool season)

Name	Varieties	Description	Full Planting Rate, pure live seed (PLS) Per Acre 1/	Planting Dates 2/ 3/	Zones (see map)					Comments
					P	N W	N E	S W	S E	
bahiagrass	Pensacola	IPW	13 - 20	3/1 – 6/30					X	Adapted to high rainfall areas of Atoka, Bryan, Choctaw, Le Flore, McCurtain, and Pushmataha Counties. Adapted to wide variety of soils with pH 5.5 – 7.0. Freezes out occasionally on northern portion of range and not as drought tolerant as bermudagrass.
	Tifton 9	IPW							X	Benefits include increased production, cold tolerance and drought resistance. Although this variety is not as persistence as Pensacola under heavy grazing.
bermudagrass, sprigs ⁴	Common, Naturalized	IPW	20 - 30 Bushels	2/1 – 6/15	X	X	X	X	X	This is not the same as the seeded “common”. This bermudagrass comes from original plantings done in the early to mid 1900’s of bermudagrass that was not considered a variety. Over time, it has naturalized and adapted to different areas and is commonly used locally as source of sprigs. It is often referred to as “common” or “native” since it is not known when it was actually planted, where the source came from or any other information related to cultivar type. Sources of sprigs used for planting should be from local harvest.
	Alicia	IPW	20 - 30 Bushels	2/1 – 6/15				X	X	Hay type variety, high yield potential. Similar to Coastal with moderate cold tolerance, but recovers slower after cold winters. Only recommended in the first tier of counties north of Red River in MLRA’s 84B, 87B, 135B and 133B.
	Coastal	IPW	20 - 30 Bushels	2/1 – 6/15				X	X	Hay type variety, high yield potential. Low to Moderate cold tolerance. Only recommended in the first tier of counties north of the Red River in MLRA’s 84B, 87B, 135B and 133B. Best adapted to moderately to well drained sandy and loamy soils, but will persist on clayey soils.
	Greenfield	IPW	20 - 30 Bushels	2/1 – 6/15		X	X	X	X	Grazing Variety with good establishment features. Similar to Midland in growth and yield with better persistence in eastern Oklahoma.
	Goodwell	IPW	20 - 30 Bushels	2/1 – 6/15	X ⁷	X				Graze / Hay variety similar to Ozark, with possibly better cold tolerance.

Name	Varieties	Description	Full Planting Rate, pure live seed (PLS) Per Acre 1/	Planting Dates 2/ 3/	Zones (see map)					Comments
					P	N W	N E	S W	S E	
	Hardie	IPW	20 - 30 Bushels	2/1 – 6/15	X ⁷	X	X	X	X	Hay type variety, high yield potential. Good cold tolerance through most of Oklahoma. Low stand persistence in eastern Oklahoma due to disease susceptibility and intolerance to low pH. Only plant on soils with pH >5.5.
bermudagrass, sprigs ⁴	Midland	IPW	20 - 30 Bushels	2/1 – 6/15	X ⁷	X	X	X	X	Hay variety with good yield potential. Hardy throughout most of Oklahoma. Best adapted to sandy loam soils in central and western Oklahoma and coarser textured, better drained soils in eastern Oklahoma.
	Midland 99	IPW	20 - 30 Bushels	2/1 – 6/15	X ⁷	X	X	X	X	Similar to Midland and Greenfield in establishment and site suitability with slightly better cold tolerance.
	Ozark	IPW	20 - 30 Bushels	2/1 – 6/15	X ⁷	X	X	X	X	Hay type similar to Midland and Midland 99 in establishment, but tends to perform better, especially in northern parts of state. Cold hardy for northern Oklahoma. Best adapted to sandy loam soils and does well with low pH (~5.0)
	Quickstand	IPW	20 - 30 Bushels	2/1 – 6/15	X ⁷	X	X	X	X	Grazing type with excellent cold tolerance and aggressive establishment capability.
	Tifton 44	IPW	20 - 30 Bushels	2/1 – 6/15		X	X	X	X	Hay type variety with high yield potential. Soils adaptation similar to Coastal, but better cold tolerance. Cold hardy through most of Oklahoma. Sometimes slow to establish.
	World Feeder	IPW	20 - 30 Bushels	2/1 – 6/15		X	X	X	X	Grazing type variety adapted to most soil types. Good establishment features. Similar to Greenfield in growth and yield.
bermudagrass, seeds (hulled and unhulled) ⁶	common	IPW	4 - 8	4/15 – 6/15				X	X	Best adapted to well and moderately well drained soils, pH 5.5-8.0. Not recommended on deep or very deep sands or areas flooded for long durations. Less drought tolerant than the hybrids.
	Wrangler	IPW	3 - 5	4/15 – 6/15	X ⁷	X	X	X	X	Very cold tolerant, well adapted across state. Good for forage (hay and grazing) and soil stabilization. Performance similar to Greenfield. Provides good cover during establishment year.
	Cheyenne	IPW	3 - 5	4/15 – 6/15		X	X	X	X	Initially release as turf variety but found to be good forage producer. Claimed to have good cold tolerance across state, but should mostly be considered in southern 2/3's of state. Establishes rapidly and has good production under drier than normal conditions.
	Giant	IPW	3 - 5	4/15 – 6/15				X	X	ONLY USED WHEN PART OF A BLEND WITH 1 or MORE APPROVED VARIETIES. Should not exceed 50% of blends with approved varieties. Since it establishes quickly, it is often used in blends with other varieties to speed establishment. Adapted to same soil conditions as common. Larger and faster to establish than common but less cold tolerant. Usually winter kills throughout Oklahoma.

Name	Varieties	Description	Full Planting Rate, pure live seed (PLS) Per Acre 1/	Planting Dates 2/ 3/	Zones (see map)					Comments	
					P	N W	N E	S W	S E		
bermudagrass, seeded blends ^{5,6}	Various Blends (not varieties) (Ranchero Frio, Texas Tough, Riata, etc.)	IPW	3 - 5	4/15 – 6/15						Planting zone will depend on dominant components (i.e. if wrangler is dominant, then refer to wrangler planting zone)	There are numerous brands of bermudagrass blends available. The components of blended bermudagrasses sold by brand name are subject to change from year to year. The components and their compositions must be given on the label. Approval to use blends will be based on inclusion of approved certified varieties (not “variety unstated”). Blends must contain a minimum of 65% approved varieties or seeded at higher rates to achieve minimum seed rates of approved varieties.
big bluestem ¹⁰	Earl	NPW	6 - 8	12/1 – 6/1				X	X	Good in native mixtures and pure stands. It is best adapted to moist, deep, loamy, fertile soils with rainfall >25". It is not tolerant of heavy clays, extremely wet bottomlands, deep sands, high salinity, or high lime.	
	Kaw	NPW	6 - 8	12/1 – 6/1	X ⁷	X	X	X	X	Good in native mixtures and pure stands. It is best adapted to moist, sandy or clay loams with >16" rainfall. It is not tolerant of heavy clays, extremely wet bottomlands, deep sands, high salinity, or high lime.	
big sandreed		NPW	4 - 5	12/1 – 6/1	X	X	X	X	X		
blue grama	Lovington Hachita	NPW	2.0	12/1 – 6/1	X	X	X	X	X	Found commonly in the western part of Oklahoma. Adapted to a wide variety of soil textures with a high level of drought tolerance	
bromegrass, smooth	Achenbach Lincoln Southland	IPC	10 - 15	8/15 – 9/20 2/1 – 4/15	X ⁷	X	X			Leafy, vigorous and rapid spreading, forms dense sod and heavy producer of seed and forage. Best adapted to fertile, well drained bottomland soils with pH >5.5. Best drilled into well prepared seedbed. Does not recover from grazing or haying well and does not do well in hot dry summers. NE Zone: East of Highway 75 and North of I-40 – uplands and bottomlands. Remainder of NE Zone – Bottomlands, sub-irrigated / overflow sites only. NW Zone: Kay, Grant, Noble counties – Bottomlands. Only with irrigation in Alfalfa, Woods, and Harper counties	
bromegrass, meadow	Regar Paddock	IPC	15 - 20	8/15 – 9/30 3/1 – 4/30	X ⁷					Adapted to most soil types but does best on fertile, moderately deep to deep, well-drained soils. It does not grow well in saline soils and wet areas with high water tables. Good re-growth after grazing or haying. Best drilled into well prepared, clean tilled seedbed.	

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					P	N W	N E	S W	S E	
buffalograss	Texoka – unhulled Bison	NPW	6 – 10 Burs 3 – 5 Dehulled	12/1-6/1	X	X	X	X	X	Not on sandy sites
creeping foxtail	Garrison	IPC	3 - 6	8/15 – 9/30 3/1 – 4/30	X ⁷					Adapted to wide variety of soils, does best on moist soils. Only plant as mixture with other cool season grasses.
crabgrass	Red River	IAW	2 - 3	4/15 – 6/30		X	X	X	X	Adapted to wide variety of soils, most productive in areas with high summer rainfall. Can be allowed to re-seed. Works well in double crop systems, overseeded into small grains or part of summer forage mixtures. For critical area plantings, must be in mix with at least 1 perennial and cannot be more than 50% of mix.
dallisgrass	-----	IPW	8 - 12	3/1 – 6/1					X	Moist, fertile, fine textured soils on bottomlands. Can tolerate poorly drained sites. Not suited to sandy lands. Very palatable grass, works good with many legumes. Plant only into tilled seedbed.
dropseed, sand	Borden County Germplasm	NPW	1 – 2	12/1 – 6/1	X	X		X		
dropseed, spike	Potter County Germplasm	NPW	1 - 2	12/10-06/1	X	X				Only in MLRA's 77A, B and E. Adapted to fine sandy soils, mesas and dry bluffs.
dropseed, tall		NPW	1 - 2	12/1 – 6/1	X	X		X		
eastern gamagrass ¹⁰	Verl Pete luka PMK-24	NPW	8 - 10	3/15 – 5/15 ⁹ (Pre-chilled seed) 12/1 – 3/1 (dormant seed)	X ⁷	X	X	X	X	Best suited to moist, well drained soils. Not on deep sandy soils. High yield potential and palatability. Precipitation >30" – adapted to all sites; Precipitation 20-30" – bottomlands and subirrigated sites only; Precipitation 10-20" – irrigation only.
	Bumpers	NPW	8 - 10	3/15 – 5/15 ⁹ (Pre-chilled seed) 12/1 – 3/1 (dormant seed)			X		X	Best suited to moist, well drained soils. Not on deep sandy soils. High yield potential and palatability.
	San Marcos	NPW	8 – 10	3/15 – 5/15 ⁹ (Pre-chilled seed) 12/1 – 3/1 (dormant seed)				X	X	Best suited to moist, well drained soils. Not on deep sandy soils. High yield potential and palatability. Precipitation >30" – adapted to all sites; Precipitation 20-30" – bottomlands and subirrigated sites only.

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					P	N W	N E	S W	S E	
fescue, tall (endophyte infected)	Kentucky 31	IPC	10 - 20	9/1 – 11/15			X		X	Well adapted to moderately acid (pH >5.5) and wet soils. Tolerant of short flood events with good drought resistance and persistence but low palatability. Not suited for sandy or drought prone soils
fescue, tall (endophyte free or low endophyte)	AU Triumph Dovey Martin Mozark Stargrazer MO-96	IPC	10 - 20	9/1 – 11/15			X		X	Same soil and site conditions as Kentucky 31. No major differences between these varieties have been reported. Typically earlier maturity than KY31, produce good fall forage and good animal performance. Potential lower persistence and drought tolerance than endophyte infected fescue.
fescue, tall (novel “friendly” endophyte)	Jesup Max Q	IPC	15 - 25	9/1 – 11/15			X		X	Same soil and site conditions as other fescues. Good forage producer, livestock performance, drought tolerance and persistence.
Florida paspalum	Harrison	NPW	6 – 8	3/15 – 6/1					X	Best to moist, well drained soils. Can tolerate coarse to fine soils.
green sprangletop		NPW	1-3	12/1 – 6/1		X	X	X	X	Used primarily as filler grass when needed for quick cover (i.e. critical area plantings)
indiangrass ¹⁰	Cheyenne	NPW	5 - 8	12/1 – 6/1	X ⁷	X	X	X	X	Can be used on variety of sites including drier, droughty type sites except panhandle. In panhandle, plant under irrigation, on sites that receive runoff or in bottoms.
	Lometa	NPW	5 - 8	12/1 – 6/1	X ⁷	X	X	X	X	Adapted to soils from sands to clays, best on loamy soils. With finer textured soils in west, does best on sites that receive runoff
	Osage	NPW	5 - 8	12/1 – 6/1			X		X	Adapted to drier, more droughty upland sites
	Llano	NPW	5 - 8	12/1 – 6/1	X					Use where adequate moisture exists
	Rumsey	NPW	5 - 8	12/1 – 6/1			X			Good seedling vigor and good production with normal rainfall. Does not establish well in dry years
little bluestem ¹⁰	Aldous	NPW	3 – 5	12/1 – 6/1		X	X	X	X	Adapted to variety of soils, not on alkaline sites. Best in areas with more than 25” rainfall
	Cimarron	NPW	3 – 5	12/1 – 6/1	X	X		X		Adapted to variety of soils, not on alkaline sites. Can be planted in MLRA’s 84A, 84B and 85 in the NE and SE zones.
	OK Select Germplasm	NPW	3 – 5	12/1 – 6/1	X	X		X		Adapted to wide variety of soils, but grows best on calcareous soils

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					P	N W	N E	S W	S E	
lovegrass, weeping	common Ermelo Morpa	IPW	3 - 5	Between last killing frost and June 1.		X	X	X	X	Best on well drained soils, prefers sandy soils. Occasionally freezes out in northern 1/3 of state.
lovegrass, sand ¹⁰	Mason Bend	NPW	1 - 3	Between last killing frost and June 1.	X	X	X	X	X	Statewide - sandy and sandy loam soils.
old world bluestems ⁸	Caucasian	IPW	1 - 3	2/1 – 6/1	X	X	X	X	X	Very productive but may be slightly less palatable than other OWB's, good winter hardiness.
	Ganada	IPW	1 - 3	2/1 – 6/1	X	X		X		Good drought tolerance and forage quality.
	WW- Ironmaster	IPW	1 - 3	2/1 – 6/1	X	X	X	X	X	Use on soils with history of chlorosis. Iron chlorosis is probable when soils exceed pH of 8.0 or when pH exceeds 7.5 on eroded limy soils. Has shown to be less susceptible to chlorosis than other introduced bluestems.
	B-Dahl	IPW	1-3	2/1 – 6/1				X	X	Introduced, perennial warm season grass. Produces a thick stand suited well for both haying and grazing. Proper management is critical due to potential freeze damage in winters with prolonged temperatures below freezing. Stands have shown to recuperate well when properly managed prior to freezing weather.
	Plains	IPW	1 - 3	2/1 – 6/1	X	X	X	X	X	Most popular of the OWB, very adaptable to wide range of sites, provides long grazing season.
	WW - Spar	IPW	1 - 3	2/1 – 6/1	X	X	X	X	X	Most drought tolerant and winter hardy.
Plains bristlegrass		NPW	2 - 3	12/1 – 6/1		X		X		
orchardgrass	Paiute Profile	IPC	10 - 12	9/1 – 11/15 2/1 – 3/31	X ⁷	X	X			Adapted to high moisture conditions or under irrigation, on sites with good drainage. Not on deep sand, wet, or shallow soils. Salinity tolerance similar to wheat. Not tolerant to overflows. 5.5 - 7.5 pH, with 95% sufficiency of phosphorus and 40 #/ac. of N. MLRA 80A, and N of I-40 east of MLRA 80A
	Latar Potomac	IPC	4 - 8	9/1 – 10/31 2/1 – 3/31	X ⁷					Adapted to high moisture conditions or under irrigation, on sites with good drainage and soils that are calcareous, neutral or slight acidity. High yielding and very palatable. Plant on clean tilled seedbed.
ryegrass - overseeding bermuda	all varieties	IAC	12 - 18	9/1 – 10/31 3/1 – 4/30		X	X	X	X	Adapted to wide range of conditions from poorly drained to clays to sands. Production occurs mostly in spring and early summer is not as high on sandy soils. Must have adequate moisture for establishment and should only be considered where rainfall >25 inches.

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					P	N W	N E	S W	S E	
sacaton, alkali ¹⁰	Saltalk	NPW	1 - 3	1/1 – 4/30	X	X	X	X	X	Saline, subirrigated slickspots.
sand bluestem ¹⁰	Chet Woodward	NPW	6 - 8	12/1 – 6/1	X ⁷	X		X		Deep sands or sandy soils
sideoats grama ¹⁰	El Reno Haskell	NPW	4 - 6	12/1 – 6/1	X	X	X	X	X	Medium to coarse textured soils, not on WEG's 1, 2, 3, deep sands or playa clays.
small grains - wheat oats rye	N/A	IAC	60 - 100	Late August – Late September	X ⁷	X	X	X	X	Must have moisture available at planting. Use higher rates when overseeding into existing introduced pastures and follow-up with topdressing of nitrogen fertilizer in early spring if moisture is available.
switchgrass ¹⁰	Blackwell Caddo	NPW	3 - 6	12/1 – 6/1	X	X	X	X	X	Upland variety adapted to most soils. Quick establishment in favorable years.
	Alamo Kanlow	NPW	3 - 6	12/1 – 6/1		X	X	X	X	Bottomlands and sub irrigated or saline sub irrigated sites in areas with >25" rainfall. Can be slow to establish, late maturity
	Grenville	NPW	3 - 6	12/1 – 6/1	X	X		X		Adapted to coarse to medium textured soils on uplands in Panhandle and MLRA 78 in the NW and SW
wheatgrass, pubescent	Luna Manska	IPC	10 -12	8/25 - 10/15 (1st week Sept. optimum)	X ⁷	X		X		Best adapted to MLRA 80A and 78C under dryland conditions. pH range should be 5.5 - 7.5. Not on deep sand, wet, shallow soils. Salinity tolerance similar to wheat. Not tolerant to overflows. Persistence under grazing conditions is somewhat variable, especially when grazed season long. Best used as fall and spring forage, prior to winter wheat grazing and following removal of livestock from wheat in spring.
wheatgrass, tall	Jose Alkar Largo	IPC	6 - 10	9/1 – 10/15	X	X	X	X	X	Adapted to heavy clay soils and sites with high water tables and strongly alkaline or salty sites. Areas with <28" and southern planting zones – only on saline sub-irrigated, wet or slickspots. NW, NE on deep medium textured soils.
wheatgrass, western ¹⁰	Barton Arriba	NPC	6 - 10	9/1 – 10/31	X	X		X		Highly productive cool season grass adapted to fine and medium textured soils. Suited for bottomlands only or under irrigation and is somewhat tolerant to saline and alkaline conditions.
wildrye, russian	Bozoisky	IPC	10 - 15	8/15 – 10/1	X	X ⁷				Adapted to silt loams, loams to heavy clay soils. Not on sandy soils. Requires good fertility and pH near neutral. Requires clean tilled seedbed. Seedlings typically slow to establish. Plants should be allowed to mature and set seed before used. Once established it is drought tolerant and persistent with good production.
Wildrye, Canada	Lavaca Germplasm	NPC	8 – 12	9/1 – 11/15		X		X		Best adapted to MLRA's 78B and C

Table 2. Forbs, Legumes and Shrubs

All legume seeds will be inoculated with the appropriate inoculant. Pre-inoculated seed shall be planted prior to the expiration date on the inoculum tag or be re-inoculated within 24 hours prior to seeding.

(Descriptions: I - introduced, N - native, A - annual, B - biennial, P - perennial, W - warm season, C - cool season)

Name	Varieties	Description	Full Planting Rate, pure live seed (PLS) Per Acre 1/	Planting Dates 2/ 3/	Zones (see map)					Comments
					P	N W	N E	S W	S E	
alfalfa	ALL	IPW	10 - 20	8/20 – 10/1 3/1 – 4/15	X	X	X	X	X	Deep soils with good infiltration, yet with sufficient clay and organic matter to hold large quantities of water. Works good with cool season grass plantings.
arrowleaf clover	Amclo (early) Meechee (later) Yuchi (med.)	IAC	8 - 10	9/15 – 11/15			X		X	Adapted to wide variety of soils but must be well drained. Not on calcareous or wet soils. pH 6-7 required. Seedlings are drought sensitive so moisture is critical at planting.
austrian winter pea	ALL	IAC	30 - 40	9/1 – 10/31		X		X		Adapted on loam to sandy loam soils with pH 6-8 and good drainage. Good cold tolerance, best used for hay or in combination with small grains
awnless bushsunflower		NWP	3	12/1 – 6/1	X	X	X	X	X	
berseem clover	Bigbee	IAC	10 - 15	9/1 - 10/15				X	X	Loamy to clayey soils, poor cold tolerance. ≥30" precipitation, fertile sites, tolerates alkalinity and wetness.
blackeyed susan		NPW	1	12/1 – 6/1		X	X	X	X	
birdsfoot trefoil	Dawn Georgia 1	IPC	6	8/1 – 9/30	X	X	X	X	X	Fertile well drained soils, ≥ 26" rainfall, can tolerate moderate salinity. Not persistent with warm season grasses but can be used with cool season grasses. Irrigated in the panhandle.

Name	Varieties	Description	Full Planting Rate, pure live seed (PLS) Per Acre 1/	Planting Dates 2/ 3/	Zones (see map)					Comments
					P	N W	N E	S W	S E	
annual medics - bur clover, button clover, black medic	ALL	IAC	6	9/1 – 10/31			X	X	X	Well drained fertile soils, except deep sands. Best on first and second bottoms. Adequate moisture at planting time is crucial. Does well with most warm season introduced grasses.
butterfly milkweed		NPW	10	12/1 – 6/1		X	X	X	X	
catclaw sensitivebriar		NPW	23	12/ 1 – 6/1	X	X	X	X	X	
cicer milkvetch	ALL	IPC	15	8/1 – 9/30		X	X	X	X	Adapted to wide range of soil types including slightly acidic to moderate alkaline soils. Has fair level of drought tolerance and is very winter hardy.
compassplant		NPW	20	12/1 – 6/1		X	X	X	X	
coneflower, upright prairie		NPW	3	12/1 – 6/1	X	X	X	X	X	
coneflower, purple (black Sampson)		NPW	7	12/1 – 6/1	X	X	X	X	X	
cowpeas	Clay Iron	IAW	40 - 100.	5/1 – 6/30	X	X	X	X	X	Adapted to well drained soils with pH 5.5-7.5. Good drought tolerance and tolerance to low fertility
crimson clover	Chief Dixie Tibbie	IAC	12	9/1 – 11/15			X		X	Best adapted to deep, well drained loamy soils. Not well adapted to sandy soils or soils that remain wet during the winter
echinacea, pale		NPW	2.0	12/1 – 6/1			X		X	
engelmann daisy		NPC	15	9/1 – 11/15	X	X	X	X	X	
Four-wing saltbush			10	12/1 – 6/1		X		X		Only planted as blocks or plots; west of I-35 except for sands or wet sites.

Name	Varieties	Description	Full Planting Rate, pure live seed (PLS) Per Acre 1/	Planting Dates 2/ 3/	Zones (see map)					Comments
					P	N W	N E	S W	S E	
gayfeather, dotted		NPW	8	12/1 – 6/1	X	X	X	X	X	
goldenrods (Canada, Missouri)		NPW	.3	12/1 – 6/1	X	X	X	X	X	
hop clover large small	ALL	IAC	2	9/1 – 10/31			X		X	Adapted to well drained, near neutral pH soils. Works well in bermudagrass pastures
Illinois bundleflower		NPW	10	12/1 – 6/1	X	X	X	X	X	
western indigo		NPW	2.0	12/1 – 6/1`	X	X	X	X	X	
leadplant		NPW	4	12/1 – 6/1	X	X	X	X	X	
lespedeza	Common Kobe	IAW	15	3/1 – 4/15					X	More tolerant of acidic soils. Can do well on thin, poor soils with adequate pH and phosphorus levels.
	Korean	IAW	30	3/1 – 4/15			X		X	Adapted to well drained soils and tolerates lower pH soils (5.0 – 6.5)
	Marion	IAW	16	3/1 – 4/15			X		X	Adapted to thin, low pH soils and tolerates drought well. It re-seeds well and should be allowed to reseed in fall to help maintain stand. Works good in cool season pastures.
lespedeza, (roundhead, slender)		NPW	5	12/1 – 6/1		X	X	X	X	
maximilian sunflower	Aztec		4	12/1 – 6/1	X	X	X	X	X	
partridge pea		NAW	2	12/1 – 6/1		X	X	X	X	

Name	Varieties	Description	Full Planting Rate, pure live seed (PLS) Per Acre 1/	Planting Dates 2/ 3/	Zones (see map)					Comments
					P	N W	N E	S W	S E	
pitchers sage		NPW	4			X	X	X	X	
plains coreopsis		NAW	.3	12/1 – 6/1	X	X	X	X	X	
Prairie acacia		NPW	5	12/1 – 6/1	X	X	X	X	X	
prairie clover (white, purple)		NPW	3	12/1 – 6/1	X	X	X	X	X	
red clover	ALL	IBC	12	9/1 – 10/31 3/1 –4/15			X	X	X	Adapted to heavy soils med-high fertility and fertile sandy loams high in available phosphorus. Acid soils must be limed to 6.5. Considered biennial but is a short lived perennial that requires plants to set seed or occasionally be re-seeded at low rates.
rose clover	Overton	IAC	12	9/1 – 10/31	X	X		X	X	Only in areas with 18-25" annual precipitation. Adapted to variety of soils but not on wet or poorly drained soils but fairly tolerant of alkaline or soils with low fertility. Good drought tolerance
sainfoin	ALL	IPW	20	3/1 – 4/30		X		X		Neutral to calcareous soils. Does best as monoculture.
sand sagebrush			1	12/1 – 6/1						Only on Ecological sites which historically had sand sagebrush
subterranean clover	ALL	IAC	15	9/1 – 10/31		X	X	X	X	Rainfall \geq 30". Tolerant of acid soils, close continuous grazing and shade. Not tolerant of pH above 7.0 and does not do well when planted in grass sod.
sweet clover	White Yellow Madrid	IBC	8	9/1 – 10/31 2/1 – 4/30		X		X		Adapted to well drained clay, clay loam soils with optimum pH 6.5 to 7.5. Relatively drought tolerant and winter hardy.
tephrosia		NPW	4	12/1 – 6/1	X	X	X	X	X	
tickclover		NPW	2	12/1 – 6/1	X	X	X	X	X	
trailing wildbean		NPW	2	12/1 – 6/1	X	X	X	X	X	

Name	Varieties	Description	Full Planting Rate, pure live seed (PLS) Per Acre 1/	Planting Dates 2/ 3/	Zones (see map)					Comments
					P	N W	N E	S W	S E	
velvet bundleflower		NPW	4.5	12/1 – 6/1		X		X		
vetch, hairy	ALL	IAC	12	9/1 – 10/31	X	X	X	X	X	Widely adaptable to well drained soils. Fairly tolerant of acid soils.
white clover	Dutch Ladino Patriot Durana	IPC	4	9/1 – 11/ 1 3/1 – 4/15			X		X	First and second bottom, clay and loamy soils. Also on uplands with good moisture, not productive under droughty conditions and could experience die out on droughty upland sites. Works well with fescue pastures with good grazing management.

Footnotes

- 1/ Mixtures: For grasses and legumes planted as part of a mixture, pro-rate the full seeding rate by the percent desired in the mixture. If broadcast seeding methods are used, planting rates will be increased by 25%. For all critical area plantings the planting rate will be doubled.
- 2/ Dates provided are considered the maximum dates for planting. Optimum dates (unless otherwise noted in Table 1): Warm season species - March 1 – May 15th; Cool season species – September 1 – October 31. Planting dates for warm season plantings can be extended 2 weeks if adequate moisture is available or with irrigation at planting. Dates can be extended 1 month if irrigation can be provided through the remainder of the growing season. Irrigation amounts must meet the needs of the establishing plants.
- 3/ The fall seeding dates for cool - season species is preferred.
- 4/ Bermudagrass planting is generally not suited for shallow clayey soils in areas of <30" rainfall or on WEG's 1 and 2 in areas with <27" rainfall. Sprigging bermudagrass can take place anytime during the specified dates as long as soil moisture is available. The best sprigging times are 4-6 weeks prior to greenup. Early sprigging, prior to spring greenup, ensures the highest root carbohydrate levels and the sprigs will be mostly rhizomes and root crowns (sources of new buds). Consideration should be given to using higher sprigging rates when sprigging after greenup. Bermudagrass sprigs will be healthy, uninjured, live stems, stolons and rhizomes. Sprigs should not be cut or chopped nor allowed to "dry out". Protect sprigs from sun and hot drying winds. Plant sprigs the same day that they are dug. Grazing types are distinguished from the hay types by being shorter in stature and forming a more dense sod. They generally spread more aggressively than hay types but may have lower yield capability in some situations. Useful Sprigging Information: 1 bushel = 1.25 cubic feet and about 15 lbs. Sprigging at a rate of 20 – 30 bushel per acre equals about 150 -225 sprigs per 100 feet of row, based on 40" row spacing.
- 5/ Blends listed as examples are not the only blends available. Example of determining if a blend can be approved to use: BGBlend 1 is comprised of 50% approved variety and 50% non-approved. Since this does not meet the requirements of 65% of blend being an approved variety, a seeding rate of 6 lb. PLS of the BGBlend 1 would be needed to achieve minimum seeding for the approved variety (6 PLS x 50% approved = 3 lb PLS).
- 6/ Bermudagrass planting is generally not suited for shallow clayey soils in areas of <30" rainfall or on WEG's 1 and 2 in areas with <27" rainfall. Planting dates for seeded bermudagrasses based on need for soil temperatures to be at or above 65°F.
- 7/ With irrigation – 4-6 acre inches of water per month during each growing season.
- 8/ Only on WEG's 3 – 6. They are best adapted to finer-textured soils such as loams, clay loams, and silt loams. Do not plant on saline or alkaline soils or areas with long term saturation. Not well adapted to soils with pH >7.5. NOTE: Consideration for planting must be account for invasiveness and potential to spread offsite.

- 9/ Spring Dates provide best results from use of pre- chilled (stratification) seed planted promptly when received into moist soil. Do not plant if soil moisture is not available (unless under irrigation) as seed will regain dormancy if they dry out before germination. Planting of non-stratified seed should be done between December 1 and March 1 when soil temperatures are at or below 50 degrees. The recommended planting depth for stratified seed is 1-1 ½ inches deep. The planting depth for non-stratified seed is ½ - 1 inch deep.
- 10/ **Native Sources** can be used: The origin of native harvest grass seed shall not exceed the following guidance from the area of intended use: South and West - 200 to 300 miles (seed from a southern source will be given preference over seed from a northern source); North and East - 100 to 150 miles; Elevation - seed source should be not more than 2,000 feet higher or 1,000 feet lower than the planting area. To certify mileage and elevation requirements for native harvest, seed sources must identify the state and county of the harvest location. Named varieties as listed in Table 1 are exempt from mileage requirements

APPENDIX 1 - CRITERIA FOR DETERMINING STAND ESTABLISHMENT

Introduced grasses and legumes: Usually establish within first growing season and can be evaluated after the first growing season. However it is not uncommon, depending on weather at time of planting and during the growing season, that extra time will result in successful establishment. Some examples may be introduced bluestems which may take 2 years and bermudagrass sprigged late in the season (not dormant sprigs) may not establish until the second year. Therefore consideration should be given to allow for two growing seasons. If plants emerged and died due to frost or drought, evaluations can be made during first growing season.

Native plantings: Native grasses and legumes may take more than one growing season to establish and should not be considered a failure until after the second season. If plants emerged and died due to frost or drought, evaluations can be made following first growing season.

Number of plants per square foot

Transects should be located in representative areas of the field and well distributed. One hundred readings, 3 - 5 steps apart with one-foot square quadrats are recommended for recording the plant counts. Count the total number of plants occurring within the quadrats and divide by 100 to get the number of plants per square foot. More than one transect may be needed on large fields or where stand establishment is not uniform. Delineate those areas of the planted area that do not meet establishment criteria.

For sprigged bermudagrass, pick several areas in the field and count number of live plants found along 100 feet of row

SPECIES	Live plants uniformly distributed – Average number per square foot		
	Failure	Questionable / Marginal	Acceptable / Satisfactory
Weeping lovegrass, tall fescue	0 - 0.3	0.3 - 1.0	>1.0
Other Seeded grasses and legumes	0 - 0.2	0.2 - .5	>0.5
Sprigged bermudagrass	<5 live plants per 100 feet of row	5 – 10 live plants per 100 feet of row	> 10 live plants per 100 feet of row

Failure - Reapplication required

Questionable / Marginal - NRCS and the producer will decide whether or not to reapply. Factors to consider are vigor of existing plants, potential to spread, extent of competition, quickness of stand desired, economics, etc.

Satisfactory – Stand is adequate.

Table 3. Nitrogen Recommendations for Establishing Grass

Nitrogen soil test values are only valid if test is within the last 60 days; therefore assume nitrogen soil test of zero (0) when old tests are used.

Soil Test N	All Grass Establishments except Native Grass Plantings
0	40
1	39
2	38
3	37
4	36
5	35
6	34
7	33
8	32
9	31
10	30
11	29
12	28
13	27
14	26
15	25
16	24
17	23
18	22
19	21
20	20
21+	0

Table 4. Phosphorus Recommendations for Establishing Grass

P Soil Test Index	Bermudagrass Establishments	Fescue and Cool Season Grass	Bluestem and Lovegrass Establishments	Native Grass Establishments
	P ₂ O ₅ lbs/ac			
0	40	40	40	40
1	40	40	40	38
2	40	40	40	36
3	40	40	40	34
4	40	40	40	32
5	40	40	40	30
6	40	40	40	28
7	40	40	40	26
8	40	40	40	24
9	40	40	40	22
10	40	40	40	20
11-20	40	40	30	0
21-40	30	30	20	0
41-48	20	20	0	0
49+	0	0	0	0

Table 5. Potassium Recommendations for Establishing Grass

Potassium (K) Soil Test Index	Bermudagrass Establishments	Fescue and Cool Season Grass Establishments	Bluestem and Lovegrass Establishments	Native Grass Establishments
	K ₂ O lbs/ac			
0-40	40	40	40	40
41-80	40	40	40	30
81-125	40	40	30	20
126-200	30	30	20	0
201-216	20	20	0	0
217+	0	0	0	0

TABLE 6. Liming Requirements

Soil Buffer Index	All Crops, Established Grasses, or Legumes except Continuous Wheat	*Continuous Wheat and New Seedlings of Grass (Establishment)
	**ECCE Lime (tons/ac)	**ECCE Lime (tons/ac)
6.0	5.2	1.4
6.1	4.7	1.2
6.2	4.2	1.0
6.3	3.7	0.9
6.4	3.1	0.8
6.5	2.5	0.6
6.6	1.9	*** 0.5
6.7	1.4	*** 0.5
6.8	1.2	*** 0.5
6.9	1.0	*** 0.5
7.0	0.7	*** 0.5
7.1	***0.5	*** 0.5
7.2	0.0	*** 0.5

* Lime will be required for grass establishment when the soil test pH is <4.5 for fescue and lovegrass and <5.0 for all other grasses.

** Effective Calcium Carbonate Equivalent - Pure calcium carbonate ground fine enough to be 100% effective. The rate of aglime to apply can be determined from the ECCE requirement using the following formula: Tons of aglime/ac = Tons ECCE lime required / %ECCE x 100.

*** Lime applications at or below 0.5 tons per acre are recommended, but not required due to economics.

**TABLE 7
Crop pH Preference ***

**Forages	Preferred pH Ranges
Bluestem, Native Hay, Fescue, Weeping Lovegrass	4.5 – 7.0
Vetch, Crimson Clover, Orchardgrass, Ryegrass	5.5 – 7.0
Bermudagrass	5.7 – 7.0
Alsike, Red and White (ladino) Clovers, Arrowleaf Clover	6.0 – 7.0
Alfalfa, Sweet Clover	6.2 – 7.5

* Most legumes will tolerate a pH 0.5 units less and 1.0 unit higher than indicated above, but production will be significantly reduced. Non-legumes tend to tolerate a pH 0.5 to 1.0 unit less (but not less than a pH of 4.0) and 1.0 to 2.0 units higher than indicated above.

** Lime will be required for grass establishment when the soil test pH is <4.5 for fescue and lovegrass and <5.0 for all other grasses.