

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

**CONSERVATION COVER
(ACRE)**

Code 327

DEFINITION

Establishing and maintaining perennial vegetative cover on the land.

PURPOSE

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

- ◆ To reduce soil erosion and sedimentation.
- ◆ To improve water quality.
- ◆ To create or enhance wildlife habitat.

CONDITIONS WHERE PRACTICE APPLIES

This practice is applicable to:

All land retired from agricultural production, including land entered into retirement programs.

CRITERIA

NOTE: *Specific program guidance may be more restrictive on a number of these criteria, particularly approved plant species, fertilizer requirements, seeding rates, weed control, and operations and maintenance.*

The following criteria are applicable to all purposes and conditions listed above.

I. Establishment of Permanent Vegetative Cover.

A. Seeding Periods.

The dates listed in Table 1 are based on long-term averages and may be extended by two weeks on either end by the district conservationist with concurrence by the area office. Extension of these deadlines shall be based on both favorable moisture and temperature for seed proper germination. Extension beyond this two-week window must be approved by the State Agronomist.

B. Fertilizer and Lime Requirements.

1. Introduced Grasses.

Refer to Nutrient Management, Practice Code 590, for fertilizer and lime recommendations. Recommendations will be based on pastureland according to ISU-Extension publication PM-1688 "General Guide for Crop Nutrient Recommendations in Iowa" for Conservation Cover establishment. In cases where soil test results indicate that less than 25 pounds per acre of total fertilizer and/or less than 2000 pounds of total liming material is required, the fertilizer requirement may be waived at the discretion of the district conservationist. This decision and reason is to be documented on the NRCS-CPA-4, Seeding Plan.

2. Native Grasses.

For native grasses and forb establishment no, N, P, or K is required. See Considerations H.

C. Companion Crop.

1. Introduced Species.

For spring seedings and dormant seedings, oats shall be seeded at a rate of one bushel/acre to reduce soil erosion and help control weed competition. The oats shall be clipped at the time of seed head emergence to promote growth of the new permanent cover. The use of the companion crop is not required when interseeding and is optional for all other seeding periods.

2. Native Species.

Companion crops are generally not recommended for native seedings. Where low residue and high erosion potential exist, the district conservationist may require a broadcast or drilled companion crop of oats seeded at one bushel/acre. Where oats are used as a companion crop, clip or chemically kill at the time of seed head emergence to promote growth of the new permanent cover.

D. Seedbed Preparation and Seeding.

1. Conventional seeding for spring and late summer seeding periods.

a. The seedbed shall be worked to a depth of three inches before seeding. It shall be reasonably smooth, friable, and firm before seeding.

b. All tillage operations shall be

performed across the general slope of the land.

c. Grass and legume seed shall be drilled uniformly over the area at a $\frac{1}{8}$ - $\frac{1}{4}$ inch depth, or broadcast uniformly over the area and rolled into the seedbed.

d. Where erosion is a concern and tillage is needed, prepare a seedbed with chisel, disk, or other similar tool that will leave enough residue to provide adequate protection.

2. No-till seeding for spring, late summer, and dormant seeding periods.

a. Approved herbicides shall be applied according to label rates to kill or suppress existing sod and/or weed competition, as necessary. Refer to Pest Management Practice Code 595 for guidance.

b. A drill designed for no-till planting shall be used to plant the seed uniformly at a $\frac{1}{8}$ - $\frac{1}{4}$ inch depth.

3. Frost Seeding.

Broadcast seed for only those species approved for frost seeding as shown in Tables 2 and 3.

4. Broadcast.

Broadcast seed on top of undisturbed cropland is allowed only if the area seeded is cultipacked following seeding to ensure good seed to soil contact.

5. Split Seeding.

Forbs may be seeded in the late summer seeding period and

native grasses seeded the following spring.

E. Seeding Stand Improvement.

(Includes any stand modification that maintains some vegetative component of the original stand.)

1. Incorporation of grasses and/or legumes with light tillage. If enhancing for wildlife, light disking can provide food from annual plants and/or be enhanced with the addition of forbs. Refer to Early Successional Habitat Development Management, Practice Code 647.
 - a. Weaken the existing stand in the fall or early winter by use of herbicides, grazing, mowing, or a combination of these methods.
 - b. Use a disk, cultivator, or similar tool to disturb 40-50 percent of the existing stand.
 - c. Grass and legumes shall be drilled uniformly over the area at a $\frac{1}{8}$ - $\frac{1}{4}$ inch depth, or broadcast uniformly over the area and rolled into the seedbed.
 - d. Remove early spring re-growth by mowing or grazing to reduce competition and allow the new seedlings to establish.
2. Incorporation of grasses and/or legumes with no-till (interseeding) for spring, late summer, and dormant seeding periods.
 - a. When interseeding into existing sod, graze, burn, mow, or apply herbicides to kill strips or suppress existing vegetation and to control weed competition. When using a non-selective, translocated herbicide to kill existing vegetation, a fall application is preferred over a spring application. The vegetation should be mowed in mid-summer and allowed to re-grow for several weeks prior to herbicide application. Herbicide should be applied at least three weeks prior to the time when the target species will enter winter dormancy.
 - b. Control perennial broadleaf weeds by applying 2,4-D herbicide at least two weeks prior to applying contact herbicides and prior to seeding. Follow label recommendations. Refer to Pest Management Practice Code 595 for guidance.
 - c. Grass and legumes shall be drilled uniformly over the area at $\frac{1}{8}$ - $\frac{1}{4}$ inch depth.
 - d. Remove early spring re-growth by mowing or grazing to reduce competition and allow the new seedlings to establish.
3. Incorporation of grasses and/or legumes with frost seeding.
 - a. Broadcast only seed species approved for frost seeding as shown in Tables 2 and 3. Small, smooth seeded species are best for incorporation into the soil during freezing and thawing.
 - b. Frost seeding is likely to be more successful if existing stand is weak and less than 50 percent of the ground is covered with live vegetation or plant residue.
 - c. Recommend cultipacking seed to improve soil to seed contact.

F. Inoculation.

1. Introduced legume seed species shall be properly inoculated. See Agronomy Technical Note #11, Legume Inoculation.

2. Inoculant shall be specific to the legume seeded. Follow label instructions.
3. When more than one legume species is used, each species shall be inoculated separately.

G. Seed Quality.

1. All seed shall comply with Iowa Seed and Weed Laws including Iowa Crop Improvement Association Guidance at www.agron.iastate.edu/ICIA and Iowa Noxious Weed Law.
2. Cool season (introduced) grass and legume seeding rates are expressed in bulk pounds/acre. Seed quality shall not drop below 70% Pure Live Seed (PLS) where $PLS = (\% \text{ germination} + \text{dormant seed}) \times \% \text{ purity}$.
3. Native grass species seeding rates are expressed in PLS pounds/acre. Either the germination test or Tetrazolium (TZ) test is acceptable for determining PLS for native species.
4. The native forbs PLS requirements may be waived by receiving concurrence from the State Agronomist.

H. Approved Plant Species and Seeding Rates.

1. Select combinations of plant species and cultivars best adapted to site conditions including moisture regime and landscape preference.
 - a. For more information on species and soil adaptation refer to Iowa Technical Guide, Section II, Forage Suitability Groups.

- b. For more information on introduced cultivar selection, refer to Agronomy Technical Note #14.
- c. For more information on native cultivar selection, refer to Agronomy Technical Note 28, "Guidance for Seeding Natives on Prairie Reconstruction Sites."
- d. For more information on native plant moisture regimes and landscape preference (i.e., prairie, woodland) see Table 3.

2. Where frost seeding is used, the normal seeding rate shown in Tables 2 and 3 shall be multiplied by 1.5.

3. Introduced Species.

- a. To calculate seeding mixtures for introduced species, multiply desired mixture percentage by the per acre bulk seed rate in Table 2.
- b. Approved introduced plant species, allowable mixture composition, and the pure stand seeding rate are shown in Table 2. The table is divided into two general seeding categories, Grassland & Wildlife and Trees & Shrubs.
- c. A designed seeding mixture shall meet criteria specified in Table 2 as to species composition and seeding rate.
- d. For critical area seeding used for erosion control, at least 50 percent of any grassland or wildlife seeding mixture shall be composed of sod forming grasses.
- e. Tall Fescue shall not compose of more than ten percent of the mixture if primary or secondary purpose is for wildlife.
- f. Mixtures may include up to 20

percent native grasses. Use the criteria for the predominant species in the mixture for stand establishment.

4. Native Species.

- a. Calculate percentages by seed count for native species. See Native Grass Seeding Calculator.
 - b. Approved native plant species, allowable mixture composition, and a pure stand seeding rate are shown in Table 3 for both grasses and forbs. The table is divided into two general seeding categories, Wetland and Upland plantings.
 - c. A designed seeding mixture shall meet criteria specified in Table 3 as to species composition and seeding rate. At least 50 percent of the mixture shall be composed of grasses. For wildlife mixtures not more than 10 percent of the mixture will be composed of switchgrass. Some programs may be more restrictive.
 - d. When developing seeding mixtures, except eastern gama grass, use 35-40 seeds/sq. ft. for pure grass stands. Grass and forbs/legume mixtures, use 30 seeds/sq. ft. for the grass component and a minimum of 10 seeds/sq. ft. for the forbs/legume component. On sites not considered highly erodible (less than five percent slope), the grass component may be reduced to 20 seeds/sq. ft. and the forb component increased to 20 seeds/sq. ft.
 - e. When using a grass/forb mixture, do not use all tall growth forms of grass species but rather use a mixture of tall, medium, and short species.
- This will allow for more light penetration to promote the forb component.
- f. When developing seeding plans for wildlife purposes, restorations or reconstructions of pothole, floodplain, and other wetland ecosystems consider the soils, moisture regimes, and topography of the site to develop seeding mixtures to meet the site characteristics. See Agronomy Technical Note 27 "Guidance on Seeding For Pothole, Floodplain, and other Wetlands."
 - g. Mixtures may include up to five percent introduced legumes. Use the criteria for the predominant species in the mixture for stand establishment.
 - h. Annual and bi-annual forbs/legumes are to be limited to no more than 20 percent of the forb/legume component.
 - i. Naturalized wildflowers are not to be included in our plantings. Naturalized plants are introduced species which have gone wild such as shasta daisy, dames rocket, baby's breath, and chicory. Since these are alien and invasive species they are not to be encouraged in wildlife seeding mixtures and are not to be included in any prairie reconstruction mixes.
 - j. Native grasses and forbs (not included in the tables) may be appropriate additions to a conservation cover planting. Inclusion of additional species shall be approved by the State Agronomist.
 - k. Because of the aggressiveness of introduced varieties of natives, long-term prairie reconstruction (greater than 15 years) is restricted to local

ecotype or local source identified seed. Refer to Technical Note 28, "Guidance for Seeding Natives on Prairie Reconstruction Sites."

- I. Native seedings should be limited to local ecotypes or source identified (seed harvested from remnant site) when planting within one mile of an existing native prairie remnant. Refer to Technical Note 28, "Guidance for Seeding Natives on Prairie Reconstruction Sites."
5. General Seeding Mixtures.

Tables 2 and 3 shall be used to customize additional seeding mixtures as needed.

II. Weed Control During the Establishment Period.

- A. Weed control during the establishment period shall be provided to ensure survival of the new permanent seeding.
 1. To manage weed competition, sites may be mowed just above the height of the seedling plants or no closer than eight inches for native species and no closer than four inches for introduced species. Mow early before the weeds have a chance to smother out the native seedlings and about every two weeks throughout the first growing season to keep competition from shading young plants.
 2. Approved herbicides may be used on both cool and native plantings to control weed species.
- B. When establishing forbs with warm season grasses, it is recommended that the cover be suppressed by mowing, grazing, chemicals or burning

in the second season to avoid grasses or weeds from shading out the forbs.

III. Establishment of Temporary Cover.

- A. Temporary cover may be required to reduce potential weed and erosion problems where one of the following conditions exists.
 1. Fields with herbicide carry over.
 2. Where planting is delayed due to unavailability of seed.
 3. The normal planting period has passed.
- B. The temporary cover shall be seeded as specified in Table 4.
- C. Seed during the normal spring or late summer seeding period or as close to these dates as practical.

CONSIDERATIONS

- A. Apply as part of a resource management system contained in a conservation plan.
- B. The long term objectives of the landuser, specific program requirements, and the needs of target wildlife species are important considerations in the selection of vegetative cover. Landowners interested in developing and restoring permanent wildlife habitat should be encouraged to establish native multi-species grasses and forbs mixtures over introduced mixtures. Monocultures are discouraged.
- C. Native plant species may benefit from periodic burning. Burning can stimulate growth by reducing unwanted competition from weedy or woody plants and removing excessive plant

residue. Refer to Prescribed Burning, Practice Code 338, for recommendations.

- D. Cooperators using herbicides to control weed competition should be cautioned as follows:

Read and follow all label directions and heed all precautions. If herbicides are handled or applied improperly, or if unused portions are not disposed of safely, they may contaminate water and soil and injure humans, domestic animals, desirable plants, and fish or other wildlife. Herbicides should not be used over or directly adjacent to ponds, lakes, or streams. Cooperators should be aware of and adhere to the provisions of local, county, state, or federal laws and regulations concerning the use of agricultural chemicals.

Refer to Pest Management, Practice Code 595, for additional information on pesticide use and safety.

For frost or dormant seeding on land susceptible to erosion and where less than 30 percent residue cover is present on the surface of the soil, consider erosion control practices such as contour planting, mulching, and cover crops to reduce erosion.

- E. The use of certified or source identified seed should be recommended whenever possible. Certified and source identified seed is defined by the Iowa Crop Improvement Association. See www.agron.iastate.edu/ICIA for more information.
- F. Wildlife benefit from blooming plants throughout the growing season. When designing a seeding mixture for wildlife benefits, consider selection of forbs/legumes that provide for full season flowering.

- G. For visual aesthetics consider selection of forbs/legumes that provide color and flowering periods to meet the landowner's objectives.

- H. On sites that have inclusions of very thin soils with little vegetative growth, such as severely eroded areas and infertile overwash, consider taking a soil test and following critical area seeding to address the plant resource needs.

- I. If the establishment of native grasses is intended for the use of seed production, forage production, forage removed for biomass, or increase carbon sequestration, consider Nutrient Management Standard 590, for fertilizer and lime recommendations. Recommendations will be based on Pastureland according to ISU-Extension publication PM-1688 "General Guide for Crop Nutrient Recommendations in Iowa."

- J. If the establishment of cover is intended to promote the forb component, consider decreasing the grass component to 20 seeds per sq. ft., increase the forb component to 20 seeds per sq. ft., and select short and intermediate grass species to reduce competition and shading of forbs.

PLANS AND SPECIFICATIONS

Specifications for conservation cover shall be prepared based on specific objectives for each site or planning unit according to the criteria and considerations described in this standard.

A job sheet or similar document shall be used to provide specifications for conservation cover to the landuser.

When formal stand evaluation is needed use Agronomy Technical Notice #19, October 1997, "Guideline for Herbaceous Stand Evaluation."

All specifications shall be consistent with federal, state, and local regulations.

OPERATION AND MAINTENANCE

- A. Mow, burn, clip, or use approved chemicals to reduce competition from existing stand to improve survival of desired species during the establishment period.
- B. After the establishment period, spot mowing, burn, or spot herbicide treatment shall be used to control noxious weeds and other undesirable plant growth.
1. Any mowing after seeding establishment (except for noxious weed control) will be done after August 1 to protect nesting wildlife.
 2. Annual mowing of entire field will not be permitted.
 3. Exceptions to # 1 or # 2 above may be allowed on a case by case basis if purpose is for a unique wildlife situation. Any exception must be approved by State Agronomist.
- C. Where plant vigor declines, maintenance levels of plant nutrients may be necessary. Refer to Nutrient Management, Practice Code 590, for recommendations.
- D. Where conservation cover is grazed or hayed, refer to Prescribed Grazing, Practice Code 528A, and Forage Harvest Management, Practice Code 511, for recommendations.
- E. Where plant vigor declines in native plant species or where invader species threaten native mix stands, burning may be appropriate. See Prescribed Burning, Practice Code 338, for additional information on burning criteria.

REFERENCES

These publications are available at County Extension Offices; Extension Distribution Center, Printing Building, Iowa State University, Ames, IA 50011; and several are available on the ISU Publications Home page at <http://www.extension.iastate.edu/Pages/pubs/>.

- ISU PM-1688 “General Guide for Crop Nutrient Recommendations in Iowa.”
- ISU PM-869 “Fertilizing Pasture.”

The following publications are available at the Iowa NRCS Home page at: <http://www.ia.nrcs.usda.gov>.

- Native Grass Seeding Calculator.
- Agronomy Technical Note 19 “Guideline for Herbaceous Stand Evaluation.”
- Agronomy Technical Note 27 “Guidance on Seeding Pothole, Floodplain, and Other Wetland”.
- Agronomy Technical Note 28 “Guidance for Seeding Natives on Prairie Reconstruction Sites”.
- NRCS Standard Prescribed Burning, Practice Code 338.
- NRCS Standard Forage Harvest Management, Practice Code 511.
- NRCS Standard Prescribed Grazing, Practice Code 528A.
- NRCS Standard Nutrient Management, Practice Code 590.
- NRCS Standard Early Successional Habitat Management, Practice Code 647.
- NRCS Standard Pest Management, Practice Code 595.

Table 1. Seeding Dates For Cool And Native Species

Type of Seeding Mixtures)	Introduced Species ² (Grasses and Legumes)	Native Species ³ (Includes Prairie Reconstruction
Spring	March 1 - May 15	April 15 - July 1
Late Summer	August 1 - September 15	Not Recommended
Dormant	November 15 - Freeze-up	November 15 - Freeze-up
Frost ¹	February 1 - March 15	February 1 - March 15
¹ Refer to Tables 2 and 3 for applicable plant species. ² Includes all species generally considered introduced. ³ Includes all warm and cool season natives when planted in mixture.		

NOTE: If selecting for a specific land retirement program, select mixtures within program guidelines.

Table 2. Seeding Chart For Introduced Plant Species

Plant Species	% of Mixture (Range Allowed)		Habitat Preference	Seeding Rate Bulk pounds/acre
	Grassland ³ & Wildlife 1	Trees & Shrubs		
Grasses				
Kentucky bluegrass ¹	0-100	0-10	Both	5
Orchardgrass	0-50	0-100	Upland	8
Smooth bromegrass ¹	0-100	0	Upland	10
Tall fescue ¹	0-25	0	Both	8
Timothy	0-50	0-100	Upland	4
Red top	0-50	0-100	Both	3
Intermediate Wheatgrass	0-25	0	Upland	10
Perennial rye	0-25	0-50	Both	15
Legumes				
Alfalfa ^{2,4}	0-100	0-50	Upland	10
Alsike clover ^{2,4}	0-50	0-50	Both	4
Birdsfoot trefoil ^{2,4}	0-50	0	Both	5
Korean lespedeza	0-50	0	Upland	20 S ½ State
Kura clover ^{2,4}	0-50	0-50	Upland	8
Ladino clover ^{2,4}	0-100	0-50	Both	3
Red clover ^{2,4}	0-50	0-50	Upland	8
¹ For critical area seeding used for erosion control at least 50% from the grassland or wildlife seeding mixture shall be composed of sod forming grasses. (Tall fescue should not be used in more than 10% of the mix if primary or secondary purpose is for wildlife.) ² Species suitable for frost seeding, increase seeding rate by a factor of 1.5. ³ Mixtures may include up to 20% native grasses. See Table 3 for seeding rates. Use the criteria for the predominate species in the mixture for establishment. ⁴ For use with NRCS practice standard, Early Successional Management (647) only, these legumes may be interseeded into disturbed areas at 50% of pure seeding rate.				

Table 3. Seeding Chart For Native Plant Species

- ¹ When developing seeding mixtures, except eastern gama grass, use 35-40 seeds/sq. ft. for grass stands. Grass and forbs/legume mixtures use 30 seeds/sq. ft for the grass component and minimum of 10 seeds/sq. ft. for forbs/legume component, sites not considered highly erodible may use 20 seeds/sq. ft. grass and 20 seeds/sq. ft. forbs.
- ² Any one species of forb shall not exceed 20% of the total seeding mixture. Annual and bi-annual forbs and legumes are to be limited to 20% of the forb/legume component. Naturalized wildflowers are not to be counted towards the forb/legume component.
- ³ Mixtures may include up to 5% cool season introduced legumes. See Table 2 for seeding rates. Use the criteria for the predominate species in the mixture for establishment.
- ⁴ These species are not native to Iowa statewide. Their use as part of seeding mixtures is to be restricted to local area with known native populations
- ⁵ Because of the aggressiveness of introduced varieties, long term >15 year prairie Reconstruction is restricted to local ecotypes or local Source Identified seed .
- ⁶ Species suitable for frost seeding, multiply seeding rate by factor of 1.5.
- ⁷ Habitat Preference P = Prairie, S = Savanna, W = Woodland. **To determine seeds/sq. ft..** seeding rate x # seeds/lb
- ⁸ Moisture Regime D = Dry, DM = Dry Mesic, M = Mesic, WM = Wet Mesic, W = Wet **43560**
- ⁹ See Agronomy Technical Note 27 "Guidance on Seeding for Pothole, Floodplain, and Other Wetlands."

Wetland Sedges, Rushes & Grasses Zone 1 and 2 ^{1, 9}	% of Mixture (Range Allowed)			Moisture ⁸ Regime	Pure Stand Seeding Rate PLS pounds/acre	Seeds per sq. ft.	# Seeds per lb.	Remarks
	Wetland ⁵ Reconstruction	Habitat ⁷ Preference						
Big bluestem, <i>Andropogon gerardii</i>	10-50	P, S		D, DM, M, WM	10	30	130,000	
Bull sedge, <i>Carex lanuginosa</i>	0-20	P, W		W	3.5 oz.	32	6,486,000	
Canada wildrye, <i>Elymus canadensis</i>	0-30	P, S		DM, M, WM	14	37	115,000	
Dark green bullrush, <i>Scirpus atrovirens</i>	0-10	p		W	3 oz	32	7,360,000	
Eastern gamagrass, <i>Tripsacum dactyloides</i>	0-10	P		M, MW, W	10	2	7,500	
Fox Sedge, <i>Carex vulpinoidea</i>	0-20	P, W		W	1	30	1,297,000	
Hard-stemmed bullrush, <i>Scirpus acutus</i>	0-10	P		W	7	33	206,400	
Hop sedge, <i>Carex lupulina</i>	0-10	P		W	3	36	528,000	
Indiangrass, <i>Sorghastrum nutans</i> ⁶	10-50	P		D, DM, M, WM	8	32	170,000	
Rough dropseed, <i>Sporobolus asper</i>	0-10	P		D, DM, M, WM	1	34	1,500,000	
Soft stemmed bullrush, <i>Scirpus validus</i>	0-10	P		W	3	33	496,000	
Switchgrass, <i>Panicum virgatum</i> ^{5,6}	0-10	P, S		D, DM, M, WM	4	37	400,000	
Upright sedge, <i>Carex stricta</i>	0-20	P		W	1	33	1,430,000	
Virginia wildrye, <i>Elymus virginicus</i>	0-10	P, S, W		WM, W	20	34	75,000	
Prairie cordgrass, <i>Spartina pectinata</i>	1-3 groupings	P		M, WM, W	groupings 1 plug ever 3 ft in linear plantings			6 feet between rows
Bluejoint reedgrass, <i>Calamagrostis canadensis</i>	1-3 groupings	P		WM, W	groupings 1 plug ever 3 ft in linear plantings			3 feet between rows

Upland Grasses Zone 3 and 4 ^{1, 9}	% of Mixture (Range Allowed)		Habitat ⁷ Preference	Moisture ⁸ Regime	Pure Stand Seeding Rate PLS pounds/acre	Seeds per sq. ft.	# Seeds per lb.	Remarks
	Upland ³	Prairie ⁵ Reconstruction						
Big bluestem, <i>Andropogon gerardii</i>	0-100	10-50	P, S	D, DM, M, WM	10	30	130,000	
Blue grama, <i>Bouteloua gracilis</i>	0-20	0-10 ⁴	P	D	2	32	710,000	W ¼ State, Sandy sites
Buffalograss, <i>Buchloe dactyloides</i>	0-20	0-30 ⁴	P	D, DM	6	38	275,000	WC & NW IA, Sandy sites
Canada wildrye, <i>Elymus canadensis</i>	0-20	0-30	P, S	DM, M, WM	14	37	115,000	
Eastern gamagrass, <i>Tripsacum dactyloides</i>	0-100	0-10	P	M, MW, W	10	2	7,500	
June grass, <i>Koeleria macrantha</i>	0-20	0-30	P	D, DM, M	1	33	1,465,000	
Indiangrass, <i>Sorghastrum nutans</i>	0-100	10-50	P	D, DM, M, WM	8	32	170,000	
Little bluestem, <i>Schizachyrium scoparium</i>	0-20	10-30	P, S	D, DM, M	7	36	225,000	
Porcupine grass, <i>Hesperostipa spartea</i>	0-10	0-10 ⁶	P	D, DM	10	34	150,000	
Prairie dropseed, <i>Sporobolus heterolepis</i>	0-10	0-10 ⁶	P	D, DM, M	1.5	41	1,200,000	
Rough dropseed, <i>Sporobolus asper</i> ⁶	0-10	0-10	P	D, DM, M, WM	1	34	1,500,000	
Sand dropseed, <i>Sporobolus cryptandrus</i>	0-10	0-10 ⁶	P	D, DM	0.5	57	5,000,000	
Sand Lovegrass, <i>Eragrostis trichodes</i>	0-10	0-10	P	D	1.5	44	1,300,000	Sandy sites only
Sideoats grama, <i>Bouteloua curtipendula</i>	0-20	10-30	P, S	D, DM	9	39	190,000	
Switchgrass, <i>Panicum virgatum</i> ^{5,6}	0-100	0-10	P, S	D, DM, M, WM	4	37	400,000	
Virginia wildrye, <i>Elymus virginicus</i>	0-20	0-10	P, S, W	WM, W	20	34	75,000	
Western wheatgrass, <i>Agropyron smithii</i>	0-20	0-10	P	DM, M	14	35	110,000	Rare in NE, NC, IA

Wetland Forbs and Legumes, Zone 1 & 2 ^{2, 9}	Lifecycle	Habitat ⁷ Preference	Moisture & Regime ⁸	Flower Period	Suggested Seeding Rate PLS ounces/acre	Seeds per sq. ft.	# Seeds per lb.	Remarks
American germander, <i>Teucrium canadense</i>	Perennial	P, S, W	M, WM	Summer	4 oz	2	350,000	
Black-eyed susan, <i>Rudbeckia hirta</i>	Biannual	P, S	D, DM, M, WM	July-Sept	1 oz	2	1,500,000	
Blue flag, <i>Iris shrevei</i>	Perennial	P, S	W	May - July	2 oz	0.05	16,000	
Blue vervain, <i>Verbena hastata</i>	Perennial	P	W	Summer-Fall	1 oz	0.14	100,000	
Boneset, <i>Eupatorium perfoliatum</i>	Perennial	P	W	Mid Sum-Fall	0.5 oz	1.	2,560,000	
Calico aster, <i>Aster lateriflorus</i> ⁴	Perennial	S, W	W	Late Summer	1 oz	0.5	320,000	Rare SW, NW, IA
Canada anemone, <i>Anemone canadensis</i>	Perennial	P, S	W	Late May-June	3 oz	0.4	96,000	
Canada or Tall goldenrod, <i>Solidago canadensis</i>	Perennial	P, S	DM, M, WM	Sept	.5 oz	0.7	1,010,000	
Cardinal flower, <i>Lobelia cardinalis</i> ⁴	Perennial	P, S	WM, W	Aug	0.5 oz	3	4,800,000	S ½ State only
Culver's root, <i>Veronicastrum virginicum</i>	Perennial	P, S	M, WM, W	Summer	0.1 oz	2	12,000,000	
Cup plant, <i>Silphium perfoliatum</i>	Perennial	P, S	M, WM, W	Jul-Sept	2 oz	0.06	622,400	
Downy gentian, <i>Gentiana puberulenta</i>	Perennial	P, S	M, WM	Sept-Oct	1 oz	5.2	3,632,000	
Feverfew-Wild quinine, <i>Parthenium integrifolium</i>	Perennial	P	WM, M, DM	Jun-Aug	4 oz	0.64	112,000	
Flat-topped aster, <i>Aster umbellatus</i>	Perennial	P, S	W	Late Sum-Fall	1 oz	1.5	1,072,000	
Fringed Loosestrife, <i>Lysimachia ciliata</i>	Perennial	P, W	WM, W	Late Spr-Summer	1 oz	2	1,440,000	

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Wetland Forbs and Legumes, Zone 1 & 2^{2, 9}	Lifecycle	Habitat ⁷ Preference	Moisture & Regime ⁸	Flower Period	Suggested Seeding Rate PLS ounces/acre	Seeds per sq. ft.	# Seeds per lb.	Remarks
Golden alexanders, <i>Zizia aurea</i>	Perennial	P, S, W	M, MW	Mid Spr-Early Sum	1 oz	0.25	176,000	
Great blue lobelia, <i>Lobelia siphilitica</i>	Perennial	P, S	W	Mid Sum-Fall	0.5 oz	5	7,320,000	
Gray-headed coneflower, <i>Ratibida pinnata</i>	Perennial	P, S	D, DM, M, WM	July-Sept	2 oz	2	625,000	
Ironweed, <i>Vernonia fasciculata</i>	Perennial	P, S	W	Late July-Early Oct	1 oz	0.6	384,000	
Joe-pye weed, <i>Eupatorium maculatum</i> ⁴	Perennial	P	W	Late Spr-Early Fall	1 oz	2	1,360,000	E ½ state only
Mountain mint, <i>Pycnanthemum virginianum</i>	Perennial	P, S	DM, M, WM	Mid Sum-Early Fall	oz	2.3	1,600,000	
New england aster, <i>Aster novae-angliae</i>	Perennial	P, S	M, WM	Aug-Oct	1 oz	2	1,300,000	
Pale gentian, <i>Gentiana alba</i>	Perennial	P	M, WM	Sept-Oct	.5 oz	2.6	3,632,000	
Prairie blazing Star, <i>Liatris pycnostachya</i>	Perennial	P	DM, M, WM	Mid Sum-Early Fall	4 oz	1	136,000	
Prairie coneflower, <i>Ratibida columnifera</i>	Perennial	P, S	D, DM, M, WM	July-Sept	0.5 oz	0.7	1,000,000	
Purple meadow rue, <i>Thalictrum dasycarpum</i>	Perennial	P	M, WM	May-June	1 oz	0.3	222,400	
Riddell's goldenrod, <i>Solidago riddellii</i> ⁴	Perennial	P	W	Late Summer	1 oz	1	700,000	N1/2, Wet/Calcareous Soils
Seedbox, <i>Ludwigia alternifolia</i>	Perennial	P	M, MW, W		.1 oz	1.8	20,800,000	
Showy tick trefoil, <i>Desmodium canadense</i>	Perennial	P, S	M, WM	July-Aug	3 oz	0.4	88,000	
Smooth blue aster, <i>Aster laevis</i>	Perennial	P, S	DM, M, WM	Aug-Oct	1 oz	1.	768,000	
Sneezeweed, <i>Helenium autumnale</i>	Perennial	P	WM, W	Aug-Sept	1 oz	2.3	1,600,000	
Spotted St. John's wort, <i>Hypericum punctatum</i>	Perennial	P, S	WM	June-Aug	1 oz	2.7	1,916,000	
Swamp Buttercup, <i>Ranunculus hispidus</i>	Perennial	S, W	W, WM	Apr-July	1 oz	0.27	192,000	
Swamp milkweed, <i>Asclepias incarnate</i>	Perennial	P	W	Summer	2 oz	0.2	72,000	
Tall bellflower, <i>Campanula Americana</i>	Perennial	W	WM, W	Jun-Sept	.5 oz	2	2,752,00	
Tall tickseed - Tall Coreopsis, <i>Coreopsis tripteris</i> ⁴	Perennial	P, S, W	M, MW	Summer	1 oz	2	1,650,000	S ½ Only
Yellow stargrass, <i>Hypoxis hirsuta</i>	Perennial	P, S	M, WM	May-June	1 oz	1.8	1,280,000	

Upland Forbs and Legumes, Zone 3 & 4^{2, 9}	Lifecycle	Habitat ⁷ Preference	Moisture & Regime	Flower Period	Suggested Seeding Rate PLS ounces/acre	Seeds per sq. ft.	# Seeds per lb.	Remarks
Alumroot, <i>Heuchera richardsonii</i>	Perennial	P	D, DM, M	Apr-June	0.5 oz	7	11,000,000	
Aromatic aster, <i>Aster oblongifolius</i> ⁴	Perennial	p	D, DM, M	Late Sum	3 oz	3.5	816,000	
American germander, <i>Teucrium canadense</i>	Perennial	P, S, W	M, WM	Summer	4 oz	2	350,000	
Bird's foot violet, <i>Viola pedata</i>	Perennial	P	D, DM	Apr-June	1 oz	0.69	416,000	
Black-eyed susan, <i>Rudbeckia hirta</i>	Biannual	P, S	D, DM, M, WM	July-Sept	1 oz	2	1,500,000	
Blue-eyed grass, <i>Sisyrinchium campestre</i>	Perennial	P, S	D, DM, M	Mid Spr-Early Summer	0.5 oz	0.5	7,568,000	
Bottle Gentian, <i>Gentiana andrewsii</i>	Perennial	P, S	M	Late Summer-Fall	2 oz	2.6	900,000	
Butterfly milkweed, <i>Asclepias tuberosa</i>	Perennial	P, S	DM, M	June -Aug	3 oz	0.1	7,000	
Canada or Tall goldenrod, <i>Solidago canadensis</i> ⁴	Perennial	P, S	DM, M, WM	Sept	.5 oz	0.7	1,010,000	
Cardinal flower, <i>Lobelia cardinalis</i> ⁴	Perennial	P, S	WM, W	Aug	0.5 oz	3	4,800,000	S ½ State only
Compass plant, <i>Silphium laciniatum</i>	Perennial	P	DM, M	Jun-Sept	4 oz	0.06	10,600	
Cream false indigo, <i>Baptisia bracteata</i>	Perennial	P, S	D, M	June	4 oz	0.12	22,400	
Culver's root, <i>Veronicastrum virginicum</i>	Perennial	P, S	M, WM, W	Summer	0.1 oz	2	12,000,000	

Upland Forbs and Legumes, Zone 3 & 4 ^{2, 9}	Lifecycle	Habitat ⁷ Preference	Moisture & Regime ⁸	Flower Period	Suggested Seeding Rate PLS ounces/acre	Seeds per sq. ft.	# Seeds per lb.	Remarks
Cup plant, <i>Silphium perfoliatum</i>	Perennial	P, S	M, WM, W	Jul-Sept	2 oz	0.06	622,400	
Dotted blazing star, <i>Liatris punctata</i>	Perennial	P	D, DM, M	Aug-Sept	2 oz	0.6	216,000	
Downy gentian, <i>Gentiana puberulenta</i>	Perennial	P, S	M, WM	Sept-Oct	1 oz	5.2	3,632,000	
Evening primrose, <i>Oenothera biennis</i>	Perennial	P, S	D, DM, M	Aug-Sept	1 oz	2	1,440,000	
False indigo, <i>Baptisia lactea</i>	Perennial	P, S	DM, M	June	4 oz	0.2	25,600	
Feverfew-Wild quinine, <i>Parthenium integrifolium</i>	Perennial	P	WM, M, DM	Jun-Aug	4 oz	.64	112,000	
Flowering spurge, <i>Euphorbia corollata</i>	Perennial	P	D, DM, M	June-September	2 oz	0.46	160,000	
Foxglove beardedtongue, <i>Penstemon digitalis</i> ⁴	Perennial	P, S	M	Late Spr-Mid Sum	0.5 oz	1.5	2,000,000	SE IA only
Fringed Loosestrife, <i>Lysimachia ciliata</i>	Perennial	P, W	WM, W	Late Spr-Summer	1 oz	2	1,440,000	
Golden alexanders, <i>Zizia aurea</i>	Perennial	P, S, W	M, MW	Mid Spr-Early Sum	1 oz	0.25	176,000	
Gray-headed coneflower, <i>Ratibida pinnata</i>	Perennial	P, S	D, DM, M, WM	July-Sept	2 oz	2	625,000	
Ground plum, <i>Astragalus crassicaarpus</i>	Perennial	P, S	D, DM	Early May	2 oz	9		
Heartleaf golden alexanders, <i>Zizia aptera</i> ⁴	Perennial	P, S	M	Mid Spr-Early Sum	1 oz	0.02	12,000	N½ State only
Heath aster, <i>Aster ericoides</i>	Perennial	P, S	D, DM, M	Aug-Oct	0.5 oz	2	3,360,000	
Hoary puccoon, <i>Lithospermum canescens</i>	Perennial	P	D, DM	May	5 oz	2.3	400,000	
Hoary vervain, <i>Verbena stricta</i>	Perennial	P	D, DM	Late Spr-Early Fall	2 oz	1.5	534,000	
Il. bundle flower, <i>Desmanthus illinoensis</i> ⁴	Perennial	P, S, W	DM, M	Late Spr-Summer	4 oz	0.3	60,000	Rare NW, NC, IA
Lousewort, <i>Pedicularis canadensis</i> (Wood betony)	Perennial	P, S	DM	May-June	1 oz	1.8	1,248,000	
Maximilian sunflower, <i>Helianthus maximiliani</i> ⁴	Perennial	P, S	DM, D	July-Aug	3 oz	0.6	150,000	NW, NC, IA only
Milk vetch, <i>Astragalus canadensis</i>	Perennial	P	M	Summer	1 oz	0.37	256,000	
Mountain mint, <i>Pycnanthemum virginianum</i>	Perennial	P, S	DM, M, WM	Mid Sum-Early Fall	1 oz	2.3	1,600,000	
New england aster, <i>Aster novae-angliae</i>	Perennial	P, S	M, WM	Aug-Oct	1 oz	2	1,300,000	
Old field (Gray) goldenrod, <i>Solidago nemoralis</i>	Perennial	P, S	D, DM, M	Late Sum-Fall	1 oz	1.4	1,008,000	
Ox-eye or False sunflower, <i>Heliopsis helianthoides</i>	Perennial	P, S	M	June-Sept	2 oz	0.3	103,900	
Pale gentian, <i>Gentiana alba</i>	Perennial	P	M, WM	Sept-Oct	.5 oz	2.6	3,632,000	
Pale purple coneflower, <i>Echinacea pallida</i>	Perennial	P	M	Mid-Late Spr	4 oz	0.6	106,000	
Partridge pea, <i>Chamaecrista fasciculata</i>	Annual	P, S	DM, M	July-Sept	4 oz	0.6	50,000	
Pasque flower, <i>Pulsatilla patens</i> ⁴	Perennial	P	D, DM	Early-Mid Spr	2 oz	0.8	288,000	N 1/2 Only
Prairie sage, <i>Artemisia ludoviciana</i> ⁴	Perennial	P, S	D, DM, M	Aug-Sept	4 oz	1	149,000	SW ¼ State
Prairie blazing Star, <i>Liatris pycnostachya</i>	Perennial	P	DM, M, WM	Mid Sum-Early Fall	4 oz	1	136,000	
Prairie cinquefoil (potentilla), <i>Potentilla arquta</i>	Perennial	P, S	D, DM, M	Late Spr-Sum	.5 oz	2.6	3,680,000	
Prairie coneflower, <i>Ratibida columnifera</i>	Perennial	P, S	D, DM, M	July-Sept	0.5 oz	0.7	1,000,000	NW only
Prairie coreopsis, <i>Coreopsis palmata</i>	Perennial	P, S	D, DM, M	June	1 oz	2	200,000	
Prairie larkspur, <i>Delphinium virescens</i> ⁴	Perennial	S, W	D, DM, M	June	0.5 oz	0.7	960,000	Rare in SE, SC
Prairie phlox, <i>Phlox pilosa</i> ⁴	Perennial	P, S	DM, M	Mid Spr-Mid Sum	1 oz	0.4	304,000	NE, NW only
Prairie ragwort, <i>Senecio plattensis</i>	Perennial	P	D, DM, M	May-June	1 oz	1.7	1,216,000	
Prairie smoke, <i>Geum triflorum</i>	Perennial	P, S	D, DM	Mid-Late Sum	1 oz	1	696,000	
Prairie violet, <i>Viola pedatifida</i>	Perennial	P	D, DM, M	Spr – Fall	1 oz	0.6	448,000	
Purple coneflower, <i>Echinacea purpurea</i> ⁴	Perennial	S, W	M	Jun-July	4 oz	0.7	115,500	SC, SE ¼ State only

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Upland Forbs and Legumes, Zone 3 & 4 ^{2, 9}	Lifecycle	Habitat ⁷ Preference	Moisture & Regime ⁸	Flower Period	Suggested Seeding Rate PLS ounces/acre	Seeds per sq. ft.	# Seeds per lb.	Remarks
Purple meadow rue, <i>Thalictrum dasycarpum</i>	Perennial	P	M, WM	May-June	1 oz	0.3	222,400	
Purple prairie clover, <i>Dalea purpurea</i>	Perennial	P	D, DM, M	July-Aug	3 oz	1	275,000	
Rattlesnake master, <i>Eryngium yuccifolium</i>	Perennial	P	DM, M	Jun-Aug	2 oz	0.5	177,770	
Rigid or Stiff goldenrod, <i>Solidago rigida</i>	Perennial	P	D, DM, M	Aug-Oct	0.5 oz	3	2,000,000	
Rosin weed, <i>Silphium integrifolium</i> ⁴	Perennial	P	DM, M	July-Sept	8 oz	0.26	22,400	Rare in NE
Roundhead lespedeza, <i>Lespedeza capitata</i>	Perennial	P, S	D, DM, M	July-Sept	3 oz	1	159,000	
Rough blazing star, <i>Liatris aspera</i>	Perennial	P, S	D, DM, M	Aug-Sept	2 oz	0.5	191,000	
Saw-tooth sunflower, <i>Helianthus grosseserratus</i> ⁵	Perennial	P, S	D, DM, M	July-Aug	.1 oz	0.02	208,000	Aggressive
Seedbox, <i>Ludwigia alternifolia</i>	Perennial	P	M, MW, W		.1 oz	1.8	20,800,000	
Shooting star, <i>Dodecatheon meadia</i>	Perennial	P, S	D, DM, M	Late July-Aug	1 oz	1.7	1,200,000	
Showy goldenrod, <i>Solidago speciosa</i>	Perennial	P, S	DM, M	May-June	.5 oz	1.2	1,675,200	
Showy Sunflower, <i>Helianthus Rigidus</i> ⁴	Perennial	P	DM, M	July-Sept	4 oz	0.5	85,000	Common W 1/2
Showy tick trefoil, <i>Desmodium canadense</i>	Perennial	P, S	M, WM	July-Aug	3 oz	0.4	88,000	
Silky Aster, <i>Aster sericeus</i>	Perennial	P, S	D, DM	Late Sum-Fall	1 oz	0.6	431,000	
Sky blue aster, <i>Aster azureus</i>	Perennial	P, S	D, DM, M	Late Sum-Fall	1 oz	0.5	1,010,000	
Smooth blue aster, <i>Aster laevis</i>	Perennial	P, S	DM, M, WM	Aug-Oct	1 oz	1.	768,000	
Sneezeweed, <i>Helenium autumnale</i>	Perennial	P	WM, W	Aug-Sept	1 oz	2.3	1,600,000	
Spiked lobelia, <i>Lobelia spicata</i>	Perennial	P	DM, M	Mid Spr-Mid Sum	.5 oz	5.	14,400,000	
Spiderwort, <i>Tradescantia ohiensis</i> ⁴	Perennial	P, S	D, DM, M	May-June	2 oz	0.4	128,000	Rare in NW
Spotted St. John's wort, <i>Hypericum punctatum</i>	Perennial	P, S	WM	June-Aug	1 oz	2.7	1,916,000	
Swamp Buttercup, <i>Ranunculus hispidus</i>	Perennial	S, W	W, WM	Apr-July	1 oz	0.27	192,000	
Sweet black-eyed susan, <i>Rudbeckia subtomentosa</i> ⁴	Perennial	P, S	M	Summer	1 oz	0.1	36,000	Not found WC, NW
Tall tickseed or Tall Coreopsis, <i>Coreopsis tripteris</i> ⁴	Perennial	P, S, W	M, MW	Summer	1 oz	2	1,650,000	Rare N 1/2
Thimbleweed, <i>Anemone cylindrica</i>	Perennial	P, S	D, DM, M	Late Spr-Mid Sum	1 oz	0.6	416,000	
White heath aster or Frost aster, <i>Aster pilosum</i> ⁴	Perennial	P, S, W	D, DM, M	Sept-Oct	1 oz	0.5	320,000	Rare N 1/2
White prairie clover, <i>Dalea candida</i>	Perennial	P	DM, M	Late Spr-Summer	4 oz	1.7	292,992	
White sage or Priairie sage, <i>Artemisia ludoviciana</i>	Perennial	P, S	D, DM, M	Aug-Oct	.5 oz	2.6	3,632,000	
Whorled milkweed, <i>Asclepias verticillata</i>	Perennial	P	D, DM, M	Jun-Aug	4 oz	1	176,000	
Wild bergamont or Bee balm, <i>Monarda fistulosa</i>	Perennial	P, S	D, DM, M	Mid Spr-Early Sum	1 oz	2	1,200,000	
Yellow stargrass, <i>Hypoxis hirsuta</i>	Perennial	P, S	M, WM	May-June	1 oz	1.8	1,280,000	

Woody species appropriate for establishment in Prairies See Tree/Shrub Establishment (612)	Moisture Regime ⁸	Flowering Period	Pure Stand Seeding Rate PLS pounds/acre	Seeds per sq. ft.	# Seeds per lb.	Remarks
Button bush, <i>Cephalanthus occidentalis</i>	D, M	June	4 oz	0.55	96,000	Good in flood plain areas
Leadplant, <i>Amorpha canescens</i>	D, DM, M	June-July	2 oz	0.95	123,000	
Meadow rose, <i>Rosa blanda</i>	DM, M, WM	June	1 oz	1.25	874,000	
New Jersey tea, <i>Ceanothus americanus</i>	DM, M	Late Spr-Fall	3 oz	0.5	112,000	
Pasture rose, <i>Rosa carolina</i>	DM, M, WM	June – Early July	2 oz	2.5	874,000	
Prairie wild rose, <i>Rosa arkansana</i>	DM, M	June-July	4 oz	0.2	40,000	
Redroot, <i>Ceanothus ovatus</i>	DM, M	June	3 oz	0.7	160,000	
Soapweed, <i>Yucca glauca</i> ⁴	D, DM	Early-Mid June	8 oz	0.12	10,600	Loess Hills only

Table 4. Temporary Seeding Recommendations

Fields with atrazine ¹ carryover, lack of suitable seed or late planting date.	
Sudangrass	20 pounds/acre
Sorghum-Sudangrass hybrid	20 pounds/acre
Milo (Grain Sorghum)	20 pounds/acre
Corn	2 bushels/acre
Fields where planting is delayed due to lack of suitable seed or late planting date.	
Oats	3 bushels/acre
Winter rye	2 bushels/acre
Soybeans	3 bushels/acre
Spring or winter wheat	1.5-2 bushels/acre

¹ For other herbicide carry-over problems, check with the area office.

Map Iowa Eco-Type Zones

