

## Iowa Native Prairie Planting Guide

# Conservation Planner Guide

## Planning and Understanding Diverse Native Seed Mixes



About 80 percent of Iowa’s landscape was once tallgrass prairie. Today, less than 0.1 percent of our original tallgrass prairie remnants remain. USDA’s Natural Resources Conservation Service (NRCS) works with farmers and private landowners to restore this important ecosystem to Iowa’s landscape.

Tallgrass prairie reconstruction is the creation of diverse native prairie habitat in areas where it previously existed. There are many factors to consider when designing and implementing a native tallgrass prairie reconstruction:

- » site history
- » seed mix design
- » site preparation
- » planting
- » establishment
- » long-term maintenance

Seed mixes are one of the most influential tools available when designing a diverse native seeding. This document will offer guidance on various considerations to aid in the evaluation and/or creation of a native seed mix and help define common ecological terminology. This document is not intended for wetland restorations, but may still provide helpful guidance.

### The Importance of Diversity in Native Seed Mixes:

- » Benefits a wide array of wildlife, from game species to soil invertebrates
- » Reduces soil erosion and improves water quality
- » Resilience to extreme weather events (e.g., droughts)
- » Resistance to weed invasion



(photo credit: Sarah Nizzi)

- » Restores site ecology
- » Increases long-term stability of the planting

### Determine the Goals and Objectives of the Planting:

- » Diverse prairie reconstruction
- » Pollinators and/or monarchs
- » Upland wildlife
- » Soil health and water quality
- » Climate change

It is important to understand the specific biological and ecological needs of target species, if the objective of the planting is to support a particular species or guild of species. For example, if one goal is to support the regal fritillary butterfly, the mix should include nectar plants for adults and host plants for the caterpillars.



## Evaluating a Native Diverse Seed Mix

### Soil Moisture Regimes

Matching native species to the appropriate soil moisture regime is a crucial aspect of a seed mix because we want to be sure species planted will do well under site-specific conditions. The amount of soil moisture, or the amount of water held by soil, depends in part on soil texture, the amount of sand, silt, and clay present. Many native prairie species, such as wild bergamot (*Monarda fistulosa*), have a wide tolerance of soils. Others are very restrictive to certain soil regimes; for example, silky aster (*Dalea candida*) prefers drier soils and common boneset (*Eupatorium perfoliatum*) prefers wetter soils.

There are five predominant soil moisture regimes:

- » Wet (hydric)
- » Wet-mesic
- » Mesic (moderate)
- » Dry-mesic
- » Dry (Xeric)

The extent of soil moisture regime may be altered from the original, native condition due to artificial drainage (e.g., tile). One example is an area that may have once been poorly drained, supporting wetland plants, but now has surface and subsurface drainage (e.g., tile) altering the hydrology. The area may no longer support wetland plants and may be considered moderately well drained. Plants will need to be selected appropriately given site specific conditions.

It may also be necessary at times for a client to purchase more than one seed mix, if a site contains significantly different soil moisture regimes (e.g., areas that may be dry or wet).

### Native Range

Species known to occur at a certain site, within a county, or within a region are more likely to establish and be successful for the long-term versus plants native to areas further away. Not all of Iowa's native species naturally occur statewide. Native species within an appropriate region have evolved under the local climatic conditions. These conditions impact when plants flower, reproduce, and the relationships they've

established with other plant and animal species. (See Resources section for more information about native range.)

Sourcing native seed as locally as possible is ideal (e.g., within 100 miles of the site). Seed source information needs to be requested from the seed vendor. The origin for each species should be reported on the seed tag, but origin information only refers to where the plant was grown, not where it was originally sourced. More detailed information on this subject can be found on the [Tallgrass Prairie Center website](#).

According to the Conservation Cover practice standard, a long-term prairie reconstruction (greater than 15 years) must use local source identified seed (seed traceable to an Iowa remnant prairie source). When planting within one mile of an existing native prairie remnant, use local ecotype or source identified seed (seed traceable to an Iowa remnant prairie source). Refer to Iowa NRCS Technical Note 28, "Guidance for Seeding Natives on Prairie Reconstruction Sites."



Wet Prairie (photo credit: Karin Jokela)

### Functional Plant Groups

Functional plant groups are plants with common physical, genetic, and reproductive characteristics. Including as many functional groups as possible is critical to increasing the diversity and the functionality of the planting (e.g., preventing weed invasion). See Table 2 for examples of functional plant groups and additional details.

## Grasses

- » Cool-season - actively growing during the spring and fall in cooler temperatures; various soil types
- » Warm-season - actively growing during the summer in warmer temperatures; various soil types

**Sedges** - grass-like; triangular stem; various soil types

**Forbs** - native herbaceous flowering plants (non-woody); various soils

- » Legumes - herbaceous flowering plants in the pea family (*Fabaceae*); important ecologically for their nitrogen fixation; various soils

**Shrubs** - woody plants that are smaller than trees and have multiple branching stems arising at or near the ground (e.g., prairie rose, *Rosa arkansana* or leadplant, *Amorpha canescens*)

The site-specific soil moisture regime will drive the proportions of cool-season grasses, sedges, and warm-season grasses that should be included in the diverse native seed mix. The wetter the site the more cool-season grasses and sedges are recommended for the seed mix. The drier the site the more warm-season grasses are recommended for the seed mix.

An example of a diverse, mesic seed mix planted at twenty seeds per square foot of grasses and sedges and twenty seeds of forbs and legumes, could be 5% cool-season grasses, 15% sedges, 80% warm-season grasses (within the grass and sedge mixture), and 80% forbs and 20% legumes (within the forb and legume mixture).

## Number of Species

A remnant prairie in Iowa can support over 300 native plant species. We are fortunate in Iowa to have many of these species commercially available through native seed vendors. More species equals more diversity, and the resilience of a planting to extreme weather events or weed invasions increases as diversity increases. As plant species diversity increases, so too will wildlife. Generally, native diverse seed mixes can range from a minimum of 30 native species to over 60 native species. The number of species will depend on the goals of the project and budget. Increasing diversity can also help balance the cost of the seed mix.

## Coefficient of Conservatism

The coefficient of conservatism is a C-value ranging from 0 to 10 assigned to species. A species with a low score (e.g., 3 or below) responds well to disturbance and is adapted to a broad range of habitats. An example is hoary vervain (*Verbena stricta*). A species with a high score (e.g., 10) has a lower tolerance to environmental degradation (i.e., disturbance) and therefore is restricted to undisturbed, high quality habitat (e.g., prairie remnants). An example is prairie Indian plantain (*Arnoglossum plantagineum*).

When evaluating or creating a seed mix it is important to note the average coefficient of conservatism value at the bottom of the Iowa Native Seeding Calculator tab. A C-value of 5 is considered a balanced seed mix.

Native species with a high C-value included in the seed mix (e.g., 8 to 10) may not be immediately present in a planting, because they may take longer to establish. These species may not be recognizable until later (years 4 or beyond), but many other factors can play a role in species establishment. Site preparation, planting, establishment maintenance, and on-going management are all variables to keep in mind when evaluating a native seeding.

## Lifespan

Including perennials, biennials and annuals ensures the planting will have active growth throughout its lifespan and stability for the long-term. About 95% of Iowa's native prairie species are perennial. A seed mix should predominantly be perennial species, with the inclusion of some biennials and annuals. Biennials and annuals aid in the establishment of a planting but will decrease over time.

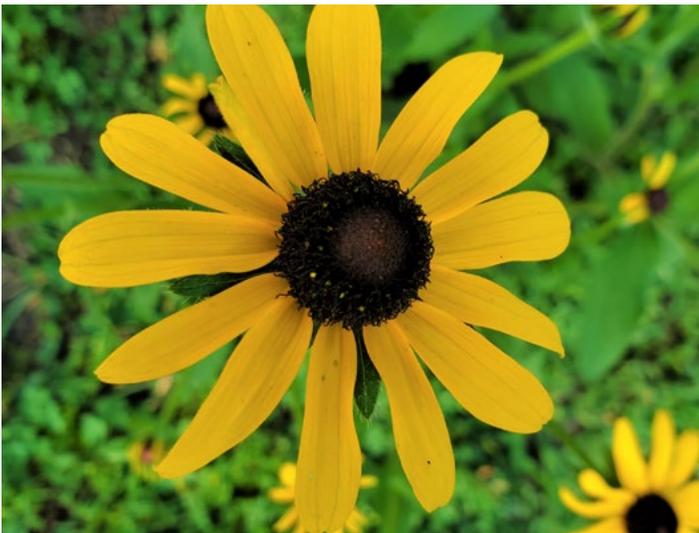
**Perennials** - can be short or long-lived; live beyond two years; slower to establish.

**Biennials** - lives for two years before completing life cycle; vegetative growth takes place in the first year. In the second year the plant flowers and produces seed; establishes quickly post planting and post disturbance (e.g., prescribed burning).

**Annuals** - completes entire life cycle in one year; establishes quickly post planting and post disturbance (e.g., prescribed burning)



Rattlesnake master (*Eryngium yuccifolium*) is a native perennial species. (photo credit: Sarah Nizzi)



Black-eyed Susan (*Rudbeckia hirta*) is a native biennial species. (photo credit: Sarah Nizzi)



Partridge pea (*Chamaecrista fasciculata*) is the most planted native annual species. (photo credit: Sarah Nizzi)

## Grass to Forb Ratio

The goals, location and soil moisture regimes will help determine how much of a planting should be grasses and sedges, and forbs and legumes. If utilizing a USDA Farm Bill program, there may be specific criteria to follow. Examples of grass to forb ratios include:

- » 25% grasses and sedges, 75% forbs and legumes
  - Preferable for increased forb diversity for pollinators and monarchs; mesic to dry soils; low weed pressure
  - may be slower to establish biomass
- » 50% grasses and sedges, 50% forbs and legumes
  - balanced; wildlife diversity; dry, mesic to wet-mesic soils; low to medium weed pressure
- » 75% grasses and sedges, 25% forbs and legumes
  - Preferable for wet soils; difficult areas such as floodplains; high weed pressure areas

## Seeding Rate of Single Species

A single forb species cannot be more than 10% of the forb mixture within a diverse native seed mix according to the Conservation Cover practice standard. Consider keeping a single forb species at 5% or less within the forb mixture. Relying too heavily on a few species may create gaps in the seeding and decrease the diversity and resilience of the stand over time, allowing for weed invasion. Often it is early successional forb species that may be included at high rates. These early species do well in the first few years, but may decrease naturally over time, especially without disturbance. A well-balanced diverse seed mix will ensure forbs are present and actively growing throughout the lifespan of the planting.

A single grass species cannot exceed 20% of a diverse native seed mix according to the Conservation Cover practice standard. Consider keeping single grass species at 10% or less.

## Aggressive Species

Certain native species can be aggressive and take over a planting. Be sure to check the seeding rates within the mix. Some USDA Farm Bill programs have limitations on certain native grass species. Check program rules for more information.

**Table 1. Recommended Seeding Rates for Known Aggressive Species**

Native Grasses	Recommended Seeds Per Square Feet	PLS Pounds Per Acre
big bluestem ( <i>Andropogon gerardii</i> )	no more than 1.00	0.25
switchgrass ( <i>Panicum virgatum</i> )	no more than 1.00	0.194
Indiangrass ( <i>Sorghastrum nutans</i> )	no more than 1.00	0.25
Native Forbs	Recommended Seeds Per Square Feet	PLS Pounds Per Acre
western yarrow ( <i>Achillea millefolium</i> )	no more than 0.30	0.004
sunflowers ( <i>Helianthus species</i> )	no more than 0.20	0.042
wild bergamot ( <i>Monarda fistulosa</i> )	no more than 2.00	0.078
gray-headed coneflower ( <i>Ratibida pinnata</i> )	no more than 1.00	0.091
cup plant ( <i>Silphium perfoliatum</i> )	no more than 0.03	0.056

### Importance of Native Grasses

Native grasses play many critical roles in prairie ecosystems and must be included in diverse native seed mixes. Grasses help with establishment of a planting, create duff vital to management (e.g., litter for prescribed burning), provide nesting and overwintering habitat for wildlife, and are host plants for many butterfly and moth species. Incorporating native cool-season grasses, sedges, and/or rushes can be beneficial in combating unwanted weed pressure under certain circumstances (e.g., wetter soil regimes). Less grass included in the mix can lead to weed invasion (Meissen et al 2019, Wilsey 2010).

- » Grass Height
  - A diversity of species with different heights helps species persist long term (Huang et al 2013). Increasing shorter grass species leads to better establishment of subdominant species, such as forbs and legumes (Wilsey 2010).

### Bloom Succession of Forbs

If planning a diverse prairie for pollinators, bloom succession of forbs is critical and a requirement for USDA Farm Bill pollinator programs. Pollinators need bloom availability for forage throughout the growing season (spring through fall). The minimum requirement is three blooming species per season (see Table 2 for examples).

### Host Plants

If planning a diverse prairie for monarch butterflies, include host plants for their caterpillars, milkweed (*Asclepias species*). If utilizing USDA Farm Bill

programs, the following is required for monarch plantings.

- » The forb mixture must be made up of 1.5% or more of one or more milkweed species. Including more than one milkweed species is desirable.
- » The forb mixture must be 60% monarch nectar plants like pale purple coneflower (*Echinacea pallida*) and showy goldenrod (*Solidago speciosa*).
  - Monarch nectar plants are highlighted yellow within the calculator tab of the native seed calculator
- » Limit the seeding rate of big bluestem, switchgrass and Indiangrass
  - Big bluestem and switchgrass can be no more than 1.00 seed per square foot
  - Indiangrass can be no more than 1.30 seeds per square foot
- » Introduced forbs (non-native species) are not allowed

In conclusion, there are many different factors to consider when evaluating and/or designing native seed mixes. It is important to make sure the planted seed mix will do well under the site-specific conditions and meet the needs of the planting. A quality seed mix in combination with adequate site preparation, proper planting, establishment maintenance, and ongoing long-term management are all key to a successful tallgrass prairie planting.



**Table 2. Native Plant Functional Groups – Commonly Available Genera and Species**

Native Cool Season Grasses					
Scientific Name	Common Name	Growth Form	Height	Soil Moisture	
<i>Bromus kalmia</i>	prairie brome	Bunch	Short	Wet-mesic, mesic, dry-mesic	
<i>Calamagrostis canadensis</i>	bluejoint grass	Rhizomatous	Short	Wet, wet-mesic, mesic	
<i>Elymus canadensis</i>	Canada wildrye	Bunch	Tall	Wet-mesic, mesic, dry-mesic, dry	
<i>Koeleria macrantha</i>	prairie Junegrass	Bunch	Short	Dry-mesic, dry	
<i>Glyceria striata</i>	fowl mannagrass	Rhizomatous	Short	Wet, wet-mesic, mesic	
<i>Stipa spartea</i>	porcupine grass	Bunch	Short	Mesic, dry-mesic, dry	
Native Warm Season Grasses					
Scientific Name	Common Name	Growth Form	Height	Soil Moisture	
<i>Andropogon gerardii</i>	big bluestem	Bunch	Tall	Wet-mesic, mesic, dry-mesic, dry	
<i>Bouteloua curtipendula</i>	sideoats grama	Rhizomatous	Short	Mesic, dry-mesic, dry	
<i>Eragrostis spectabilis</i>	purple lovegrass	Bunch	Short	Dry	
<i>Panicum virgatum</i>	switchgrass	Rhizomatous	Tall	Wet-mesic, mesic, dry-mesic, dry	
<i>Schizachyrium scoparium</i>	little bluestem	Bunch	Short	Mesic, mesic-dry, dry	
<i>Sorghastrum nutans</i>	Indiangrass	Bunch	Tall	Mesic, mesic-dry, dry	
<i>Spartina pectinata</i>	prairie cordgrass	Rhizomatous	Tall	Wet, wet-mesic, mesic	
<i>Sporobolus compositus</i>	composite dropseed	Bunch	Short	Mesic, dry-mesic, dry	
<i>Sporobolus heterolepis</i>	prairie dropseed	Bunch	Short	Wet-mesic, mesic, dry-mesic, dry	
Native Sedges					
Scientific Name	Common Name	Growth Form	Height	Soil Moisture	
<i>Carex bebbii</i>	Bebb's sedge	Bunch	Short	Wet-mesic, mesic	
<i>Carex bicknellii</i>	Bicknell's sedge	Bunch	Short	Wet-mesic, mesic, dry-mesic	
<i>Carex brevior</i>	shortbeak sedge	Bunch	Short	Wet-mesic, mesic, dry-mesic, dry	
<i>Carex hystericina</i>	bottlebrush sedge	Bunch	Shore	Wet, wet-mesic	
<i>Carex molesta</i>	troublesome sedge	Bunch	Short	Wet-mesic, mesic, dry-mesic, dry	
<i>Carex stricta</i>	upright sedge	Bunch	Short	Wet, wet-mesic	
<i>Carex vulpinoidea</i>	fox sedge	Bunch	Short	Wet, wet-mesic, mesic, dry-mesic	
Native Forbs					
Scientific Name	Common Name	Life Cycle	Height	Soil Moisture	Bloom
<i>Asclepias spp.</i>	milkweed	Perennial	Short	Wet-mesic, mesic, dry-mesic, dry	Summer
<i>Baptisia spp.*</i>	white wild indigo and others	Perennial	Short	Wet-mesic, mesic, dry-mesic, dry	Spring, Summer
<i>Brickellia eupatorioides</i>	false boneset	Perennial	Short	Mesic, dry-mesic, dry	Summer
<i>Chamaecrista fasciculata*</i>	partridge pea		Short	Mesic, dry-mesic, dry	Summer, Fall
<i>Coreopsis spp.</i>	prairie coreopsis and others	Perennial	Short or Tall	Wet-mesic, mesic, dry-mesic, dry	Summer
<i>Dalea spp.*</i>	prairie clover	Perennial	Short	Mesic, dry-mesic, dry	Summer
<i>Echinacea spp.</i>	coneflower	Perennial	Short	Wet-mesic, mesic, dry-mesic, dry	Summer

**Table 2. Functional Native Plant Groups – Commonly Available Genera and Species Cont...**

<b>Native Forbs Cont...</b>					
<b>Scientific Name</b>	<b>Common Name</b>	<b>Life Cycle</b>	<b>Height</b>	<b>Soil Moisture</b>	<b>Bloom</b>
<i>Eryngium yuccifolium</i>	rattlesnake master	Perennial	Tall	Wet-mesic, mesic, dry-mesic	Summer
<i>Eupatorium spp.</i>	boneset	Perennial	Tall	Wet, wet-mesic, mesic, dry-mesic, dry	Summer, Fall
<i>Gentiana spp.</i>	bottle gentian and others	Perennial	Short	Wet-mesic, mesic, dry-mesic, dry	Summer, Fall
<i>Helianthus spp.</i>	sunflower	Perennial	Tall	Wet-mesic, mesic, dry-mesic	Summer
<i>Liatris spp.</i>	blazing star	Perennial	Short or Tall	Wet, wet-mesic, mesic, dry-mesic, dry	Summer
<i>Lobelia spp.</i>	great lobelia and others	Perennial	Short	Wet, wet-mesic, mesic	Summer, Fall
<i>Monarda spp.</i>	wild bergamot and spotted bee balm	Perennial	Short	Wet-mesic, mesic, dry-mesic, dry	Summer
<i>Penstemon spp.</i>	beardtongue	Perennial	Short	Mesic, dry-mesic, dry	Spring, Summer
<i>Pycnanthemum spp.</i>	mountain mint	Perennial	Short	Wet, wet-mesic, mesic, dry-mesic	Summer, Fall
<i>Rudbeckia spp.</i>	black-eyed Susan and others	Biennial	Short	Wet-mesic, mesic, dry-mesic	Summer
<i>Solidago speciosa</i>	showy goldenrod and others	Perennial	Short or Tall	Mesic, dry-mesic, dry	Summer, Fall
<i>Symphotrichum spp.</i>	aster	Perennial	Short or Tall	Wet, wet-mesic, mesic, dry-mesic, dry	Summer, Fall
<i>Tradescantia spp.</i>	spiderwort	Perennial	Short	Wet-mesic, mesic, dry-mesic, dry	Spring
<i>Verbena spp.</i>	vervain	Perennial	Short	Wet, wet-mesic, mesic, dry-mesic, dry	Summer
<i>Vernonia spp.</i>	ironweed	Perennial	Tall	Wet-mesic, mesic, dry-mesic	Summer
<i>Veronicastrum virginicum</i>	Culver's root	Perennial	Tall	Wet-mesic, mesic, dry-mesic	Summer
<i>Zizia aurea</i>	golden Alexanders	Perennial	Short	Wet-mesic, mesic, dry-mesic	Spring

\*legumes

**Spp.** = species

**Height:** 4 feet or less = short; 5 feet or more = tall



## Considerations for Native Seed Mixes Checklist

### Soil Moisture Regimes

Do the species match the site-specific soil conditions?  YES  NO

### Native Range

Are species native to the county, neighboring counties, or region?  COUNTY  NEIGHBOR  REGION

» *Sourcing native seed as locally as possible is ideal (e.g., within 100 miles of the site).*

*For long-term prairie reconstruction, use local source identified seed (traceable to an Iowa remnant prairie source).*

» *Refer to Iowa NRCS Technical Note 28, "Guidance for Seeding Natives on Prairie Reconstruction Sites."*

» *When planting within one mile of an existing native prairie remnant, use local source identified seed (traceable to an Iowa remnant prairie source). Refer to Technical Note 28, "Guidance for Seeding Natives on Prairie Reconstruction Sites."*

### Functional Plant Groups

Are cool-season and warm-season grasses, sedges, forbs, and legumes included in the mix?  YES  NO

### Number of Species

How many species are in the mix? *A recommended minimum for diverse prairie plantings is 30 species.*

### Coefficient of Conservatism

What is the average coefficient of conservatism for the mix? *A C-value of 5 is a well-balanced mix*

### Lifespan

Are annuals, biennials and perennials included in the mix?  YES  NO

*Annuals and biennials must be less than 20% of the forb mixture within a seed mix.*

### Grass to Forb ratio

Does the grass to forb ratio meet the objectives of the planting?  YES  NO

### Seeding Rate of Single Species

Are there any single species dominating the mix?  YES  NO

*See section on seeding rate of single species for specific rates.*

### Aggressive Species

Are known aggressive species included at a high rate?  YES  NO

*Some native species are known to outcompete other native species. A few examples of aggressive species include big bluestem, switchgrass, gray-headed coneflower, western yarrow, and more. Refer to the section on aggressive native species for a more detailed list.*

### Native grasses

How many grasses are present in the mix? What is the percentage of grasses?

*Grasses provide litter for prescribed fire, nesting, and overwintering habitat, and are host plants for lepidoptera species.*

### Bloom Period

If planning for pollinator habitat, are there at least 3 forb species per bloom period (spring, summer, and fall)?

YES  NO

### Host Plants

If planning for monarch butterflies, are milkweeds included?  YES  NO

*Milkweed needs to make up 1.5% of the forb mixture. Are monarch nectar plants included? Monarch nectar plants need to make up at least 60% of the forb mixture.*

## Resources

Guidance for Seeding Natives on Prairie Reconstruction Sites Technote 28

[https://efotg.sc.egov.usda.gov/references/public/IA/Iowa\\_Ecotype\\_Planting\\_Guidance\\_28\\_AGR\\_TN\\_2003\\_10.pdf](https://efotg.sc.egov.usda.gov/references/public/IA/Iowa_Ecotype_Planting_Guidance_28_AGR_TN_2003_10.pdf)

Iowa NRCS Technical Resources

[https://www.nrcs.usda.gov/wps/portal/nrcs/ia/technical/ecoscience/NRCS142P2\\_008193/](https://www.nrcs.usda.gov/wps/portal/nrcs/ia/technical/ecoscience/NRCS142P2_008193/)

Interseeding Wildflowers to Diversify Grasslands for Pollinators: Guidance for the Great Plains and Midwest Regions

<https://xerces.org/publications/guidelines/interseeding-wildflowers-to-diversify-grasslands-for-pollinators>

Minnesota Wildflowers: A Guide to the Flora of Minnesota

<https://www.minnesotawildflowers.info/>

Prairie Plants of Iowa

<http://uipress.lib.uiowa.edu/ppi/>

Prairie Restoration Diversity - Planting and Seed Mixes

[https://files.dnr.state.mn.us/natural\\_resources/prairies/podcast/s1ep05-restoration.pdf](https://files.dnr.state.mn.us/natural_resources/prairies/podcast/s1ep05-restoration.pdf)

Tallgrass Prairie Center

<https://www.tallgrassprairiecenter.org/>

The Biota of North American Program: North American Vascular Flora

<http://www.bonap.org/>

USDA PLANTS

<https://plants.usda.gov/home>

Vascular Plants of Iowa

<http://uipress.lib.uiowa.edu/vpi/>

Web Soil Survey

<https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>

## Glossary

**Bunchgrass** - a native grass that is non-sod forming; grows in clumps or tufts

**Coefficient of Conservatism** – is a C-value ranging from 0 to 10 assigned to species. A species with a low score (e.g., 3 or below) responds well to disturbance and is adapted to a broad range of habitats. A species with a high score (e.g., 10) has a lower tolerance to environmental degradation (i.e., disturbance) and therefore is restricted to undisturbed, high quality habitat (e.g., prairie remnants).

**Early successional species** - species that respond well to disturbance and are typically easy to establish; coefficient of conservatism value of 3 or less

**Forb** - native herbaceous flowering plant, particularly a prairie species

**Host plant** - food source for a specific organism (e.g., monarch caterpillars feed only on milkweed plants)

**Hydric** - habitat with plenty of moisture; very wet; poorly-drained; saturated for a significant portion of the growing season

**Iowa ecotype seed** - source identified seed known to have been originally collected from prairie remnants in one of the three Iowa eco-type zones

# Planning and Understanding Diverse Native Seed Mixes

## Glossary Cont...

**Introduced species** - a plant that has been brought into the country; not native

**Legume** - herbaceous plant species in the pea family (Fabaceae), important for their nitrogen fixation

**Mesic** - habitat with a moderate amount of moisture; medium; well-drained

**Prairie remnant** - remaining, usually small areas of original prairie

**Rhizomatous** - bearing below ground horizontal stems; results in extensive clonal growth (large patch of one species)

**Species Diversity** - a measure of the variety of species present in a community

**Xeric** - habitat with little moisture; dry or very dry; sand and/or gravel soil

## References

- Huang, Y., Martin, L.M., Isbell, F.I., and Wisley, B.J. 2013. Is Community Persistence Related to Diversity? A Test with Prairie Species in a Long-Term Experiment. *Basic and Applied Ecology*, 14(3), 199-207.
- Meissen, J., A. Glidden, M. Sherrard, K. Elgersma, and L. Jackson. 2019. Seed Mix Design and First Year Management Influence Multifunctionality and Cost-effectiveness in Prairie Reconstruction. *Restoration Ecology*, rec.13013.
- Shirley, S. 1994. *Restoring the Tallgrass Prairie*, University of Iowa Press, Iowa City, Iowa.
- Thompson, J. 1992. *Prairie Restoration in Iowa*. Thompson, J. *Prairies, Forests, and Wetlands: The Restoration of the Natural Landscape Communities in Iowa*, University of Iowa Press, Iowa City, Iowa. Pp. 7-41.
- Williams, D. 2010. *Designing Seed Mixes*. D. Smith, D. Williams, G. Houseal, K. Henderson (ed.). *The Tallgrass Prairie Center Guide to Prairie Restoration in the Upper Midwest*, University of Iowa Press, Iowa City, Iowa. Pp. 16-36.
- Williams, D., J. Eckberg, J. Hopwood, R. Powers, M. Vaughn, K. Jokela, S. Foltz Jordan, and E. Lee-Mader. 2018. *Interseeding Wildflowers to Diversify Grasslands for Pollinators: Guidance for the Great Plains and Midwest Regions*. 36 pp. Portland, OR: The Xerces Society for Invertebrate Conservation. Available at: <https://xerces.org/publications/guidelines/interseeding-wildflowers-to-diversify-grasslands-for-pollinators>
- Wilsey, B.J. 2010. Productivity and Subordinate Species Response to Dominant Grass Species and Seed Source During Restoration. *Restoration Ecology*, 18(5), 628-637.



*Indiangrass (photo credit: Sarah Nizzi)*



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