Photo: Dave Williams

Evaluating Seed Mix Composition for Pollinators

Karin Jokela

Pollinator Conservation Planner and NRCS Partner Biologist

Xerces Society for Invertebrate Conservation

xerces.org

National Pollinator Week June 22 – 29, 2020

OUR FUTURE FLIES WITH POLLINATORS

Pollinators provide many ecosystem services that support the health of plants, people, and the planet. Get involved at www.pollinator.org.

Meet these plants and pollinators, and learn how you can help them at https://www.pollinator.org/poster-2020.
Art by Fiorella Ikeue

Los polinizadores proveen de los servicios ecosistémicos que mantienen la salud de las plantas, la gente y el planeta. Involucrate a www.pollinator.org.

Les pollinisateurs assurent plusieurs services écosystémiques qui contribuent à la santé des plantes, des personnes et de la planète. Impliquez-vous en visitant www.pollinator.org.

The Xerces Society for Invertebrate Conservation

Protecting wildlife through the conservation of invertebrates and their habitats

Photos: 2018 Xerces staff by Matthew Shepherd/Xerces Society. Blue butterfly by Dana Ross.

Xerces blue butterfly (*Glaucopsyche xerces*), the first U.S. butterfly to go extinct due to human activities

Main Office: Portland, Oregon

Regional Offices: California, Connecticut, Indiana, Iowa, Maine, Minnesota, Nebraska, New Jersey, New York, North Carolina, North Dakota, Oklahoma, Washington

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Xerces-NRCS Conservation Partnership

- Joint Staff Biologist positions with USDA Natural Resources Conservation Service (NRCS)
- Technical assistance for Farm Bill programs
- Developing / enhancing on-farm pollinator habitat

Photo: Dana Jokela

GENERAL MILLS

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Photo: David Van Eeckhout, Dana Jokela

Xerces Society Partner Biologists

- Provide NRCS staff and farmers with technical support and training focused on habitat for pollinators and beneficial insects
- Assist with habitat evaluations, conservation planning, restoration efforts for declining species (e.g. monarchs, rusty patched bumble bee, Karner blue butterfly, etc.)
- Conduct field days and trainings on pollinators, monarchs, threatened and endangered species, and beneficial insects
- Refine technical documents, conservation practice guides, fact sheets, seed mixes, etc.

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Photo: Karin Jokela

Where we're headed...

- Basics of pollinator conservation
- Recognizing existing habitat (assessment tools)
- Principles of seed mix design
- Evaluation of pollinator seed mixes

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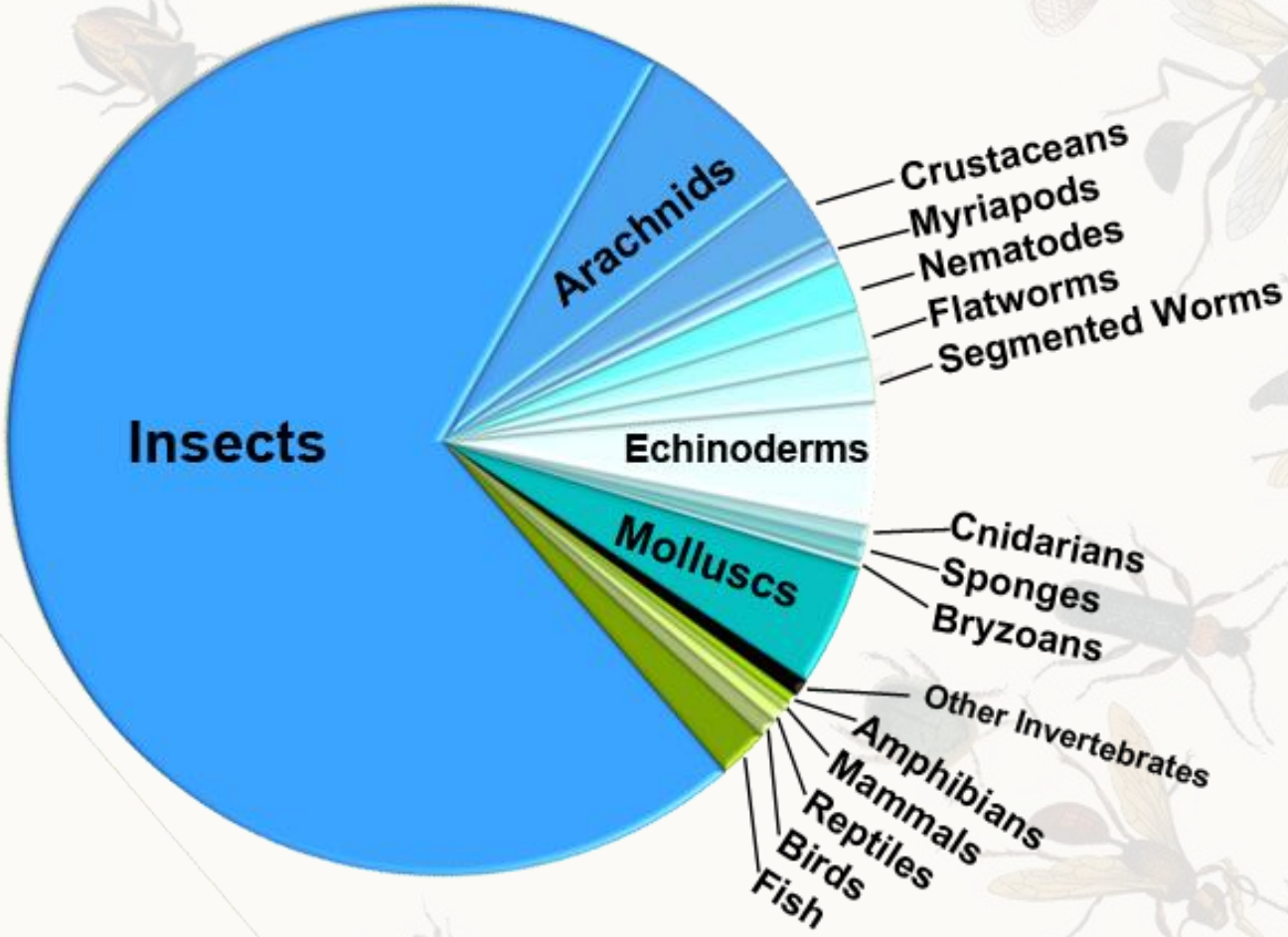
The importance of invertebrate conservation



There are about **2,130,000** described species on Earth (fungi, plants, invertebrates, vertebrates)

~ 70% of all described species are invertebrates! (1,500,000 species)

Kingdom Animalia:
~95% invertebrates!

Photo: Illinois Natural History Survey (https://www.inhs.illinois.edu/outreach/animals/); New York Times (https://www.nytimes.com/2018/11/27/magazine/insect-apocalypse.html)

“The Little Things that Run the World”

Only a small fraction (~2%) of insects are pests.

The rest are beneficial to humans or important for food webs

Photo: Piotr Naskrecki

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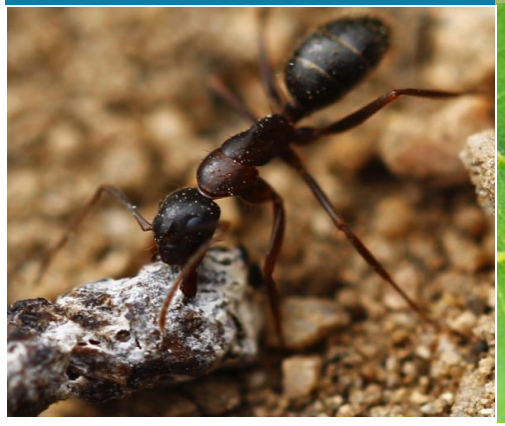
“The fate of the world’s insects is inseparable from our own”

Soil health, pest control, crop pollination, higher yields…

Nutrient cycling and decomposition	Offer free pest control services	Turn plants into food for other animals	Help plants reproduce
			

Photos: (left to right): Magnus Robinson; USDA ARS Scott Bauer; Marcel Holyoak via flickr; Emily May / Xerces Society
Quote from NYT Editorial Insect Armageddon October 29, 2017

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What is a pollinator?

An animal that helps move pollen from the male anther to the female stigma on a flower

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Photos: Bryan E. Reynolds (2); Sarah Foltz Jordan; David Inouye; Bruce Newhouse; Mace Vaughan

Bees are the most efficient and important pollinators

- Actively collect and transport pollen
- Exhibit flower constancy

Photo: Nancy Adamson / Xerces Society

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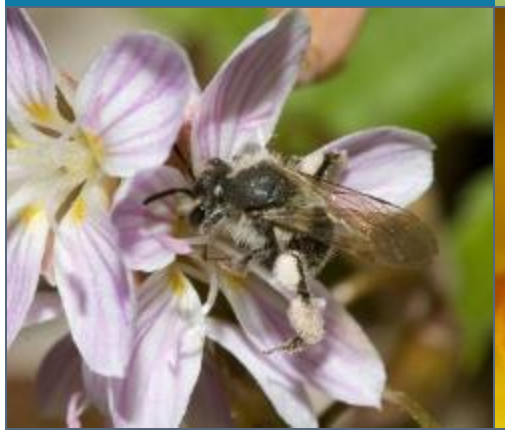
Recognizing Bee Diversity

Tremendous diversity of wild bees

~450+ species of native bees in Minnesota	~3,600 species of native bees in the U.S	> 5,000 species of native bees in North America	> 20,000 species of native bees in the world
			

Photos: Rollin Coville; Betsy Betros

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Source: Ascher, J. S. and J. Pickering. 2015. Discover Life bee species guide and world checklist (Hymenoptera: Apoidea: Anthophila). www.discoverlife.org.

Photo: USDA-ARS/Scott Bauer (top); Sara Morris (bottom)

Pollinator conservation

Honey bees

- 1 species in the Upper Midwest
- Not at risk of extinction
- Managed by humans
- Nest provided for them
- Social, large colonies
- Prefer nonnative flowers

Native bees

- > 460 spp. in Upper Midwest
- Many at risk of extinction
- Mostly not managed by humans
- Nest in the wild (ground, stems, wood)
- Mostly solitary, small nests
- **Many are dependent on native flowers**

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Native Bee Groups

Social Nesting (~1%)

Ground Nesting (~ 70%)

Stem/Wood Nesting (~30%)

Photos: Kent McFarland-flickr-CC, Kelly Gill, Nancy Lee Adamson

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Nesting opportunities for bees

Photos: Xerces Society

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Life cycle of a solitary bee

Mining bee (*Andrena* sp.): a year in its underground nest as egg, larva, and pupa before emerging to spend a few weeks as an adult.

Photos: Dennis Briggs

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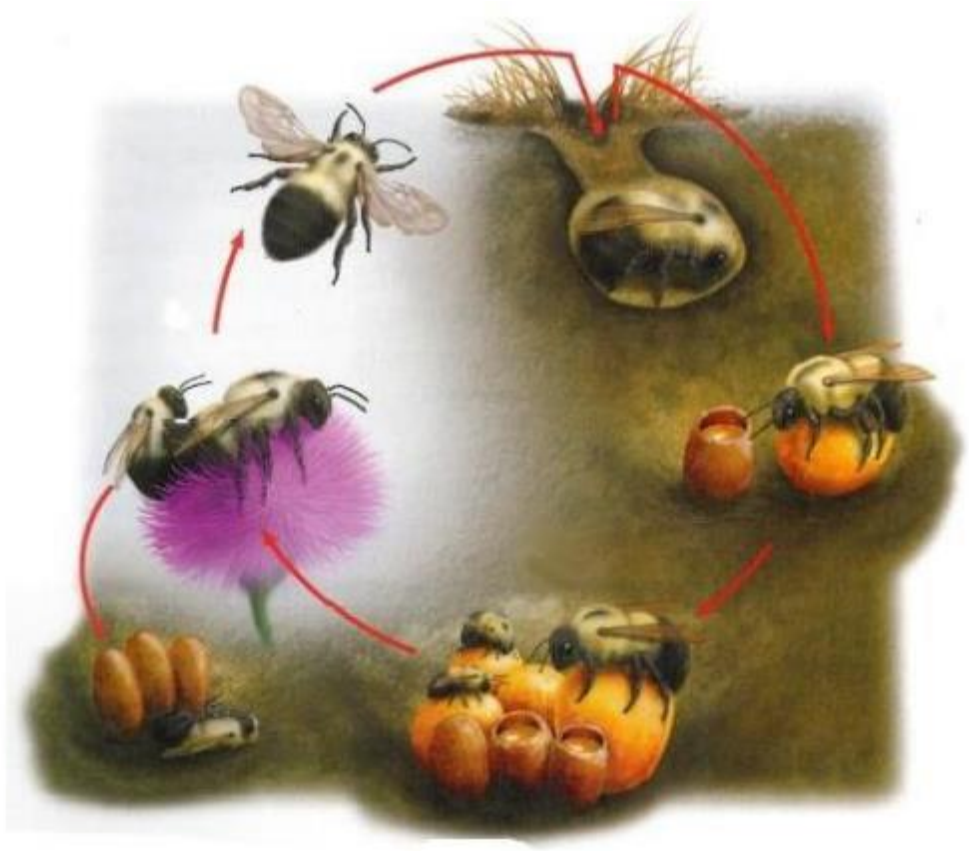
Bumble bee life cycle

Winter: Hibernating queen

Fall: Mated queens seek overwintering sites, founding queen dies

Spring: Queen establishes nest and lays eggs



Early Fall: Males leave nest, then new queens leave to find a mate

Early Summer: Worker females help grow the colony

After mating, males die

Summer: Colony peak

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Illustration: David Wysotski

Bumble bee nesting and overwintering sites

Photo by Daniel Murdiyarso for Center for International Forestry Research (CIFOR). (Creative Commons)

Photos: Kelly Gill / Xerces Society

Photos: Sarah Foltz Jordan / Xerces Society

Three habitat requirements for all pollinators

Diverse vegetation for season-long nectar, pollen, and host plants

Shelter for nesting and overwintering

Refuge from pesticides

Photo: Karin Jokela; Jennifer Hopwood / Xerces Society; USDA-ARS

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Assessing habitat and designing improvements

Photo: Anne Stine / Xerces Society

Habitat planning process:

1. Recognize existing habitat
2. Identify habitat deficiencies
3. Prioritize habitat improvements

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Identify and protect habitat

- Riparian buffers / natives trees and shrubs
- Fallow fields / filter strips
- Cover crops
- Flowering hedgerows / windbreaks
- Understory plantings
- Gardens / wildflower patches / bolting crops
- Natural areas
- Rock piles / brush piles / bare soil for nesting

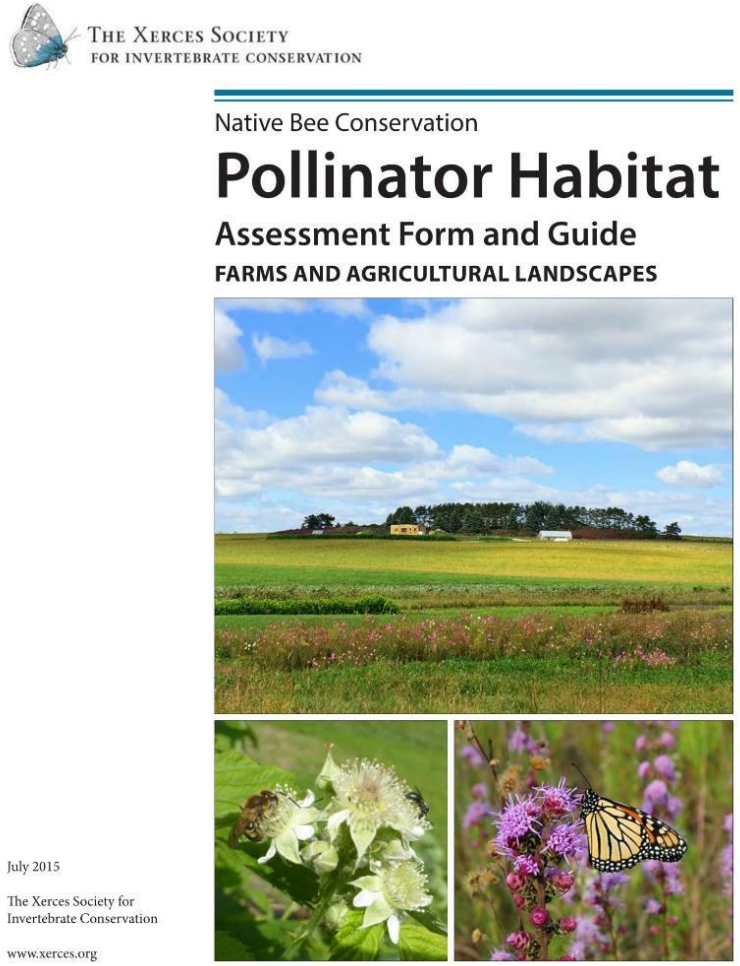
If you have these areas, conserving them can provide pollinator and beneficial insect habitat.

Assessing habitat and designing improvements

- Xerces' Pollinator Habitat Assessment Form and Guide for Farms and Agricultural Landscapes

- An assessment form and guide is also available for natural areas, rangelands, beneficial insects, bumble bees, and urban habitats

- Quantify habitat characteristics
  - Landscape-level
  - Site-level



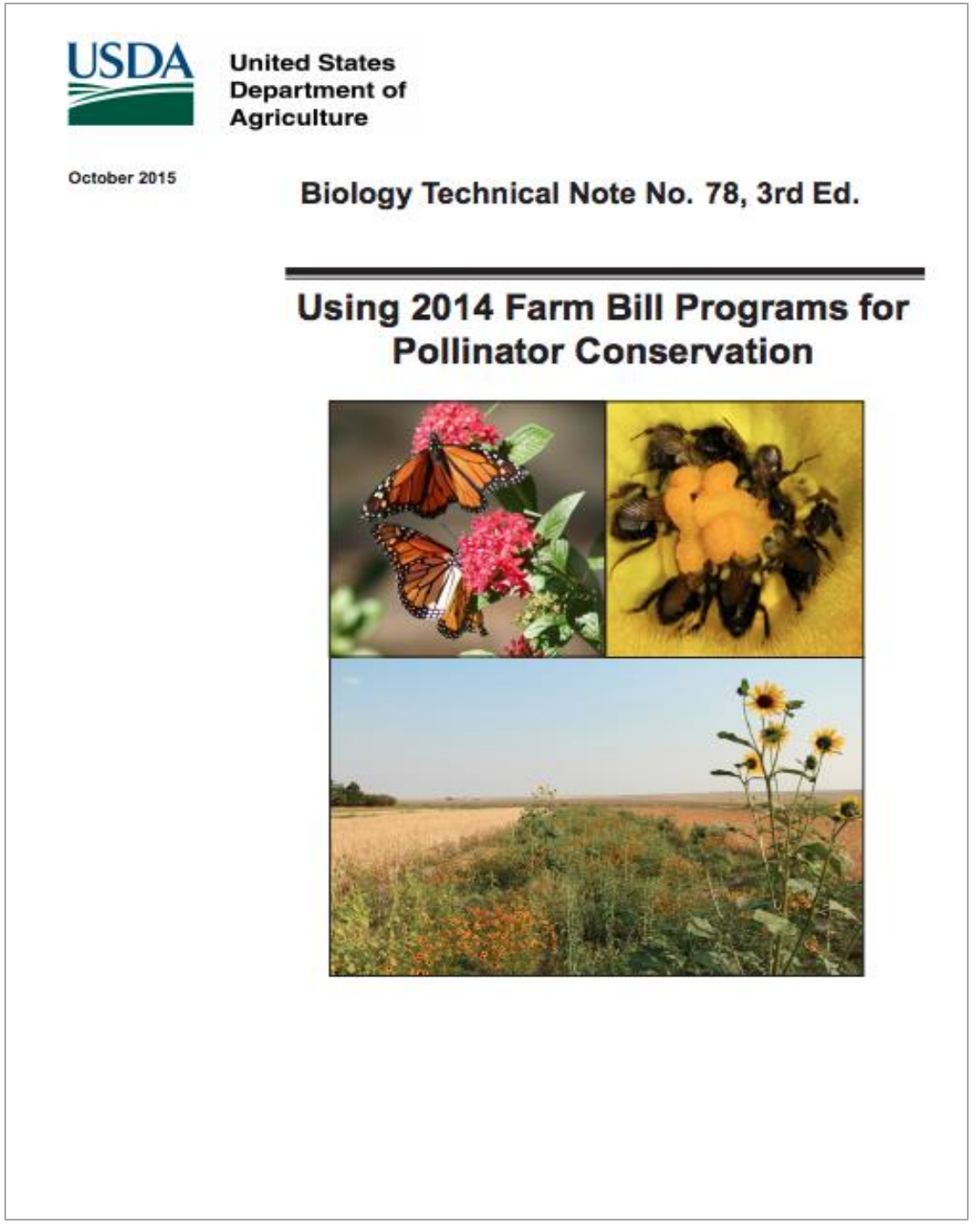
USDA technical and financial assistance programs

NRCS programs:

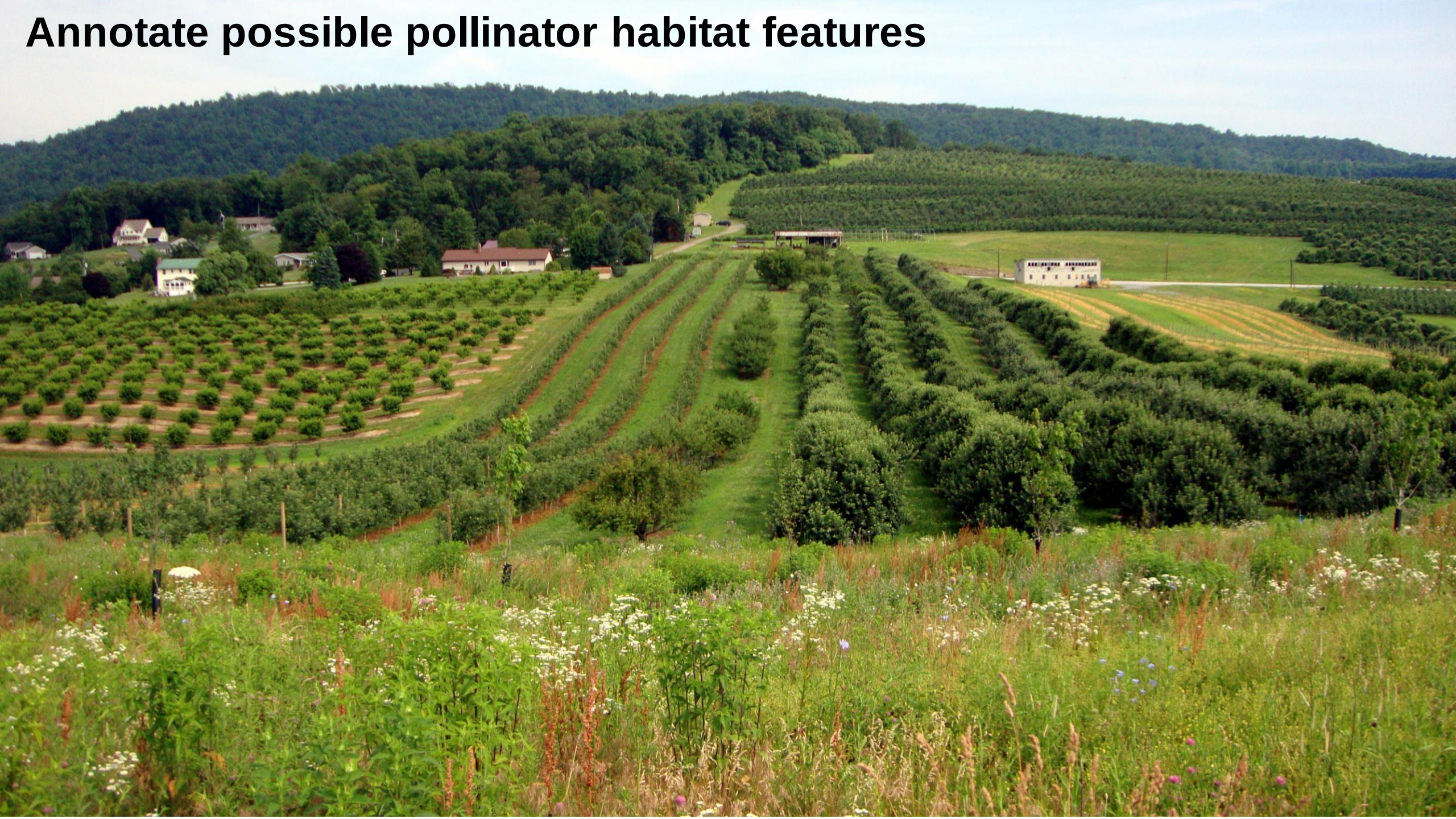
- Environmental Quality Incentives Program (EQIP)
- Conservation Stewardship Program (CSP)
- Agricultural Conservation Easement Programs (ACEP)
- Conservation Technical Assistance (CTA)

FSA programs:

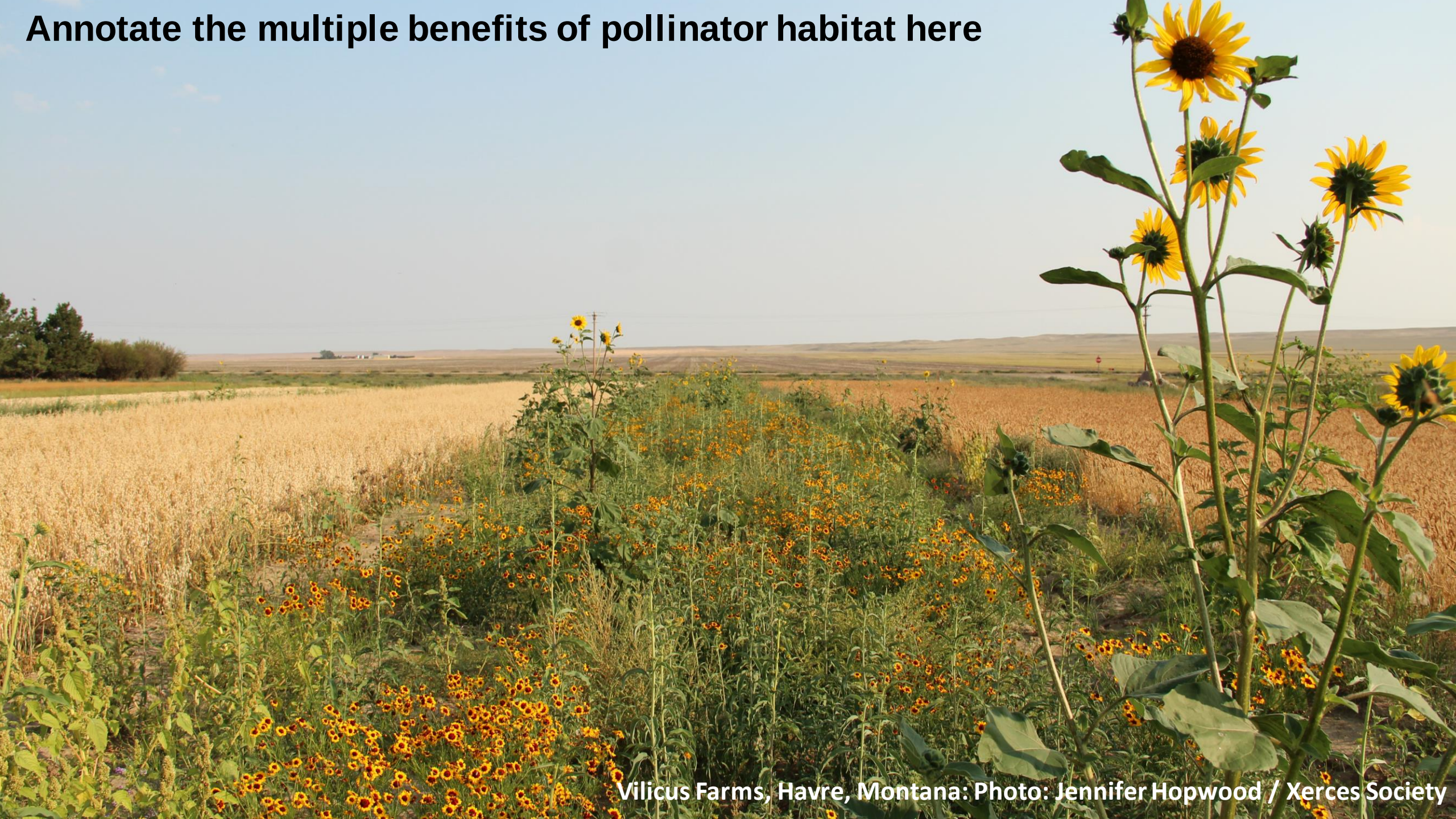
- Conservation Reserve Program (CRP)
- Conservation Reserve Enhancement Program (CREP)



Annotate possible pollinator habitat features



Annotate the multiple benefits of pollinator habitat here



Vilicus Farms, Havre, Montana: Photo: Jennifer Hopwood / Xerces Society

Insect habitat is multifunctional...

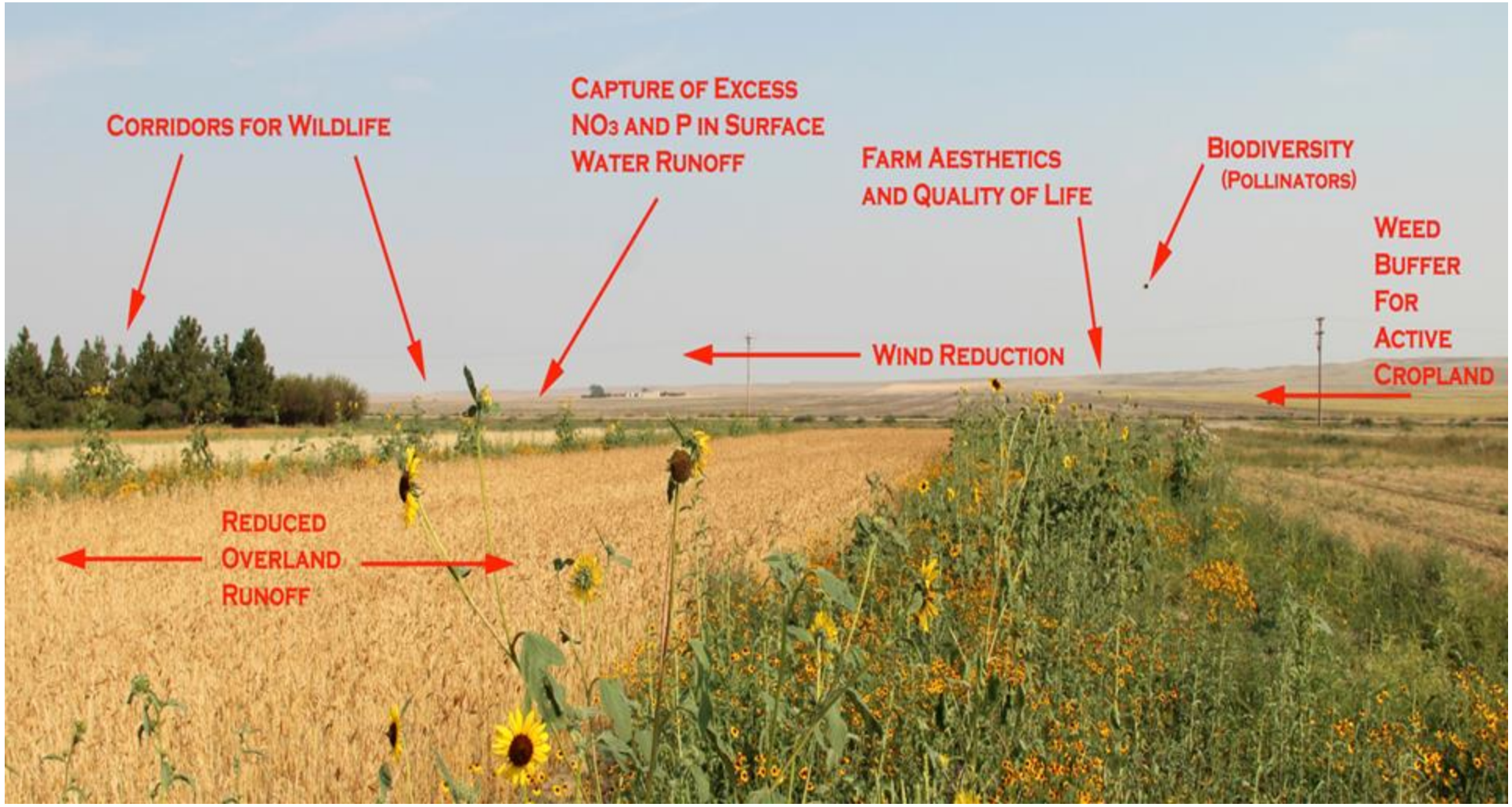


Photo: Jennifer Hopwood, Xerces Society

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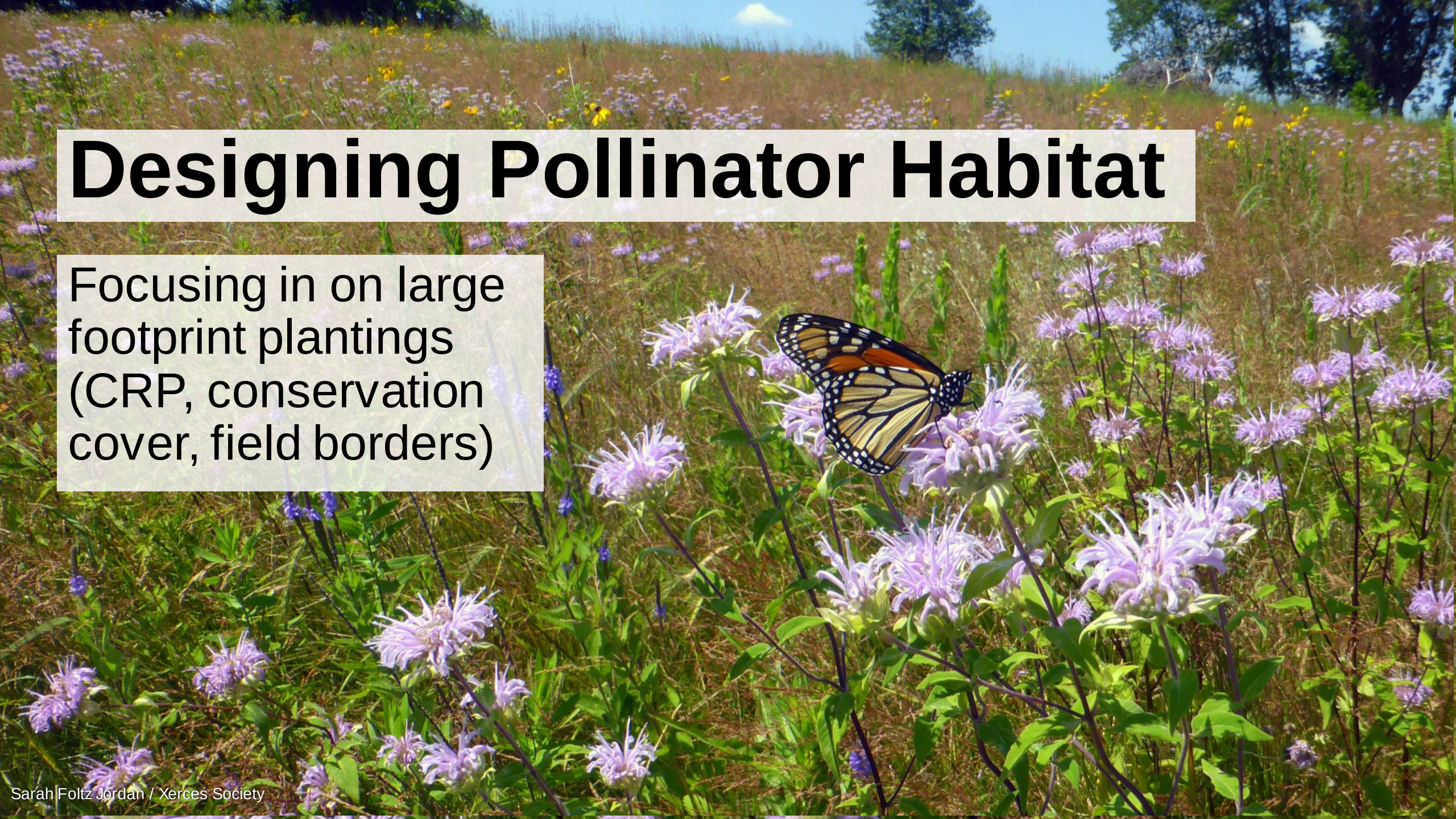
Designing Pollinator Habitat

Focusing in on large footprint plantings (CRP, conservation cover, field borders)



Sarah Foltz Jordan / Xerces Society

Photos: Karin Jokela

Set your restoration goals

Timeline

Landform (topography)

Soils

Field characteristics

- Current vegetation
- Past vegetation
- Pesticide history (herbicides and insecticides)
- Disturbance history
- Edge effects
  - Long and linear vs. large blocks
  - Neighboring weeds: Siberian elm, boxelder, thistle, brome, reed canary grass, introduced clovers?
- Differences across the site

Budget

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Get to know your site

- Learn about your soils
- Consider using more than one seed mix if you the site grades from poorly drained to well-drained
- Group similar types together by drainage class and content

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Verify soils on site and make seeding zones

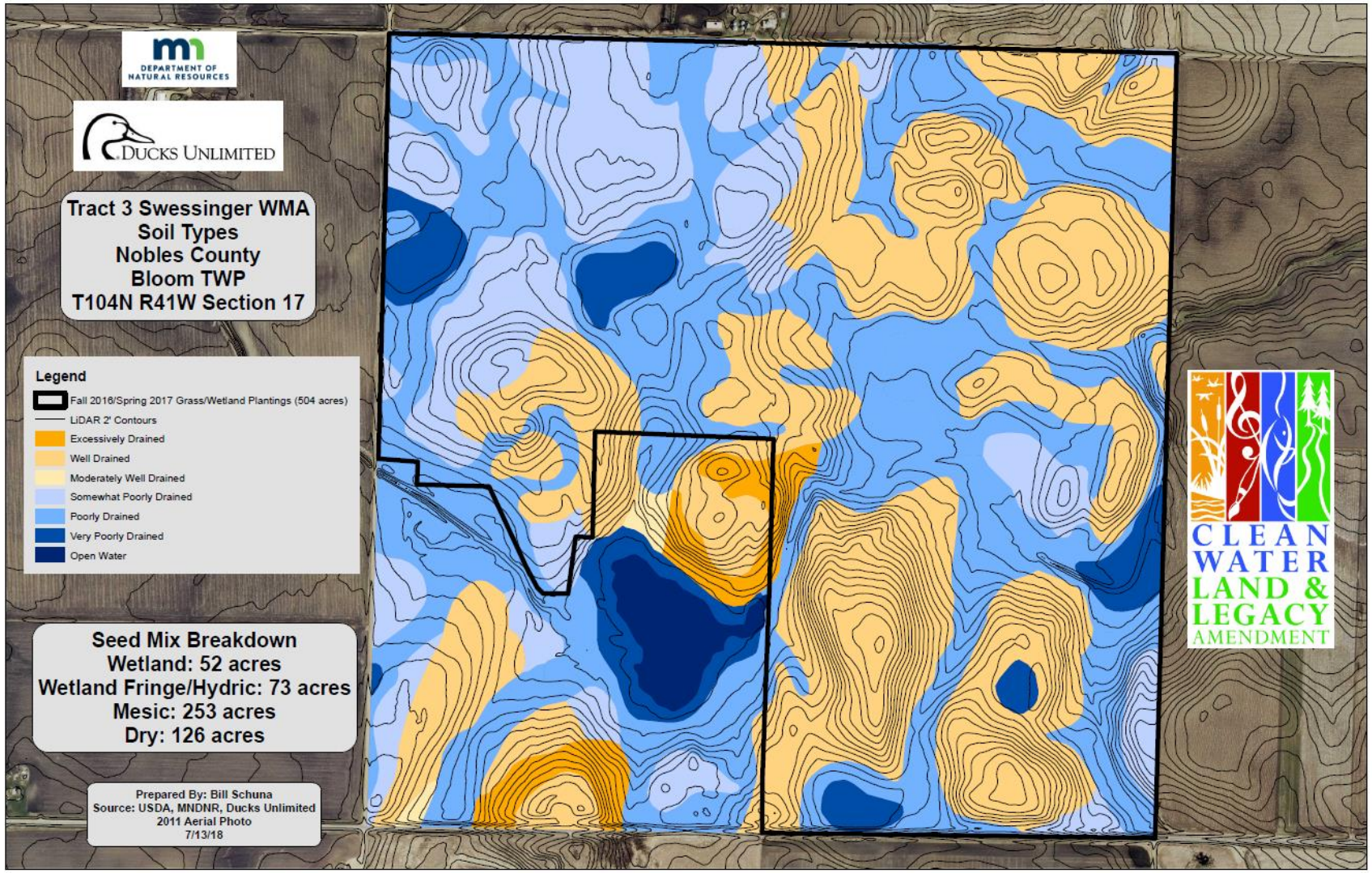

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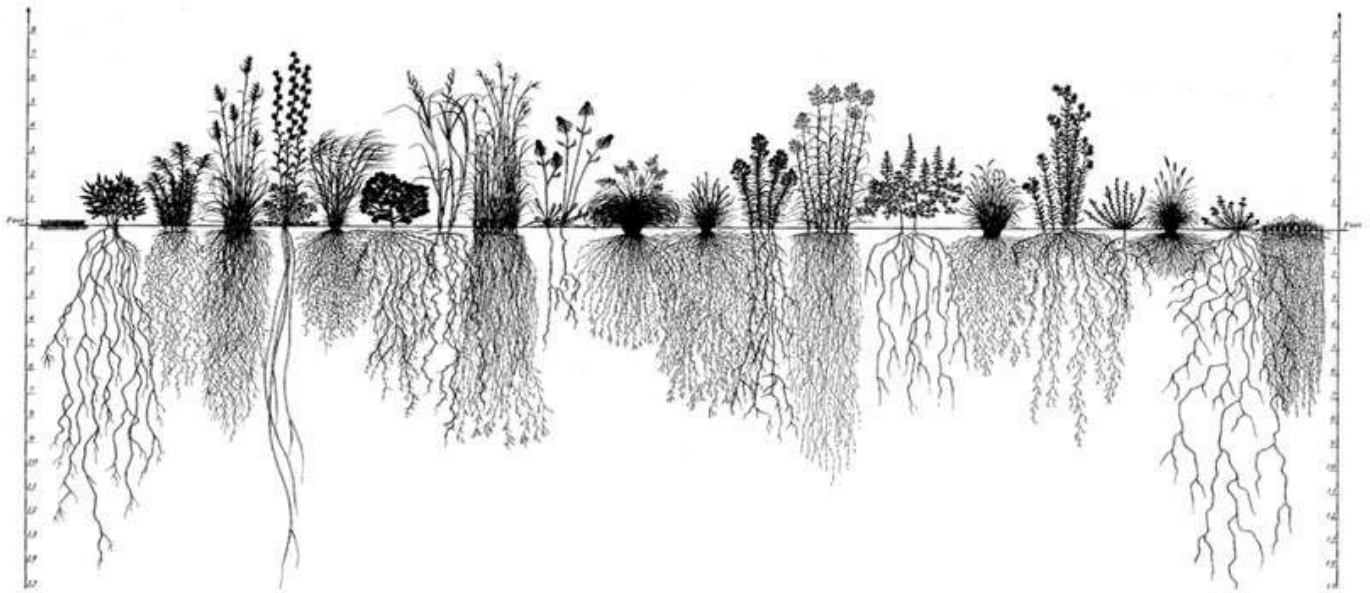
Photo: Dave Williams

Diversity matters!

Diversity in your seed mix increases:

- overall biodiversity and functionality for wildlife
- soil health
- water interception/infiltration
- resistance to plant invasion
- resilience in the face of extreme weather events
- stand longevity



Species Selection

Match the species habitat preferences to soil moisture conditions

NRCS	Nurseries / Seed Companies
Excessively drained	Dry
Somewhat excessively drained	Dry Mesic
Moderately well drained	Mesic
Well drained	Mesic
Somewhat poorly drained	Wet Mesic
Poorly drained	Wet Mesic
Very poorly drained	Wet

Birdfoot violet (*Viola pedata*)

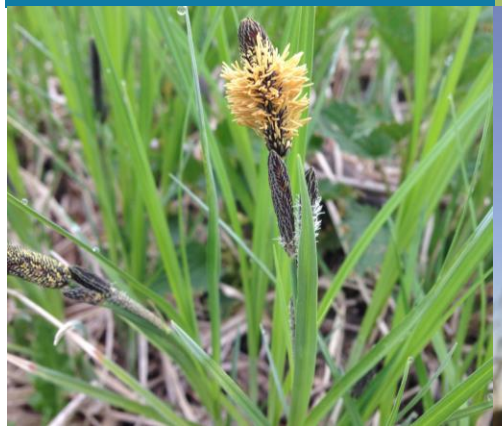
Joe Pye Weed (*Eutrochium maculatum*)

Photos: Karin Jokela

Species Selection

Select species from different plant functional groups (guilds)

Cool season grasses, sedges, and rushes	Warm season grasses	Legumes	Non-legume forbs
Pennsylvania sedge	Side oats grama	Purple prairie clover	New England aster




Photos: Karin Jokela (left two); Scott Siegried (purple prairie clover); Adam Varenhorst (New England aster)

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Species Selection

Select species with different bloom phenology

Early-season blooms	Early-summer blooms	Late-summer blooms	Fall blooms
Prairie spiderwort	Butterfly milkweed	Rough blazing star	Stiff goldenrod




Photos: Karin Jokela; Justin Wheeler; Karin Jokela; Karin Jokela

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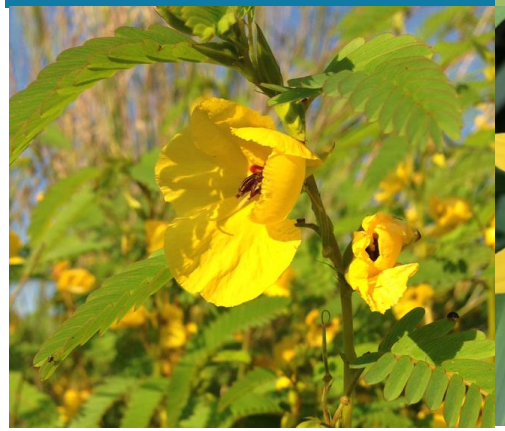
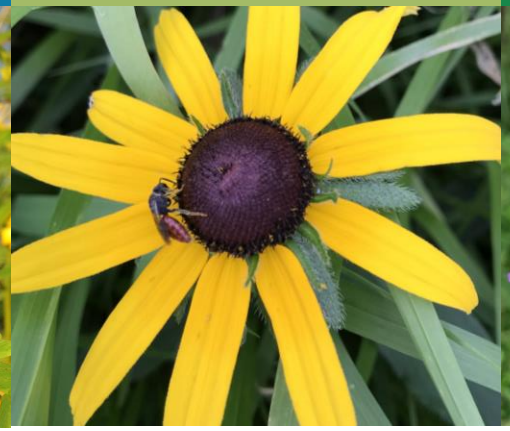
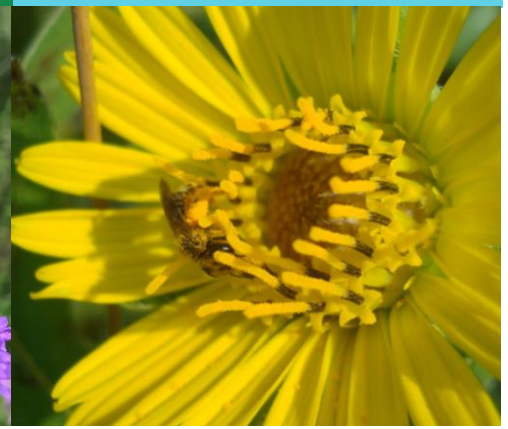
Species Selection

Select species with different life histories

Annuals	Biennials	Short-lived perennials	Long-lived perennials
Partridge pea	Black-eyed Susan	Blue vervain	Compass plant



Photos: Karin Jokela

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Species Selection

Select species from different plant families

Asteraceae (Asters)	**Fabaceae (Legumes)**	**Salicaceae (Willows)**	**Primulaceae (native loosestrife – *Lysimachia*)**
Flodman's thistle	Leadplant	Willow	Fringed loosestrife




Photos: Karin Jokela

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Species Selection Resources

Select species that are regionally appropriate

- Minnesota Wildflowers
  https://www.minnesotawildflowers.info/
  - Identification tools, range maps, habitat types, plant families
- USDA PLANTS Database
  https://plants.sc.egov.usda.gov/java/
  - County-level range maps, plant families, sometimes offers plant characteristics and fact sheets
- Prairie Moon Nursery
  https://www.prairiemoon.com/
  - Cultural information, seeds/oz., germination requirements, sun and soil moisture requirements, filters for "deer resistant" and "pollinator favorite," etc.

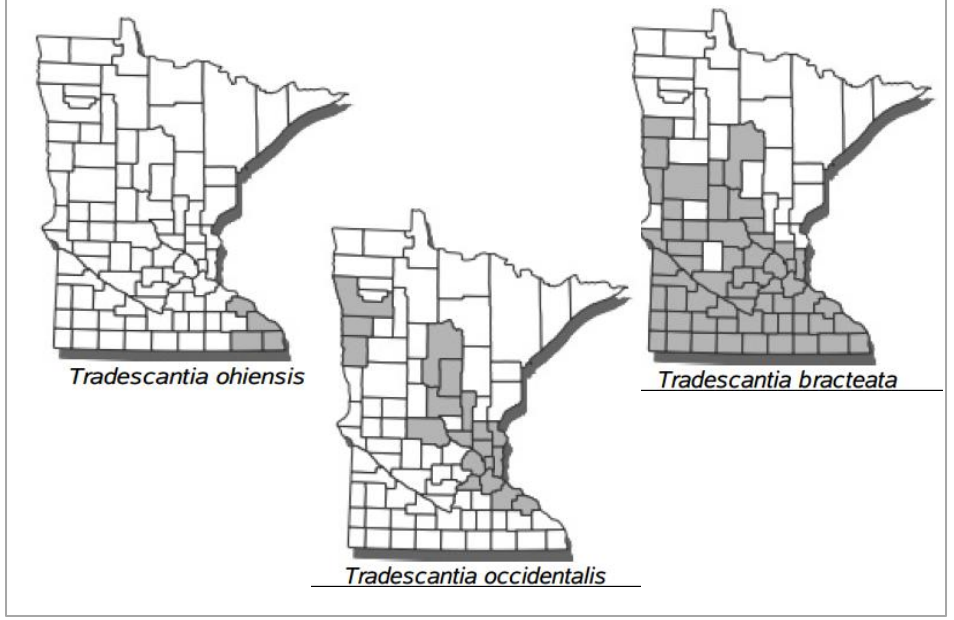
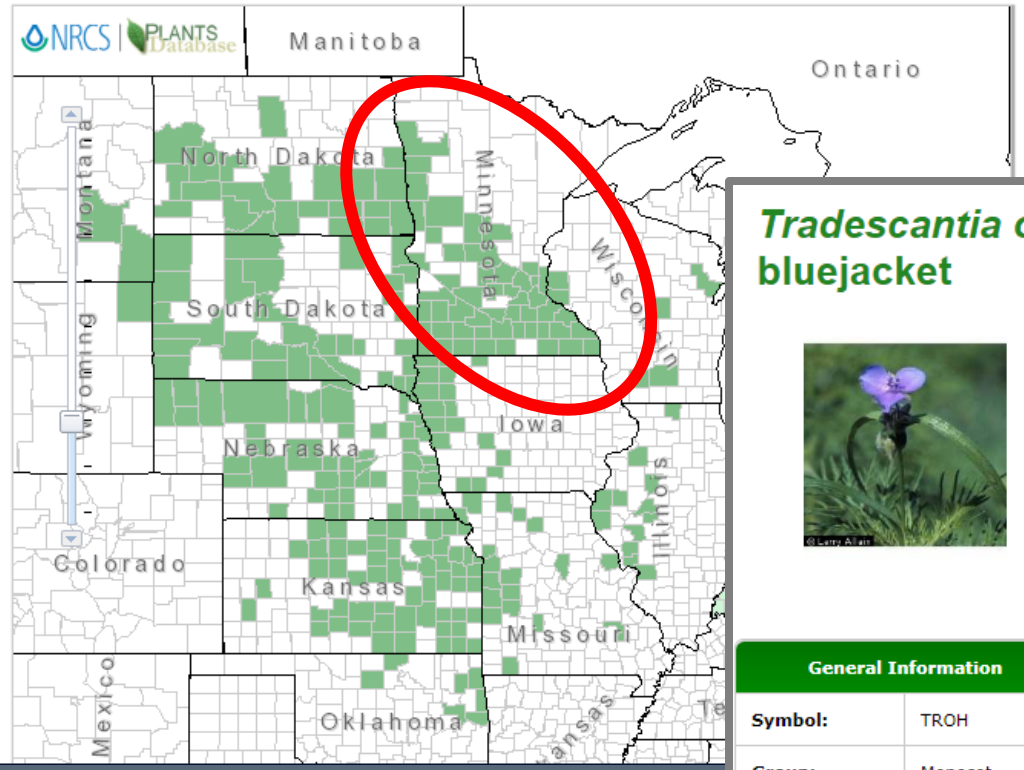


Photo: Karin Jokela; range maps from MN DNR's MN TAXA Database, 2017

Not all spiderworts are equal

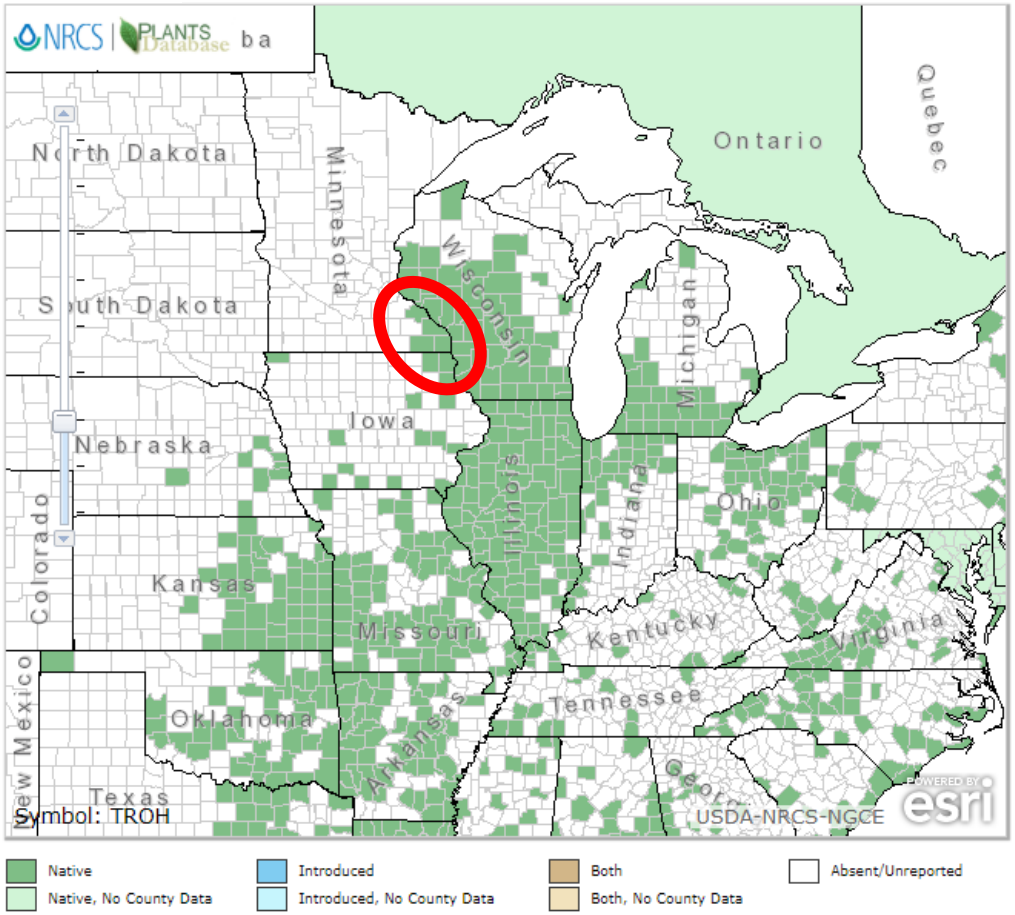
Tradescantia bracteata Small
longbract spiderwort

General Information	
Symbol:	TRBR
Group:	Monocot
Family:	Commelinaceae
Duration:	Perennial
Growth Habit:	Forb/herb
Native Status:	L48 N
Data Source and Documentation	



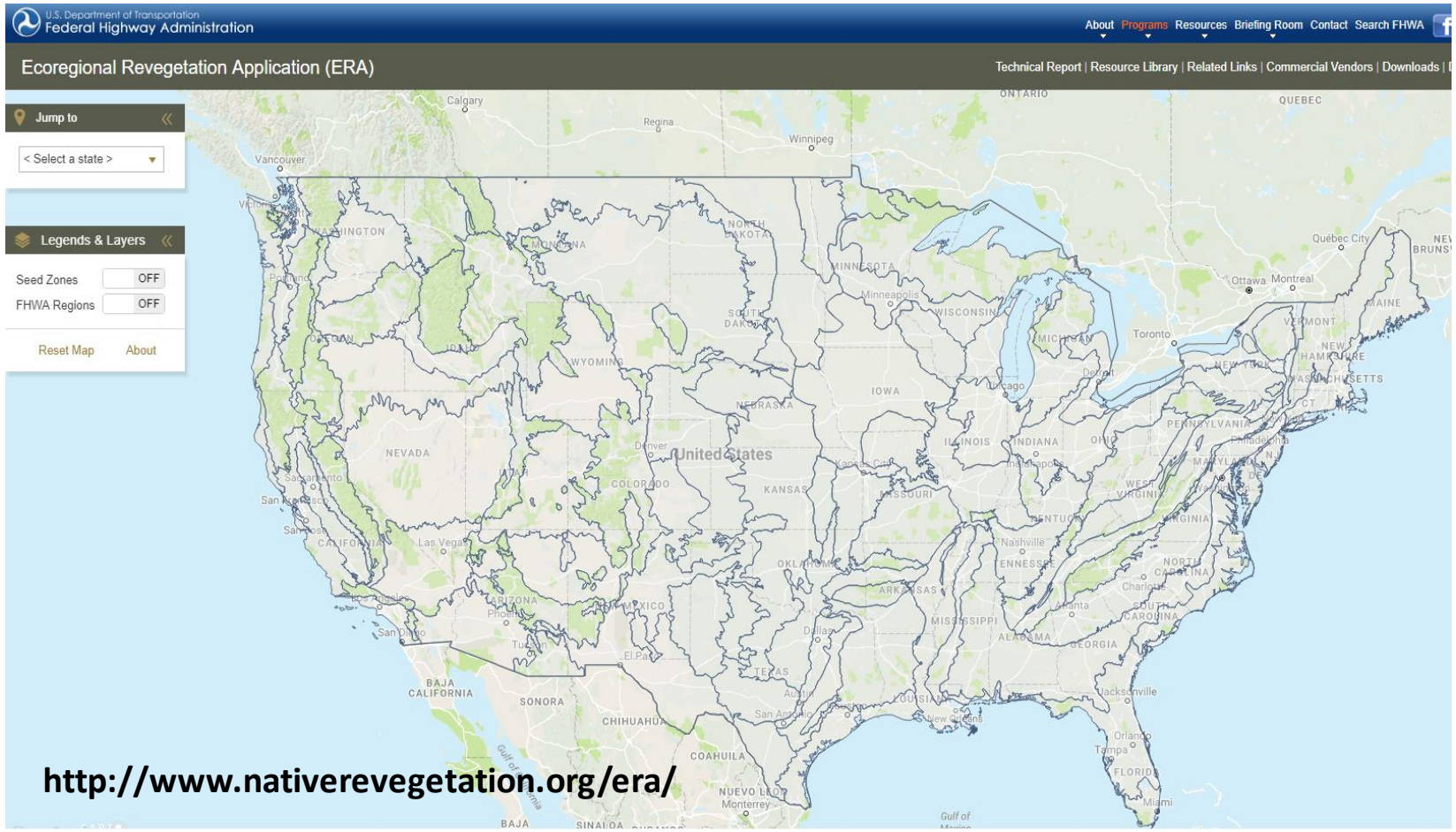
Tradescantia ohiensis Raf.
bluejacket

General Information	
Symbol:	TROH
Group:	Monocot
Family:	Commelinaceae
Duration:	Perennial
Growth Habit:	Forb/herb
Native Status:	CAN N L48 N
Data Source and Documentation	



FHWA's Ecoregional Revegetation Application Tool

- Search for native plants by ecoregion or state
- Filter plants by > 50 attributes (soil, moisture, value to pollinators, salt tolerance, more)
- Includes workhorse species for revegetation



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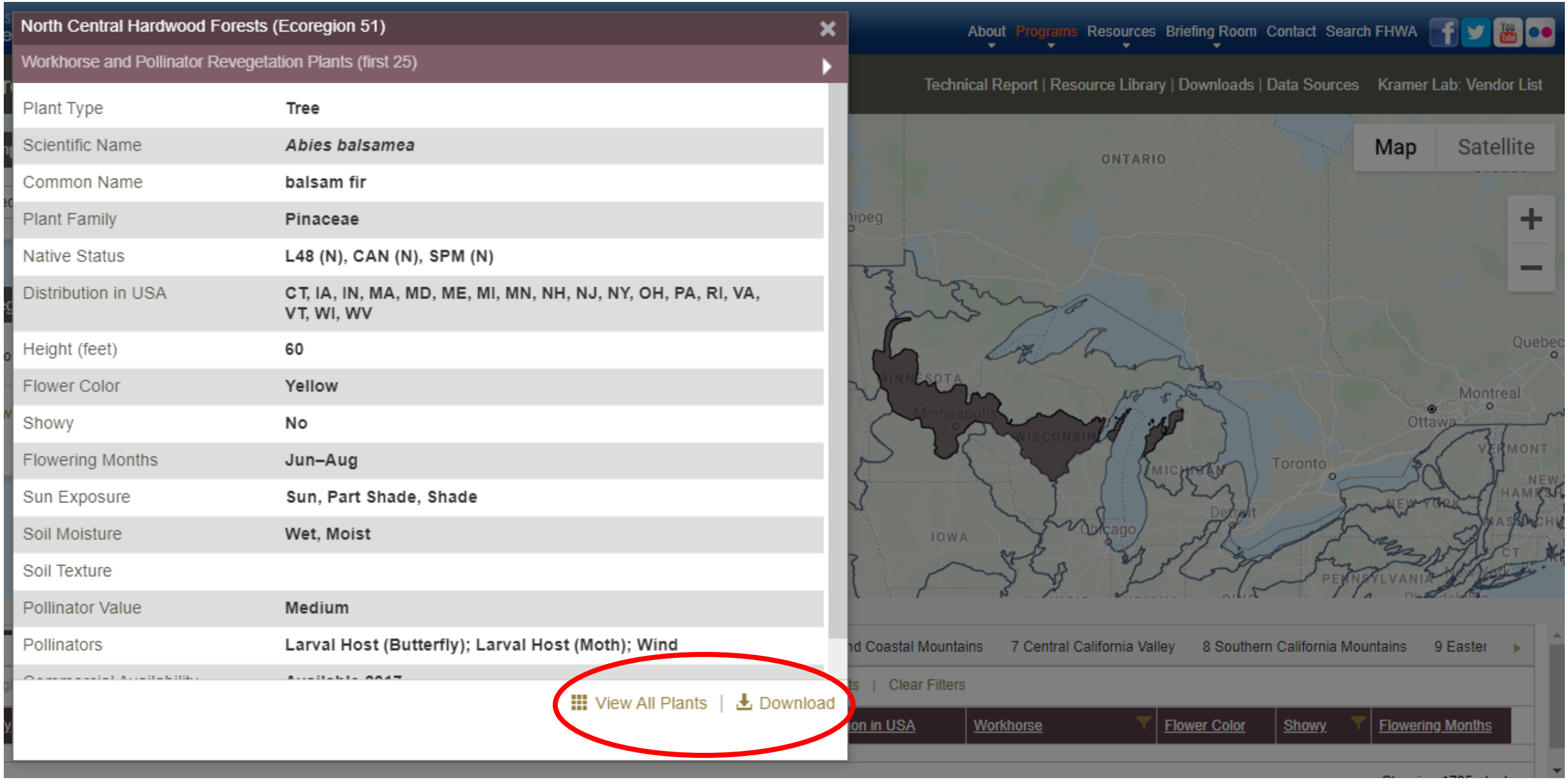
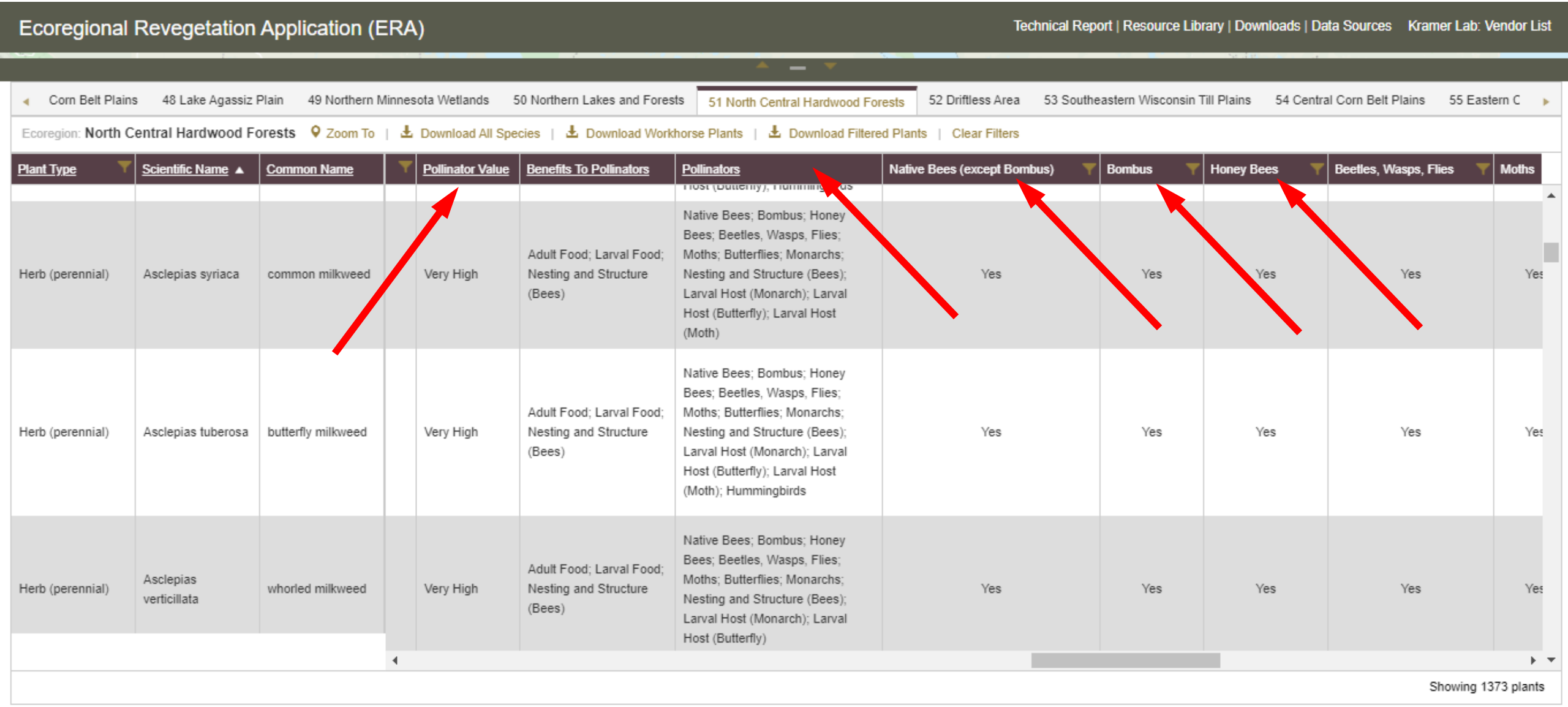
FHWA's Ecoregional Revegetation Application Tool



FHWA's Ecoregional Revegetation Application Tool



Ecoregional Revegetation Application (ERA)

Technical Report | Resource Library | Downloads | Data Sources Kramer Lab: Vendor List

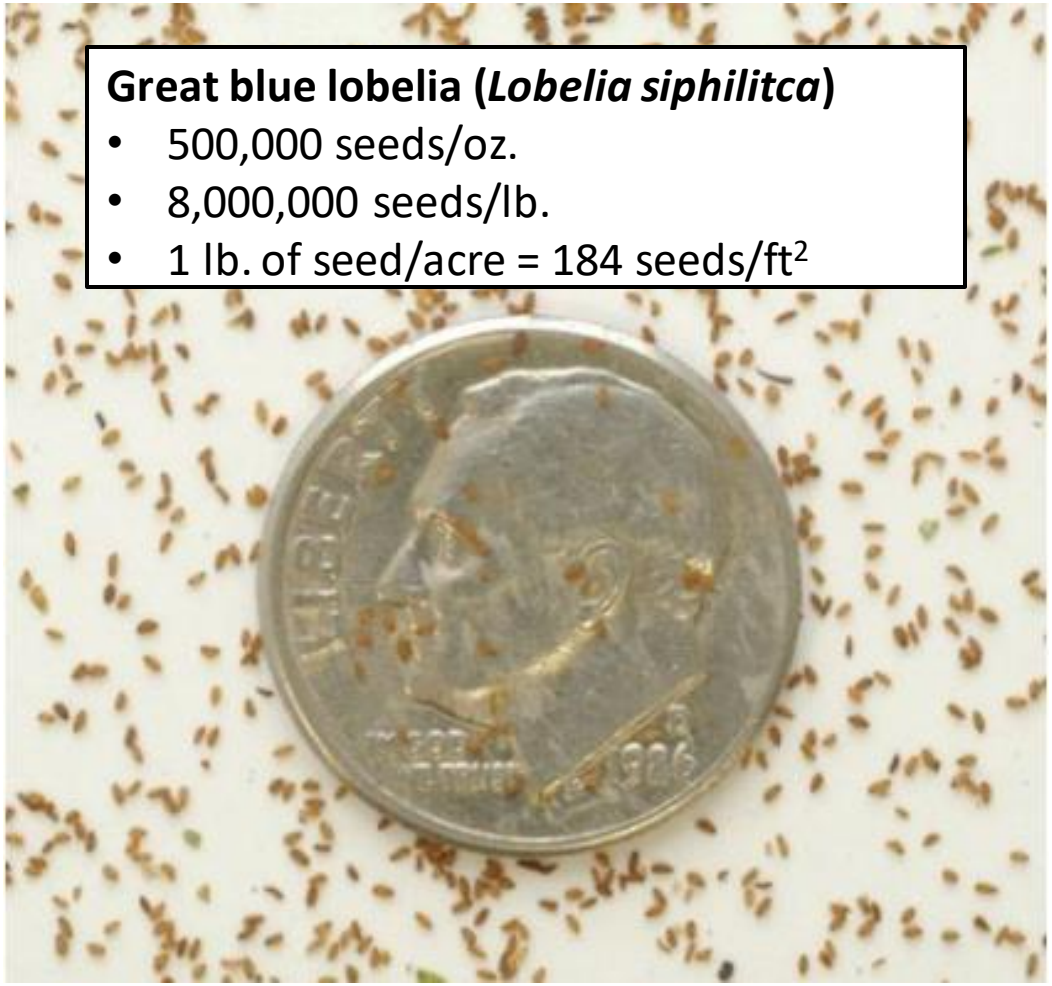
Corn Belt Plains | 48 Lake Agassiz Plain | 49 Northern Minnesota Wetlands | 50 Northern Lakes and Forests | 51 North Central Hardwood Forests | 52 Driftless Area | 53 Southeastern Wisconsin Till Plains | 54 Central Corn Belt Plains | 55 Eastern C

Ecoregion: North Central Hardwood Forests | Zoom To | Download All Species | Download Workhorse Plants | Download Filtered Plants | Clear Filters

Plant Type	Scientific Name	Common Name	Pollinator Value	Benefits To Pollinators	Pollinators	Native Bees (except Bombus)	Bombus	Honey Bees	Beetles, Wasps, Flies	Moths
Herb (perennial)	Asclepias syriaca	common milkweed	Very High	Adult Food; Larval Food; Nesting and Structure (Bees)	Native Bees; Bombus; Honey Bees; Beetles, Wasps, Flies; Moths; Butterflies; Monarchs; Nesting and Structure (Bees); Larval Host (Monarch); Larval Host (Butterfly); Larval Host (Moth)	Yes	Yes	Yes	Yes	Yes
Herb (perennial)	Asclepias tuberosa	butterfly milkweed	Very High	Adult Food; Larval Food; Nesting and Structure (Bees)	Native Bees; Bombus; Honey Bees; Beetles, Wasps, Flies; Moths; Butterflies; Monarchs; Nesting and Structure (Bees); Larval Host (Monarch); Larval Host (Butterfly); Larval Host (Moth); Hummingbirds	Yes	Yes	Yes	Yes	Yes
Herb (perennial)	Asclepias verticillata	whorled milkweed	Very High	Adult Food; Larval Food; Nesting and Structure (Bees)	Native Bees; Bombus; Honey Bees; Beetles, Wasps, Flies; Moths; Butterflies; Monarchs; Nesting and Structure (Bees); Larval Host (Monarch); Larval Host (Butterfly)	Yes	Yes	Yes	Yes	Yes

Showing 1373 plants

Seeds per square foot vs. pounds per acre



Great blue lobelia (*Lobelia siphilitca*)

- 500,000 seeds/oz.
- 8,000,000 seeds/lb.
- 1 lb. of seed/acre = 184 seeds/ft^2

Cup plant (*Silphium perfoliatum*)

- 1,400 seeds/oz.
- 22,400 seeds/lb.
- 1 lb. of seed/acre = 0.5 seeds/ft^2

Photos: Prairie Moon Nursery

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How to decide on seeding rates?

Tallgrass Prairie Center, University of Northern Iowa

CALCULATOR | OVERVIEW | SEEDING RATES | SPECIES SELECTION | BID LETTING | NURSE CROPS

TABLE 1

Recommended minimum number of species and seeding rates by soil moisture for a diverse prairie seed mix planted in Iowa.

	Number of Species					Seeding Rates (seeds/square foot)				
Plant Guild	**Wet**	**Wet-Mesic**	**Mesic**	**Dry-Mesic**	**Dry**	**Wet**	**Wet-Mesic**	**Mesic**	**Dry-Mesic**	**Dry**
Cool-season Grasses	4	1	2	1	3	10.00	3.00	1.25	1.25	4.00
Warm-season Grasses	1	3	7	8	9	0.15	5.00	18.50	21.50	22.50
Sedges/Rushes	6	9	4	2	2	23.00	24.00	2.00	0.28	0.27
Legumes	1	2	6	7	10	0.10	1.10	3.78	4.65	3.50
Non-Legume Forbs	30	29	27	35	31	35.00	29.00	18.30	17.60	19.20
Total	**42**	**44**	**46**	**53**	**55**	**68.25**	**62.10**	**43.83**	**45.28**	**49.47**

Source: Tallgrass Prairie Center

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Photo: Thelma Heidel-Baker

NRCS seeding rates

<u>Minimum</u> recommendations – Agron. Tech Note #31

- 9 species of pollinator-friendly forbs (≥1 legume)
- At least 3 species from each bloom period
- At least 2 native bunch grasses
- Minimum of 35-40 seeds/square foot
- Forbs must be 75% of the mix based on seeds/square foot
- Virginia wild rye cannot exceed 20% of the grass mixture
- No individual forb can exceed 20% of the mixture
- Milkweed must comprise at least 1.5% of the mixture (grasses + forbs) – monarch plantings
- At least 60% of the forbs should be monarch nectar plants

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Wild bergamot (*Monarda fistulosa*) at ~6.5 seeds/sq.ft.

Photos: Anne Stine / Xerces Society (top); Tom Ryan (bottom)

Seeding rates

Additional considerations

- Limit annuals + biennials
  - No NRCS limitations except ≤ 20% of one species
  - TPC recommends: ≤ 1 seed/square foot
  - Aim for ≤ 10% of mix
- Consider easy vs. difficult to germinate
  - Get to know Prairie Moon Nursery's germination codes
- Reduce rates for aggressive species
  - big bluestem, Indian grass
  - sunflowers
  - cup plant – no more than 0.1 seeds/sq. ft.
  - wild bergamot – no more than 4 seeds/sq. ft.
- Seed cost

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Factors that Cause Seed to be Inexpensive

- Short life cycle
- Easy to germinate
- Common species
- Popularity
- Mechanically harvested
- Small, hard seed
- Easy to clean
- Less shatter (seed retention)

Great St. John's wort (*Hypericum ascyron*)

Photo: Karin Jokela

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Factors that Cause Seed to be Expensive

- Species rarity
- Hand-harvested
- Spring-blooming
- Difficult germination requirements
- Irregular shaped seed
- Seed pests

Pasque flower (*Anemone patens*)

Milkweed (*Asclepias asperula*)

Photo: Karin Jokela / Xerces Society; Brianna Borders / Xerces Society

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Economics of diversity

Cost $ (per acre)

Economical: $100 - $250

Moderate: $300 - $600

High quality: $700 - $1000

Diversity

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30 species

Genus	Species	Common Name	% of MIX (seeds/ sq. ft.)	Seeding rate (seeds/sq. ft.)	Seeding rate (lbs seed/ac)	Number of acres	Price per Species in this mix	
Asclepias	*syriaca*	Common Milkweed	0.1%	0.05	0.034	1	$4.08	
Astragalus	*canadensis*	Canada Milk Vetch	0.3%	0.1	0.016	1	$1.92	
Chamaecrista	*fasciculata*	Partridge Pea	0.3%	0.1	0.101	1	$3.03	
Dalea	*candida*	White Prairie Clover	1.4%	0.5	0.072	1	$4.30	
Dalea	*purpurea*	Purple Prairie Clover	2.0%	0.7	0.127	1	$5.72	
Drymocallis	*arguta*	Prairie Cinquefoil	6.0%	2.1	0.025	1	$9.32	
Helianthus	*maximiliani*	Maximilian's Sunflower	0.3%	0.1	0.021	1	$1.26	
Heliopsis	*helianthoides*	Early Sunflower	0.3%	0.1	0.043	1	$2.59	
Liatris	*pycnostachya*	Prairie Blazing Star	0.1%	0.05	0.012	1	$3.96	
Lobelia	*siphilitica*	Great Blue Lobelia	2.0%	0.7	0.004	1	$3.66	
Monarda	*fistulosa*	Wild Bergamot	2.9%	1	0.039	1	$7.47	
Oenothera	*biennis*	Common Evening Primros	7.1%	2.5	0.076	1	$6.81	
Oligoneuron	*rigidum*	Stiff Goldenrod	0.9%	0.3	0.020	1	$3.82	
Penstemon	*digitalis*	Foxglove Beardtongue	1.4%	0.5	0.010	1	$2.51	
Pycnanthemum	*virginianum*	Mountain Mint	0.3%	0.1	0.001	1	$0.79	
Ratibida	*pinnata*	Yellow Coneflower	0.9%	0.3	0.027	1	$2.45	
Rudbeckia	*hirta*	Black-eyed Susan	7.7%	2.7	0.080	1	$2.40	
Solidago	*speciosa*	Showy Goldenrod	0.3%	0.1	0.003	1	$2.29	
Symphyotrichum	*laeve*	Smooth Blue Aster	0.3%	0.1	0.005	1	$2.23	
Symphyotrichum	*novae-angliae*	New England Aster	0.3%	0.1	0.004	1	$2.64	
Tradescantia	*ohiensis*	Ohio Spiderwort	0.1%	0.05	0.017	1	$6.81	
Verbena	*hastata*	Blue Vervain	0.3%	0.1	0.003	1	$0.26	
Veronicastrum	*virginicum*	Culver's Root	4.4%	1.55	0.005	1	$5.91	
Zizia	*aurea*	Golden Alexanders	0.3%	0.1	0.025	1	$3.71	
Andropogon	*gerardii*	Big Bluestem	11.4%	4	1.089	1	$13.07	
Bouteloua	*curtipendula*	Side-oats Grama	8.6%	3	1.361	1	$24.50	
Elymus	*canadensis*	Canada Wild Rye	4.3%	1.5	0.785	1	$11.78	
Panicum	*virgatum*	Switch Grass	10.0%	3.5	0.681	1	$10.21	
Schizachyrium	*scoparium*	Little Bluestem	15.7%	5.5	0.998	1	$21.96	
Sorghastrum	*nutans*	Indian Grass	10.0%	3.5	0.794	1	$14.29	
			100.0%	35			$95.81	Price for forbs
Max 60% grasses							$89.94	Price for grasses
40% forbs							$185.75	Total
6 grasses		Sum grasses		21				
24 forbs (4 legumes)		Sum forbs		14				

Adding diversity doesn't *necessarily* mean adding cost

<u>Demonstration</u> mix developed to meet 643/CP25 standards

- **Mix with 30 species**
- **Mix with 15 species**

Using January 2020 pricing from Prairie Moon Nursery, BOTH mixes came to $185/acre

15 species

Genus	Species	Common Name	% of MIX (seeds/ sq. ft.)	Seeding rate (seed/ft2)	Seeding rate (lbs seed/ac)	Number of acres	Price per Species in this mix	
Asclepias	*syriaca*	Common Milkweed	0.0%	0	0.000	1	$0.00	
Astragalus	*canadensis*	Canada Milk Vetch	0.0%	0	0.000	1	$0.00	
Chamaecrista	*fasciculata*	Partridge Pea	0.0%	0	0.000	1	$0.00	
Dalea	*candida*	White Prairie Clover	0.0%	0	0.000	1	$0.00	
Dalea	*purpurea*	Purple Prairie Clover	7.1%	2.5	0.454	1	$20.42	
Drymocallis	*arguta*	Prairie Cinquefoil	0.0%	0	0.000	1	$0.00	
Helianthus	*maximiliani*	Maximilian's Sunflower	2.3%	0.8	0.168	1	$10.05	
Heliopsis	*helianthoides*	Early Sunflower	0.0%	0	0.000	1	$0.00	
Liatris	*pycnostachya*	Prairie Blazing Star	0.0%	0	0.000	1	$0.00	
Lobelia	*siphilitica*	Great Blue Lobelia	0.0%	0	0.000	1	$0.00	
Monarda	*fistulosa*	Wild Bergamot	4.3%	1.5	0.058	1	$11.20	
Oenothera	*biennis*	Common Evening Primros	10.0%	3.5	0.106	1	$9.53	
Oligoneuron	*rigidum*	Stiff Goldenrod	2.1%	0.75	0.050	1	$9.56	
Penstemon	*digitalis*	Foxglove Beardtongue	2.9%	1	0.021	1	$5.03	
Pycnanthemum	*virginianum*	Mountain Mint	0.0%	0	0.000	1	$0.00	
Ratibida	*pinnata*	Yellow Coneflower	2.9%	1	0.091	1	$8.17	
Rudbeckia	*hirta*	Black-eyed Susan	7.7%	2.7	0.080	1	$2.40	
Solidago	*speciosa*	Showy Goldenrod	0.0%	0	0.000	1	$0.00	
Symphyotrichum	*laeve*	Smooth Blue Aster	0.0%	0	0.000	1	$0.00	
Symphyotrichum	*novae-angliae*	New England Aster	0.0%	0	0.000	1	$0.00	
Tradescantia	*ohiensis*	Ohio Spiderwort	0.1%	0.05	0.017	1	$6.81	
Verbena	*hastata*	Blue Vervain	0.0%	0	0.000	1	$0.00	
Veronicastrum	*virginicum*	Culver's Root	0.0%	0	0.000	1	$0.00	
Zizia	*aurea*	Golden Alexanders	0.6%	0.2	0.050	1	$7.43	
Andropogon	*gerardii*	Big Bluestem	15.7%	5.5	1.497	1	$17.97	
Bouteloua	*curtipendula*	Side-oats Grama	8.6%	3	1.361	1	$24.50	
Elymus	*canadensis*	Canada Wild Rye	5.7%	2	1.047	1	$15.71	
Panicum	*virgatum*	Switch Grass	14.3%	5	0.972	1	$14.58	
Schizachyrium	*scoparium*	Little Bluestem	0.0%	0	0.000	1	$0.00	
Sorghastrum	*nutans*	Indian Grass	15.7%	5.5	1.248	1	$22.46	
			100.0%	35			$95.22	Price for forbs
Max 60% grasses							$90.58	Price for grasses
40% forbs							$185.81	Total
		Sum grasses		21				
5 grasses		Sum forbs		14				
10 forbs (1 legume)								

Adding diversity doesn't *necessarily* mean adding cost

<u>Demonstration</u> mix developed to meet 643/CP25 standards

- **Mix with 30 species**
- **Mix with 15 species**

Using January 2020 pricing from Prairie Moon Nursery, BOTH mixes came to $185/acre

Annotate!

Evaluating Seed Mixes

Common Name	Scientific Name	% of Mix	Seeds/ft^2	Total lb
Grasses				
Big Bluestem	Andropogon gerardii	13.75%	2.2	11.000 PLS lb
Sideoats Grama	Bouteloua curtipendula	12.50%	2.1	10.000 PLS lb
Canada Wild Rye	Elymus canadensis	10.00%	0.9	8.000 PLS lb
Little Bluestem	Schizachyrium scoparium	13.75%	3.6	11.000 PLS lb
Forbs				
Canada Milk Vetch	Astragalus canadensis	2.50%	0.6	2.000 PLS lb
Partridge Pea	Chamaecrista fasciculata	6.25%	0.2	5.000 PLS lb
Sand Coreopsis	Coreopsis lanceolata	8.75%	2.6	7.000 PLS lb
Purple Prairie Clover	Dalea purpurea	10.00%	2.6	8.000 PLS lb
Sawtooth Sunflower	Helianthus grosseserratus	0.13%	0.0	0.100 PLS lb
Maximillian's Sunflower	Helianthus maximiliani	3.75%	0.7	3.000 PLS lb
Great Blue Lobelia	Lobelia siphilitica	0.25%	1.8	0.200 PLS lb
Wild Bergamot	Monarda fistulosa	1.50%	1.5	1.200 PLS lb
Common Evening Primrose	Oenothera biennis	4.00%	5.3	3.200 PLS lb
Foxglove Beardtongue	Penstemon digitalis	0.13%	0.2	0.100 PLS lb
Long-headed Coneflower	Ratibida columnifera	8.50%	5.2	6.800 PLS lb
Black-eyed Susan	Rudbeckia hirta	3.88%	5.2	3.100 PLS lb
Stiff Goldenrod	Solidago rigida	0.25%	0.2	0.200 PLS lb
Golden Alexanders	Zizia aurea	0.13%	0.0	0.100 PLS lb

- How many species?
- Forb : grass ratio?
- Number of seeds/ft^2?
- 3 species blooming in each season?
- Butterfly host plants?
- Number of annuals and biennials?
- Regionally appropriate species?
- Any species dominating the mix?
- Soil moisture types?
- Cost?

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Evaluating Seed Mixes

	Common Name	Scientific Name	% of Mix		Seeds/ft^2	Total lb
	Grasses					
	Big Bluestem	Andropogon gerardii	13.75%		2.2	11.000 PLS lb
	Sideoats Grama	Bouteloua curtipendula	12.50%		2.1	10.000 PLS lb
	Canada Wild Rye	Elymus canadensis	10.00%		0.9	8.000 PLS lb
	Little Bluestem	Schizachyrium scoparium	13.75%		3.6	11.000 PLS lb
			50%		**8.8**	
	Forbs					
	Canada Milk Vetch	Astragalus canadensis	2.50%		0.6	2.000 PLS lb
	Partridge Pea	Chamaecrista fasciculata	6.25%	Annual	0.2	5.000 PLS lb
Spring	Sand Coreopsis	Coreopsis lanceolata	8.75%		2.6	7.000 PLS lb
	Purple Prairie Clover	Dalea purpurea	10.00%		2.6	8.000 PLS lb
Fall	Sawtooth Sunflower	Helianthus grosseserratus	0.13%		0.0	0.100 PLS lb
Fall	Maximillian's Sunflower	Helianthus maximiliani	3.75%		0.7	3.000 PLS lb
	Great Blue Lobelia	Lobelia siphilitica	0.25%		1.8	0.200 PLS lb
	Wild Bergamot	Monarda fistulosa	1.50%		1.5	1.200 PLS lb
	Common Evening Primrose	Oenothera biennis	4.00%	Biennial	5.3	3.200 PLS lb
Spring	Foxglove Beardtongue	Penstemon digitalis	0.13%		0.2	0.100 PLS lb
	Long-headed Coneflower	Ratibida columnifera	8.50%		5.2	6.800 PLS lb
	Black-eyed Susan	Rudbeckia hirta	3.88%	Biennial	5.2	3.100 PLS lb
Fall	Stiff Goldenrod	Solidago rigida	0.25%		0.2	0.200 PLS lb
Spring	Golden Alexanders	Zizia aurea	0.13%		0.0	0.100 PLS lb
			50%		**26.1**	

~ 35 seeds/ft^2

- How many species? **18**
- Forb : grass ratio? **75% : 25%**
- Number of seeds/ft^2? **35**
- 3 species blooming in each season? **Yes**
- Butterfly host plants? **No…**
- Number of annuals and biennials?
  3 species = 31% of total mix
- Regionally appropriate species?
- Any species dominating the mix?
- Soil moisture types?
- Cost?

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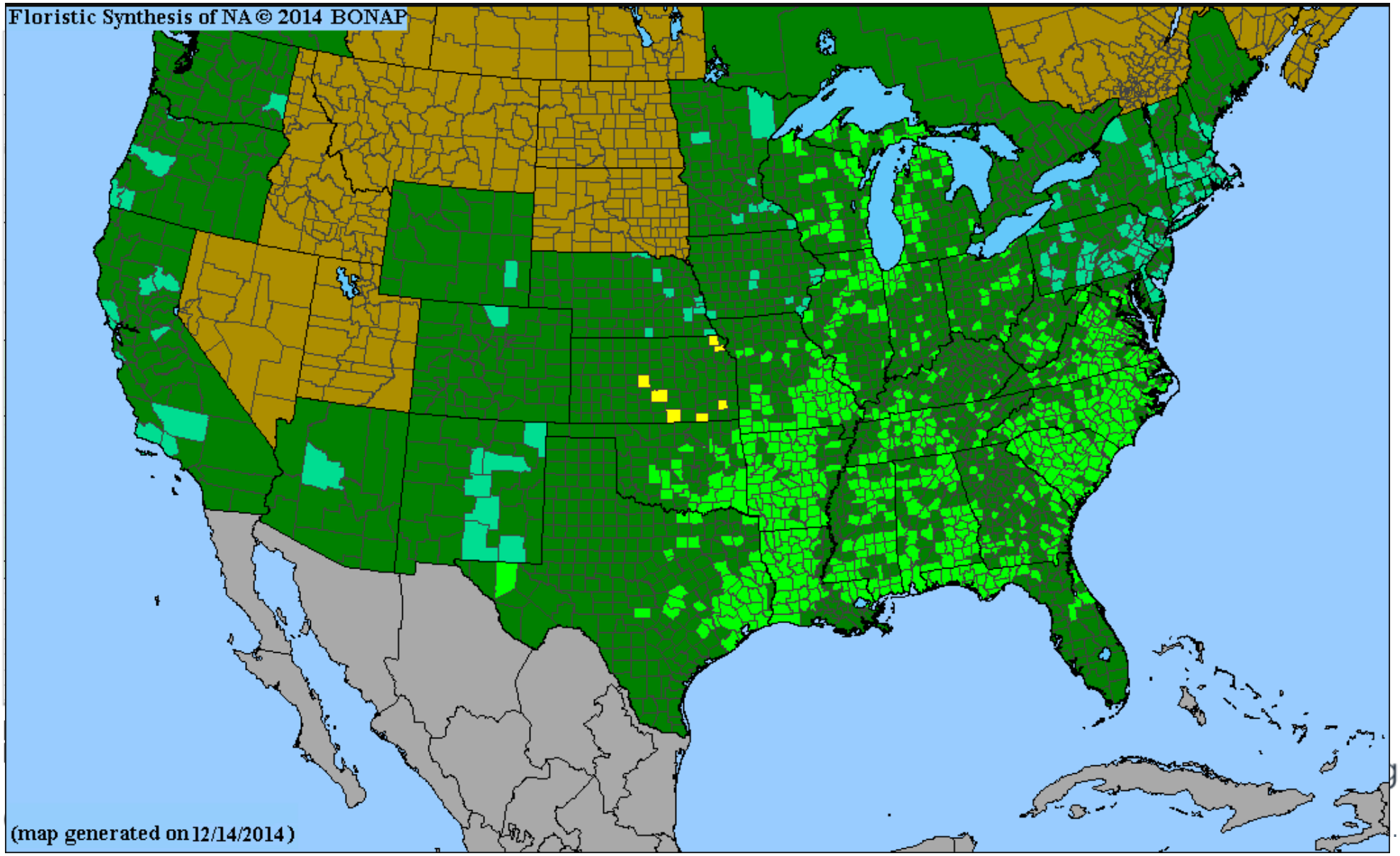
Lanceleaf coreopsis (*Coreopsis lanceolata*)

General Information	
Symbol:	COLA5
Group:	Dicot
Family:	Asteraceae
Duration:	Perennial
Growth Habit:	Forb/herb
Native Status:	CAN N HI I L48 N PB I
Characteristics	
Fact Sheet (pdf) (doc)	
Data Source and Documentation	



Evaluating Seed Mixes

	Common Name	Scientific Name	% of Mix		Seeds/ft^2	Total lb
	Grasses					
	Big Bluestem	Andropogon gerardii	13.75%		2.2	11.000 PLS lb
	Sideoats Grama	Bouteloua curtipendula	12.50%		2.1	10.000 PLS lb
	Canada Wild Rye	Elymus canadensis	10.00%		0.9	8.000 PLS lb
	Little Bluestem	Schizachyrium scoparium	13.75%		3.6	11.000 PLS lb
			50%		**8.8**	
	Forbs					
	Canada Milk Vetch	Astragalus canadensis	2.50%		0.6	2.000 PLS lb
	Partridge Pea	Chamaecrista fasciculata	6.25%	Annual	0.2	5.000 PLS lb
Spring	Sand Coreopsis	Coreopsis lanceolata	8.75%		2.6	7.000 PLS lb
	Purple Prairie Clover	Dalea purpurea	10.00%		2.6	8.000 PLS lb
Fall	Sawtooth Sunflower	Helianthus grosseserratus	0.13%		0.0	0.100 PLS lb
Fall	Maximillian's Sunflower	Helianthus maximiliani	3.75%		0.7	3.000 PLS lb
	Great Blue Lobelia	Lobelia siphilitica	0.25%		1.8	0.200 PLS lb
	Wild Bergamot	Monarda fistulosa	1.50%		1.5	1.200 PLS lb
	Common Evening Primrose	Oenothera biennis	4.00%	Biennial	5.3	3.200 PLS lb
Spring	Foxglove Beardtongue	Penstemon digitalis	0.13%		0.2	0.100 PLS lb
	Long-headed Coneflower	Ratibida columnifera	8.50%		5.2	6.800 PLS lb
	Black-eyed Susan	Rudbeckia hirta	3.88%	Biennial	5.2	3.100 PLS lb
Fall	Stiff Goldenrod	Solidago rigida	0.25%		0.2	0.200 PLS lb
Spring	Golden Alexanders	Zizia aurea	0.13%		0.0	0.100 PLS lb
			50%		**26.1**	

~ 35 seeds/ft^2

- How many species? **18**
- Forb : grass ratio? **75 : 25**
- Number of seeds/ft^2? **35**
- 3 species blooming in each season? **Yes**
- Butterfly host plants? **No…**
- Number of annuals and biennials?
  3 species = 31% of mix
- Regionally appropriate species? **Mostly…**
- Any species dominating the mix?
  2 biennials = 40% of forbs
- Soil moisture types?
- Cost?

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	Scientific Name	Common Name	% of Mix	Seeds/ Sq Ft	PLS lbs/ac	Bloom Season
Grasses:	Bouteloua curtipendula	Side-Oats Grama	16.00	5.85	1.60	
	Bouteloua gracilis	Blue Grama	4.00	5.88	0.40	
	Bromus kalmii	Prairie Brome	3.00	0.88	0.30	
	Elymus trachycaulus	Slender Wheat Grass	2.00	0.51	0.20	
	Koeleria macrantha	Junegrass	0.50	3.21	0.05	
	Schizachyrium scoparium	Little Bluestem	17.00	9.37	1.70	
	Sporobolus heterolepis	Prairie Dropseed	1.50	0.88	0.15	
Sedges/Rushes:	Carex bicknellii	Bicknell's Sedge	1.00	0.62	0.10	
Forbs:	Achillea millefolium	Yarrow	0.20	1.29	0.02	Summer
	Agastache foeniculum	Fragrant Giant Hyssop	0.50	1.65	0.05	Summer
	Allium stellatum	Prairie Onion	0.60	0.24	0.06	Summer
	Amorpha canescens	Leadplant	3.00	1.76	0.30	Summer
	Anemone canadensis	Canada Anemone	1.00	0.29	0.10	Spring
	Aquilegia canadensis	Columbine	0.35	0.49	0.04	Spring
	Asclepias speciosa	Showy Milkweed	0.50	0.08	0.05	Summer
	Asclepias syriaca	Common Milkweed	1.75	0.26	0.18	Summer
	Asclepias tuberosa	Butterfly Milkweed	1.50	0.24	0.15	Summer
	Astragalus canadensis	Canada Milk Vetch	2.00	1.25	0.20	Summer
	Chamaecrista fasciculata	Partridge Pea	7.00	0.69	0.70	Fall
	Coreopsis palmata	Prairie Coreopsis	0.30	0.11	0.03	Summer
	Dalea candida	White Prairie Clover	5.00	3.49	0.50	Summer
	Dalea purpurea	Purple Prairie Clover	7.50	4.13	0.75	Summer
	Desmodium canadense	Canada Tick Trefoil	4.00	0.81	0.40	Summer
	Echinacea angustifolia	Narrow-leaved Coneflower	1.50	0.39	0.15	Summer
	Heliopsis helianthoides	Common Ox-Eye	4.00	0.93	0.40	Summer
	Helianthus pauciflorus	Stiff Sunflower	0.25	0.04	0.03	Fall
	Lespedeza capitata	Round-headed Bushclover	1.50	0.44	0.15	Summer
	Liatris aspera	Rough Blazing Star	0.50	0.29	0.05	Summer
	Liatris ligulistylis	Meadow Blazing Star	1.00	0.37	0.10	Summer
	Monarda fistulosa	Wild Bergamot	0.60	1.54	0.06	Summer
	Penstemon gracilis	Slender Beardtongue	0.15	3.31	0.02	Spring
	Penstemon grandiflorus	Showy Penstemon	0.75	0.39	0.08	Spring
	Phlox pilosa	Prairie Phlox	0.10	0.07	0.01	Spring
	Pycnanthemum virginianum	Mountain Mint	0.20	1.62	0.02	Summer
	Ratibida columnifera	Long-Headed Coneflower	1.25	1.93	0.13	Summer
	Rudbeckia hirta	Black Eyed Susan	1.80	6.08	0.18	Summer
	Solidago nemoralis	Gray Goldenrod	0.20	2.20	0.02	Fall
	Solidago speciosa	Showy Goldenrod	0.20	0.70	0.02	Fall
	Symphyotrichum ericoides	Heath Aster	0.25	1.84	0.03	Fall
	Symphyotrichum laeve	Smooth Blue Aster	1.00	2.02	0.10	Fall
	Symphyotrichum oolentangiense	Sky Blue Aster	1.50	4.41	0.15	Fall
	Tradescantia bracteata	Prairie Spiderwort	0.60	0.22	0.06	Spring
	Verbena stricta	Hoary Vervain	1.50	1.54	0.15	Summer
	Zizia aptera	Heart-leaf Golden Alexanders	0.25	0.11	0.03	Spring
	Zizia aurea	Golden Alexanders	0.70	0.28	0.07	Spring
			100.00	74.69	10.00	

Seeds/sq ft:	75.00
Grass Species:	7
Sedges/Rush Sp:	1
Forb Species:	37

- How many species? **45**
- Forb : grass ratio? **64% forbs : 36% grasses/sedges**
- Number of seeds/ft^2? **75**
- 3 species blooming in each season? **Yes**
- Butterfly host plants? **Yes – 3 species of milkweed**
- Number of annuals and biennials? **Partridge pea and Black-eyed Susan = 9% of mix**
- Regionally appropriate species?
- Any species dominating the mix? **No**
- Soil moisture types? ✓
- Cost? **$1,100/acre**

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327 CONSERVATION COVER POLLINATOR HABITAT
Seeding Design

DATE: 6/19/2020

LANDOWNER: Real example

TRACT/FIELD:

PLANNER: Karin Jokela / Xerces Society

ACRES SEEDED: 1.00

COPY TO SEEDING PLAN

CLEAR CALCULATOR

GRASS SPECIES		PLANNED % OF GRASS COMPONENT BY SEEDS/SQ. FOOT	POUNDS PLS/AC. DRILL	TOTAL SEEDS/ SQ. FOOT	% OF GRASS MIX BY		Background Information: SEEDS/lb.	SEEDS/ SQ. FOOT At 1 lb/ac Rate	POUNDS PLS
		Planned			Can't Exceed Planned %				
Big Bluestem or Indiangrass	Big Blue	0 to 25	0.60	2.42	[illegible]	OK	176000	4.0	0.60
Canada/Virginia Wildrye	Canada	0 to 20	0.50	1.10	11.6	OK	96000	2.2	0.50
Little Bluestem	Schizachryrium scoparium	0 to 50	0.60	3.94	41.3	OK	286000	6.6	0.60
Prairie Dropseed	Sporopolus heterolepis	0 to 50	0.00	0.00	0.0	OK	224000	5.1	0.00
Rough Dropseed	Sporobolus compositus	0 to 25	0.00	0.00	0.0	OK	480000	11.0	0.00
Side-oats grama	Bouteloua curtipendula	0 to 25	0.50	2.07	21.7	OK	180000	4.1	0.50
TOTAL - Pounds PLS Drill Seeding			2.20	9.53	100.0				

TOTAL SEEDS/FT² 3/	36.3
PERCENT GRASS	26.24%
PERCENT FORBS 4/	73.76%

Grasses: 2.2 PLS lbs/acre

Forbs: 1.52 PLS lbs/acre

2/ Individual species not to exceed 20% of the forb component by seeds/ft

3/ Minimum 35-40 seeds/ft²

4/ 75-80% forbs

5/ Consult appropriate NRCS Area Resource Conservationist or Biologist for prior approval

Total Species by Bloom Period

Early Total	3.00
Mid Total	7.00
Late Total	3.00

1/ ACTUAL SEEDS PER SQUARE FOOT SHALL BE WITHIN THE RANGE SPECIFIED IN PLANNED CONDITION

FORB SPECIES			OUNCES PLS/AC. DRILL	TOTAL SEEDS/ SQ. FOOT	% OF FORB MIX BY SEEDS/FT		SEEDS/oz	SEEDS/ SQ. FOOT At 1 oz/ac Rate	Bloom Period Early = April-June Mid = June-August Late = August-Oct.	BLOOM COLOR	OUNCES PLS
DRY TO MESIC											
Butterfly Weed	Asclepias tuberosa		0.00	0.00	0.0	OK	4300	0.10	Mid	Orange	0.00
Canada Milkvetch*	Astragalus canadensis	Legume	0.00	0.00	0.0	OK	17000	0.39	Mid	Cream	0.00
Compass Plant	Sliphium lactinatum		0.00	0.00	0.0	OK	660	0.02	Mid	Yellow	0.00
Culvers Root	Veronicastrum virg.		0.00	0.00	0.0	OK	800000	18.37	Mid	White	0.00
Dotted Blazingstar	Liatris punctata		0.00	0.00	0.0	OK	7000	0.16	Mid	Rose	0.00
Evening Primrose	Oenothera biennis	Biennial	2.50	5.17	19.3	OK	90000	2.07	Mid	Yellow	2.50
Foxglove Beardtongue	Penstemon digitalis		0.20	0.60	2.2	OK	130000	2.98	Early	Yellow	0.20
Ground Plum	Astragalus crassicarpus		0.00	0.00	0.0	OK	5200	0.12	Early	Purple	0.00
Hoary Vervain	Verbena stricta		0.65	0.42	1.6	OK	28000	0.64	Mid	Blue	0.65
Lance-leaved Coreopsis	Coreopsis lanceolata		5.60	2.57	9.6	OK	20000	0.46	Early	White	5.60
Leadplant	Amorpha canescens	Legume	0.00	0.00	0.0	OK	16000	0.37	Mid	Purple	0.00
Long-headed Coneflower	Ratibida columnifera	Short-lived perennial	5.50	5.30	19.8	OK	42000	0.96	Mid	Yellow	5.50
Ontario Blazingstar	Liatris cylindracea		0.00	0.00	0.0	OK	14000	0.32	Late	Purple	0.00
Purple Coneflower, Narrow Leaved	Echinacea angustifolia		0.00	0.00	0.0	OK	7000	0.16	Mid	Pink	0.00
Purple Coneflower, Eastern	Echinacea purpurea		0.00	0.00	0.0	OK	7000	0.16	Mid	Pink	0.00
Rough Blazingstar	Liatris aspera		0.00	0.00	0.0	OK	16000	0.37	Late	Purple	0.00
Showy Goldenrod	Solidago speciosa		0.00	0.00	0.0	OK	95000	2.18	Late	Yellow	0.00
Large-flowered Penstemon	Penstemon grandifloris		0.00	0.00	0.0	OK	14000	0.32	Early	Lavender	0.00
Silky Aster	Symphyotrichum sericeum		0.00	0.00	0.0	OK	26000	0.60	Late	Purple	0.00
Sky Blue Aster	Symphyotrichum		0.00	0.00	0.0	OK	80000	1.84	Late	Blue	0.00
Smooth Aster	Symphyotrichum laeva		0.10	0.13	0.5	OK	55000	1.26	Late	Blue	0.10
Spotted Beebalm	Monarda punctata		0.00	0.00	0.0	OK	70000	1.61	Mid	Lavender	0.00
Stiff Sunflower	Helianthus pacuifloris		0.00	0.00	0.0	OK	4000	0.09	Mid	Yellow	0.00
Stiff Tickseed	Coreopsis palmata		0.00	0.00	0.0	OK	10000	0.23	Mid	Yellow	0.00
Wild Blue Phlox	Phlox divaricata		0.00	0.00	0.0	OK	12500	0.29	Early	Blue	0.00
Wild Columbine	Aquilegia canadensis		0.00	0.00	0.0	OK	38000	0.87	Early	Red	0.00
Wild Lupine	Lupinus perrenis	Legume	0.00	0.00	0.0	OK	1100	0.03	Early	Lavender	0.00
Wild White Indigo	Baptista leucantha	Legume	0.00	0.00	0.0	OK	1700	0.04	Early	White	0.00
Whorled Milkweed	Asclepias verticillata		0.00	0.00	0.0	OK	11000	0.25	Mid - Late	White	0.00

6 species

FORB SPECIES		7 more species (13 total)	OUNCES PLS/AC. DRILL	TOTAL SEEDS/ SQ. FOOT	% OF FORB MIX BY SEEDS/FT		SEEDS/oz	SEEDS/ SQ. FOOT At 1 oz/ac Rate	Bloom Period Early = April-June Mid = June-August Late = August-Oct.	BLOOM COLOR	OUNCES PLS
MESIC to WET MESIC											
Blue Vervain	Verbena hastata	Short-lived perennial	2.40	5.12	19.1	OK	93000	2.13	Mid	Blue	2.40
Bottle Gentian	Gentiana andrewsii		0.00	0.00	0.0	OK	280000	6.43	Late	Blue	0.00
Canada Tick Trefoil	Desmodium canadense	Legume	0.00	0.00	0.0	OK	5500	0.13	Mid	Purple	0.00
Common Ox-eye	Heliopsis helianthoides		0.00	0.00	0.0	OK	6300	0.14	Mid	Yellow	0.00
Giant Sunflower	Helianthus giganteus		0.00	0.00	0.0	OK	10000	0.23	Late	Yellow	0.00
Golden Alexanders	Zizia aurea		0.10	0.03	0.1	OK	11000	0.25	Early	Yellow	0.10
Great Blue Lobelia	Lobelia siphilitica		0.00	0.00	0.0	OK	500000	11.48	Late	Blue	0.00
Ironweed	Veronia fasciculata		0.00	0.00	0.0	OK	24000	0.55	Late	Purple	0.00
Meadow Blazingstar	Liatris ligulistylis		0.00	0.00	0.0	OK	11000	0.25	Late	Purple	0.00
Mountain Mint	Pycnanthemum virginianum		0.00	0.00	0.0	OK	220000	5.05	Mid	White	0.00
Partridge Pea	Chamaechrista fasciculata	Legume	0.35	0.02	0.1	OK	2700	0.06	Mid	Yellow	0.35
Rattlesnake Master	Eryngium yuccifolium		0.00	0.00	0.0	OK	7500	0.17	Mid	White	0.00
Sawtooth Sunflower	Helianthus grosseserratus		0.00	0.00	0.0	OK	10000	0.23	Late	Yellow	0.00
Tall Blazingstar	Liatris pycnostachya		0.00	0.00	0.0	OK	11000	0.25	Mid	Purple	0.00
Virginia Bluebells	Mertensia virginica		0.00	0.00	0.0	OK	9700	0.22	Early	Blue	0.00
Wild Bergamot	Monarda fistulosa		0.20	0.32	1.2	OK	70000	1.61	Mid	Lavender	0.20
Yellow Coneflower	Ratibida pinnata		0.00	0.00	0.0	OK	30000	0.69	Mid	Yellow	0.00
WET											
Boneset	Eupatorium perfoliatum		0.00	0.00	0.0	OK	160000	3.67	Late	White	0.00
Cup Plant	Silphium perfoliatum		0.00	0.00	0.0	OK	1400	0.03	Mid	Yellow	0.00
Joe-pye Weed	Eutrochium maculatum		0.00	0.00	0.0	OK	95000	2.18	Mid	Rose	0.00
New England Aster	Symphyotrichum novae-angliae		0.00	0.00	0.0	OK	66000	1.52	Late	Purple	0.00
Panicled Aster	Symphyotrichum lanceolatum		0.00	0.00	0.0	OK	156000	3.58	Late	White	0.00
Sneezeweed	Helenium autumnale		0.00	0.00	0.0	OK	130000	2.98	Late	Yellow	0.00
Swamp Milkweed	Asclepias incarnata		0.00	0.00	0.0	OK	4800	0.11	Mid	Red	0.00
Wingstem	Verbesina alternifolia		0.00	0.00	0.0	OK	9000	0.21	Mid	Yellow	0.00
DRY to WET MESIC											
Anise Hyssop	Agastache foeniculum		0.00	0.00	0.0	OK	91000	2.09	Mid	Purple	0.00
Black-eyed Susan	Rudbeckia hirta	Biennial	2.50	5.28	19.7	OK	92000	2.11	Late	Yellow	2.50
Common Milkweed	Asclepias syriaca		0.00	0.00	0.0	OK	4000	0.09	Mid	Purple	0.00
Cream Gentian	Gentiana flavida		0.00	0.00	0.0	OK	140000	3.21	Late	Cream	0.00
Grassleaved Goldenrod	Euthamia graminifolia		0.00	0.00	0.0	OK	350000	8.03	Mid	Yellow	0.00
Purple Prairie Clover	Dalea purpurea	Legume	4.00	1.65	6.2	OK	18000	0.41	Mid	Purple	4.00
Maximillian Sunflower	Helianthus maximiliani		0.00	0.00	0.0	OK	13000	0.30	Late	Yellow	0.00
Spiderworts	Tradescantia spp.		0.00	0.00	0.0	OK	10000	0.23	Early	Blue	0.00
Stiff Goldenrod	Solidago rigida		0.20	0.19	0.7	OK	41000	0.94	Late	Yellow	0.20
White Prairie Clover	Dalea candida	Legume	0.00	0.00	0.0	OK	19000	0.44	Mid	White	0.00
Yellow Giant Hyssop	Agastache nepetoides		0.00	0.00	0.0	OK	91000	2.09	Late	Cream	0.00
ADDITIONAL APPROVED FORBS 5/											

Evaluation of “Real Example” mix

- This mix meets the NRCS seed calculator requirements for the CP42 practice, but it needs improvement to address the resource concern.

Key criticisms and areas for improvement:

- Nearly 80% of the forbs (based on seeds/sq. ft.) are biennials or short-lived perennials (4 of 13 species). If these do not aggressively re-establish from seed, the landowner may be out of compliance in as little as 5 years.

- Some of these species prefer very dry soils, and others prefer very wet soils (e.g. long-headed coneflower vs. blue vervain), so “dominant” species may not establish well.

- Weed pressure will likely increase after the first few years because the mix was not designed for long-term establishment (not enough diversity and abundance of perennials).

- Doubling the seeding rate will not help to stabilize the conservation planting; adding plant diversity is the only way to restore the native plant community to benefit pollinators.

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Questions?

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