Elements of an Ecologically Designed Seed Mix for Tallgrass Prairie Plantings

National Native Seed Conference, Washington DC 2017

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- PRAIRIE ROOTS
- MONARCH BUTTERFLIES AND MORE
- GRADUATE ASSISTANTSHIPS

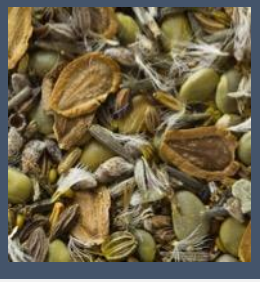
The Tallgrass Prairie Center restores native vegetation for the benefit of society and environment through research, education, and technology.

The Iowa Prairie Seed Calculator designs a custom blend of grasses, sedges, legumes and other forbs fine-tuned for your county and five different soil moisture classes. You have complete control to add or substract species as your budget allows, and it also provides an easy way to send the seed mix out for bid. Try this out and tell us what you think. *For a demonstration video of the Seed Calculator, click **here**.*

“Iowa Prairie Seed Calculator”

www.tallgrassprairiecenter.org

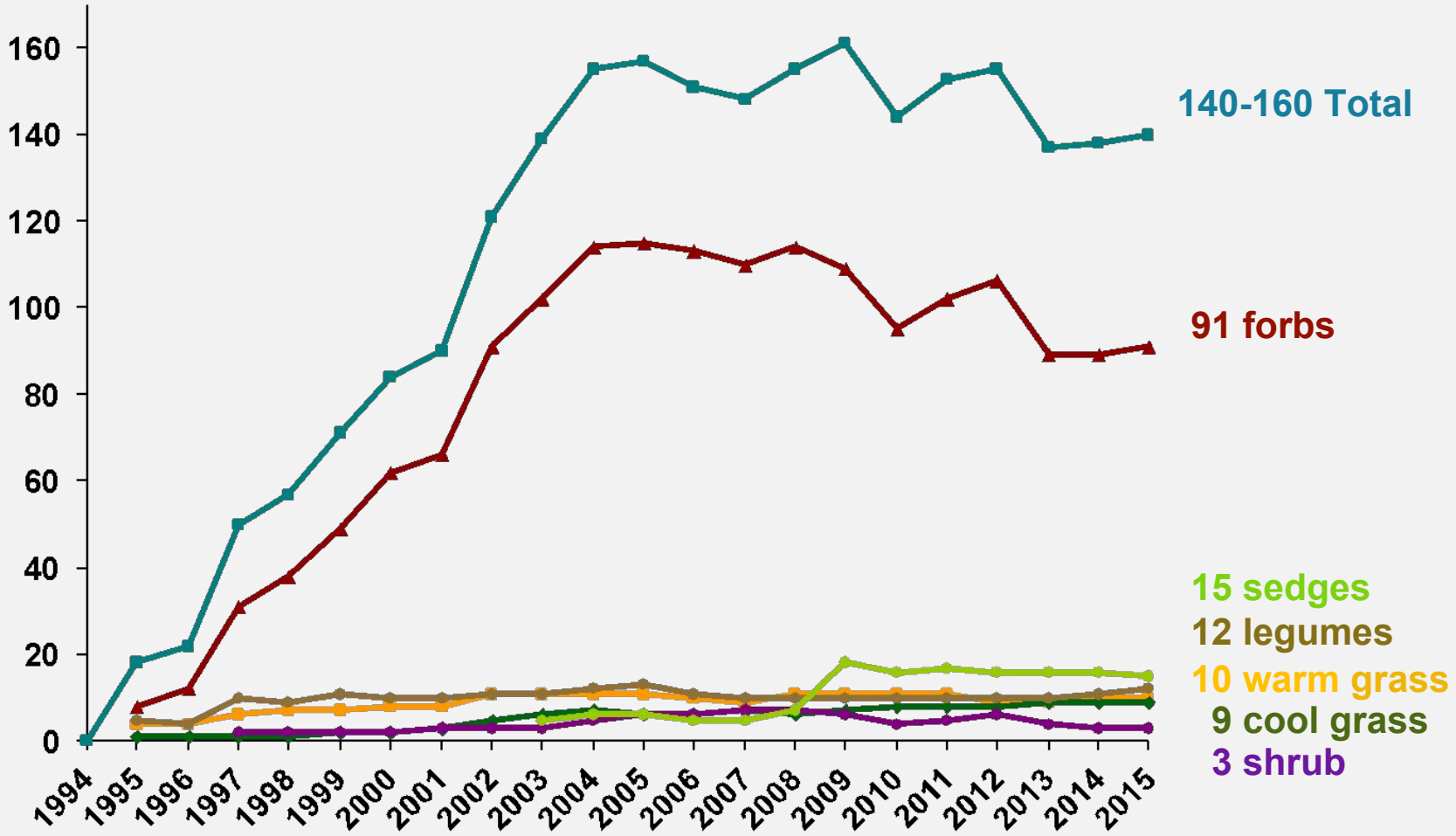
Seed Mix Design Fundamentals
(Iowa Prairie Seed Calculator)



- 160 species
- Commercially available, appropriately sourced
- Balance of plant guilds
- Match to soils (hydrology), geographic distribution (species range), full sun
- Base Seed Rate for mixes = 40 seeds/ft^2
- ~ 50:50 Graminoid:Forb(+ legumes)
- Success = 1 established plant/ft^2

  (<10% of seed establishes)

Iowa Source Identified species by guild (ICIA 1994-2015)



Balance of Functional Guilds in Calculator

Total Species in Calculator	160	
Physiognomy of Seed Calculator (#spp)		
Guild	Perennial	Annual
Forb	105	1
Legume	13	1
WS Grass	10	
CS Grass	13	
Sedge	15	
Shrub	2	

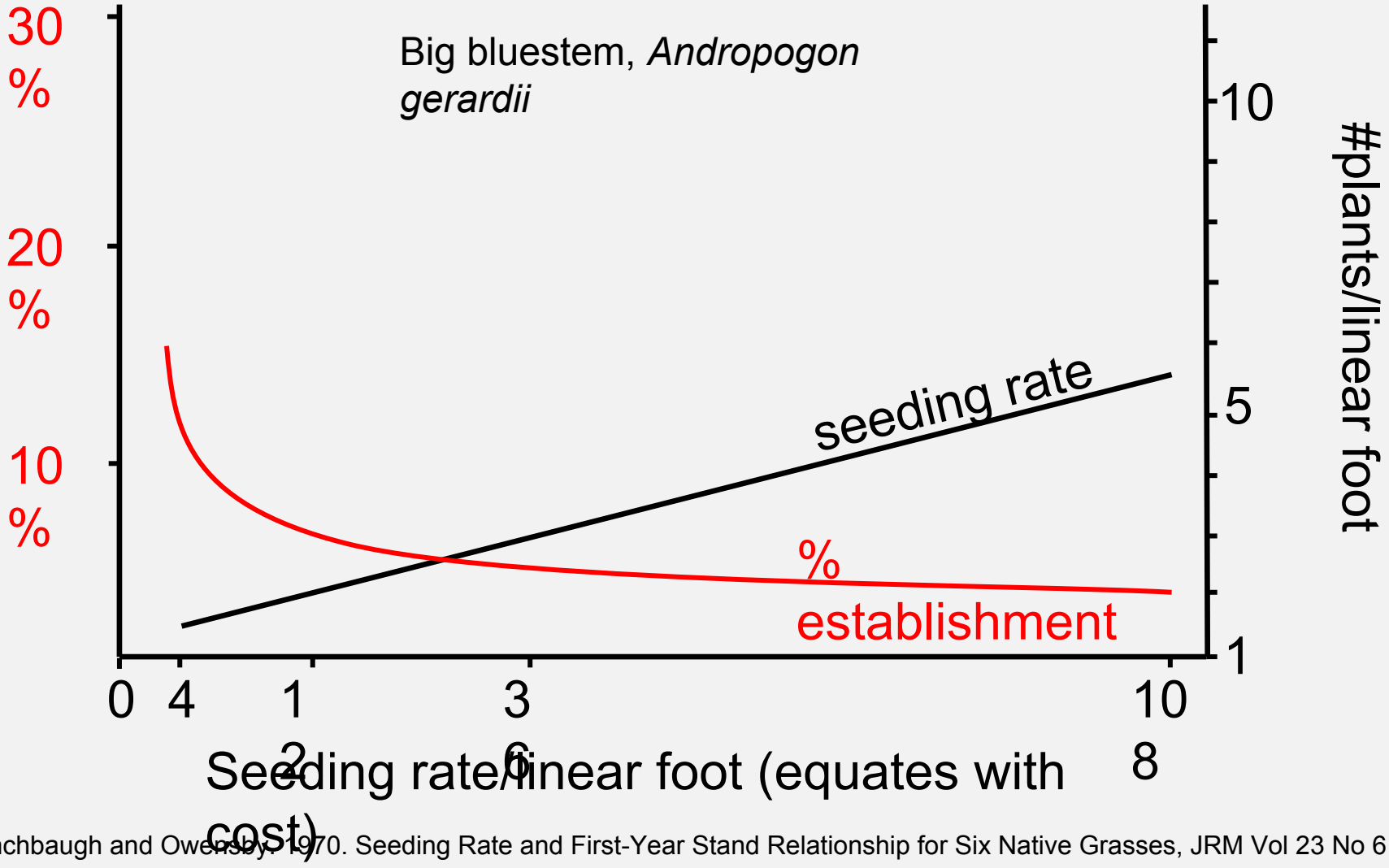
Species and Seeding Rates for Guilds by Hydrology – Diversity Mix

TABLE 1

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

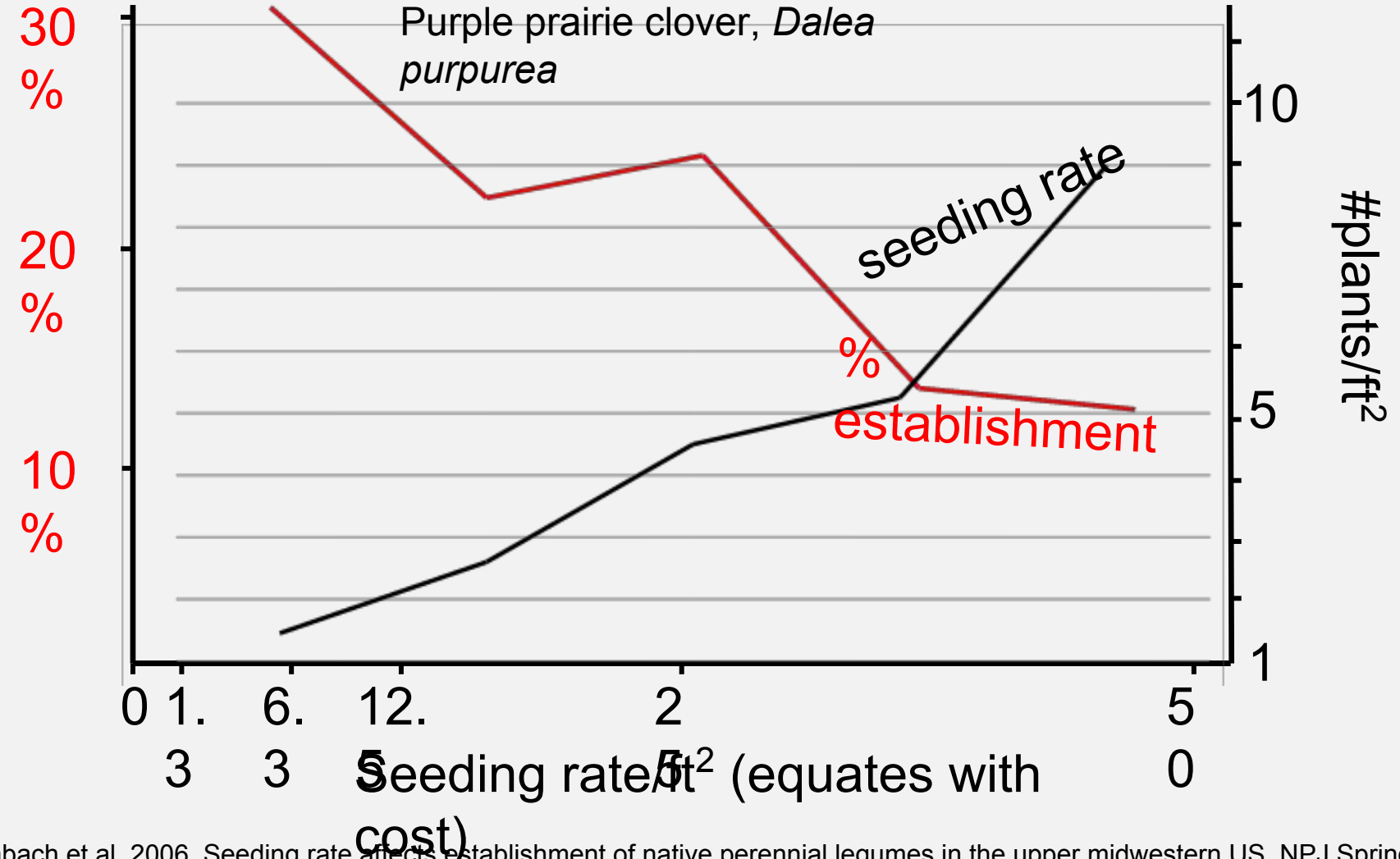
	Number of Species					Seeding Rates (seeds/square foot)				
Plant Guild	**Wet**	**Wet-Mesic**	**Mesic**	**Dry-Mesic**	**Dry**	**Wet**	**Wet-Mesic**	**Mesic**	**Dry-Mesic**	**Dry**
Cool-season Grasses	4	1	2	1	3	10.00	3.00	1.25	1.25	4.00
Warm-season Grasses	1	3	7	8	9	0.15	5.00	18.50	21.50	22.50
Sedges/Rushes	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**

Relationship of seeding rate to establishment



Launchbaugh and Owensby. 1970. Seeding Rate and First-Year Stand Relationship for Six Native Grasses, JRM Vol 23 No 6 1970

Relationship of seeding rate to establishment



Fischbach et al. 2006. Seeding rate affects establishment of native perennial legumes in the upper midwestern US, NPJ Spring 2006

Hydrology (5 types)

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

CALCULATOR

Project Name: (*optional*)

Soil Moisture:
- Dry (Xeric)
- Dry-Mesic (somewhat excessively drained)
- ✓ Mesic (Medium)
- Wet-Mesic
- Wet (Hydric)

Seeding Method:

Is the planting in bare soil? No

Planting time: Spring

Area: 1 *acres* or *length (ft)* x *width (ft)*

Iowa County: Black Hawk

Cost Factor: Premium

Include optional species? Yes

Calculate

The following table will help you determine the appropriate soil moisture choice for your location (also, see Species Selection):

Dry (Xeric) - Water drains very rapidly resulting in dry soil for most of the year.

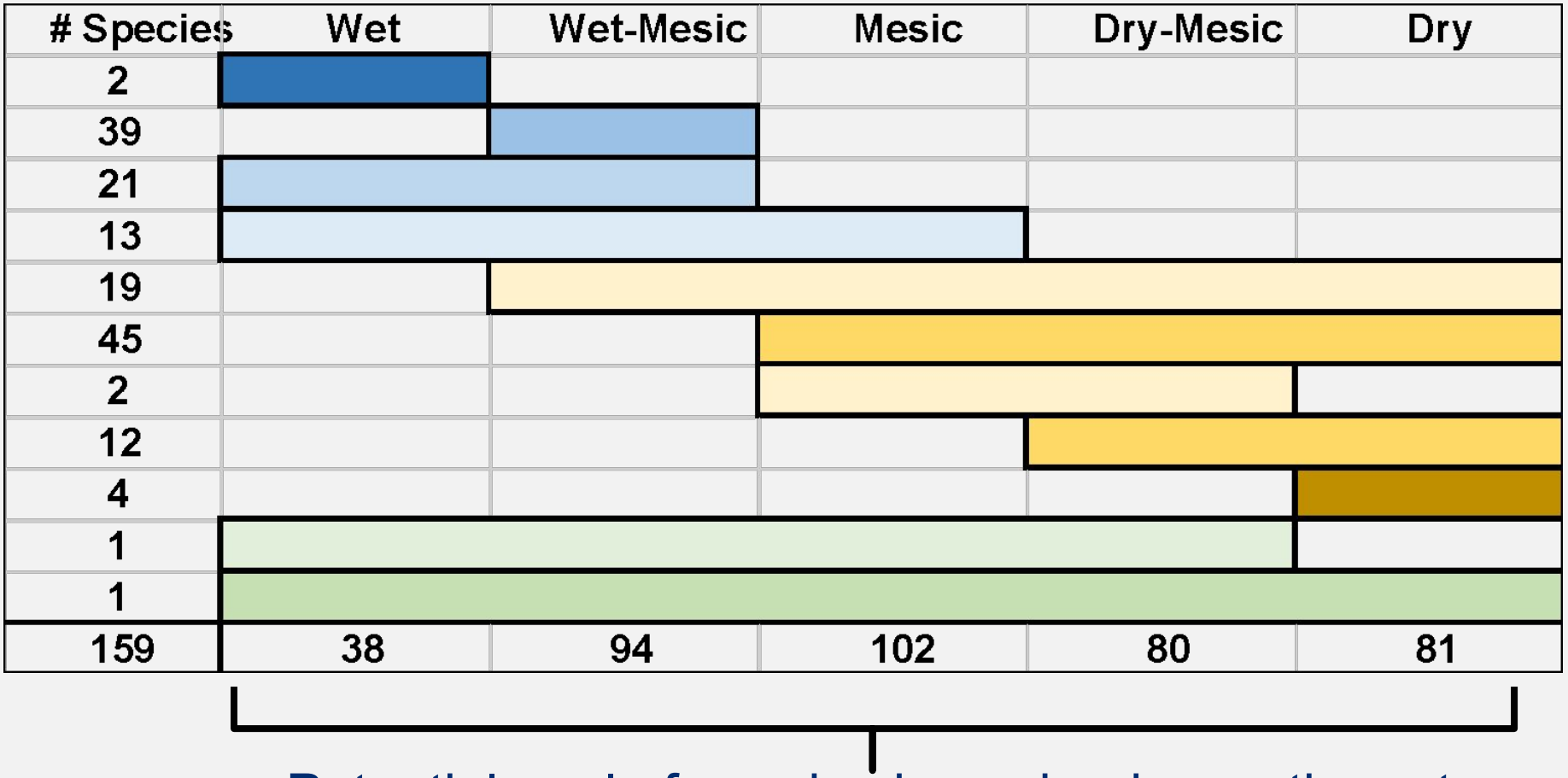
Dry-Mesic - Water drains rapidly resulting in dry soil for periods during the year.

Mesic (Medium) - Water drains readily from the soil but soil remainsmoist for most of the year.

Wet-Mesic - Water drains slowly resulting in wet soil for periods during the year.

Wet (Hydric) - Water drains very slowly resulting in standing water at or near the surface for most of the year.

Number of Species by Hydrologic Affinity



Seeding Method, Site Condition, Season

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

CALCULATOR

Project Name: (*optional*)

Soil Moisture: Dry (Xeric)

Seeding Method: Drilling

Is the planting in bare soil? No

Planting time: Spring

Area: *acres* or *length (ft)* x *width (ft)*

Iowa County: Black Hawk

Cost Factor: Premium

Include optional species? No

Calculate

The seeding method will have an effect on the rate of native plant establishment and the calculator adjusts for this.

Select Drilling if you are using a tractor mounted implement that plants seed into bare soil or intact sod.

Select Broadcast if you are slinging the seed over the soil surface by hand or using a hand-held seeder, tractor, or ATV mounted implement.

Select Hydroseed if your seed is mixed with water, mulch, or tackifier to form a slury that is sprayed directly on the ground.

Drilling is the most efficient, saving 23% in seed cost versus the other methods.

Seeding Rate Multipliers

- Seeding Rate 40-60 seeds/ft^2 for mix
- 50:50 graminoid:forb (+ legumes)

Technique	Multiplier	Site Conditions	Nurse Crop
Drill	x1	killed sod	None
Spring (soil>50 F)	x1	bare soil	16 lbs/ac oats
Fall (soil<38 F)	x1.5 (WSG only)	"	15 lbs/ac w.wheat
Slopes	x1.5	"	x2 nurse crop
Broadcast	x1.3	"	
Hydro	x1.3	"	

Geographic Location (99 Counties)

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

CALCULATOR

Project Name: (*optional*)

Soil Moisture: Dry (Xeric)

Seeding Method: Drilling

Is the planting in bare soil? No

Planting time: Spring

Area: 1 *acres* or *length (ft)* x *width (ft)*

Iowa County: Black Hawk

Cost Factor: Premium

Include optional species? No

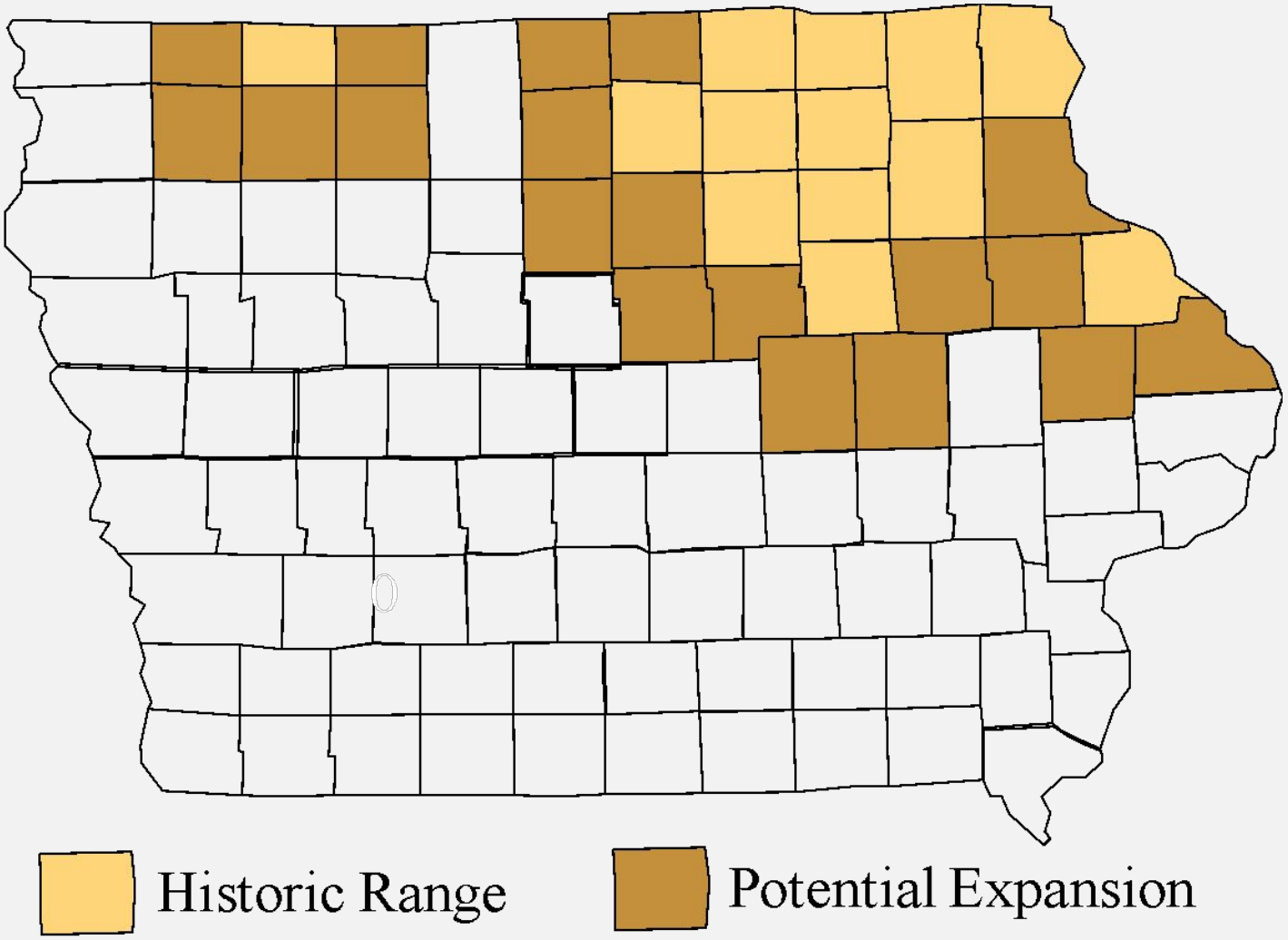
Calculate

Enter the county where the planting site is located. The calculator automatically chooses the suite of species that historically occurred in the region of the planting site.

For additional information see "Geographic Distribution" in Species Selection.

Geographic Distribution Example

Prairie smoke *Geum triflorum*



Cost Factor ‘Economy’ or ‘Premium’

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

CALCULATOR

Project Name: (*optional*)

Soil Moisture: Dry (Xeric)

Seeding Method: Drilling

Is the planting in bare soil? No

Planting time: Spring

Area: *acres* or *length (ft)* x *width (ft)*

Iowa County: Black Hawk

Cost Factor: Premium

Include optional species? No

Calculate

"Premium" mixes cost more per acre than the economy mixes, but they include many more species than "economy" mixes.

All base seed mixes meet and exceed Iowa NRCS specifications for seeding natives.

Economy vs Premium Comparison (2015 prices)

Economic vs Premium (2015 prices) Example, Black Hawk county 1 acre mix				
Hydrology	Economy Mix		Premium Mix	
	Cost Range	# Species	Cost Range	# Species
Dry	$280-756	54	$447-1,253	74
Dry Mesic	$270-829	52	$421-1,195	69
Mesic	$259-773	45	$444-1,171	75
Wet Mesic	$226-593	44	$426-1,086	69
Wet	$229-530	42	$415-$853	54
MEANS	**$253-696**	**47.4**	**$431-1111**	**68.2**

Review Your Input

YOUR CUSTOM SEED MIX

#1 - Review the following information that you entered on the previous page. If you find a mistake, click \"Return to Calculator\" to make corrections. It is important to correct this information before moving on to #2 to avoid data loss.

Your custom seed mix provides seeding recommendations on prairie habitats (0-20% shade):

- in **Mesic** soil,
- seeding method **Drilling**,
- with **No** bare soil,
- in **Spring**,
- in **1 acres**,
- in **Black Hawk County**,
- using a **Premium** seed mix,
- including optional species,

Return to Calculator

#2 - If the information above is correct, we are pleased to present the following results summary:

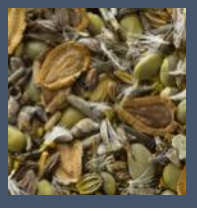
Total species: 75

Cost range: $444 - $1,171

If this looks good, you can skip to the bidding instructions and a list of vendors below.

#3 - You may make adjustments to the recommended custom seed mix below to better fit your needs.

Species and Seed Rate - Grasses



Common Name	Scientific Name	Seeding Rate	Oz PLS	Cost Range
Cool-season grasses				
Slender Wheatgrass	*Agropyron trachycaulum*	1.00	6.31	$2.40 - $18.94
Prairie Brome	*Bromus kalmii*	0.50	2.72	$6.81 - $10.89
Blue Joint Grass	*Calamagrostis canadensis*	0.00	0.00	$0.00
Scribner's Panic Grass	*Dichanthelium oligosanthes*	0.00	0.00	Not available
Canada Wildrye	*Elymus canadensis*	1.00	7.03	$4.43 - $21.08
Virginia Wild Rye	*Elymus virginicus*	0.00	0.00	$0.00
Fowl Manna Grass	*Glyceria striata*	1.00	0.27	$3.27 - $4.30
Cool-season sedges				
Yellow Fox Sedge	*Carex annectens*	1.00	0.48	$6.05 - $9.68
Copper-shoulder oval sedge	*Carex bicknellii*	0.25	0.64	$6.01 - $12.81
Plains oval sedge	*Carex brevior*	0.25	0.38	$3.52 - $7.51
Long-awned bracted sedge	*Carex gravida*	0.02	0.07	$4.36
Field oval sedge	*Carex molesta*	0.25	0.44	$4.09 - $5.23

Species and Seed Rate - Grasses

Long awned bracted sedge	*Carex gravida*	0.02	0.07	$4.80
Field oval sedge	*Carex molesta*	0.25	0.44	$4.09 - $5.23
Lance-fruited oval sedge	*Carex scoparia*	0.00	0.00	$0.00
Common Fox Sedge	*Carex stipata*	0.00	0.00	$0.00
Warm-season grasses				
Big Bluestem	*Andropogon gerardii*	3.00	13.07	$4.97 - $39.20
Side-oats Grama	*Bouteloua curtipendula*	3.00	15.11	$9.52 - $45.32
Switchgrass	*Panicum virgatum*	2.00	5.45	$3.43 - $16.34
Little Bluestem	*Schizachyrium scoparius*	3.00	8.54	$9.65 - $25.62
Indian Grass	*Sorghastrum nutans*	3.00	11.36	$11.36 - $34.09
Prairie Cordgrass	*Spartina pectinata*	0.00	0.00	$0.00
Tall Dropseed	*Sporobolus compositus*	5.00	7.26	$5.45 - $21.78
Prairie Dropseed	*Sporobolus heterolepis*	0.75	2.18	$8.17 - $17.42
TOTAL Grasses/sedges:		**25.02**		

Recalculate grasses/sedges

Reset grasses/sedges

Species and Seed Rate - Legumes

Legumes				
Leadplant	*Amorpha canescens*	0.25	0.61	$5.71 - $9.13
Indigo Bush	*Amorpha fruticosa*	0.00	0.00	$0.00
Milk Vetch	*Astragalus canadensis*	1.00	2.56	$4.82 - $15.37
White Wild Indigo	*Baptisia alba*	0.03	0.77	$5.77 - $38.44
Cream False Indigo	*Baptisia bracteata*	0.01	0.31	$13.61 - $19.70
Partridge Pea	*Chamaecrista fasiculata*	0.30	4.84	$3.05 - $14.52
White Prairie Clover	*Dalea candida*	0.00	0.00	$0.00
Purple Prairie Clover	*Dalea purpurea*	2.00	5.81	$9.06 - $17.42
Showy Tick Trefoil	*Desmodium canadense*	0.25	1.98	$6.34 - $39.60
Illinois Tick Trefoil	*Desmodium illinoense*	0.25	2.53	$2.38 - $7.60
Licorice Root	*Glycyrrhiza lepidota*	0.05	0.56	$5.24 - $8.38
Round-Headed Bush Clover	*Lespedeza capitata*	0.10	0.54	$8.17 - $10.89
TOTAL Legumes:		**4.24**		

Recalculate legumes

Reset legumes

Species and Seed Rate – Forbs & Total

Sky-blue Aster	*Symphyotrichum oolentangiense*	1.00	0.54	$8.17 - $20.42
Germander	*Teucrium canadense*	0.00	0.00	$0.00
Purple Meadow Rue	*Thalictrum dasycarpum*	0.10	0.40	$4.95 - $10.45
Prairie Spiderwort	*Tradescantia bracteata*	0.10	0.44	$6.88 - $13.07
Ohio Spiderwort	*Tradescantia ohiensis*	0.20	1.09	$8.60 - $16.34
Hoary Vervain	*Verbina stricta*	0.00	0.00	$0.00
Ironweed	*Vernonia fasciculata*	0.50	0.91	$6.81 - $9.08
Culver's Root	*Veronicastrum virginicum*	1.00	0.05	Not available
Purple Vetch	*Vicia americana*	0.00	0.00	$0.00
Prairie Violet	*Viola pedatifida*	0.00	0.00	$0.00
Heartleaf Alexanders	*Zizia aptera*	0.00	0.00	$0.00
Golden Alexanders	*Zizia aurea*	0.50	1.98	$7.43 - $15.84
TOTAL Forbs:		**21.50**		

Recalculate forbs

Reset forbs

GRAND TOTAL:	**50.76**	**$444 - $1,171**

Includes 75 total species!

Sample output (bid sheet)

To move these results to Excel, open Excel and then select and copy this table here in your browser. Next, paste it into Excel.

Common Name	Scientific Name	Quantity (Oz. PLS)	Bid Price	Seed Source
Cool-season grasses				
Slender Wheatgrass	*Agropyron trachycaulum*	6.31		
Prairie Brome	*Bromus kalmii*	2.72		
Canada Wildrye	*Elymus canadensis*	7.03		
Fowl Manna Grass	*Glyceria striata*	0.27		
Cool-season sedges				
Yellow Fox Sedge	*Carex annectens*	0.48		
Copper-shoulder oval sedge	*Carex bicknellii*	0.64		
Plains oval sedge	*Carex brevior*	0.38		
Long-awned bracted sedge	*Carex gravida*	0.07		
Field oval sedge	*Carex molesta*	0.44		
Warm-season grasses				
Big Bluestem	*Andropogon gerardii*	13.07		
Side-oats Grama	*Bouteloua curtipendula*	15.11		
Switchgrass	*Panicum virgatum*	5.45		
Little Bluestem	*Schizachyrium scoparius*	8.54		
Indian Grass	*Sorghastrum nutans*	11.36		
Tall Dropseed	*Sporobolus compositus*	7.26		
Prairie Dropseed	*Sporobolus heterolepis*	2.18		

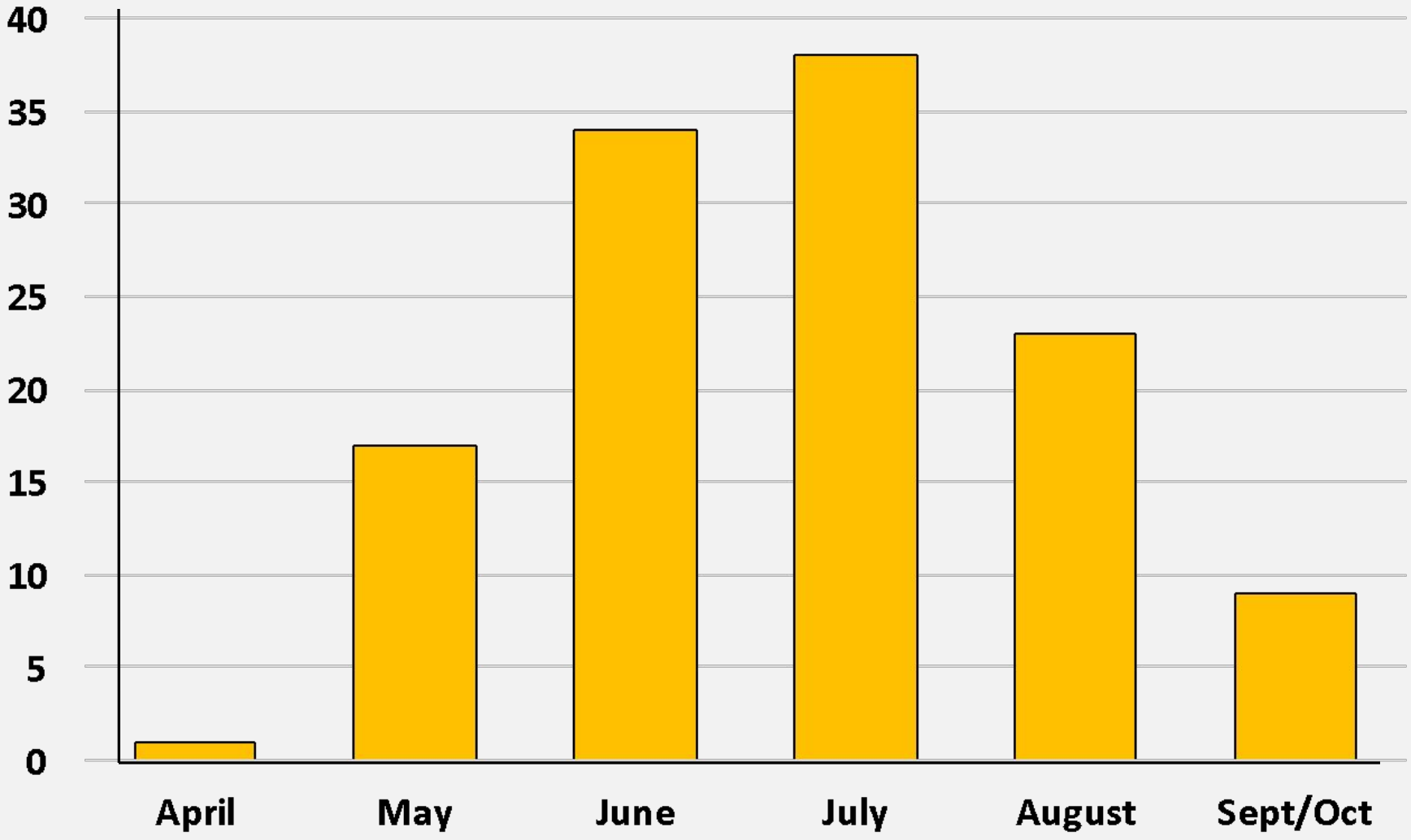
Cost Cutting Strategies

- Don’t automatically eliminate high-cost species
  - % reduction in seeding rate across several species
  - Increase seeding rate of more affordable species to compensate

Substitutions for Unavailable Species

- Contact additional nurseries for those species
- Increase seeding rate of available species
- Substitute with other species in the calculator not in the original mix
- Leave out unavailable species so long as it doesn’t compromise overall mix or seeding rate

Number of species in bloom by month




IRVM
Fayette County Roadside

Thank you!
Questions?

Tallgrass Prairie
CENTER
UNIVERSITY OF NORTHERN IOWA

University of Northern Iowa

The preceding presentation was delivered at the

2017 National Native Seed Conference

Washington, D.C. February 13-16, 2017

This and additional presentations available at http://nativeseed.info

NATIVE SEED NETWORK

Institute for Applied Ecology