



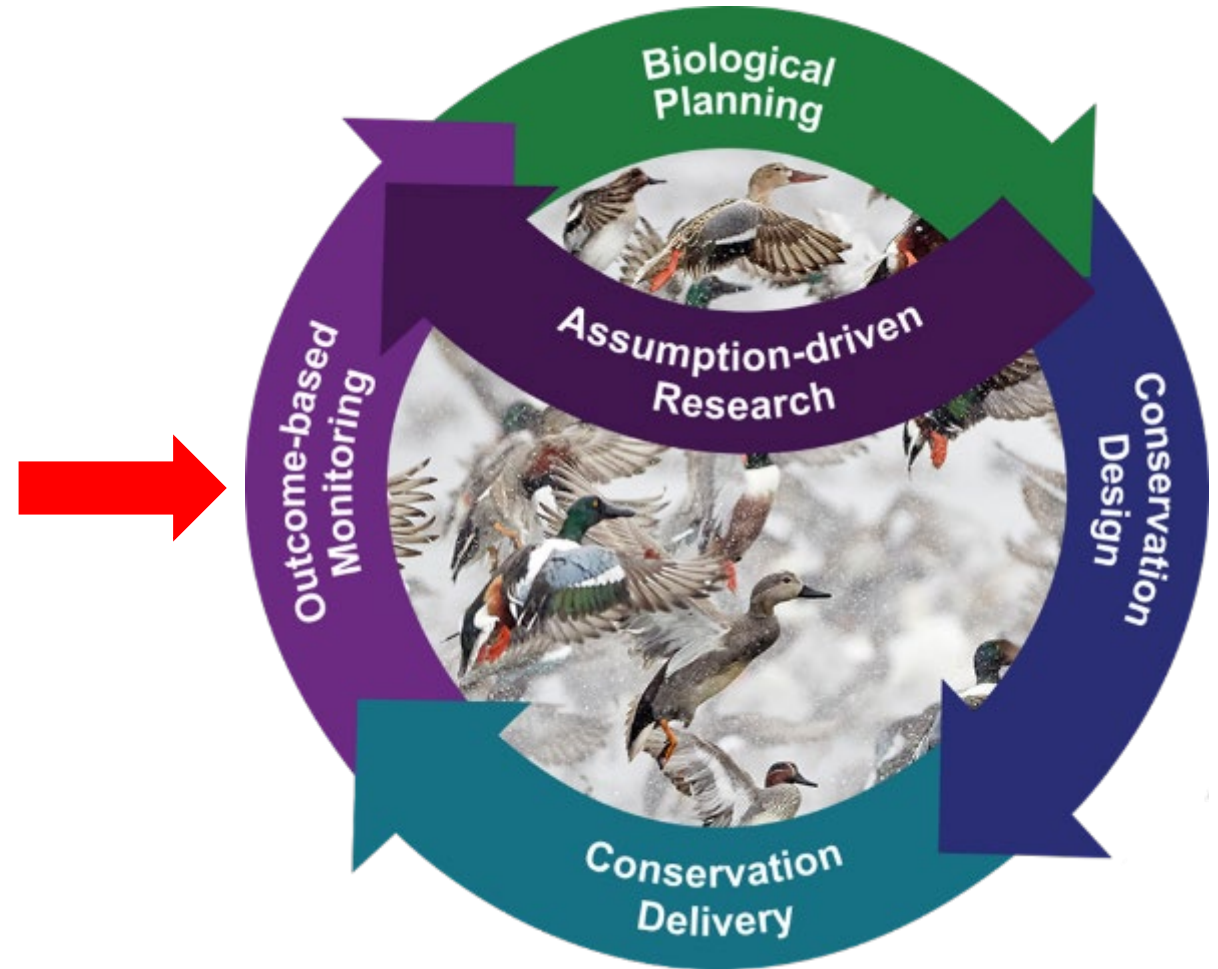
Grassland Monitoring for More Cost-Effective and Ecologically Sustainable Restorations

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Greg Hoch – Prairie Habitat Team Supervisor

What are we doing?

- Adaptive Management – Wildlife
 - Continuous Improvement – Govt
 - QA / QC – Business
-
- Share with conservation community so everyone can integrate information into their work as soon as possible



Courtesy USFWS – Strategic Habitat Conservation (SHC)

A VERY brief history of large-scale restoration efforts

- 1950s/60 (Soil Bank)
 - Brome/fescue/sweetclover
- Late 1980s (CRP)
 - Native grasses, few wildflowers
 - Origin? (Western Plains in many cases)
 - Availability at the time
 - Can still see these plantings today (that's bluestem, but not Minnesota bluestem)
- Recent years
 - Increased diversity – pollinators and wildlife
 - Local ecotype seed when available
 - HOW ARE WE DOING?



Restorations – older and newer



- 90 lb Lab at 5 yards
- Wall of grass, dotted with a few forbs
- Couple species of wildflowers at my feet



- 90 lb Lab at 15 yards
- Carpet of wildflower leaves with some grasses poking through
- 15-20 species of wildflowers at my feet

What we have in Minnesota

- 100s of restorations/reconstructions funded with OHF - 1 to ~15 years old
- Seeding methods - Drill or broadcast
- Seeding seasons - Fall, spring, summer
- Weather first summer - Cool and wet, hot and dry
- Range of seed mixes – purchased, native harvest, etc
 - (Aside – funds invested into rural economies)
- 1st/2nd year management - Mowing, etc.

- A lot of information to pull together and **learn from**



One Example - Detroit Lakes seed consortium



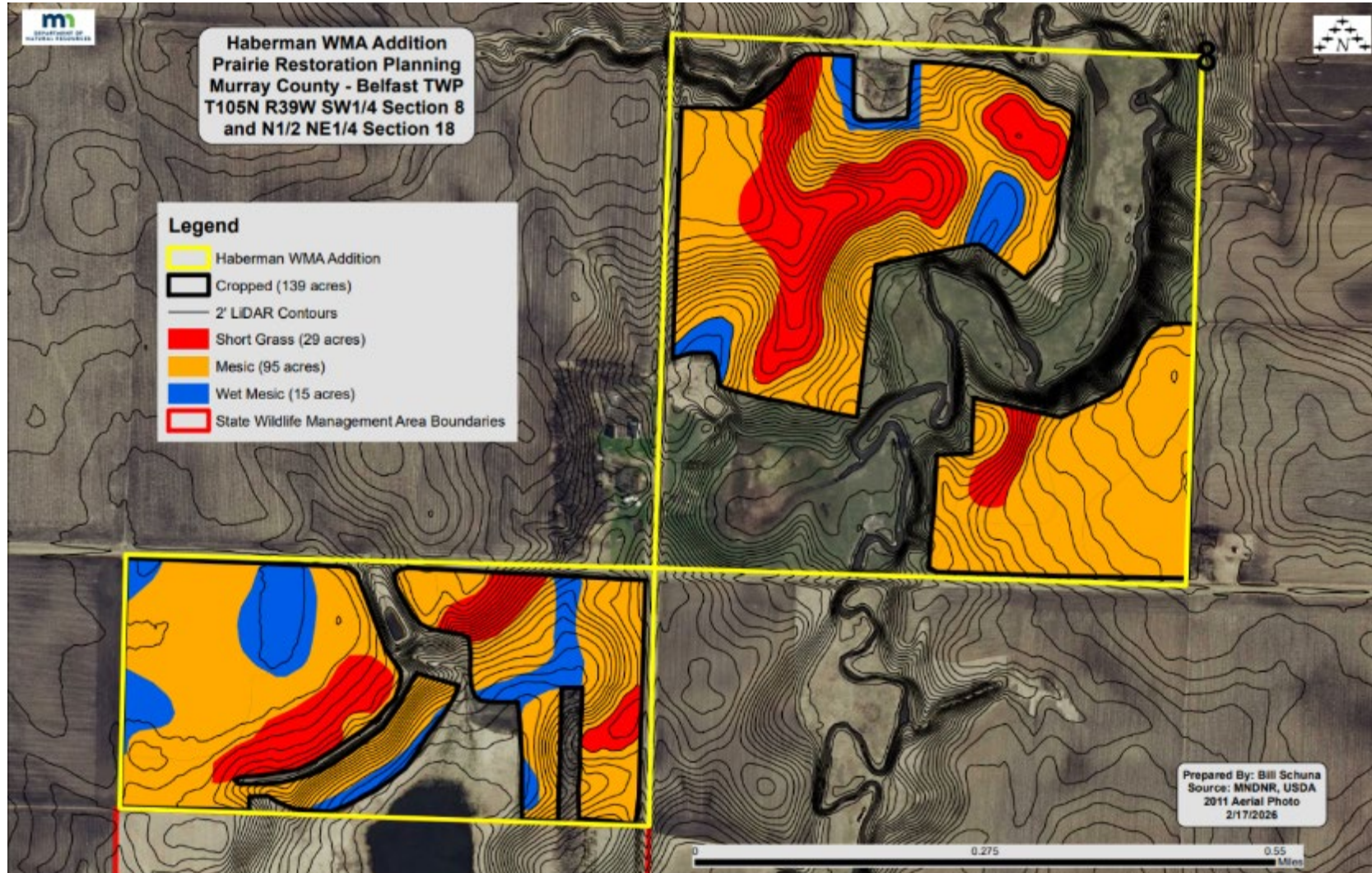
Since inception of the seed consortium, 146,949 lbs. of seed harvested (4,198 bags). If we stacked those bags, it would be over 2x the height of the tallest building in the world (Burj Khalifa – Dubai, 2,717 ft). -Travis Issendorf, TNC Prairie Recovery Specialist



Photos courtesy S. May (USFWS) and T. Issendorf (TNC)

Sculpted Seeding

Different seed mixes for each soil type



PRI Development

Fit into regional efforts – create an even larger database



National Protocol Framework for Monitoring Vegetation in Prairie Reconstructions



Version 1.0

December 2019

Acknowledgments

We thank senior leadership of the US Fish and Wildlife Service (FWS) Region 3 Division of Natural Resources and Conservation Planning, especially Patricia Heglund and Melinda Knutson, for providing staff and logistical support for PRI and for their guidance. We are grateful for the collaboration and contributions of the US Geological Survey (USGS) and The Nature Conservancy (TNC). The nested plot technique was adapted from field protocols developed by Patrick Anderson (USGS). Jennifer Larson (USGS) developed methods to assign soil moisture to sample polygons. The meandering walk technique was adapted from field protocols developed by Marissa Ahlering and Meredith Cornett (TNC), with input from Tom Skilling (FWS) regarding abundance category descriptions. Karen Viste-Sparkman (FWS) provided assistance in developing the objectives appendix. We thank all those who tested and provided feedback about the PRI Management Database (Database) and this monitoring protocol. Victoria Hunt and Sarah Jacobi of the Chicago Botanic Garden developed the SharePoint interface for the Database. Andrew Allstadt (FWS) provided substantial input on the data management section of this protocol framework and has provided guidance on the Database development. We appreciate the reviews provided by Karen Viste-Sparkman (FWS), Steven Winter (FWS), James Ellis (University of Illinois), and Thomas Rosburg (Drake University). Patrick Ward (FWS) coordinated the review and provided technical edits. Mary Grant (FWS) compiled comments and helped archive versions of this document. Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the US Government.

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Monitoring Questions >> Feed into Research Hypotheses

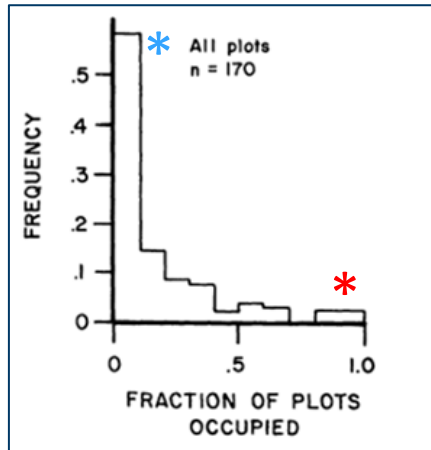
- What species are in 'every' mix and 'always' show up?
 - Keep planting
- What species show up 'half the time'?
 - What's different about the sites they do / don't establish? (research Q)
- What species 'rarely/never' shows up? **Two** issues
 - **Ecologically**, why don't they establish? (research Q)
 - **Economically**, why are we spending the money?
 - **How do all of us make the best use of these public funds?**



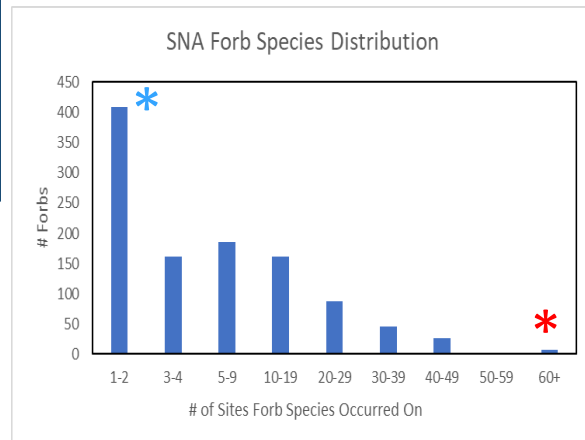
Patterns across restorations/reconstructions

Most species are rare

- Published data and SNA data

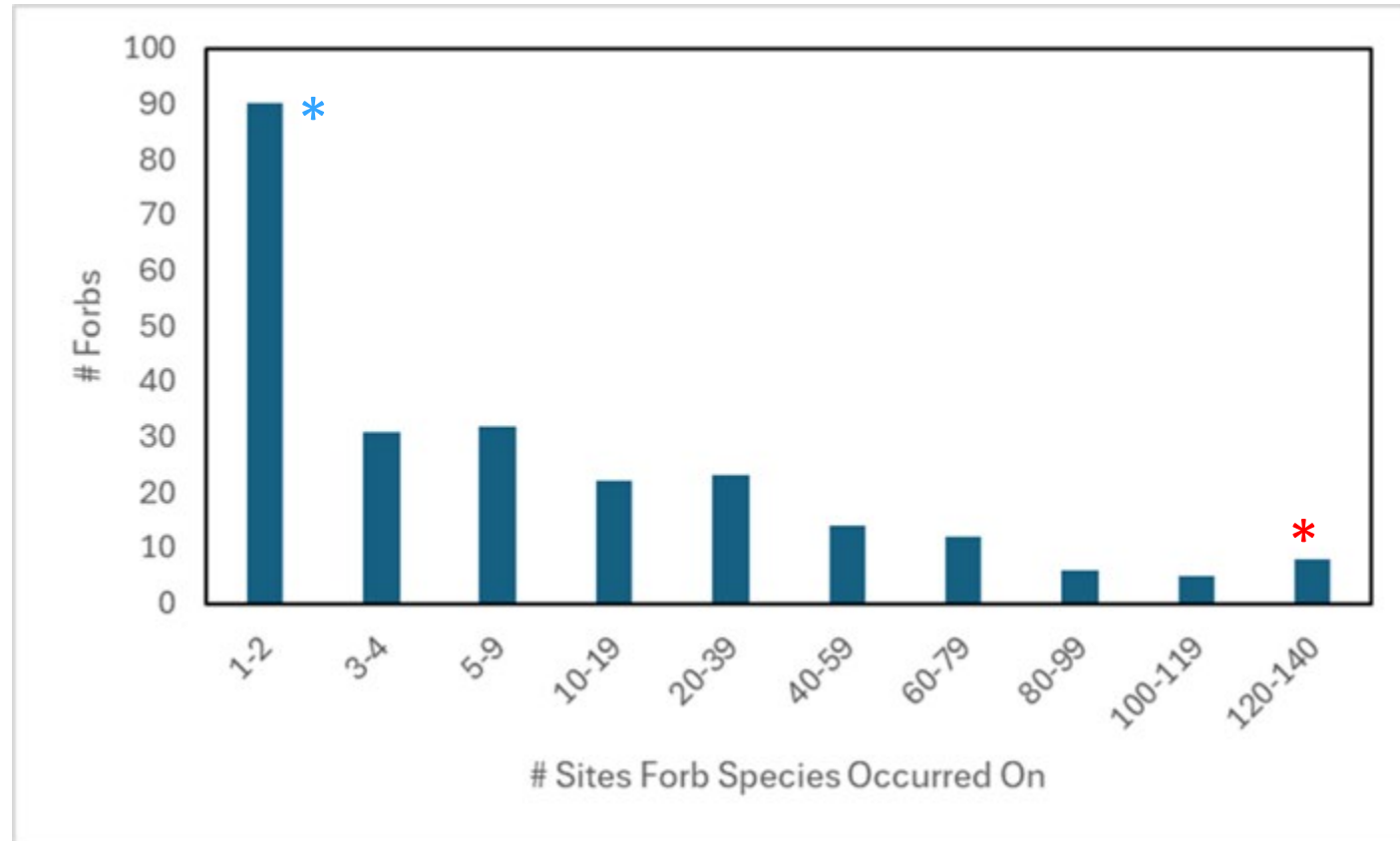


Gotelli and Simberloff 1987
Konza Prairie, KS



Thank you to SNA staff for providing data

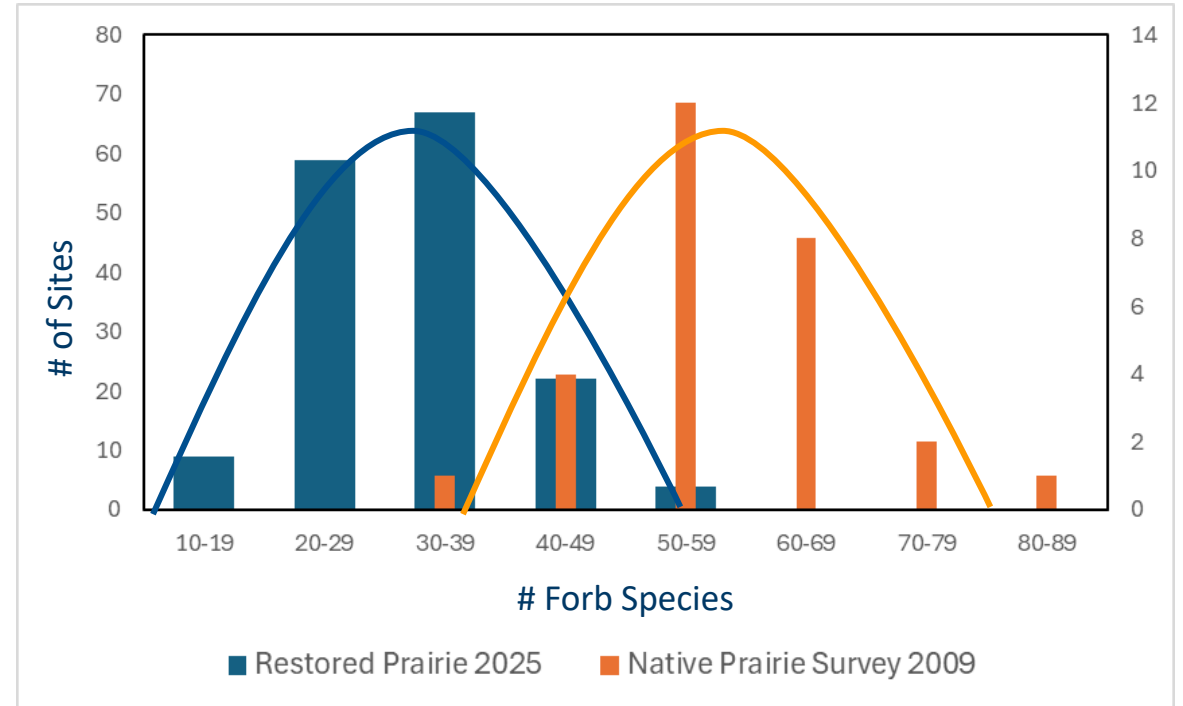
OHF Restorations



- * Many species found at a few sites
- * A few species found at many sites

Wildflower Diversity in Restored and Native Prairie

- Don't quite have the level of diversity of native prairie
- Same bell-shaped pattern of distribution
- **At a high level and across sites, restorations have similar patterns of diversity compared to native prairie**

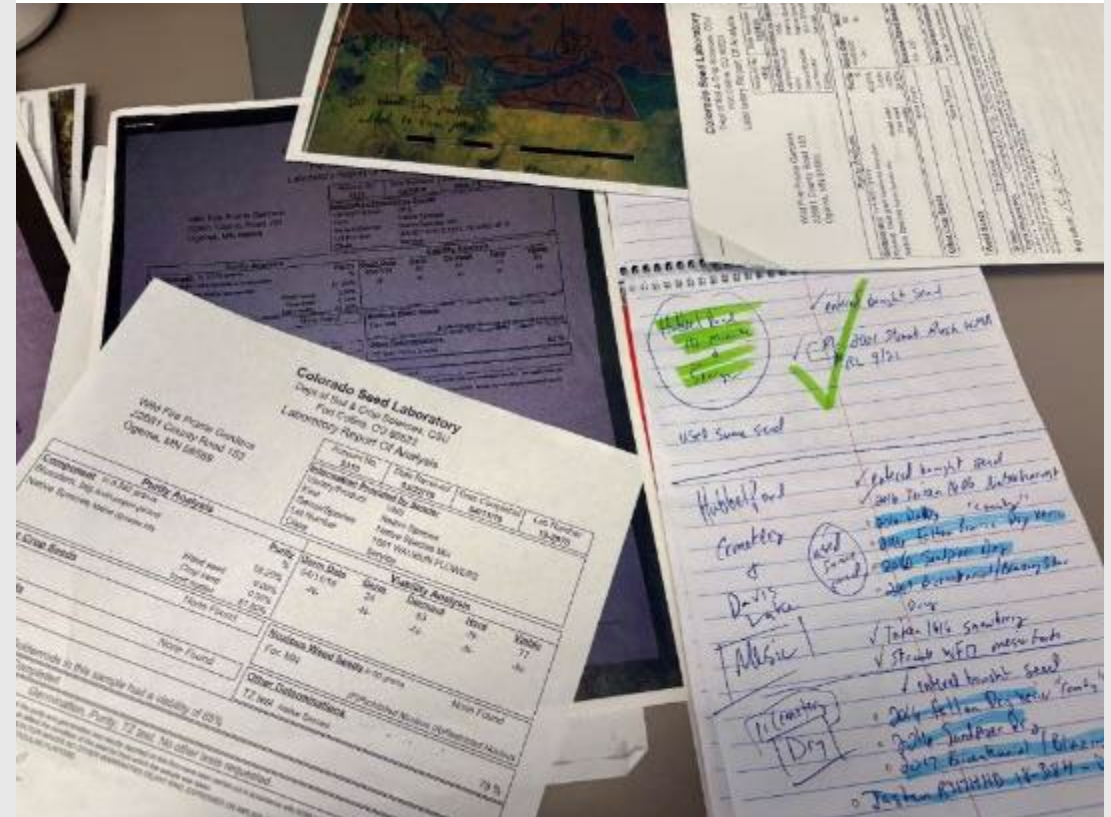


Survey of WPAs in Becker and Clay County – Hoch and Esser 2009

Entering the Numbers

Entered our surveyed species, but also...

- What was planted?
 - Species
 - Amounts
 - Seed tests
- When was it planted?
- How was it planted?
- Site conditions
- Site prep
- Prior cropping history



Most Commonly Found

Most common (native grass)



Big Bluestem
144 of 161 = 89.4%

2nd Most Common (native forb)



Common Milkweed
136 of 161 = 84.5%

3rd Most Common (native forb)

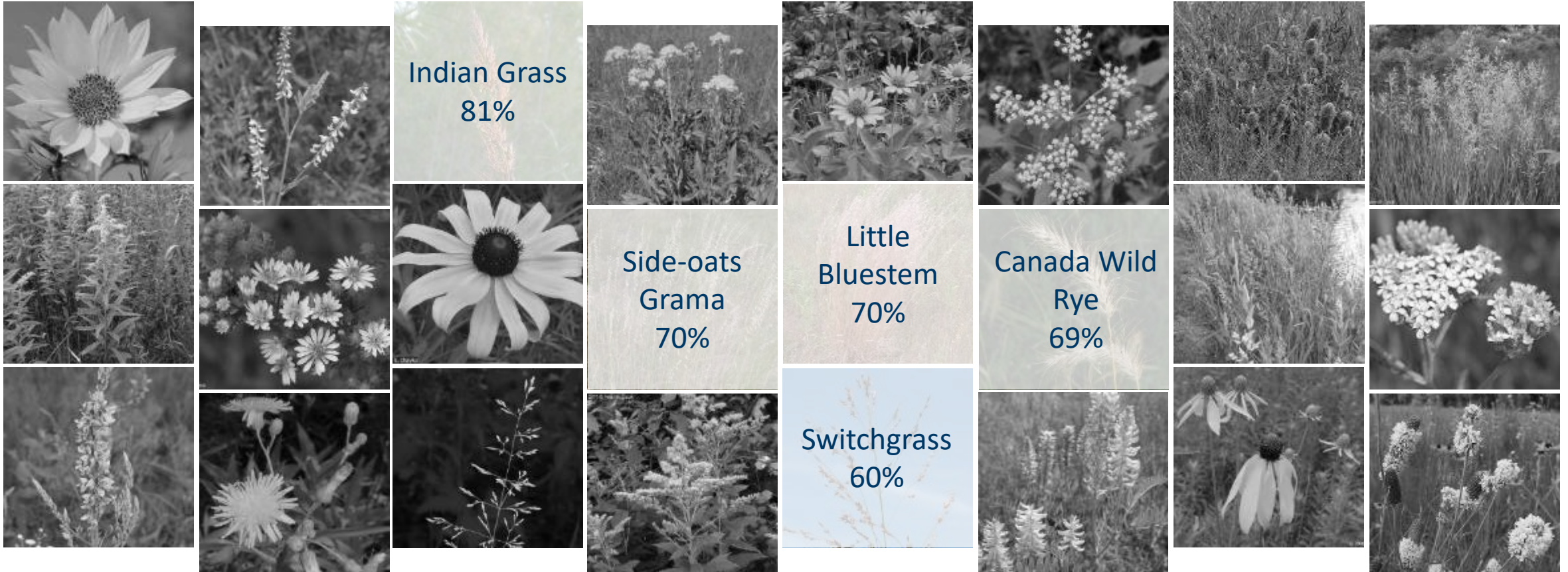


Wild Bergamot
134 of 161 = 83.2%

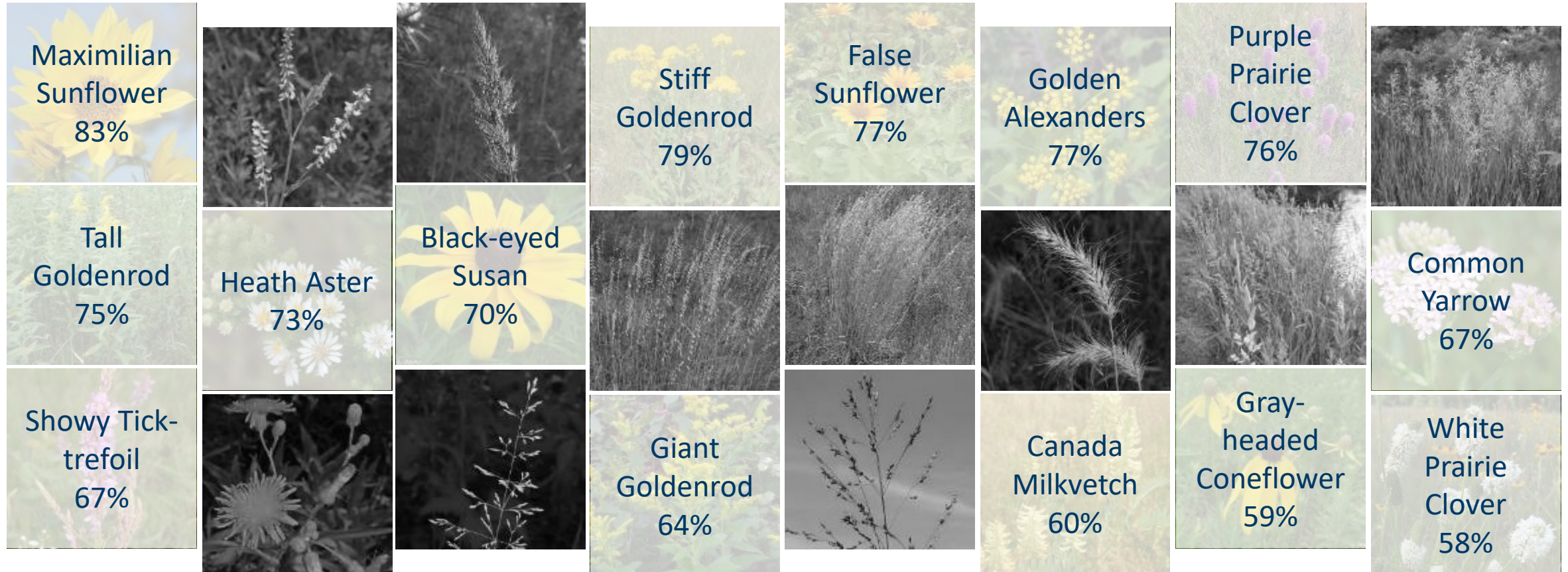
Next Most Commonly Found Species



Most Commonly Found Species: Native Grasses



Most Commonly Found Species: Native Forbs



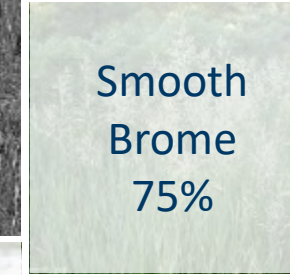
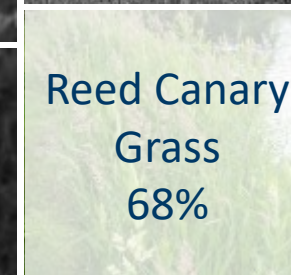
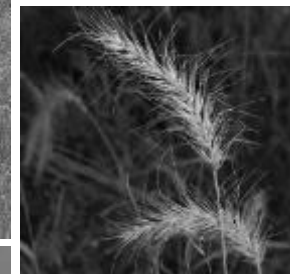
Most Commonly Found Species: Non-native Species



White
Sweet
Clover
81%



Kentucky
Bluegrass
65%



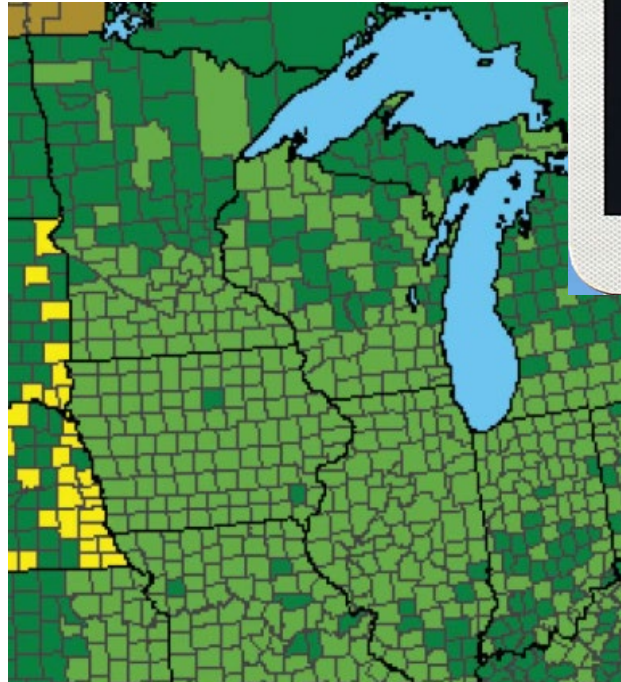
Smooth
Brome
75%

Reed Canary
Grass
68%

Perennial
Sowthistle
66%

The Coneflower Conundrum

- Prairie coneflower one of most iconic and recognizable tallgrass prairie wildflower
- The Iowa and Illinois prairie
- Only southern Minnesota
- SHOULD be rare to absent in restorations across much of state

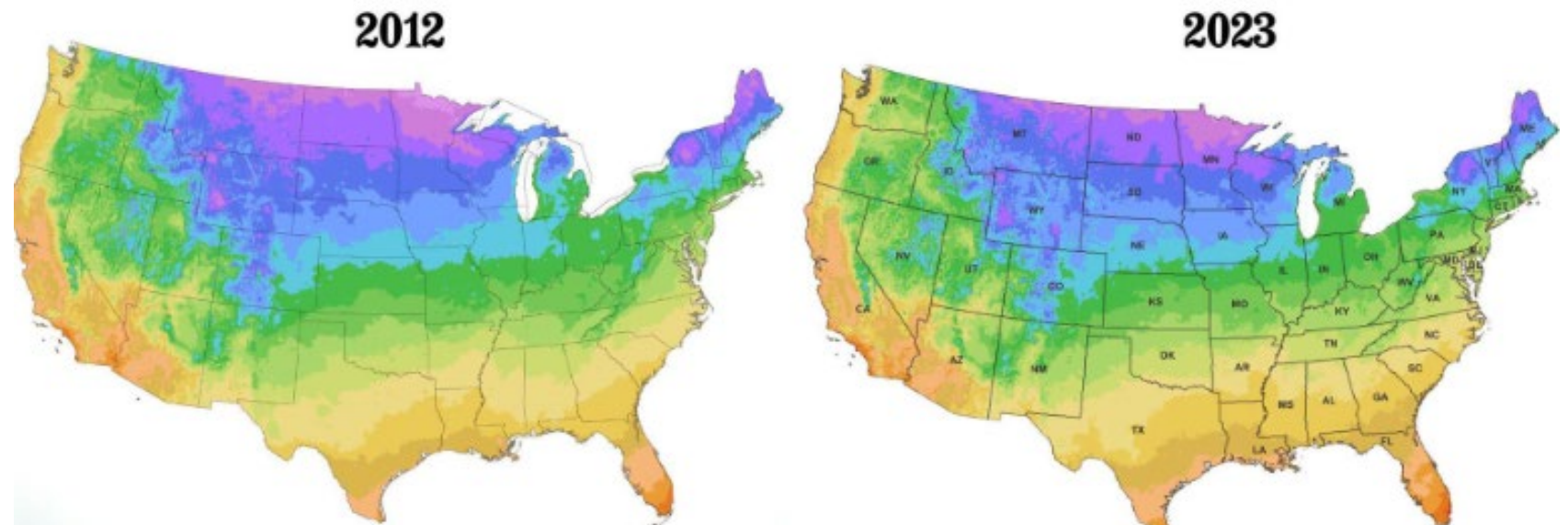


<https://www.northstarhighways.com>

The Conundrum – Part 2

- The times they are a changin’
- We should proactively move species (and genes) northward
- “Assisted Migration”

SHIFTING PLANTING ZONES



If You Plant it, Does it Grow?



7/25/2026



20

50 Most Commonly Planted Species

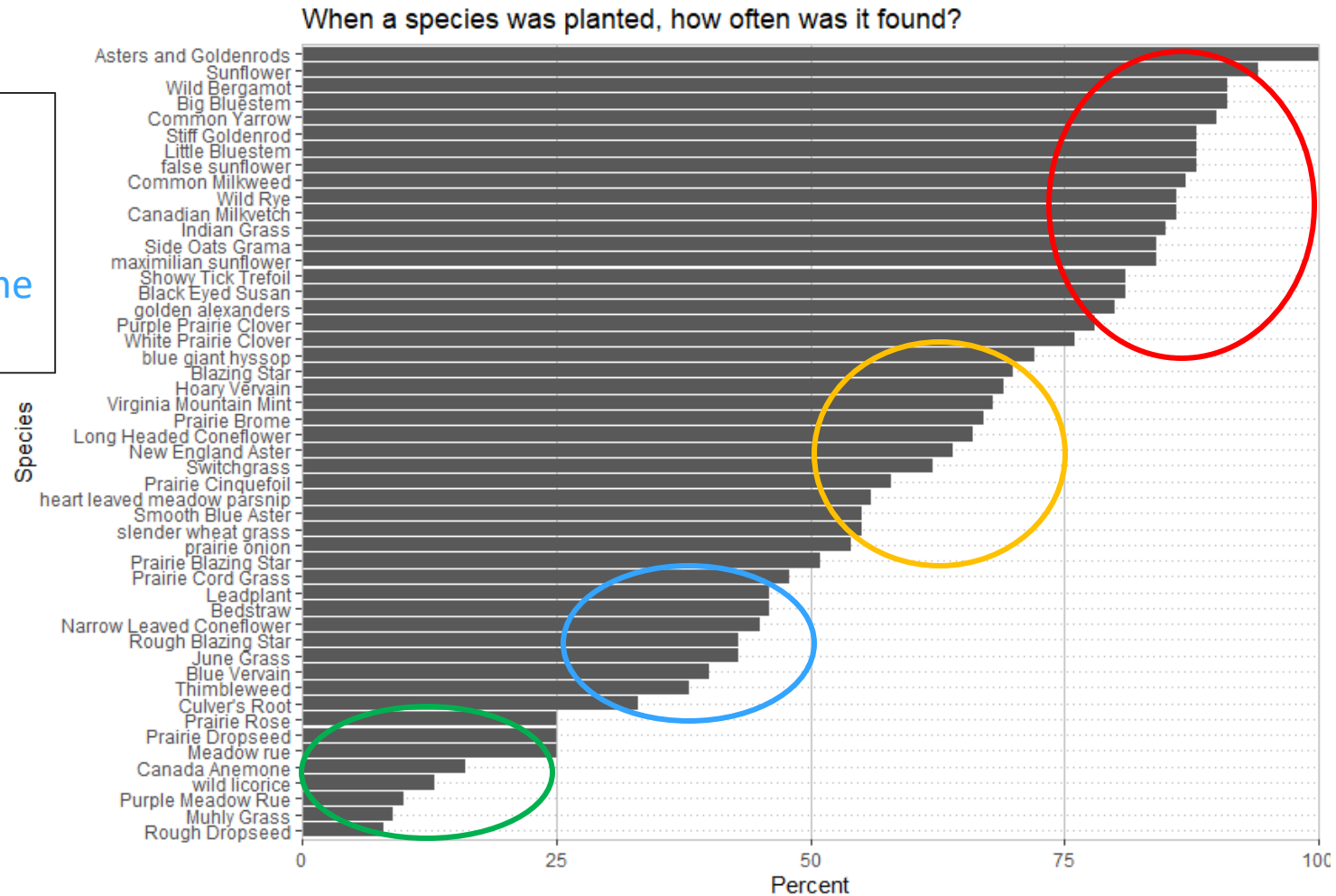
Shows up...

Most of the time

Some of the time

Less than half the time

Rarely

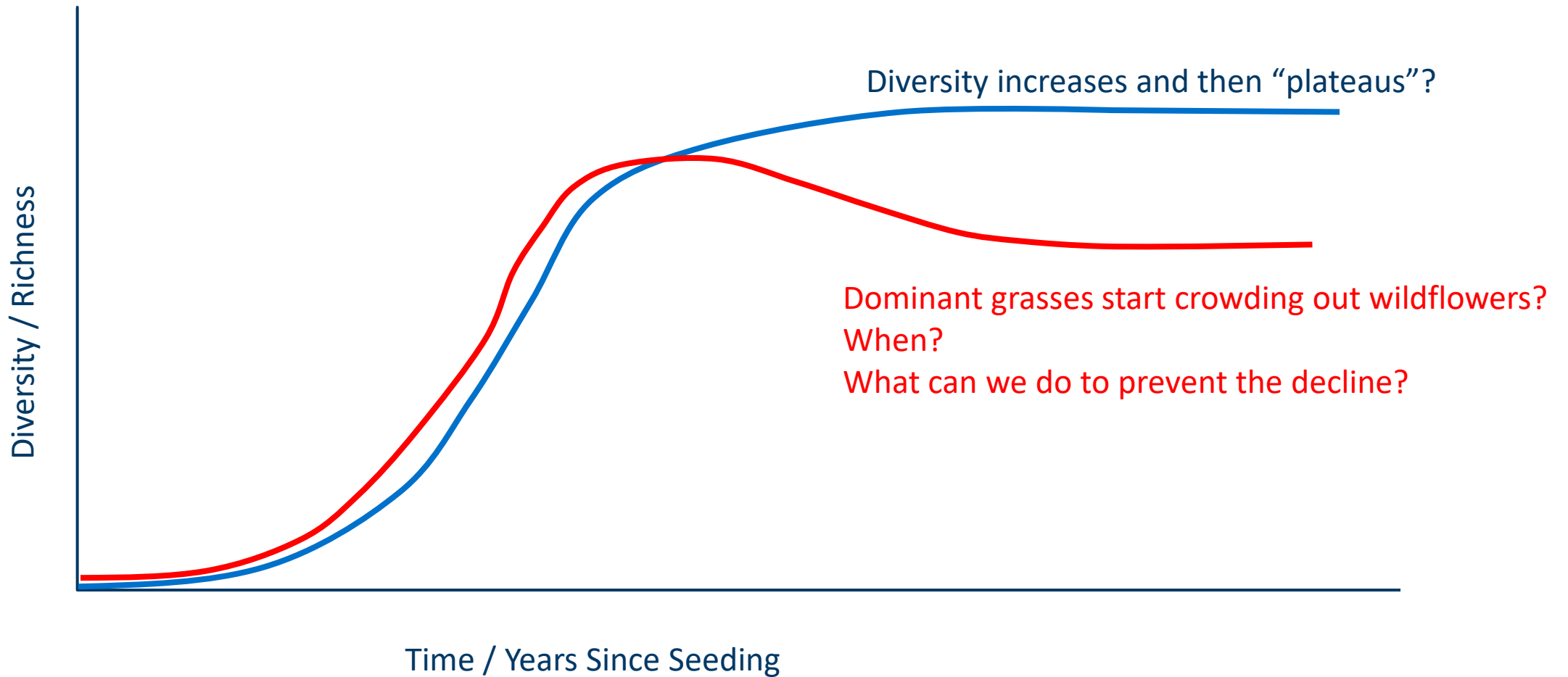


Reasons Why Species Aren't Showing Up?

- Young seeding – not established yet
- Old seeding – crowded out
- Slow growers
- Early management actions
- Low germination
- Seed storage conditions not favorable
- Susceptible to extreme weather (drought)
- Hard to find
- Needs to be seeded at specific time / season
- Seeded at low rates
- Seeded in wrong location / soil type
- Seed predation?
- Disease?
- Soil conditions / site history
 - Residual pre-emergent herbicides
- Unknown...

What is happening to diversity over time??

We can do the “what”, the “why” is a research question



Let's Talk About It – Wood Lily



- It can be done
 - Nelson/Rogers sites seeded in March of 2018
- It readily germinates
- It's just a slow grower

Let's Talk About It – Pasque Flower



- Match the phenology
- “Seed it fresh”
- The key is to seed it into warm/moist soil. Never cold.
- We found Pasque flower twice in 2025. **Both sites were June seedings** - one WPA, one WMA.
- Baby Pasque benefits from shade

So What? Why Does Diversity Matter in Restorations?

- Insects named after plants
 - alumroot flea beetle, iris weevil, sage leafhopper, cordgrass bug, scurf-pea argid sawfly, and Liatris borer moth,
- Insects and plant anatomy
 - bushclover stem-borer beetle, phlox stem borer, bluestem leaf-mining beetle, spiderwort leaf beetle, Baptisia seed weevil, sunflower seed bug, false boneset flower moth
- One plant species, many insects
 - Amorpha borer, Amorpha stem gall moth, leadplant gall-midge, leadplant plantlice,
 - Silphium aphid, Silphium leaf-miner, Silphium internal stem gall wasp
- (names provided courtesy R. Henderson, WI DNR retired)



Invertebrate Diversity

- “All of these arthropod variables were significantly positively correlated to plant species richness in the fields. (Siemann et al. 1999)
- The composition of the grasshopper community at a given location depends on the species composition of the plant community. (Kaufman et al 1998)
- Differences in insect communities between native and restored prairie may best be explained by the presence of insect host plants (Nemec and Bragg 2008)



Invertebrate abundance

- Wood ducks, about the size of a pheasant hen, need to eat ~57,600 inverts to lay a clutch of 12 eggs (from Drobney 1980)
- “Practices that maintain or increase forb cover likely will increase invertebrate biomass and habitat quality [for lesser prairie-chickens] in southwestern Kansas. (Jamison et al. 2002)
- “Gamebird chick survival is dependent on invertebrate availability...(Doxon and Carroll 2010)



Blooms to Bugs to Birds



Bird photos – Cornell Lab of Ornithology

Some Questions We Have Others can Develop into Research Projects

- Many questions on individual species
- Is there a “best” planting method
- What is the optimal planting rate for different species?
- Do some species do better with particular planting method?
- How do conditions at the time of planting affect species composition?



Larger overarching research questions this information can feed into

- Is there a correlation between diversity and the presence of invasive species?
- Is there a correlation between plant diversity and diversity/abundance of wildlife and pollinators?
 - Do we get more wildlife with a higher diversity seeding? Bang for our buck?
- Role of enhancements in maintaining diversity once established?



Stay Tuned – More to Come



Thank You!

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