Functional Landscapes & Regional Habitat Restoration:

A Case Study with AEP on Seeding Native Prairie in Utility Right-of-Ways at The Dawes Arboretum

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FIELD

THE DAWES ARBORETUM:
COMMITTED TO CONSERVATION & RESTORATION

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FUNCTIONAL LANDSCAPES

GOALS

determine feasibility for using native plantings
demonstrate practicality of technique
provide solution for conservation and industry

WHY PRAIRIE?

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- Well adapted, offers eco-services:
  - greater pollination services
  - growth in various soil conditions
  - no fertilization needed
  - drought tolerance
  - deep roots, stabilizes soil
- Regulatory use of native seed in progress:
  - Highway right-of-ways

    West Virginia, USA (Skousen, et. al, 2008)[1]
  - Abandoned coal mine lands

    Ohio, USA (Div. Mineral Resource Management, 2017)
  - Bureau of Land Mgt, Oil & Gas, Reclamation

    West of Mississippi, USA (www.osmre.gov, 2014)

REBUILDING NORTH AMERICA'S MOST ENDANGERED LARGE ECOSYSTEM

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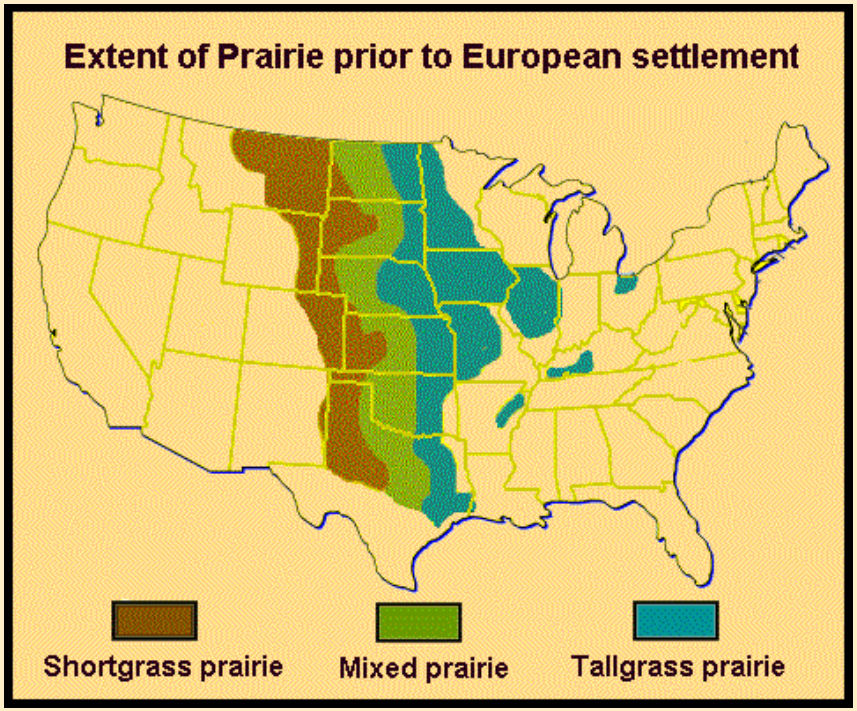
- **Presently:** < 5 % of original 142 million acres of tallgrass prairie in United States remains (USDA/NRCS)

- **Disturbed lands provide an ideal opportunity** to re-establish prairie in parts of former range



‘SEED’ING IS BELIEVING: NATIVE REVEGETATION EVOLVES OVER TIME

Est. 2004

- (WILDS)
- Restoration Ecology Research
- 1 site

COAL SURFACE MINE

Est. 2014

- (ODNR)
- Natives in Reclamation on Abandoned Mines
- Select sites in OHIO

ABANDONED LANDS

Est. 2015*

- (AEP & EPRI)
- Powerline Prairies
- Multiple sites in OHIO & Eastern US

RIGHTS-OF-WAY

Experimentation across industries:

led to refinement of native seeding application regionally

LAND DEGRADATION MAY LEAD TO NEW ECOLOGICAL OPPORTUNITIES

- Ex: Coal mine land reclamation to 'original ecological condition' may not be feasible (Cairns 1979, Holl 2002).
- Standard practice dictates reseeding NON-NATIVE grasses with limited ecological value
- "novel ecosystems…using native species in plantings can serve to improve ecological structure and function" (Cusser & Goodell 2014).

BARE GROUND POST-CONSTRUCTION

= Native Plant Restoration Opportunity

ODOT RIGHT OF WAY PARTNERSHIP (EST. 2015)

ODOT RIGHT OF WAY COMPANION PRAIRIE (EST. 2015)

Maturation (2015, 2016, 2017)

PILOT STUDY: POWER PRAIRIE (EST. 2015)

ECONOMY SEED MIX DESIGN GOAL:

- **FLEXIBLE, Maximum Diversity, HARDY NATIVE PLANTS**
- **Minimum Cost Per Pound**
- **Cover Crop & Flowering Annual Nurse Crops**

NATIVES IN RECLAMATION: HARDY NATIVE PLANTS WORK

Contents lists available at ScienceDirect

Ecological Engineering

journal homepage: www.elsevier.com/locate/ecoleng

Native vegetation in reclamation: Improving habitat and ecosystem function through using prairie species in mine land reclamation

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ABSTRACT

In the Appalachian region, coal mining has impacted 600,000 ha historically. While a return to forest would be a preferable postmining land use, due to the difficulty and higher costs of reforestation, many

Not all natives will suffice…
Natives in seed mixes must be competitive.

PUBLISHED 2016

"Incorporating hardy native prairie plants …can increase value of ecosystem… (soil, pollination) more than non-native plantings alone"

VEGETATION: INITIAL RESULTS

What has grown?

Table 1: Avg % cover of species observed in the Powerline Prairie (Established in 2015) –

13 of 19 species seeded* (68%)

Species	Common name	% cover	Native Status
Rudbeckia hirta	black-eyed Susan	25-50%	Native
Solidago canadensis	Canada goldenrod	10-25%	Native
Senna hebecarpa	wild senna	2-5%	Native
Elymus canadensis	Canada wild rye	5-10%	Native
Ratibida pinnata	gray-headed coneflower	5-10%	Native
Aster novae-angliae	New England aster	5-10%	Native
Heliopsis helianthoides	oxeye sunflower	2-5%	Native
Monarda fistulosa	wild bergamont	2-5%	Native
Silphium perfoliatum	cup plant	10-15%	Native
Sorghastrum nutans	Indian Grass	5-15%	Native
Panicum virgatum	switchgrass	0-1%	Native
Rudbeckia triloba	sweet browneyed Susan	5-10%	Native
Chamaecrista fasciclata	partridge pea	10-20%	Native
Asclepias incarnata	swamp milkweed	2-5%	Native

NATIVE VEGETATION IN POWERLINE PRAIRIES

EST. 2017

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PROJECT GOALS & OUTCOMES

GOALS

- evaluate the feasibility of establishing native vegetation
- determine potential for soil erosion control and stability
- measure resistance to tree invasion
- document diversity of wildlife

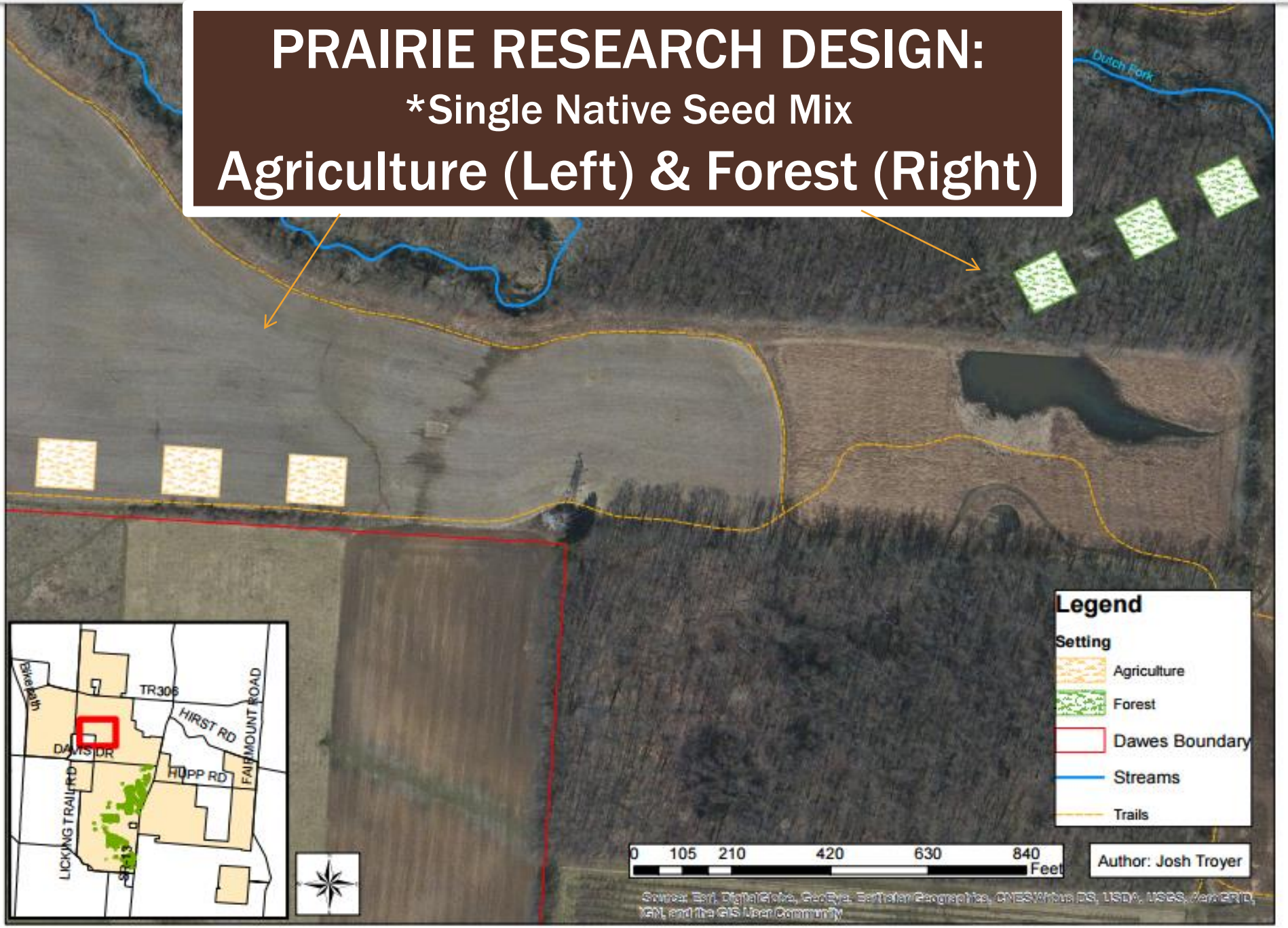
OUTCOMES

- recommendations native seeding
- vegetation management guide

PRAIRIE RESEARCH DESIGN:

*Single Native Seed Mix

Agriculture (Left) & Forest (Right)



POWERLINE PRAIRIES SITE PREP & PLANTING FORESTED CORRIDOR

EST. 2017

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Dozer replicated conditions of work pad construction

3 plots demarcated, 100x100ft ^{2}

Seeded by hand broadcast method, Rate 14 Bulk Lbs/ac (8 PLS)

Clean straw mulch applied, Rolled with cultipactor


~ 1 year later

POWERLINE PRAIRIES SITE PREP & PLANTING AG FIELD

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Great Plains

Convert farmland to conservation crop? WHY?

- Increased yields from pollinator buffer strips around crop fields
- Reduce erosion in unproductive sites

https://www.nrem.iastate.edu/research/STRIPS/content/about-strips

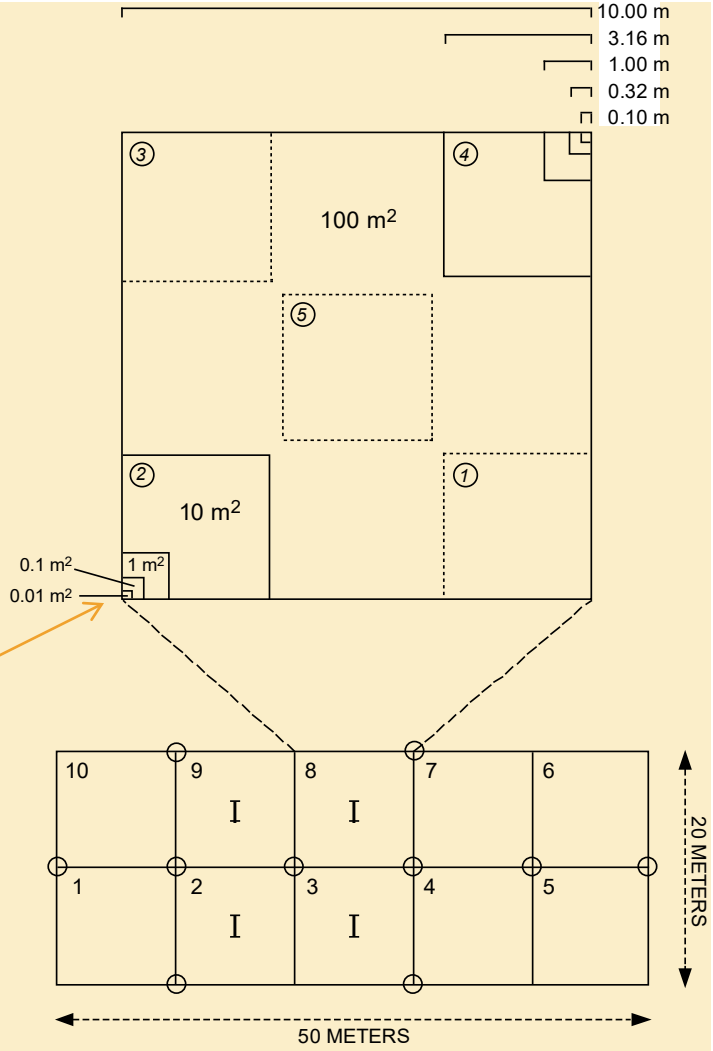
RESULTS: VEGETATION SURVEYS 2017 & 2018

Hard to know what is succeeding unless you look really close…


DATE 8/6/17
NO. ROWP1-1
P.A. AEP ROW Prairies
ALLOT.
PAST. Licking Trails Rd

VEGETATION SURVEY METHODS

- (2) techniques:
  - Daubenmire method *(standard)*
  - NCVS[1] method *(intense)*
- Species diversity, abundance, presence:
  - Native status, Invasive status



[1](NCVS) North Carolina Vegetation Survey Method

EST. 2017
Right-of-way Native Prairie Seed Mix

Common Name	Scientific Name	Percent of Mix
	Native Power Mix	
Little Bluestem	*Schizachyrium scoparium*	.22
Sideoats Grama	***Bouteloua curtipendula***	.11
Canada Wild Rye	***Elymus canadensis***	.10
Virginia Wild Rye	***Elymus virginicus***	.05
Blackeyed Susan	***Rudbeckia hirta***	.075
Purple Coneflower	***Echinacea purpurea***	.030
Wild Senna	***Cassia hebecarpa***	.025
Oxeye Sunflower	***Heliopsis helianthoides***	.025
Illinois Bundleflower	***Desmanthus illinoensis***	.022
Desmodium canadense	***Desmodium canadensis***	.022
Prairie Clover	*Dalea purpurea*	.020
Sweet Browneyed Susan	***Rudbeckia triloba***	.020
Grey Headed Coneflower	***Ratibida pinnata***	.011
Tall White Beardtounge	*Penstemon digitalis*	.010
Lanceleaf Coreopsis	***Coreopsis lanceolata***	.010
New England Aster	***Aster novae-angliae***	.007
Prairie Blazing Star	*Liatris pycnostachya*	.005
Swamp Milkweed	***Asclepias incarnata***	.005
Showy Milkweed	*Asclepias speciosa*	.005
Butterfly Milkweed	*Asclepias tuberosa*	.005
Giant Ironweed	***Vernonia gigantea***	.005
Blue False Indigo	*Baptisia australis*	.020
Partridge Pea	***Chamaecrista fasciculata***	.08
Plains Coreopsis	***Coreopsis tinctoria***	.05
Annual Oats	***Avena sativa***	.08

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SPECIES PRESENT

18 OF 25

From seed mix

Within 2nd growing season

72%

PRAIRIE PROVIDED EFFECTIVE EROSION CONTROL

70%	REQUIRED % COVER WITHIN 1 YEAR OF SEEDING.
80%	PLOTS HAD > 80% COVERAGE IN LESS THAN 4 WEEKS.
100%	EXCLUSIVELY NATIVE MIX WAS 100% EFFECTIVE AT MEETING EROSION CONTROL AND VEGETATION STANDARDS.

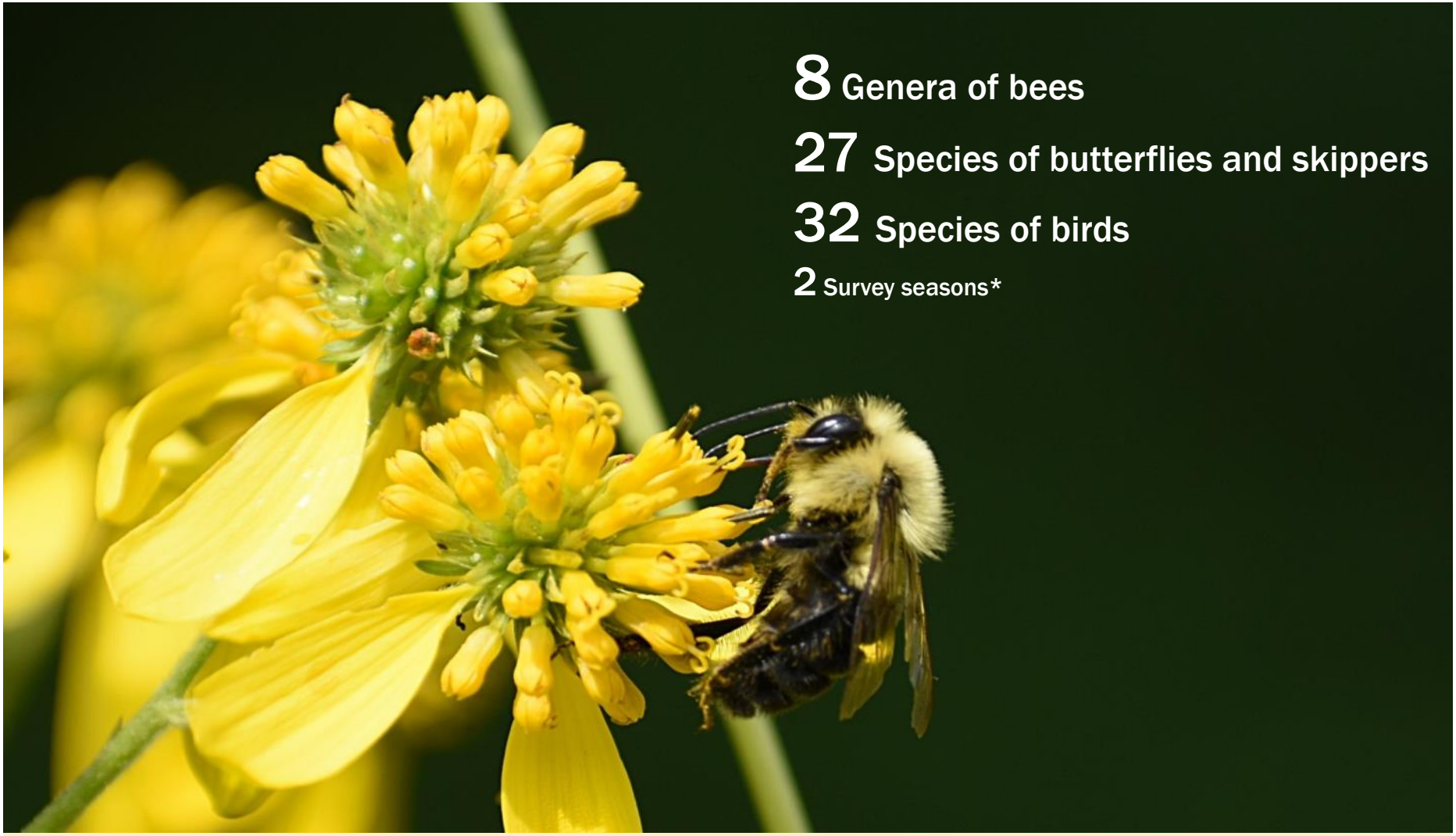

1
8
7
2
6
4
3
5
7

CAN HEALTHY NATIVE PLANT ROOTS INHIBIT TRESS?

- YR 2: need results over time
- Suggest seeding diverse mix, sufficiently dense* to limit space and resources avail. for trees & invasives
- Some species may have inhibitory effects, add to seed mixes. Include fast-growing annuals.
- No evidence prairie increases tree invasion (= or + seeding NN)

* Avoid seeding too dense to reduce native density-dependant mortality (14lbs/ac)

RIGHT-OF-WAYS ARE IMPORTANT HABITATS



RIGHT-OF-WAYS ARE IMPORTANT HABITATS

BUSINESS CASE FOR NATIVE SEED MIXES

Item	Dawes Arboretum Native Seeding Approach		Sample Traditional Seeding Approach
Seed Rate Bulk	14 lb/ac. (rate consistent)	≠	100-250 lb/ac. * (rate site dependent)
Seed Cost	$27.35/lb. * $382.90/ac. *	*varies	$2-4/lb. * $200-720/ac.*
Days to 70% Establishment	42	*varies	~60[1]
Finish Disk Required	Yes	=	Yes
Cultipacker Required	Recommended	=	Recommended
Fertilizer Required	Not needed (cost savings)	<	Yes
Lime Required	Not needed (cost savings)	<	Yes
Straw Mulch Required	Yes	=	Yes

1. Based on Turk, J., Alp, N., Dattilo, A., & Boyd, J. (2017). Cost-benefit analysis of native warm season grasses for transmission line right-of way revegetation. *Ecological Engineering*, *108*, 123-131.

POSSIBLE CHALLENGES & SOLUTIONS

CHALLENGES

- Cost vary based on mix
- Fluctuation of seed prices

- Flowering maturation (3 years)
- Sites change during est.

- Mow-Management vs. No-Mow Management

SOLUTIONS

- RPF bid process, flexible mixes
- Lock in rates, stabilize price, better forecast budgets (DOTs)

- Choose bloomers (years 1-2)
- Include annual flowering cover
- Seed at appropriate rate, ratio*

- No-mow sites support natives, but offer less diversity

* Recommendations on 1:1 grass to forb ratio (TPC)

MOW? HERBICIDE? NO-MOW?

MOW MANAGEMENT:

- Most beneficial & important to mow during (yr 1) *est.
- Obvious difference between mowed versus no-mow plots (yr 1)

HERBICIDE MANAGEMENT:

- Herbicide selectivity can be built into mixes (compatible forbs)
- Once est., grasses & flowers can fill in after woodies sprayed out

NO-MOW and NO HERBICIDE:

- Not recommended, but some native plants will still persist
- Reduces benefits of robust vegetation to repel tree invasion

* Additional studies recommend mowing yr 1 (at min), promotes establishment

SHORT & LONG TERM BENEFITS

REVEGETATION WITH NATIVE SEED:

stabilizes soil
protects watersheds
tolerates challenging lands
creates regionally native habitat
increases native species presence
better supports ecosystem function
comps to non-natives in performance & cost
builds natural capital
financially sustainable

NATIVE SEEDING WORKS

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