

Large Scale, High Diversity Restoration as a Threat Reduction Strategy in a High Priority, Fragmented Landscape

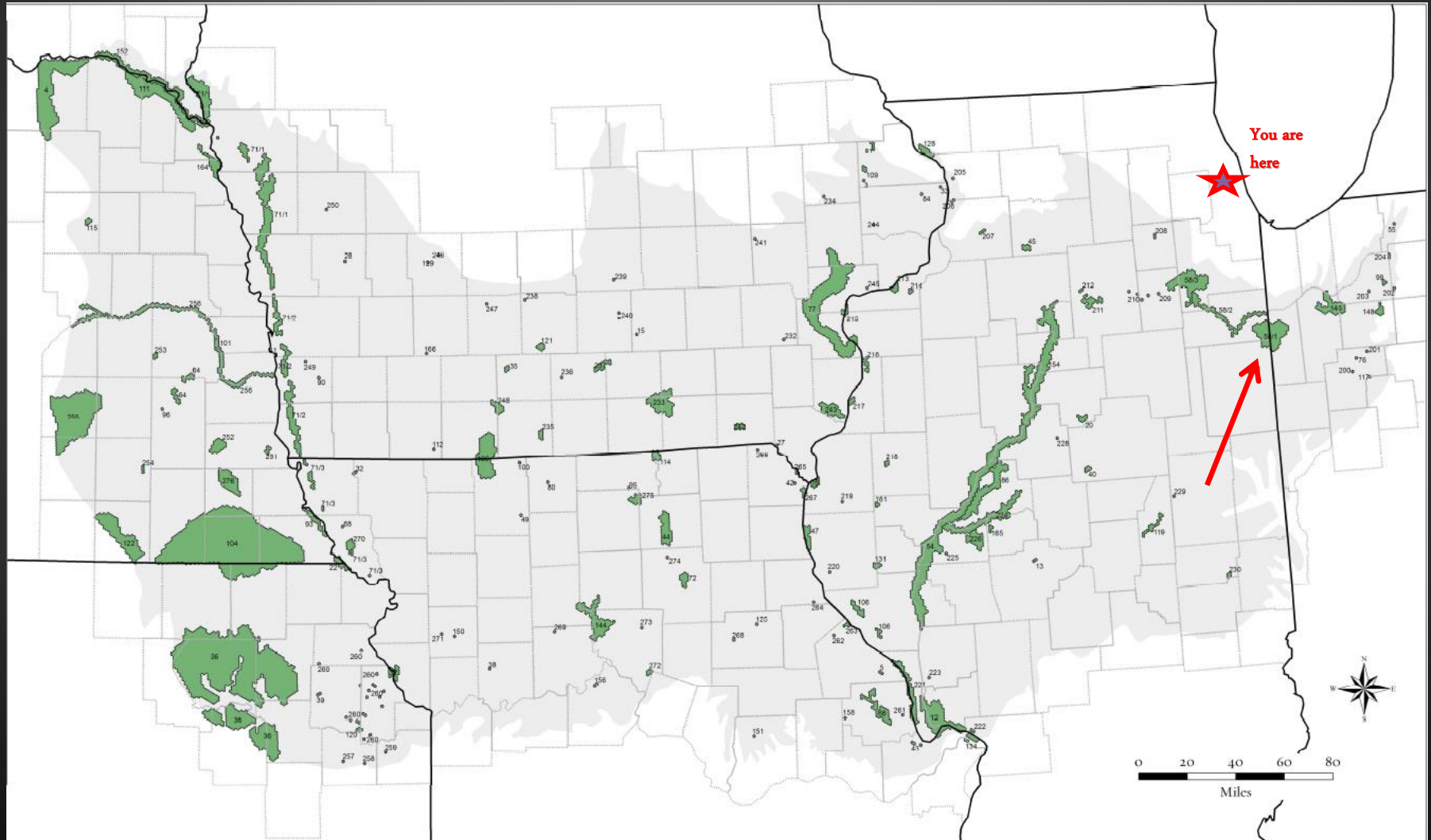


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Indiana Office of The Nature Conservancy



Location – eastern edge of the Central Tallgrass Prairie Ecoregion



Kankakee Sands Landscape Timeline

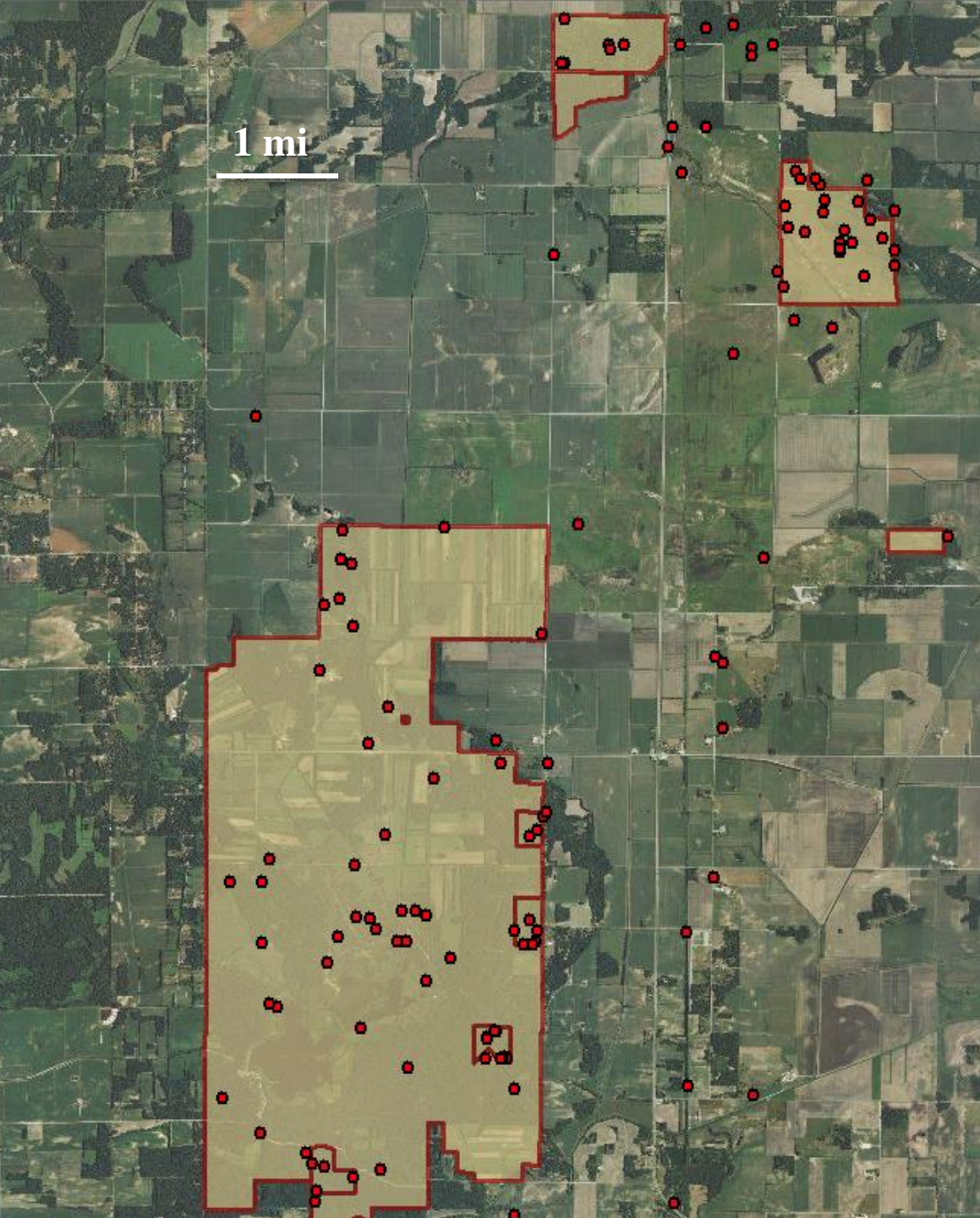
Intact mosaic



Presentation Goals

Explain the rationale for **restoration** as a strategy (not a goal) for conserving in-situ diversity in a fragmented landscape

Elaborate on the implications relative to restoration design and long-term assessment of restoration success



Kankakee Sands Macrosite

Supports a unique assemblage of moderate to high-quality ecosystem remnants and rare species

Most of the “parts” are still present – but are scattered haphazardly across the landscape

Target Occurrences

Natural Community

<u>Portfolio Status</u>	<u>Common Name</u>	<u>Viability Rank</u>
Confirmed	Pin Oak - Swamp White Oak Sand Flatwoods	B
Confirmed	Midwest Dry-Mesic Sand Prairie	B
Confirmed	Tussock Sedge Wet Meadow	B
Confirmed	Midwest Dry Sand Prairie	B
Unknown	Water-lily Aquatic Wetland	U
Confirmed	Black Oak / Lupine Barrens	B
Confirmed	Shrubland Hardhack Wet-Mesic Sand Shrub Meadow	B
Confirmed	Mesic Sand Tallgrass Prairie	B
Confirmed	Central Wet-Mesic Sand Tallgrass Prairie	B
Confirmed	Central Cordgrass Wet Sand Prairie	B
Confirmed	Swamp White Oak Woodland	A

Bird

Confirmed	<i>Ammodramus henslowii</i> / Henslow's Sparrow	B
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Insect

Confirmed	<i>Speyeria idalia</i> / Regal Fritillary	B
Confirmed	<i>Papaipema beeriana</i> / Blazing Star Stem Borer	B

Vascular Plant

Confirmed	<i>Hypericum adpressum</i> / Creeping St. John's-wort	B
Confirmed	<i>Echinodorus parvulus</i> / North American Dwarf Burhead	C
Unknown	<i>Schoenoplectus hallii</i> / Hall's Bulrush	U

Our primary interest at Kankakee Sands

Ensure the continued viability of this important concentration of native habitats and all native grassland and barrens species, both common and rare.

A photograph of a field of tall green plants with purple flower spikes. The background is a hazy, misty landscape with a line of trees in the distance. The text is overlaid on the image.

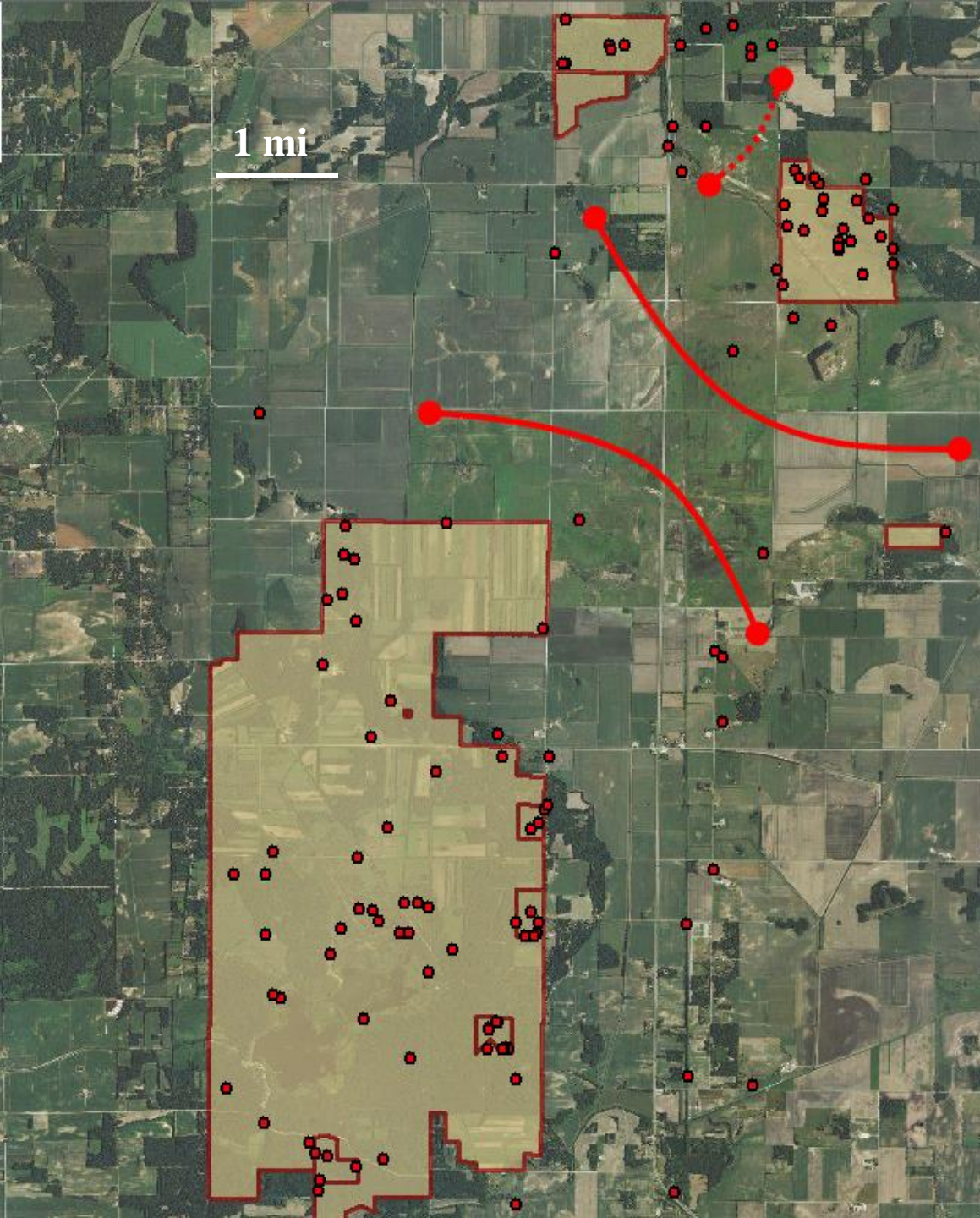
In other words,

It is the pre-existing prairie and oak barrens remnants that we actually care about.

The restoration is simply the tool we are using to ensure that these ecosystem remnants remain viable into the future.

A threats analysis indicated that long-term viability of prairie and oak barrens is compromised by a variety of ongoing stressors at the Macrosite.

	<i>Habitat size</i>	<i>Wind Power Development</i>	<i>Hydrologic Alteration</i>	<i>Invasive Plants</i>	<i>Invasive Animals</i>	<i>Fire Suppression</i>	<i>Deer Browse</i>	<i>Inappropriate fire management</i>	<i>Geographic distribution of suitable habitat</i>
Sand Prairie	High		Med	High		Med	Low		
Black Oak Barrens	High			Med		High	Low		
Sand Flatwoods			Med	Med		Low			
Sub-emergent and Emergent Wetlands	High		High	High	Med				
Grassland birds	High	Med		Low		Med		Low	
Shorebirds and Marsh Birds	High		Med	Med					
Herptile Communities	High		Med		High			Med	Low
Remnant-dependent Insects	High			High			Low	Med	Med
Regal Fritillary Butterfly	High			High				Med	Med
Weighted threat rank	High	Low	Med	High	Low	Med	Low	Med	Med



And that historic land conversion results in habitat fragmentation, creating artificial metapopulations that are vulnerable to stochastic extinction events...

with reduced opportunities for recolonization or gene flow

Analysis of threats highlighted the **potential for restoration as a strategy to reduce threats** to biodiversity at the site.



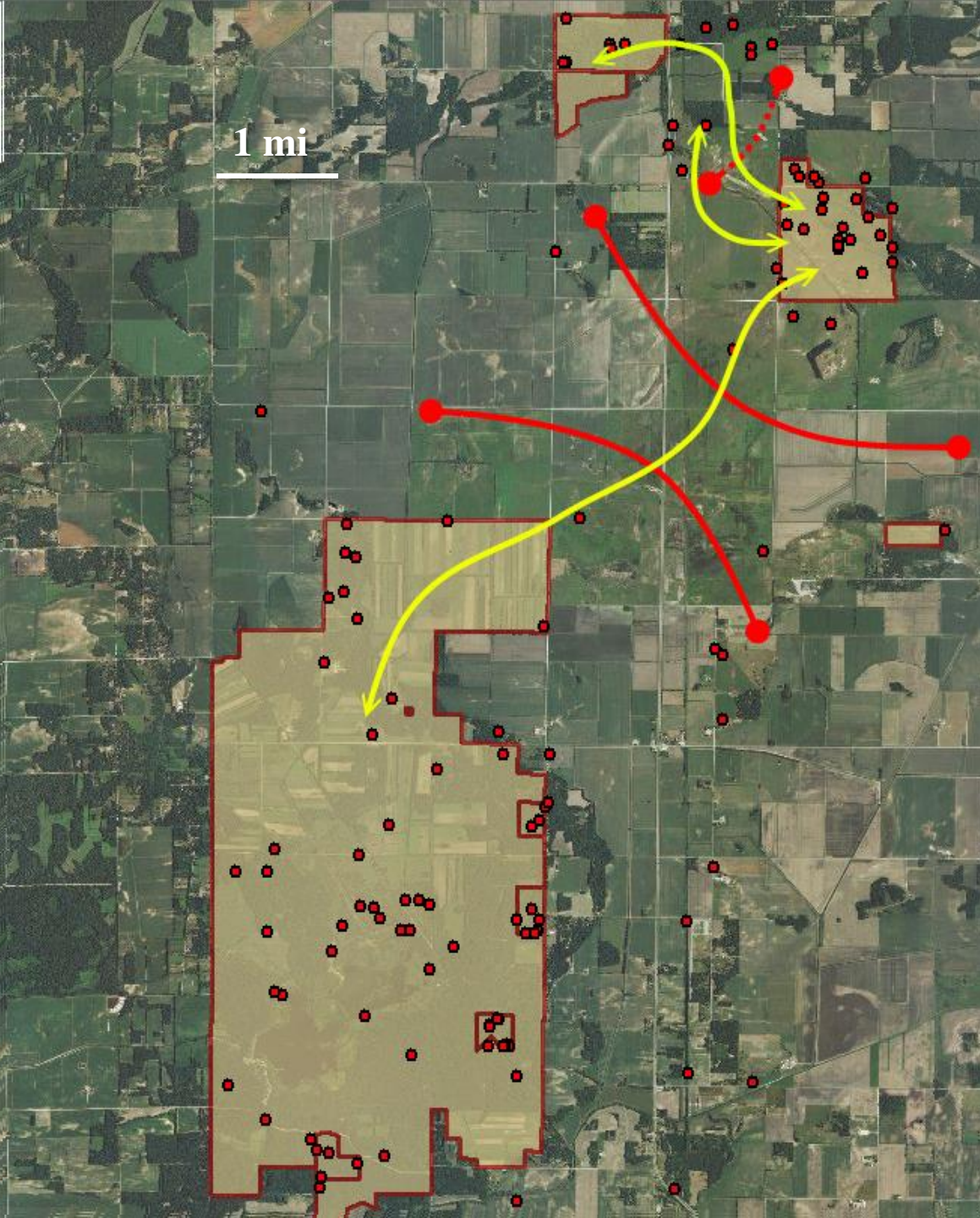
A priori, we set explicit goals to be achieved by the restoration strategy.

- Restore connectivity between isolated plant and animal populations to heal artificial metapopulation structure
- Restore ecological gradients across the landscape to maximize ecological complexity
- Increase habitat size for habitat restricted species (both plants and animals)
- Buffer existing ecosystem remnants from incompatible adjacent land uses

Note that none of these goals revolve around achieving “*botanical authenticity*”

All goals are functional –

- designed to reduce threats to native species assemblages,
- and are best assessed by functionality rather than botanical compositional comparison to ecosystem remnants

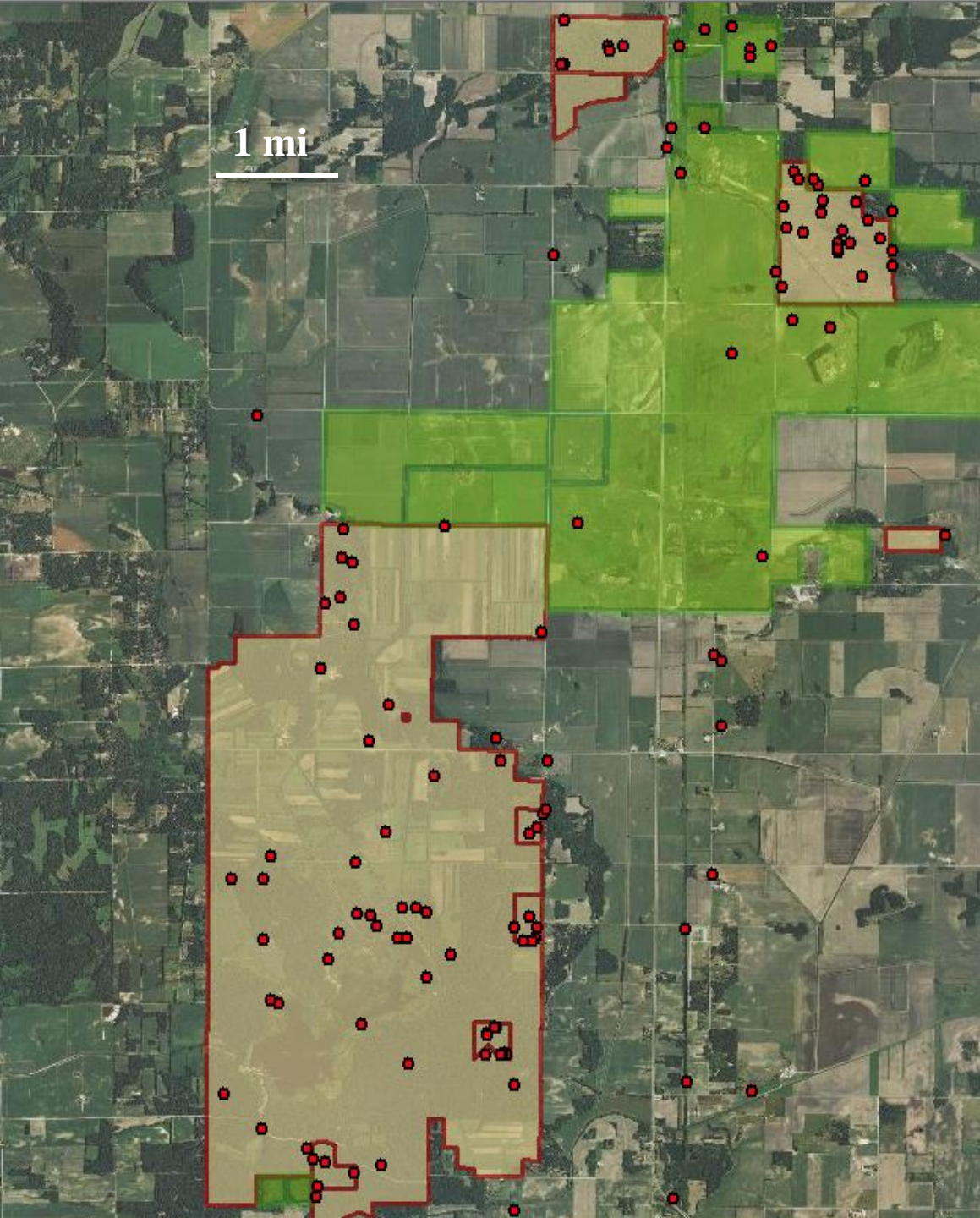


In other words, restoration is used to create a landscape that is permeable to native species and communities and which facilitates ecological connectivity.

NOT to create a prairie wonderland...



Setting these *a priori* goals had a ripple effect throughout all aspects of the restoration design



Design implications of strategies

Restore connectivity

- Over 8,000 acres purchased to date
- Additional purchases will be required to fully address connectivity

Design implications of strategies



Increase habitat size for habitat restricted species

- Minimum size driven by key low density species

- Local genotype seed sources

- Entire local plant community to be restored

(> 600 species)

- Very low density of warm season grasses planted



Design implications of strategies

Restore ecological gradients

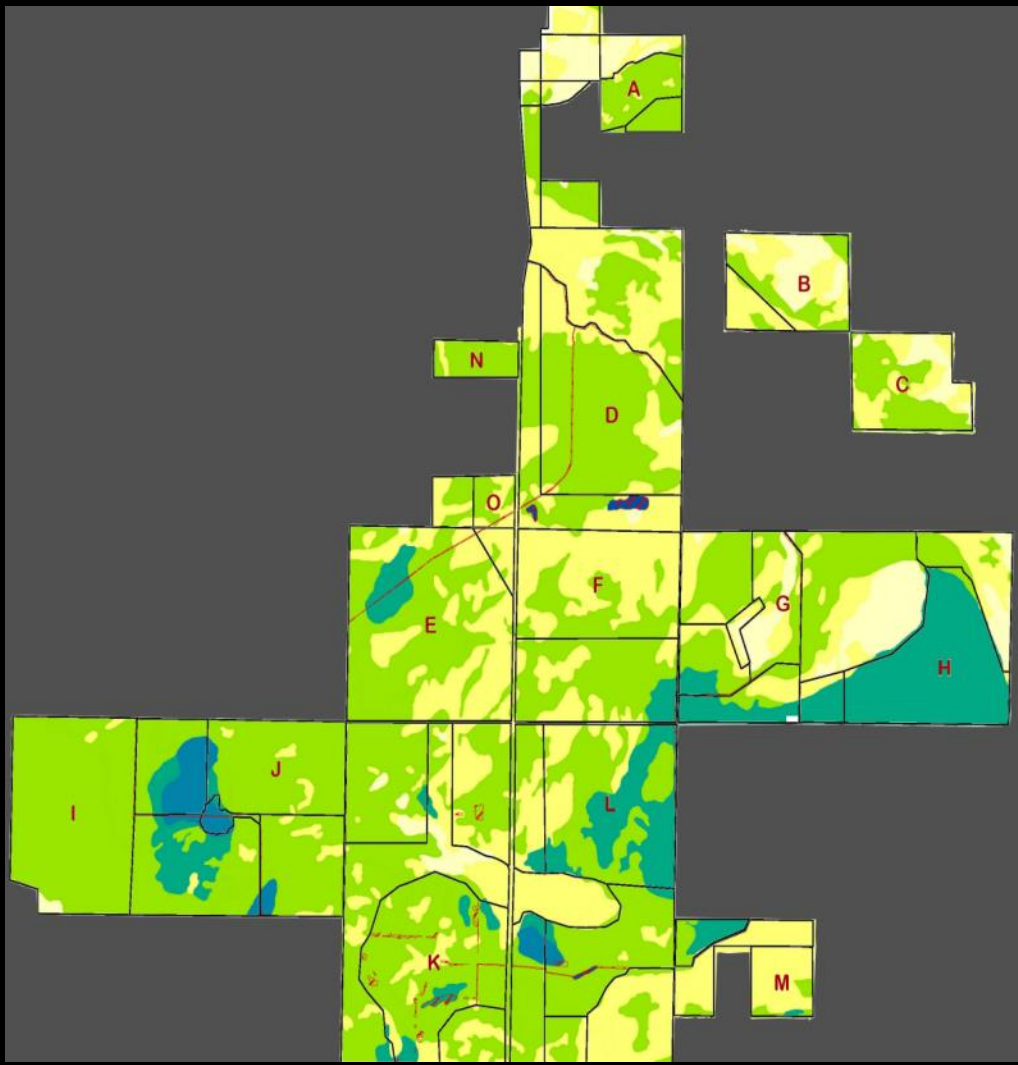


- To the maximum extent possible without off-site impacts, all agricultural drainage was eliminated

Design implications of strategies

Restore ecological
gradients

- Initial plantings
designed to emulate
natural community
patterning across the
landscape (based on soil
and restored hydrology)



Design implications of strategies

Buffer existing
ecosystem remnants

- local genotype seed
sources

-aggressive invasive
species management
on restored acres

- additional land
protection required



Design implications of strategies

Initial restoration cost is high

Range between \$1,200 and \$1,500 per acre (not including land acquisition costs)

Restoration maintenance is resource intensive

Four FTEs devoted to the project

Five 6-month “seasonal interns” per year

Design implications of strategies

Restoration assessment is critical

Did the restoration achieve ecological goals?

Is high diversity restoration required to achieve ecological goals?

Are the strategies exportable to other sites across the ecoregion?

Preliminary *a priori* goal assessments

- Restore ecological gradients across the landscape to maximize ecological complexity

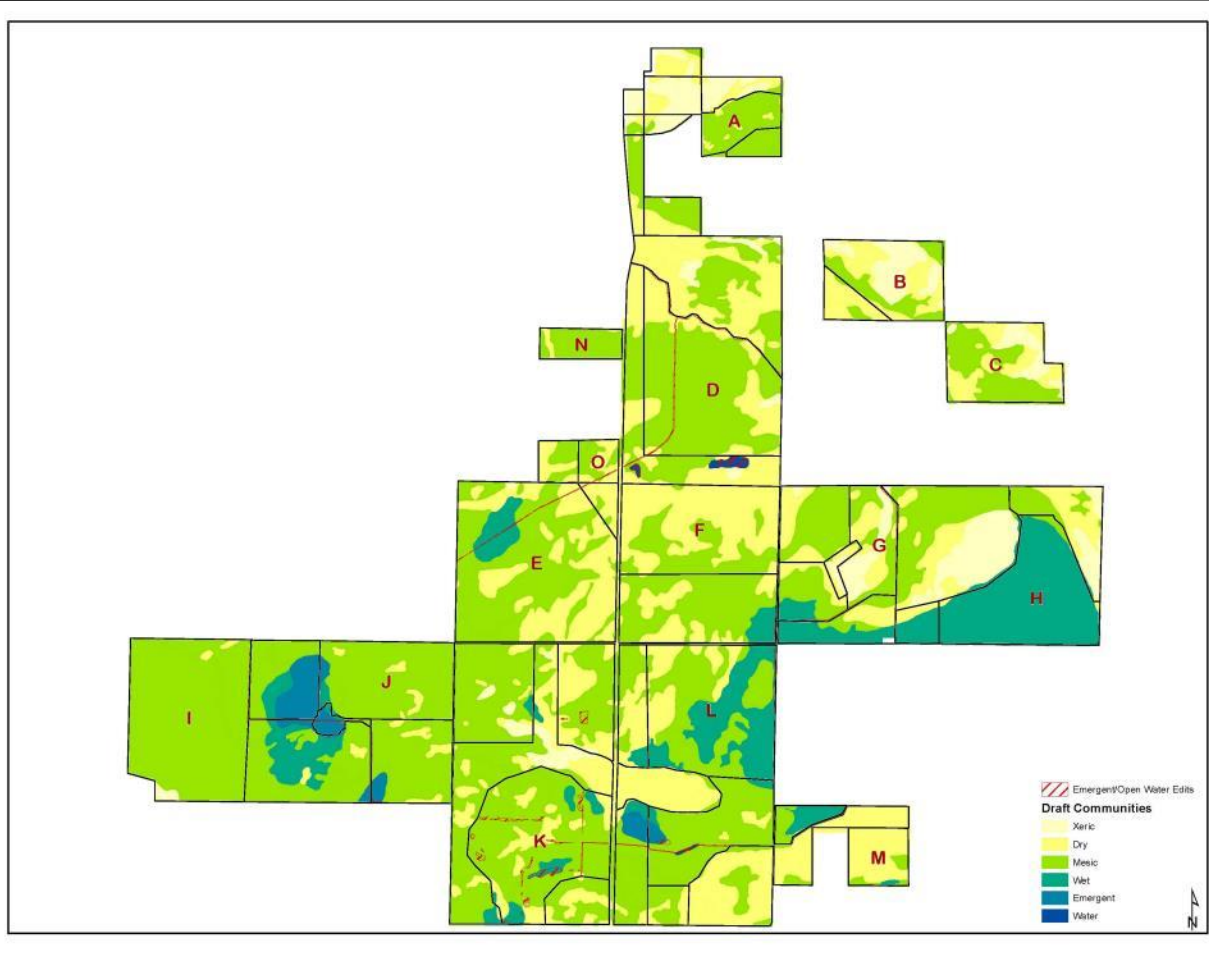
The “bottom” of the hydrologic gradient is easy to restore at the site



and can be successfully seeded into a diverse wetland mosaic

Preliminary *a priori* goal assessments

- Restore ecological gradients across the landscape to maximize ecological complexity



Summer 2014 – quantitative assessment of community mosaic planned to assess patterning and ecological complexity of the restoration

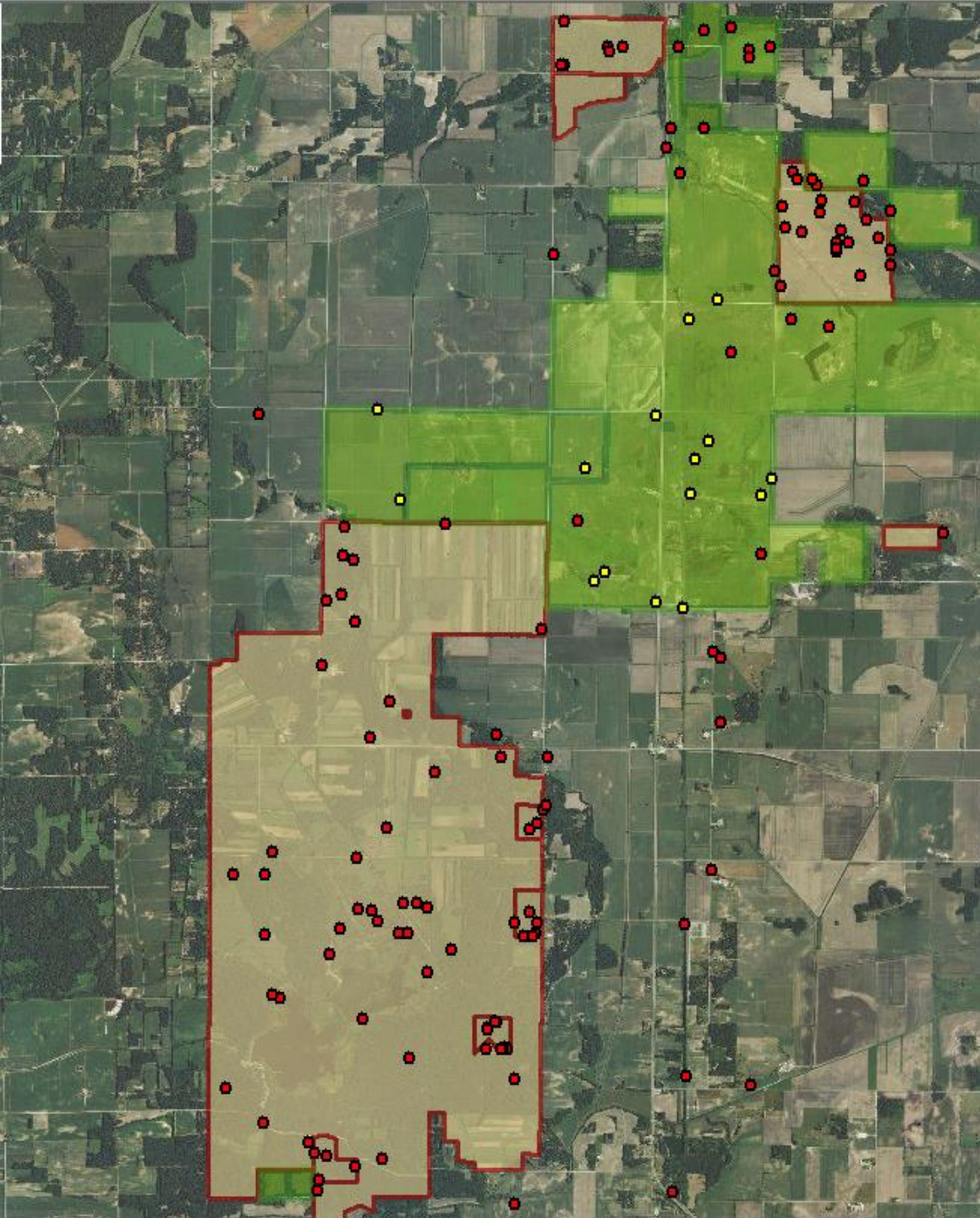
Preliminary *a priori* goal assessments

Restore connectivity between isolated plant and animal populations to heal artificial metapopulation structure



The planting mosaic has established very well,

and over 500 native plant species have been recorded across the restoration units



Preliminary *a priori*
goal assessments

Restore connectivity
between isolated plant
and animal populations
to heal artificial
metapopulation
structure

Increase habitat size
for habitat restricted
species (both plants
and animals)

Preliminary *a priori* goal assessments

Restore connectivity & Increase habitat size

Table 9. Distribution of conservative insect species richness within the greater KSR Landscape (2009).

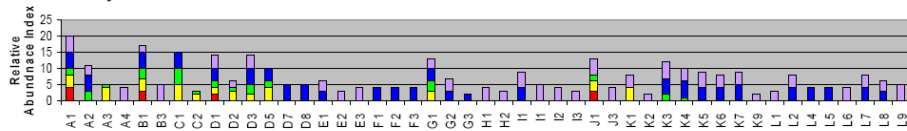
Taxa	TOTAL KSands LANDSCAPE ¹	Beaver Lake	KSands restoration plots	KSands old fields
moths	126	78	56	16
butterflies	24	17	5	4
homoptera	73	37	32	8
others	13	8	2	0
	236	140	95	28

Preliminary *a priori* goal assessments

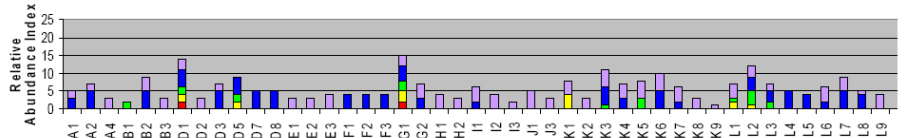
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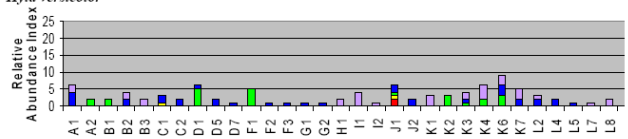
Pseudacris crucifer



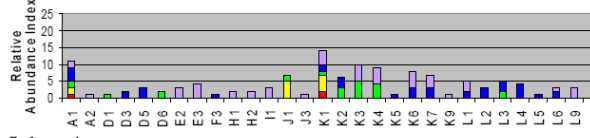
Pseudacris triseriata



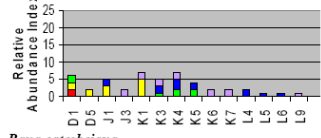
Hyla versicolor



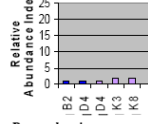
Bufo fowleri



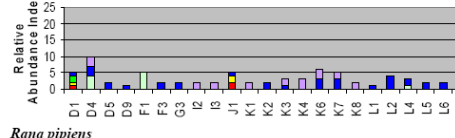
Bufo americanus



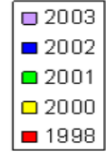
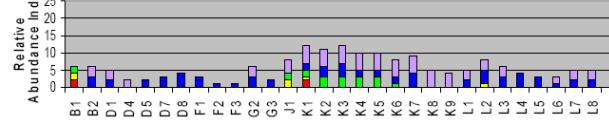
Rana catesbeiana



Rana clamitans



Rana pipiens

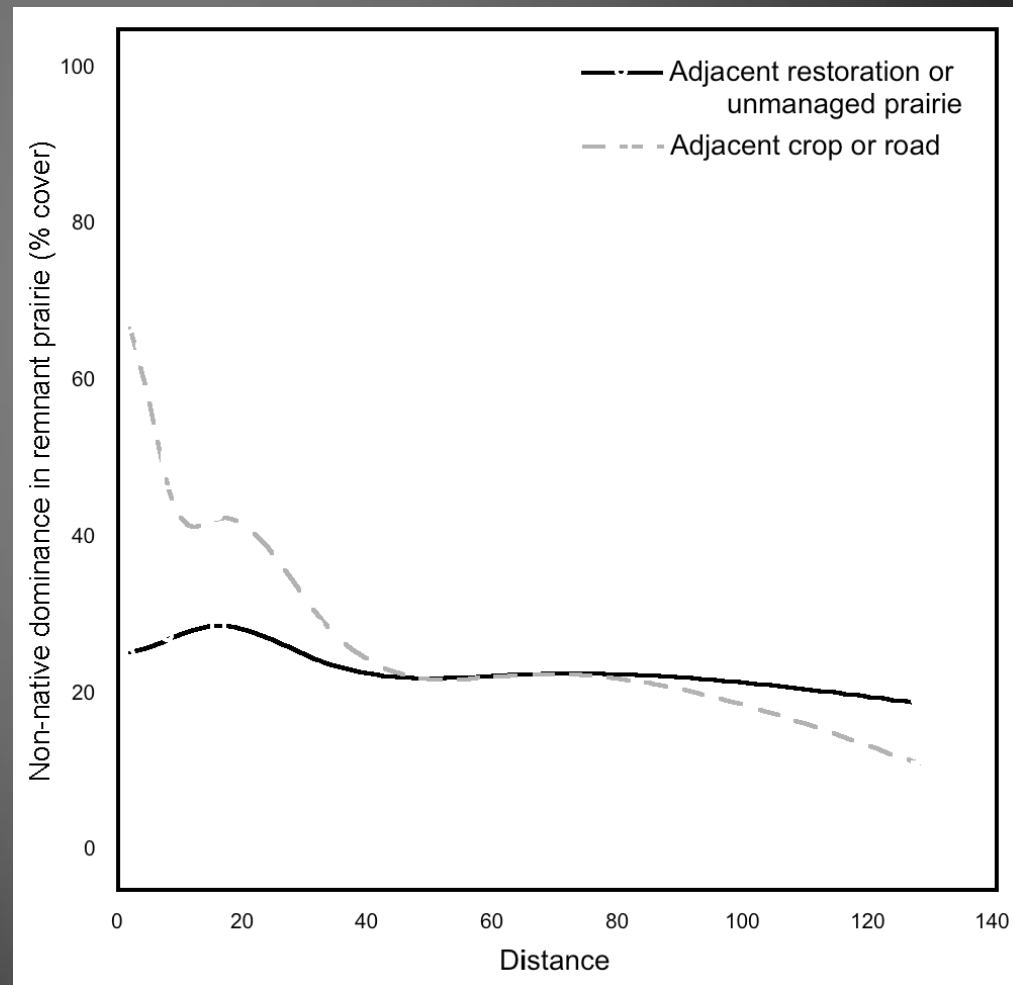


Breeding pool use by Amphibians

Preliminary *a priori* goal assessments

- Buffer existing ecosystem remnants from incompatible adjacent land uses

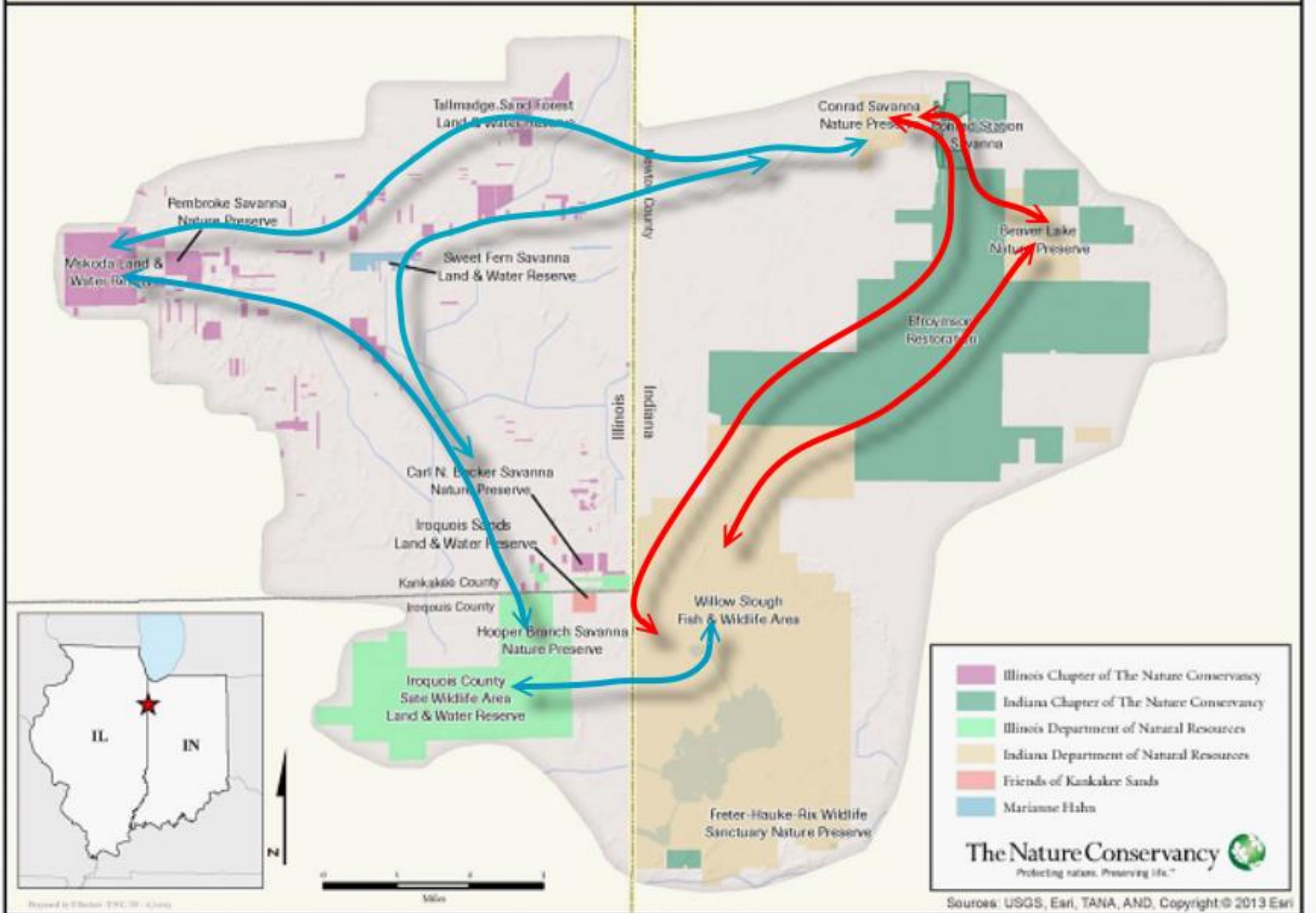
Restoration buffers reduce the dominance of invasive species in edges of native prairie



Where does the Project go from here?

- 2014 Strategy assessment – designed to explicitly assess threat reduction across the
- 2013-2015 – approximately 350 additional acres will be restored.
- Bison introduction – as ecological disturbance
- Ongoing ecological management
 - Invasive species
 - Prescribed Fire
- Address fragmentation concerns across the entire macrosites

KANKAKEE SANDS PROJECT AREA





Acknowledgements - too many to list individually

Lilly Endowment

NRCS

..., and many TNC members