

The PHiLL (Pollinator Habitat in Log Landings) Project

How a grassroots management problem became a collaborative research study across 3 National Forests.



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The Management Need

- Poor plant regeneration on highly impacted log landings
- Log Landings are highly visible.
- Harvests are controversial with some of our public.
- How do we mitigate the soil compaction issue?



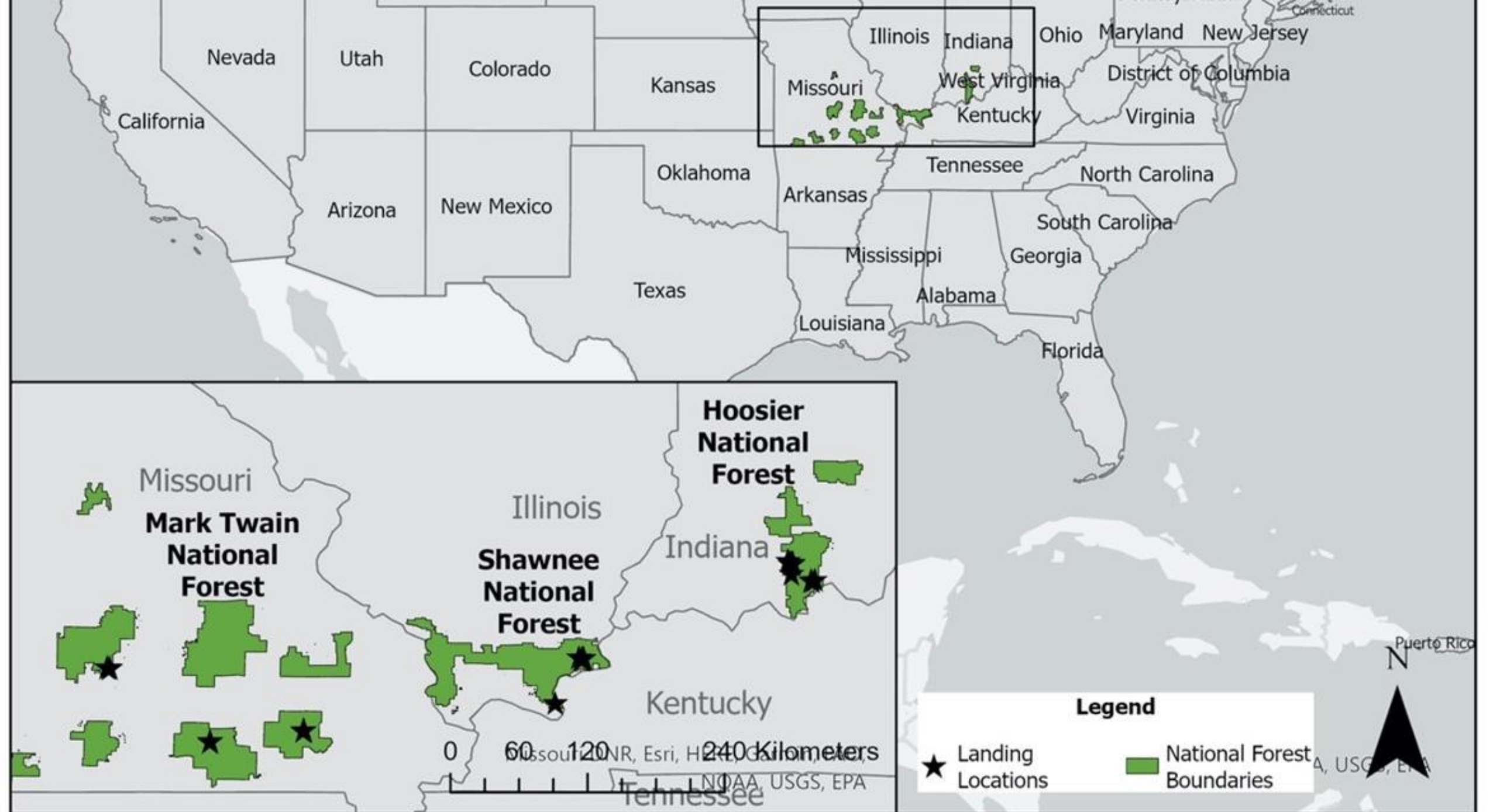
Recent Log Landing on the Hoosier National Forest



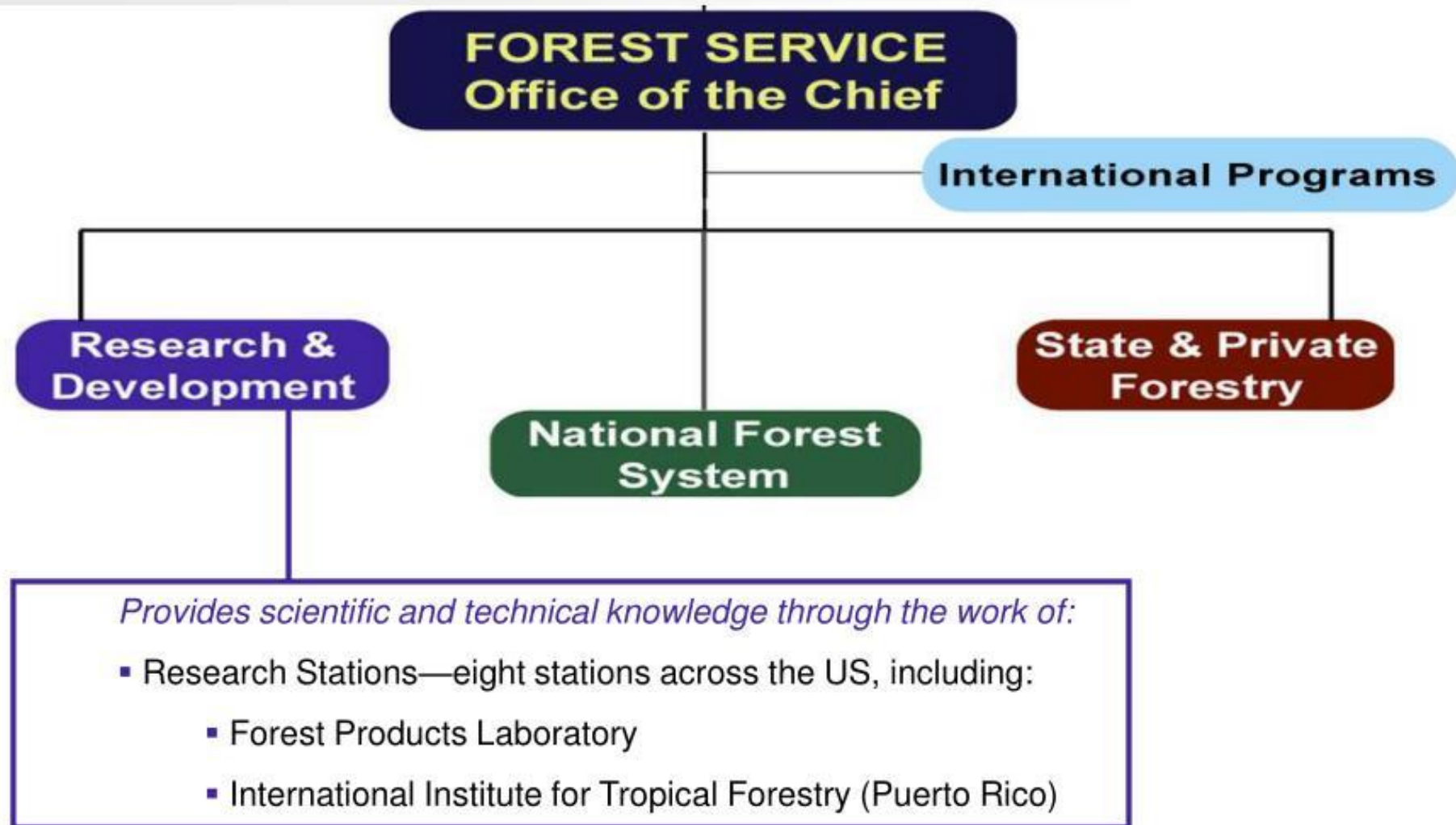
How do we do this? Who can be partners?



- Asked for help/thoughts from other Forests/Regional Office/ local University contacts.
- Two other Forests are interested in idea.
- Looked into grants/local funding – no good fit
- How share knowledge with partners and get the data?
- Budgets are limited.



A LOOK AT THE STRUCTURE OF THE FOREST SERVICE



The glue = Northern Research Station (NRS)



Collaboration aka Co-production of Knowledge

A new paradigm or a long-standing way of doing business? Trust Ecology

- Scientists, managers, others, working together to develop practical solutions
- Requires developing relationships between managers and scientists
- Field Days and Networking were supported by Leadership



Continuing the Culture: A new scientist to NRS





PHILL: Coming together for native bees.



Why Wild Bees?



- Over 20,000 described bee species worldwide
- 400-500 species in U.S. midwestern states
- Wild bees are very different than European honeybees
- Majority are solitary species
- Worldwide > 70 nest in the ground
- Crucial for pollination services
- Due to their feeding ecology, bees are very effective pollinators

Colletes_cunicularius_-_botanischer_Garten_Sch%C3%B6nbrunn.jpg Danforth et al. Princeton University Press 2019

PC: USGS Native Bee Inventory flicker.com

Who are we? National Forest Project Team



Hoosier National Forest: Jason Combs, Cheryl Coon, Bryan King, Jason Isbell, Chad Menke, Travis Swaim, and Chris Thornton

Mark Twain National Forest: Brian Davidson, Matt Dillion, Casey Hawes, Corey Large, Andrew Radomski, Scot Robinson, Kyle Steele, Mike Stevens, and Megan York-Harris

Shawnee National Forest: Justin Dodson, Brooke Hagarty, Lisa Helmig, Lennie Pitcher, and Mark Vukovich

Who are we? Research Team



Susannah Lerman – NRS Research Ecologist
Pollinator Ecology

David King – NRS Research Wildlife Biologist
Pollinator Ecology

Ben Knapp – University of Missouri
Associate Professor
Silviculture

Debbie Dumroese – RMRS Research
Soil Scientist
Forest Soils/Biochar

John Kabrick – NRS Research
Forester

Silviculture/Forest Soils
Morgan Davis – University of Missouri
Assistant Professor
Soils

Lauren Pile – NRS Research
Ecologist
Invasive Plant
Ecology/Disturbance

Dan Dey – NRS Research Forester
Silviculture/Forest Management

Who Are We? The Graduate Students



Sloane Scott – Plants



Aliza Boles Fassler – Bees



Will Rumpf – Soils

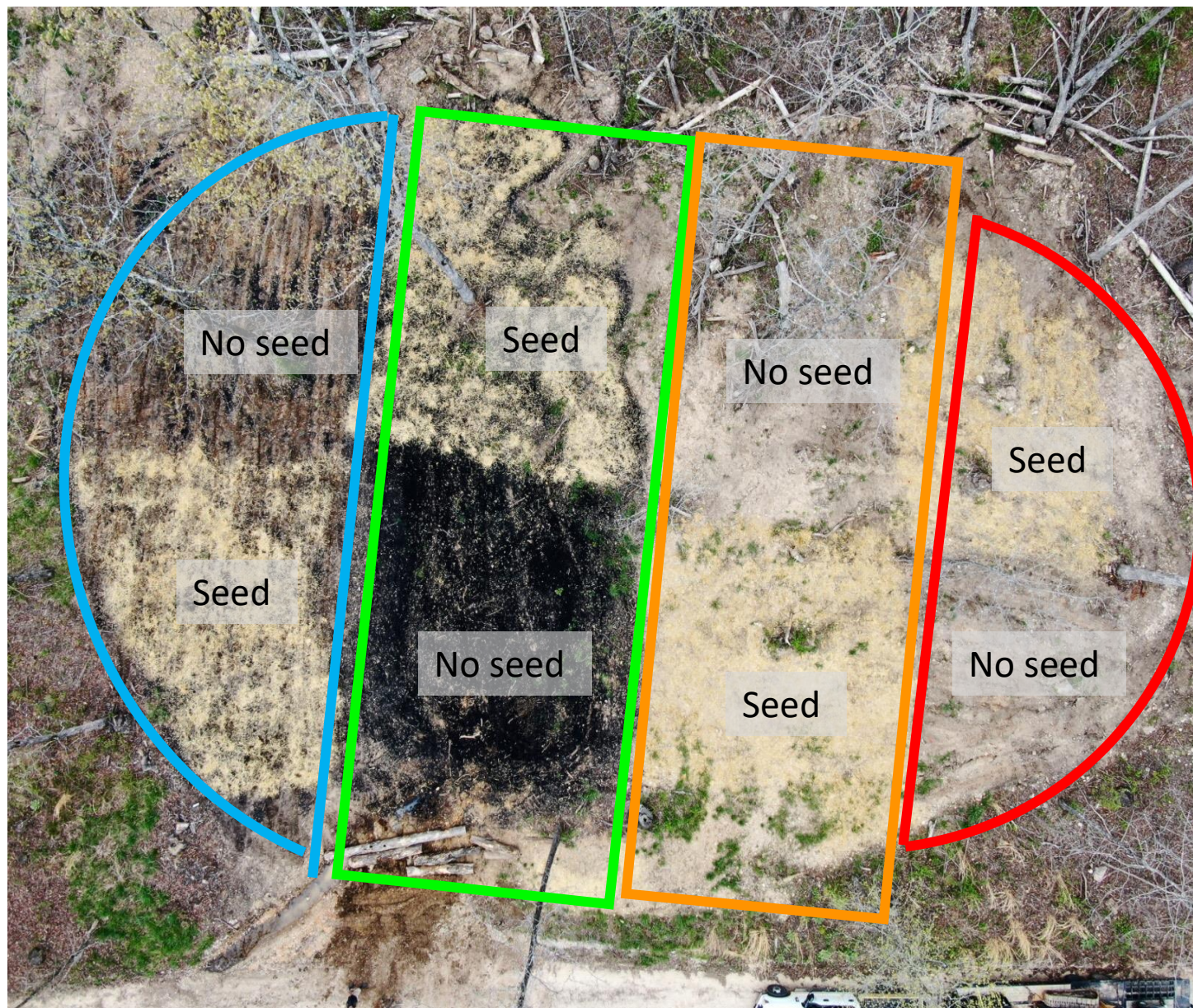


The Integrated Experiment



Goal:

Rapid Establishment of Functional (Ephemeral)
Pollinator Habitat



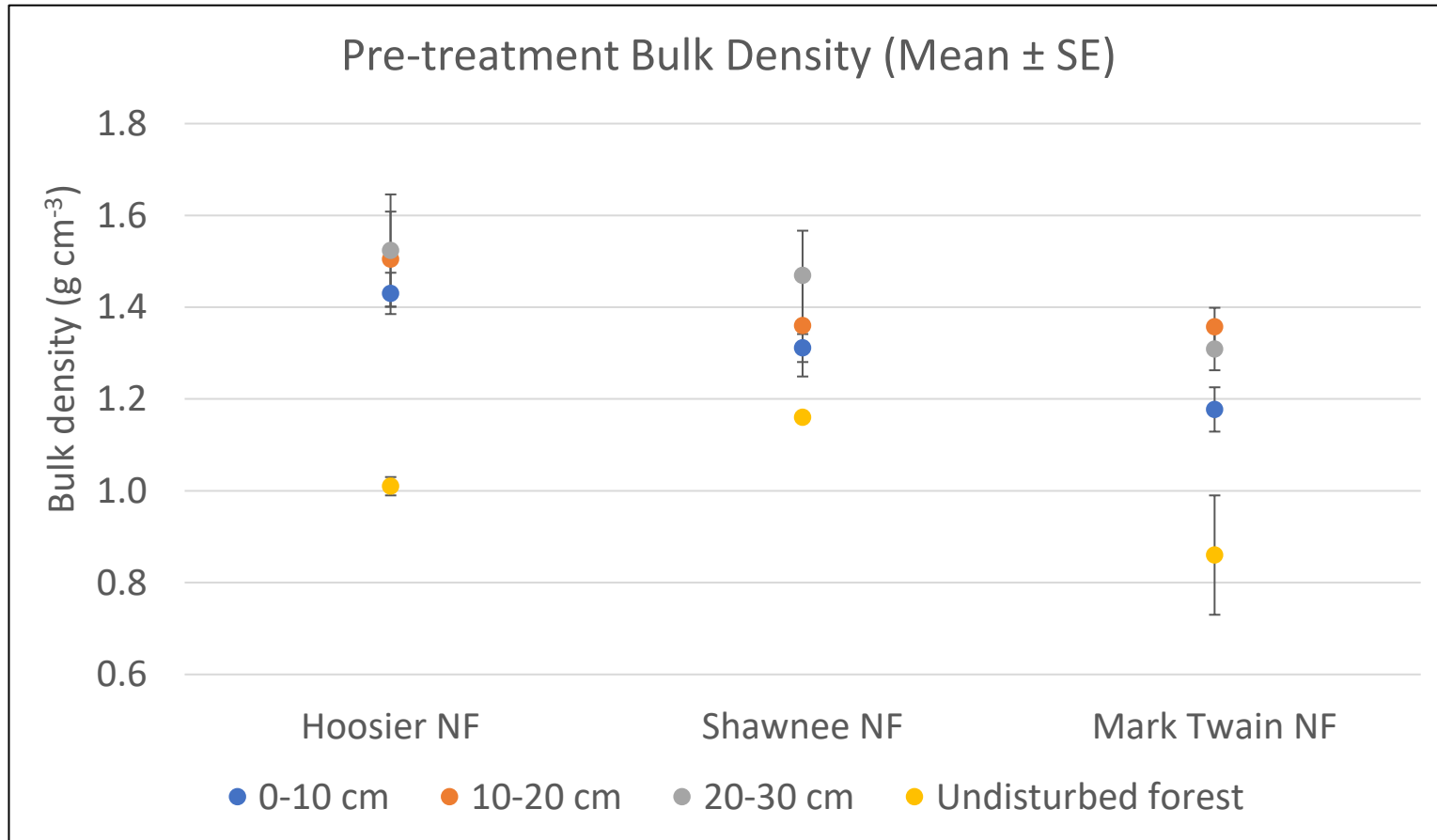
Biochar + Subsoil

Biochar

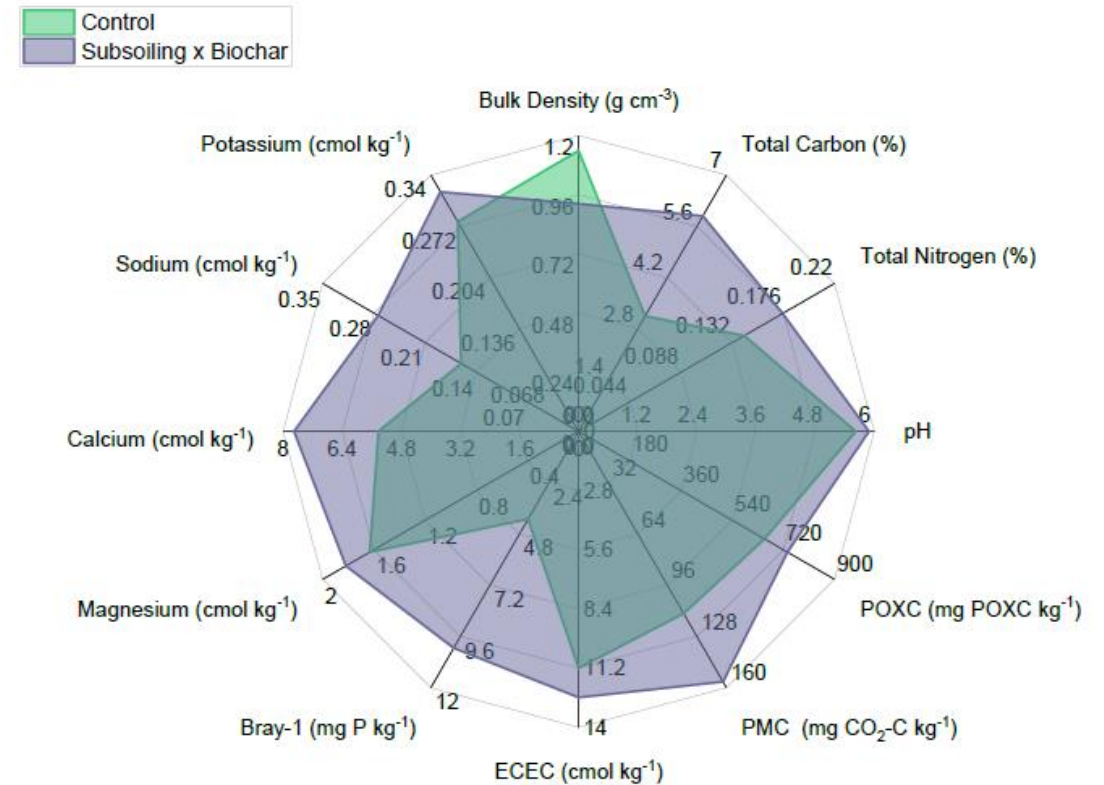
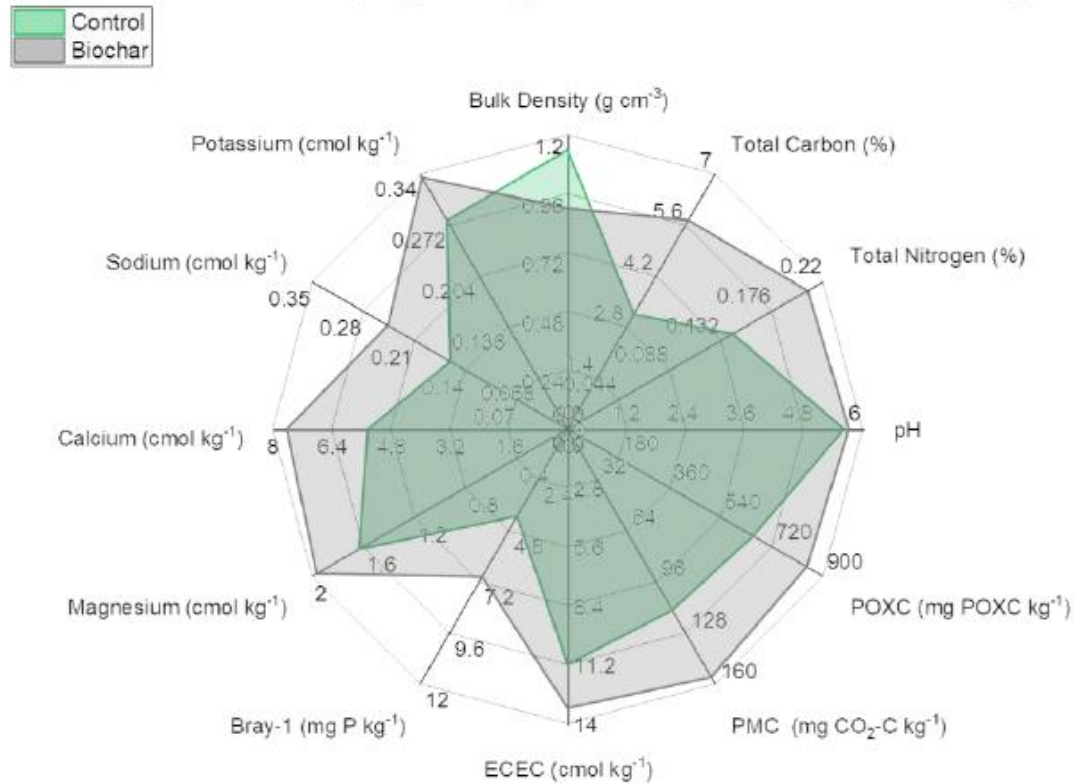
Control

Subsoil

Pre-treatment Soil Sampling – Compaction



Key takeaway: Biochar and biochar + subsoiling increases other soil properties



Key takeaway: Only some plants perform well and seeding matters most.

↑ = abundant ↔ = occasional ○ = rare or absent
Flowering Period

Species Name		Spring	Summer	Fall	Outcome		
<i>Amorpha canescens</i>					○		
<i>Asclepias syriaca</i>					○		
<i>Asclepias tuberosa</i>					↔		
<i>Coreopsis lanceolata</i>					↑		
<i>Coreopsis tinctoria</i>					↔		
<i>Dalea purpurea</i>					○		
<i>Echinacea pallida</i>					↔		
<i>Penstemon digitalis</i>					↔		
<i>Rudbeckia hirta</i>					↑		
<i>Tephrosia virginiana</i>					○		
<i>Tradescantia ohiensis</i>					↔		
<i>Bidens aristosa</i>					↑		
<i>Chamaecrista fasciculata</i>					↑		
<i>Eryngium yuccifolium</i>					↔		
<i>Eupatorium fistulosum</i>					↔		
<i>Eupatorium perfoliatum</i>					○		
<i>Helianthus angustifolius</i>					↑		
<i>Heliopsis helianthoides</i>					↔		
<i>Lespedeza virginica</i>					↔		
<i>Monarda fistulosa</i>					↑		
<i>Oenothera biennis</i>				○			
<i>Pycnanthemum tenuifolium</i>				↑			
<i>Silphium perfoliatum</i>				↔			
<i>Verbesina alternifolia</i>				↔			
<i>Zizia aurea</i>				○			
<i>Aster novae-angliae</i>				↔			
<i>Solidago nemoralis</i>				↔			

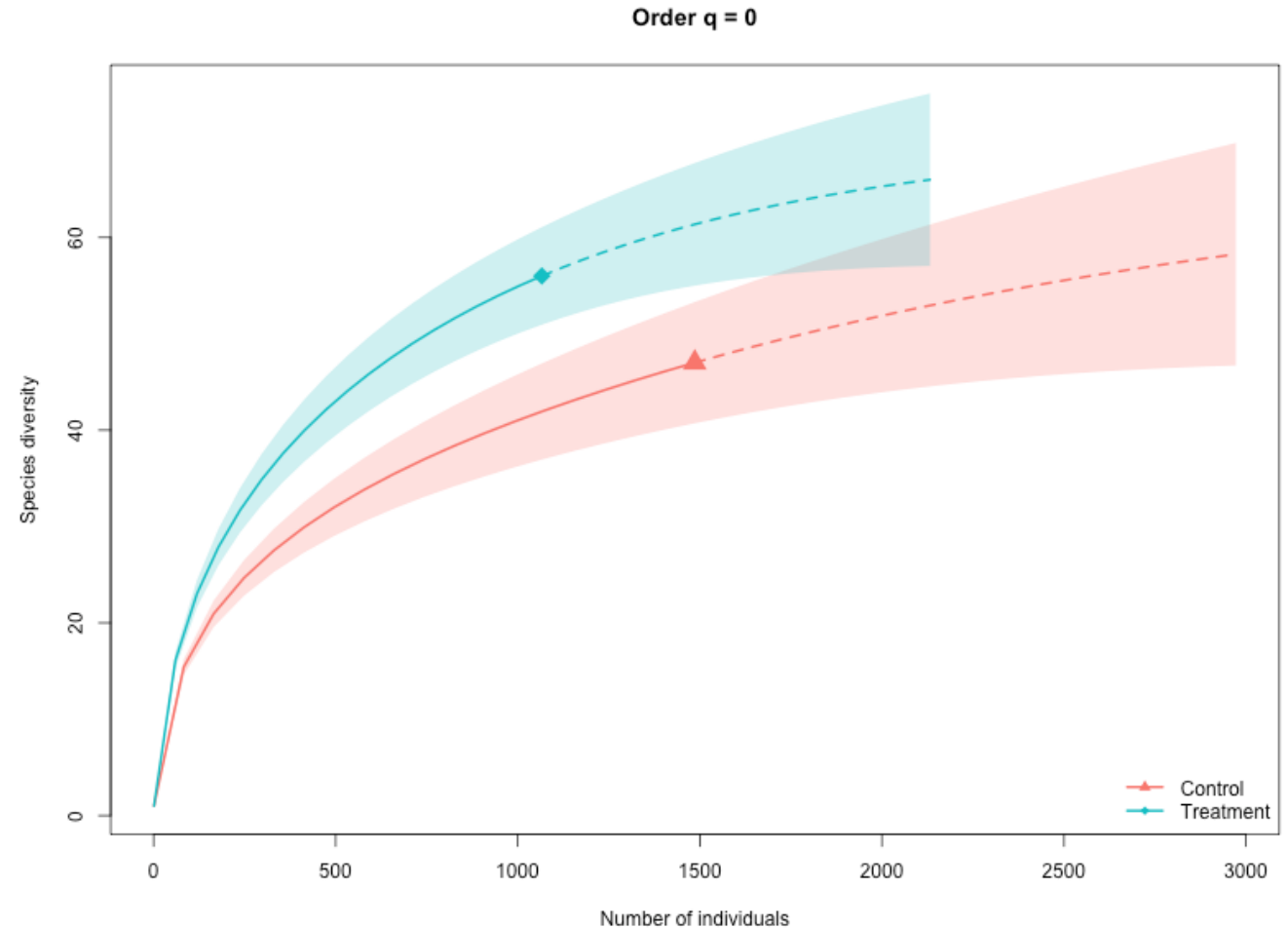
Bee Diversity

Hoosier NF (2021)

Pan trapping

N = 3,001 bees

- 2,552 are identified (85%)
- 62 different species
- Higher diversity on treated landings



Assemblage <chr>	Diversity <chr>	Observed <dbl>	Estimator <dbl>	s.e. <dbl>	LCL <dbl>	UCL <dbl>
Control	Species richness	47.000000	68.318977	22.5558079	47.000000	112.527548
Control	Shannon diversity	6.539392	6.700857	0.3037201	6.105577	7.296138
Control	Simpson diversity	2.949610	2.953488	0.1115100	2.734932	3.172043
Treatment	Species richness	56.000000	70.436445	11.5851304	56.000000	93.142883
Treatment	Shannon diversity	9.778599	10.139415	0.5019157	9.155678	11.123152
Treatment	Simpson diversity	4.141269	4.153520	0.1985141	3.764440	4.542601

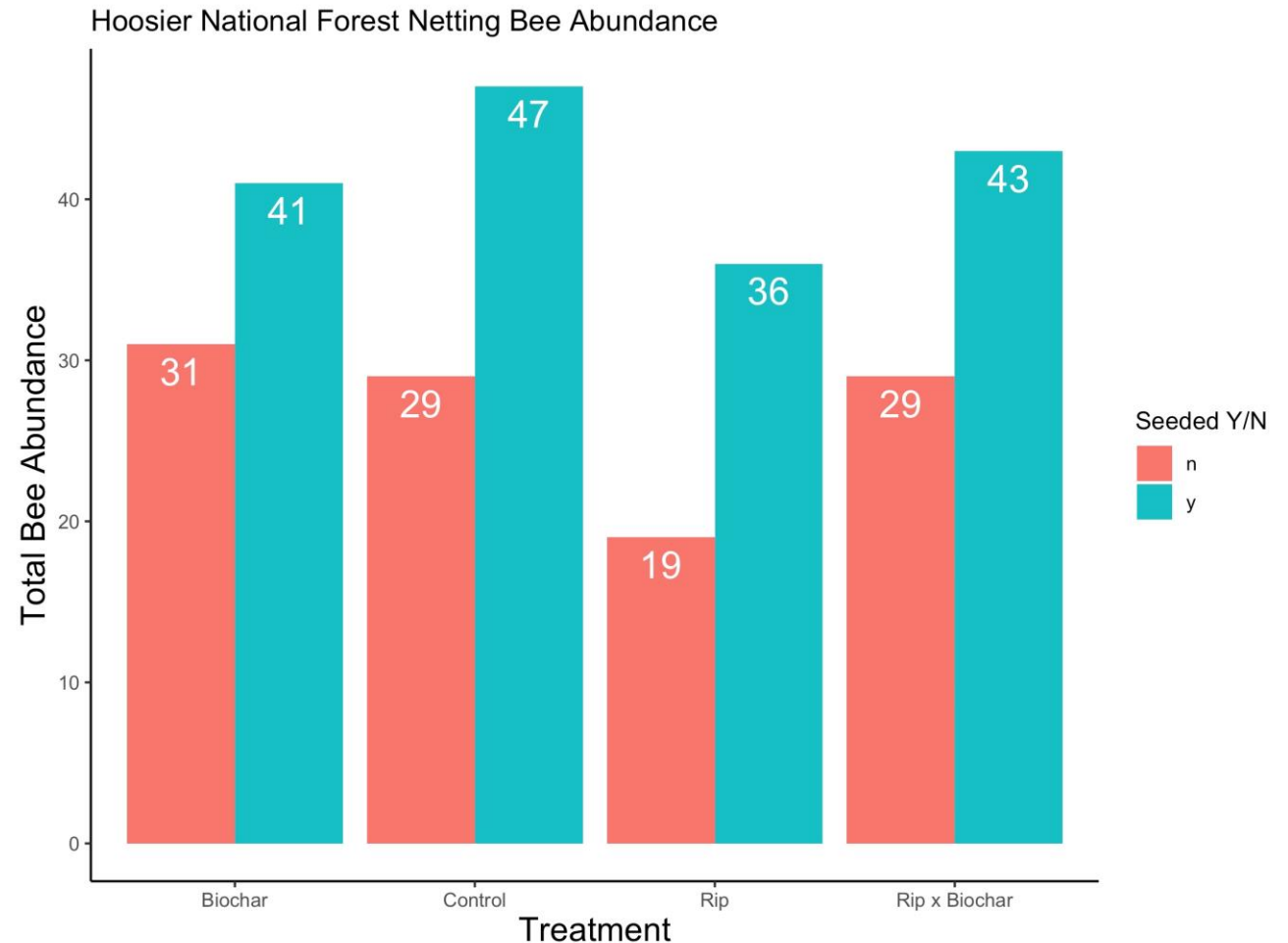
Bee Abundance

Hoosier NF (2021)

Timed netting

N = 531 bees

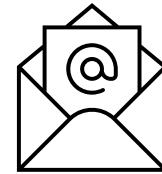
Species	Common Name	Number of Bees Collected on Floral Host
Rudbeckia hirta	Black-eyed susan	79
Erigeron annuus	Daisy Fleabane	74
	Yellow Sweet	
Melilotus albus	Clover	25
Daucus carota	Queen Anne's Lace	21
Chamaecrista fasciculata	Partridge Pea	18
Ludwigia alternifolia	Boxplant	17
Trifolium repens	White Clover	15
Coreopsis tinctoria	Plains Coreopsis	13
Oxalis stricta	Wood sorrel	10
Pyscnanthemum tenuifolium	Slender Mountain Mint	10



Enhancing Log Landings to Sustain Native Bees and Other Pollinators

Practitioner Guide

Currently in
final editing!



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If the bee disappeared off the surface of the globe, then man would have only four years of life left. No more bees, no more pollination, no more plants, no more animals, no more man.

Albert Einstein

