UIC

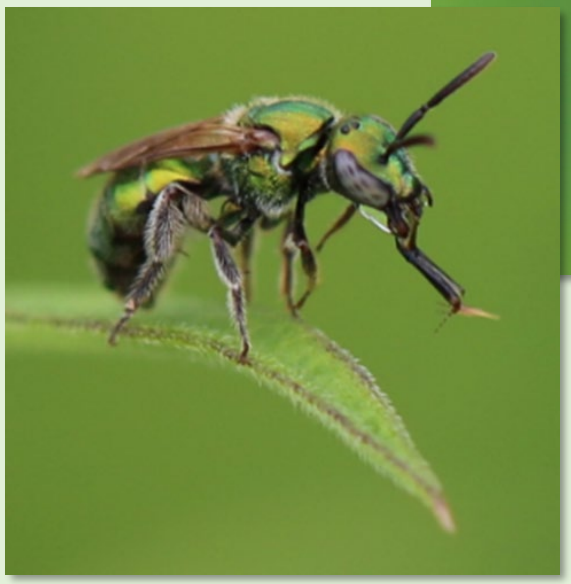
ROW HWG

Southern Company

Welcome!

Today's Webinar:

Pollinator Habitat Establishment & First Year Management



March 25, 2021

Photos: A. Bennett

Today's Hosts

Claire Ike
Southern Company

Ashley Bennett
EPRI, T&D ROW

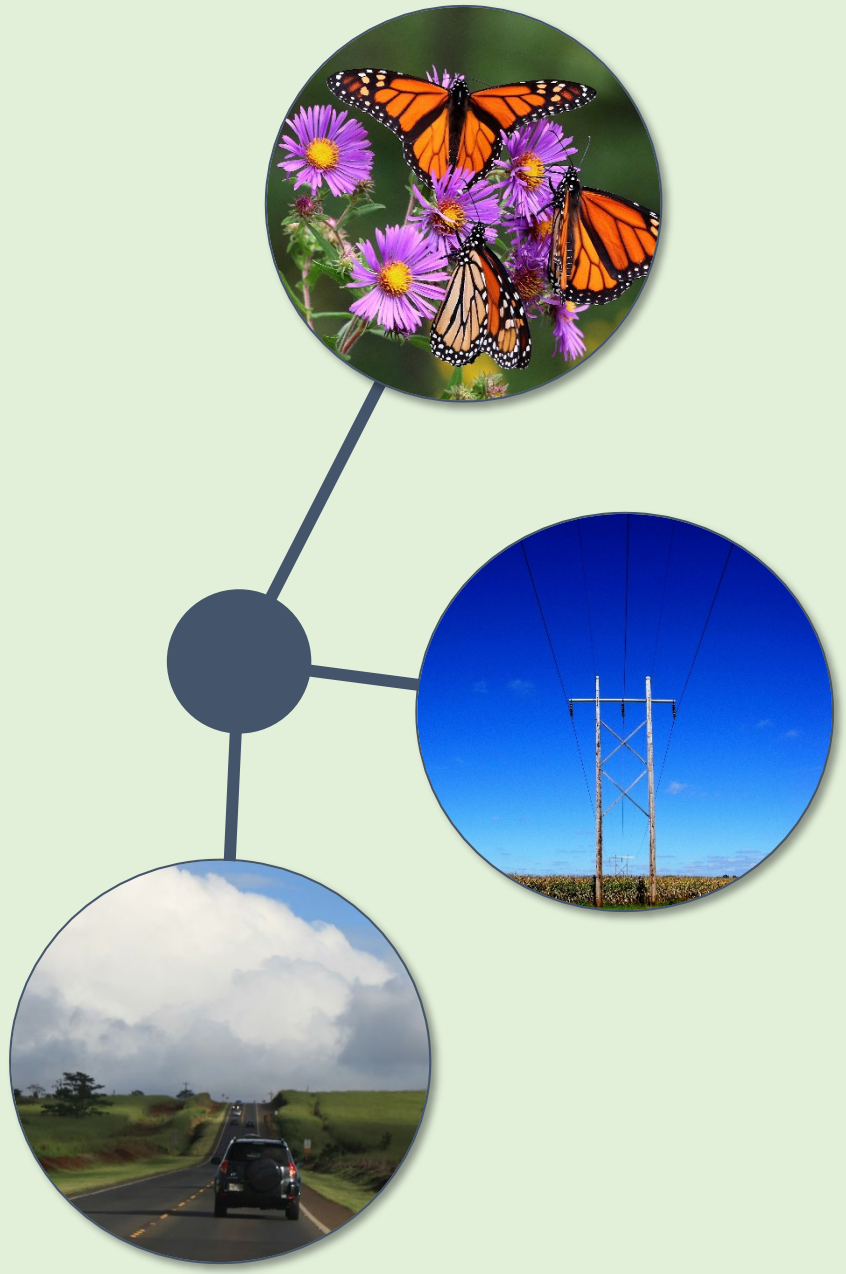
Iris Caldwell
UIC

Caroline Hernandez
UIC

Klaudia Kuklinska
UIC

Introduction

- First in 4-part webinar series
- Objectives:
  - Highlight current research
  - Facilitate discussion about other related research
  - Identify **research needs** and **spark collaborative work**



Housekeeping Items

- Keep yourself muted and video off, except during breakout discussions
- Update your Zoom name to include your organization
- If you are having technical issues, contact **Klaudia Kuklinska** via Chat box
- Submit all other questions/comments in the Chat box
- We are recording the presentations and will share afterwards

1. Click the three dots in your video box.
2. Selected "RENAME"
3. Enter your Full Name, Organization

Today's Agenda

- **First half:**
  - Four Research Lightning Presentations

- **Second half:**
  - Breakout Sessions by Topic (30 min)
  - Large group recap

Today's Speakers

Logan Rowe
Conservation Associate
Michigan State University

Cheryl Daniels
Senior Project Manager
Davey Resource Group

Justin Meissen
Manager
Tallgrass Prairie Center

Aaron Feggestad
Senior Ecologist
Stantec

Plant Selection to Support Pollinators in the Great Lakes Region

Dr. Logan Rowe

Plant selection to support pollinators in the Great Lakes region

Logan Rowe, Michigan Natural Features Inventory
Michigan State University
3/25/2021

Selection Criteria

From Isaacs et al. 2009:

Local adaptation. Plants native to a given region are adapted to the local climate and frequently have lower water, nutrient, and pest-control requirements than do non-native species.

Habitat permanency. Use of native perennial plants in conservation seed mixes can help to ensure year-round provision of resources to sup-port beneficial arthropods, such as shelter and overwintering sites.

Increased native plant diversity. Conversion of lands to agriculture has resulted in the decline of many native plant species. Agricultural conservation programs can contribute to ecosystem restoration through the re-establishment of otherwise declining native plant communities.

Minimized recurring costs. Once established, many species will persist or re-seed themselves for decades, in contrast to annuals or biennials, which require regular re-seeding.

Identifying Attractive Plant Species to Use in Wildflower Programs

Species	common name	season
Zizia aurea	Golden Alexanders	early
Potentilla fruticosa	Shrubby cinquefoil	middle
Asclepias incarnata	Swamp milkweed	middle
Veronicastrum virginicum	Culver's root	middle
Ratibida pinnata	Yellow conflower	middle
Spiracea alba	Meadow Sweet	middle
Agastache nepetoides	Yellow giant hyssop	late
Silphium perfoliatum	Cup plant	late
Lobelia siphilitica	Great blue lobelia	late
Solidago riddellii	Riddlell's goldenrod	late
Solidago speciosa	Showy goldenrod	late

Species	common name	season
Anemone canadensis	Canada anemone	early
Angelica atropurpurea	Great Angelica	early
Coreopsis lanceolata	Lance-leaved coreopsis	early
Monarda punctata	Spotted bee balm	middle
Potentilla fruticosa	Shrubby cinquefoil	middle
Spiracea alba	Meadow Sweet	middle
Silphium perfoliatum	Cup plant	late
Eupatorium perfoliatum	common boneset	late
Agastache nepetoides	Yellow giant hyssop	late

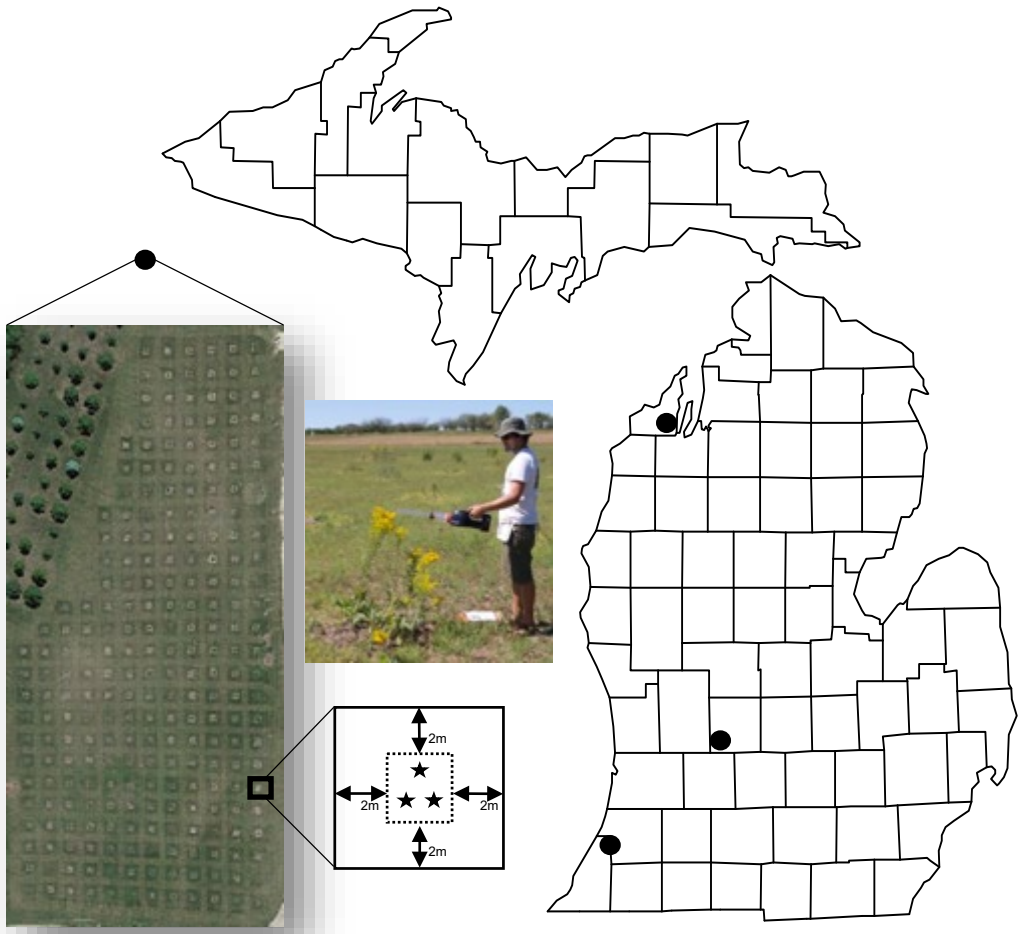
Fiedler and Landis 2007, Tuell et al. 2008

Attracting Beneficial Insects with Native Flowering Plants

Anna Fiedler, Julianna Tuell, Rufus Isaacs, and Doug Landis
Department of Entomology, Michigan State University

Fiedler et al. 2007

Great Lakes forb attractiveness to bees and natural enemies

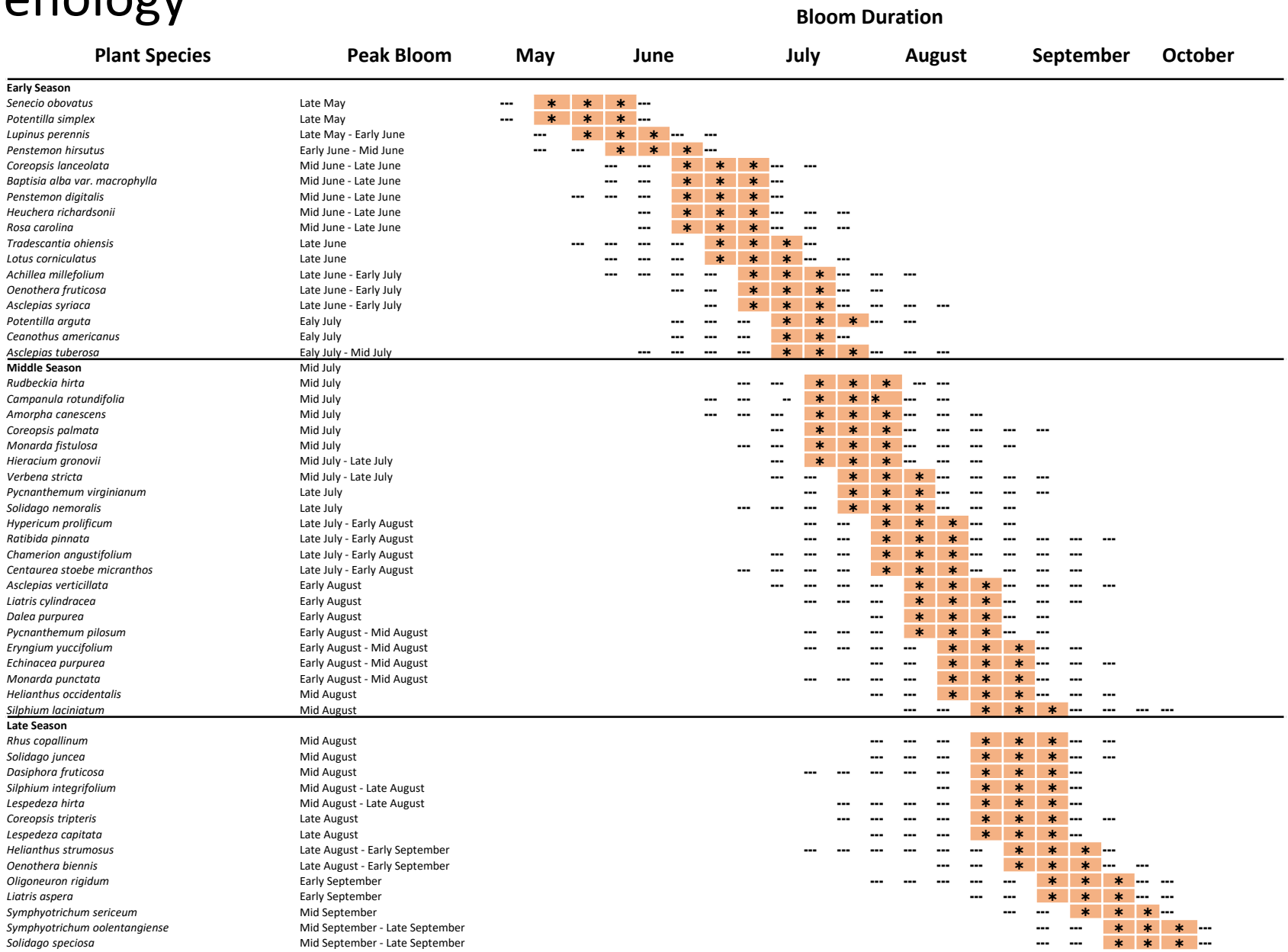


- 54 plant species in randomized blocks
- Weekly insect collections from single species plots (May-Oct)
- Weekly plant trait measurements from single species plots
- Data separated into 3 bloom periods for analysis
  - Early bloom (late May- mid July)
  - Middle bloom (mid July- mid August)
  - Late bloom (mid August- early October)

Beekeeper picks	**Previously tested in Tuell et al. 2008**
C. stoebe micranthos	*A. tuberosa*
L. corniculatus	*C. lanceolata*
P. pilosum	*L. hirta*
P. virginianum	*M. punctata*
	P. hirsutus
	R. pinnnata
	R. hirta

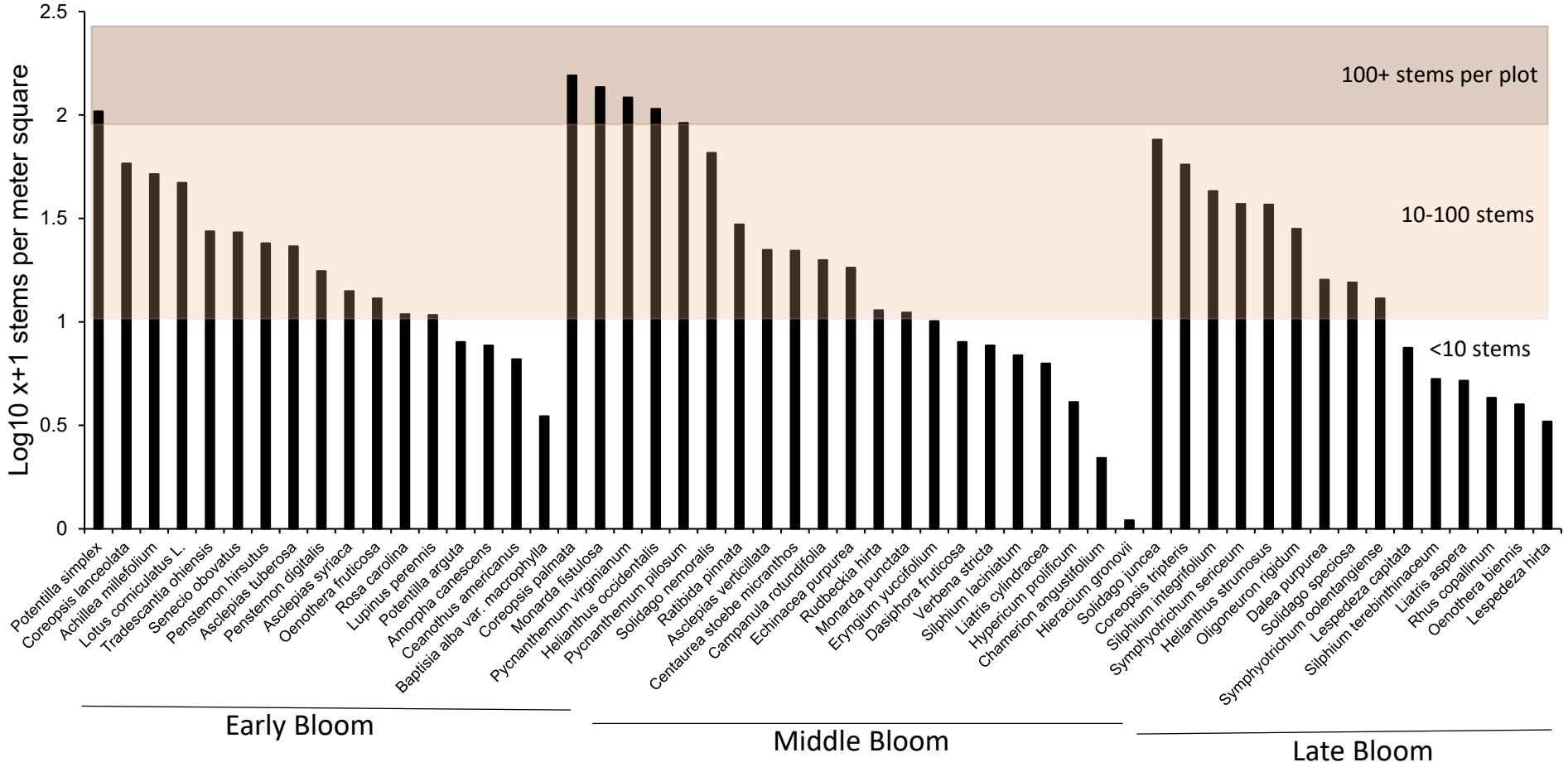
Rowe et al. 2018, Gibson et al. 2020

2016 Plant Phenology



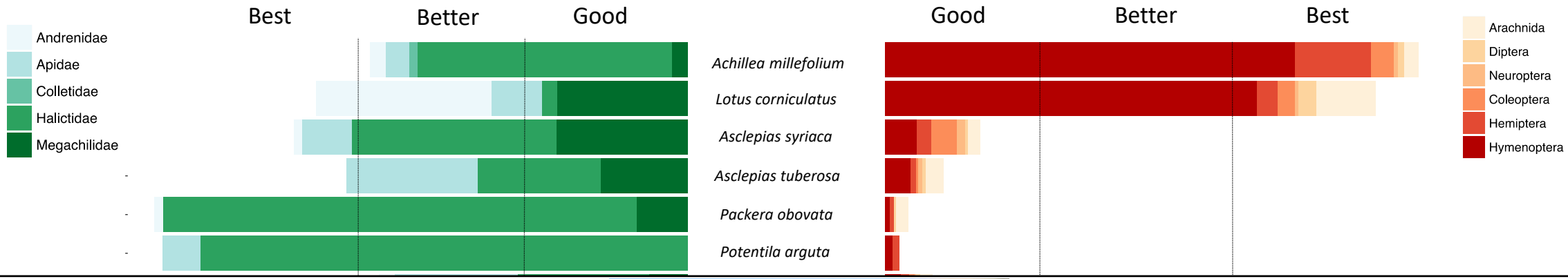
Rowe et al. 2018, Gibson et al. 2020

Plant Establishment 2014-2017



Rowe et al. 2018, Gibson et al. 2020

Early Season Plant Attractiveness to Wild Bees and Natural Enemies



Achillea millefolium

Asclepias syriaca

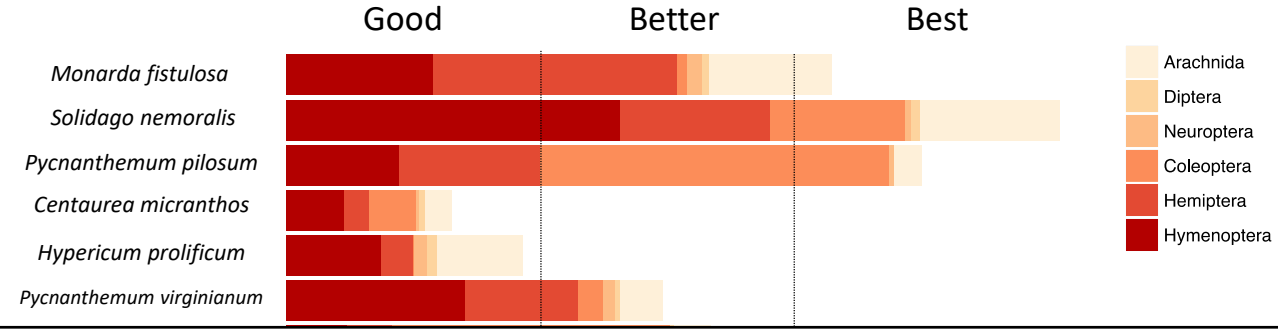
Asclepias tuberosa

Packera obovata

Potentilla arguta

Rowe et al. 2021, in review

Middle Season Plant Attractiveness to Wild Bees and Natural Enemies



Monarda fistulosa

Solidago nemoralis

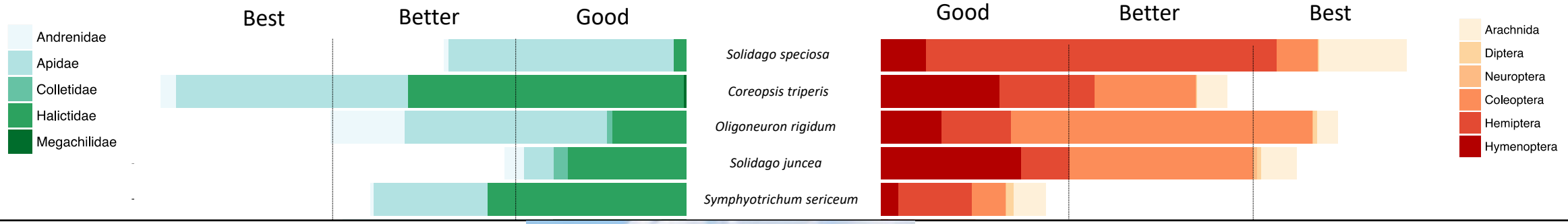
Pycnanthemum pilosum

Hypericum prolificum

Pycnanthemum virginianum

Rowe et al. 2021, in review

Late Season Plant Attractiveness to Wild Bees and Natural Enemies



Solidago speciosa

Coreopsis tripteris

Oligoneuron rigidum

Solidago juncea

Symphyotrichum sericeum

Rowe et al. 2021, in review

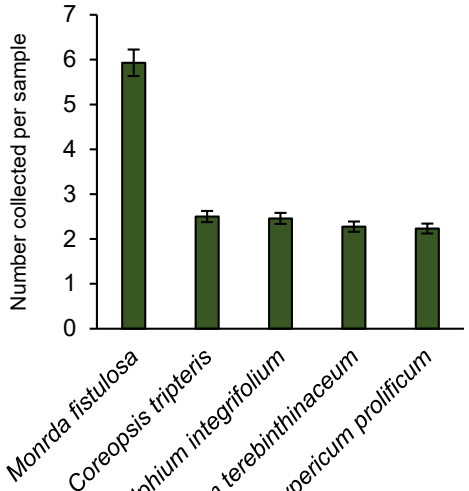
Bee Families Have Distinct Flower Preferences

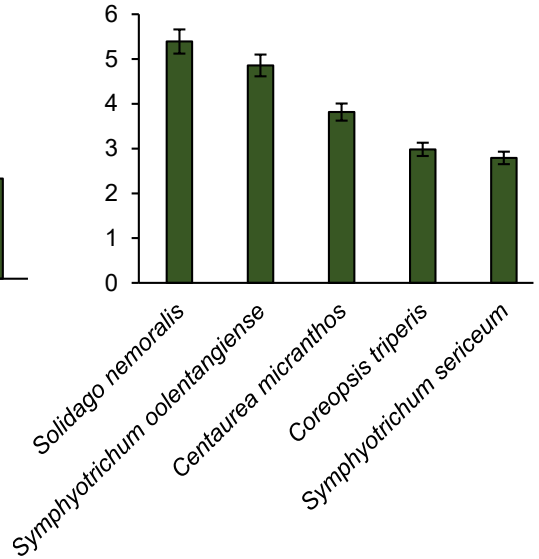
Apidae

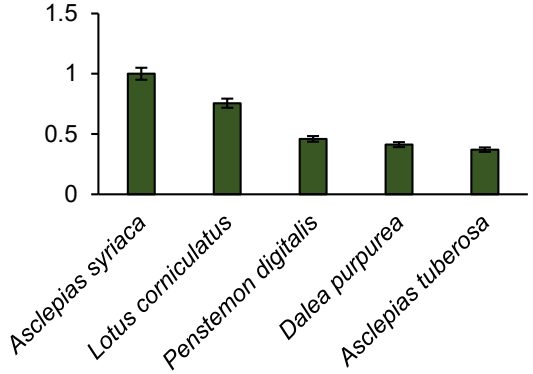
Halictidae

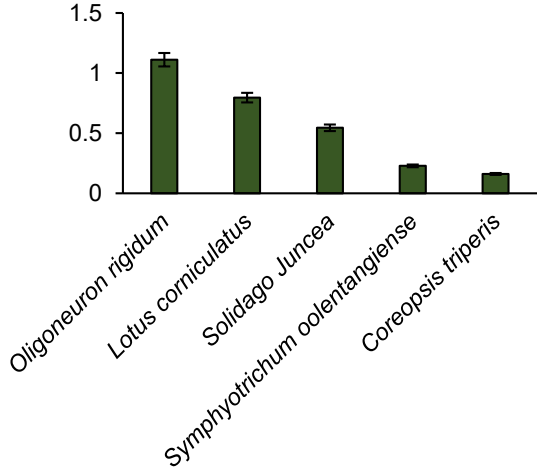
Megachilidae

Andrenidae



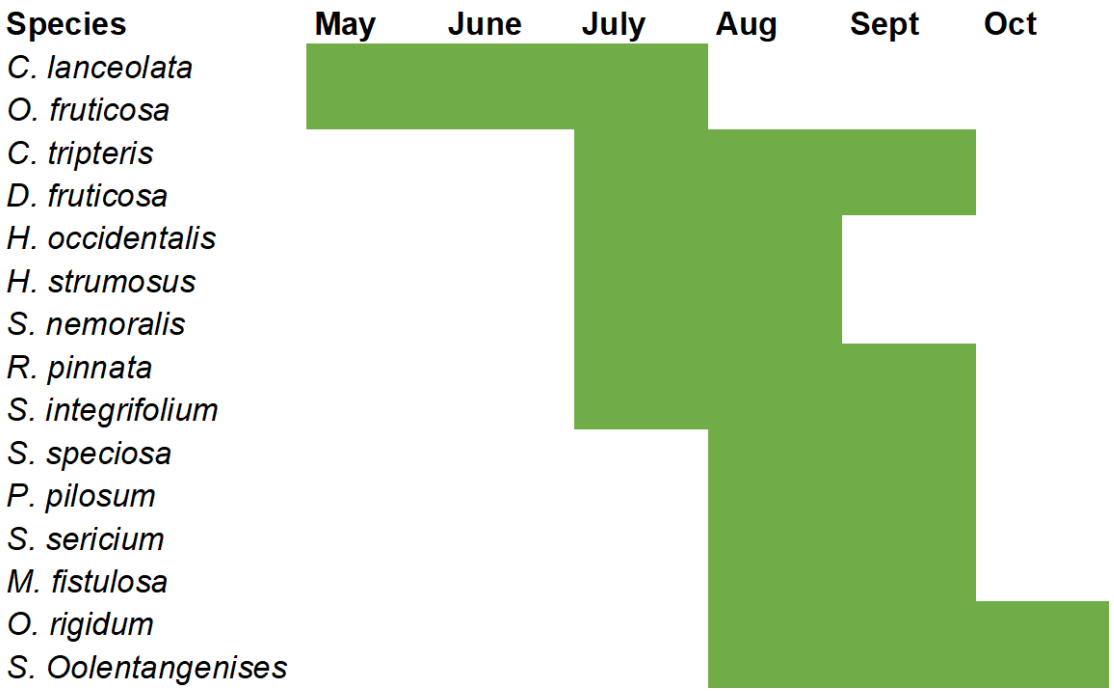




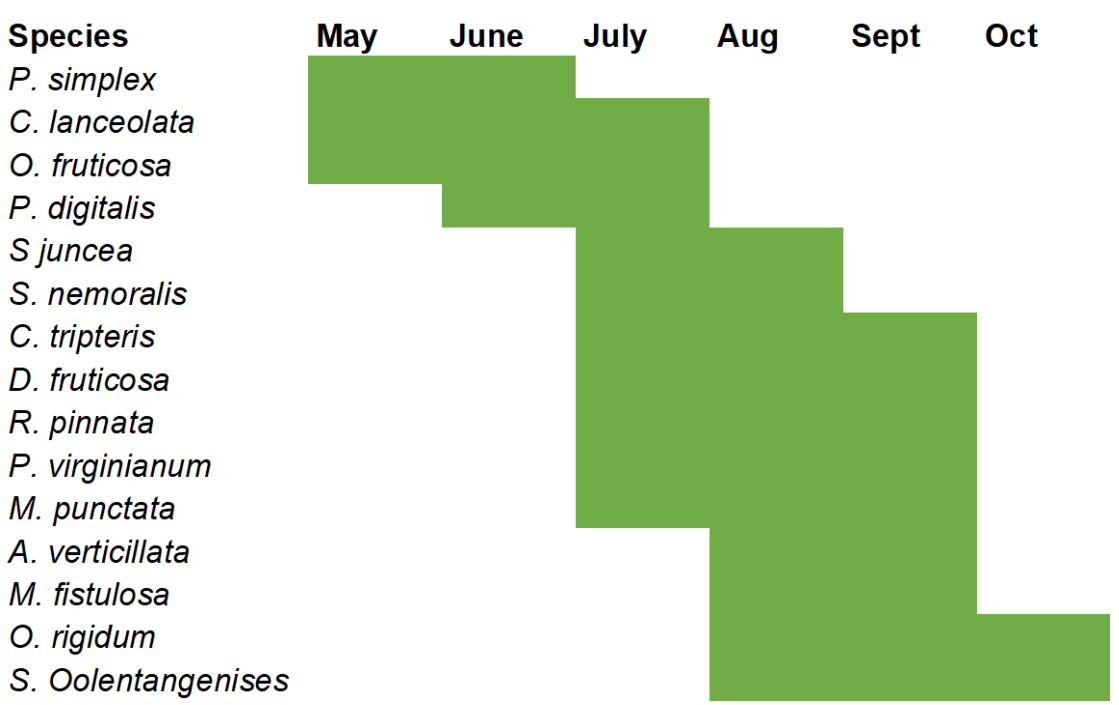


Rowe et al. 2018

Scenario 1: Bee Abundance vs Richness

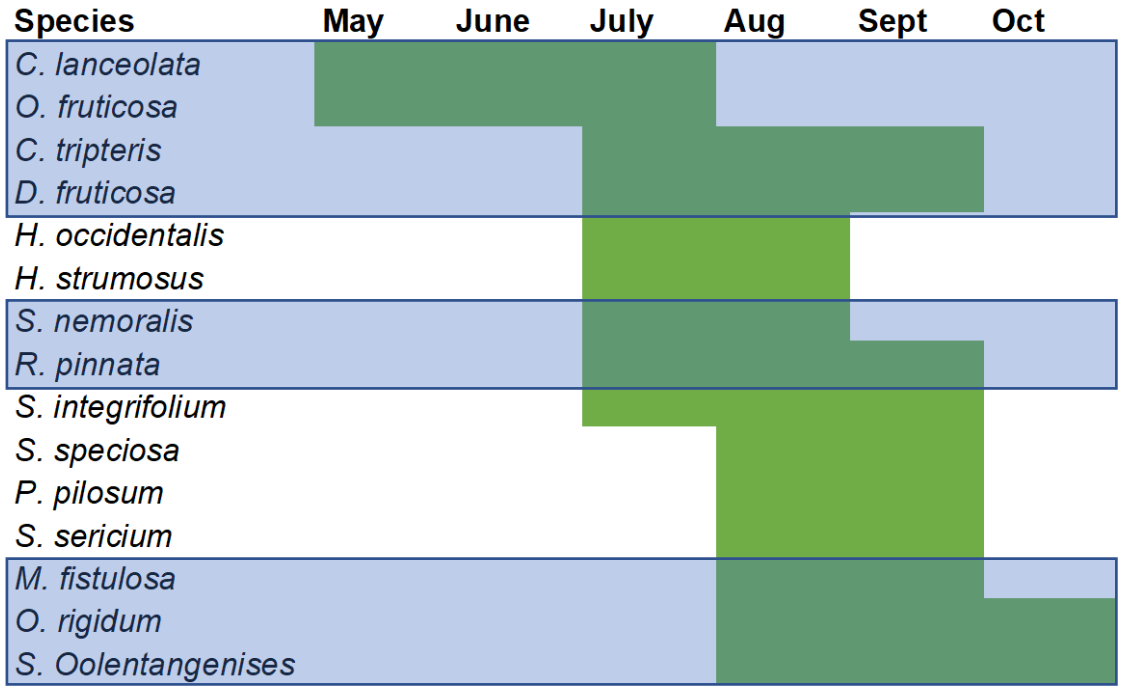


Abundance

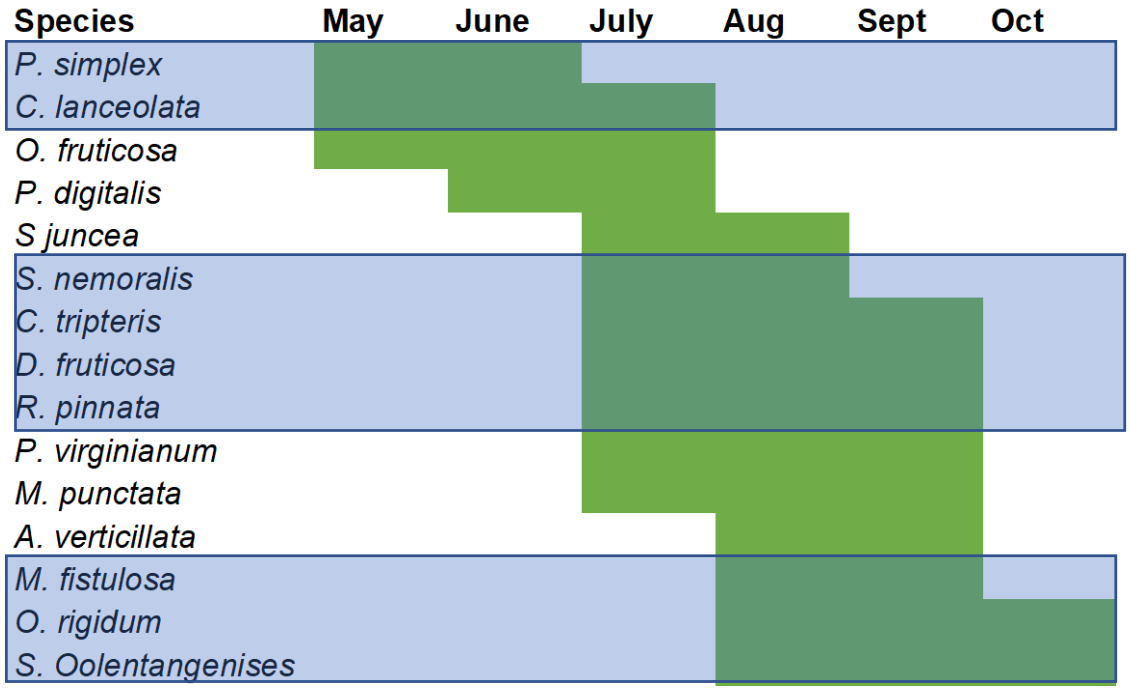


Richness

Scenario 1: Bee Abundance vs Bee Richness

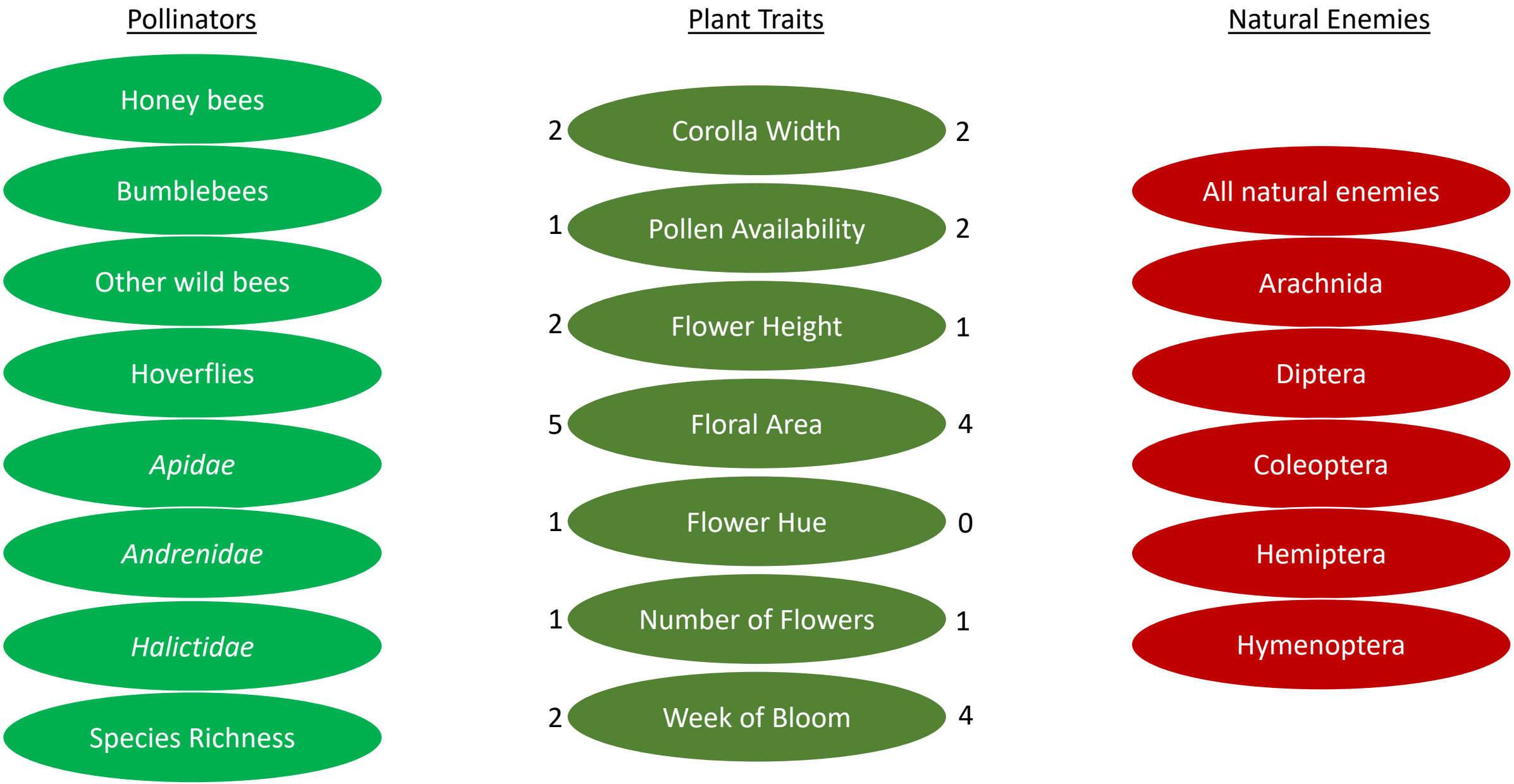


Abundance



Richness

9/15 shared plant species



Rowe et al. 2020

Questions?

Acknowledgements

Lars Brudvig
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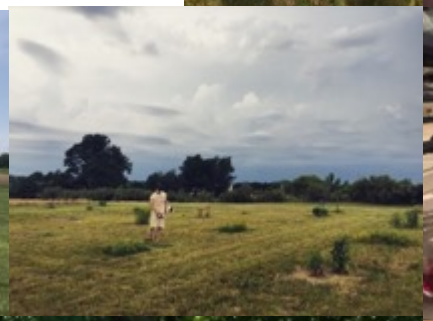
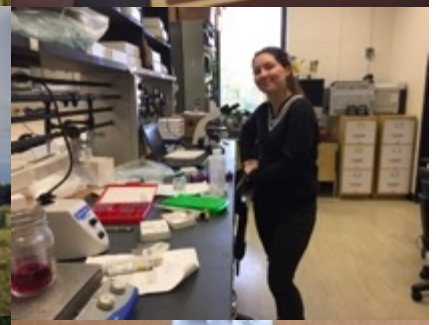
Katie Manning
Gabe King

Funding sources:





Contact: Roweloga@msu.edu

More Cost-Effective & Predictable Outcomes in Prairie Reconstruction

Dr. Justin Meissen

More cost-effective and predictable outcomes in prairie reconstruction

Justin Meissen | Tallgrass Prairie Center | University of Northern Iowa

Tallgrass Prairie CENTER
UNIVERSITY OF NORTHERN IOWA

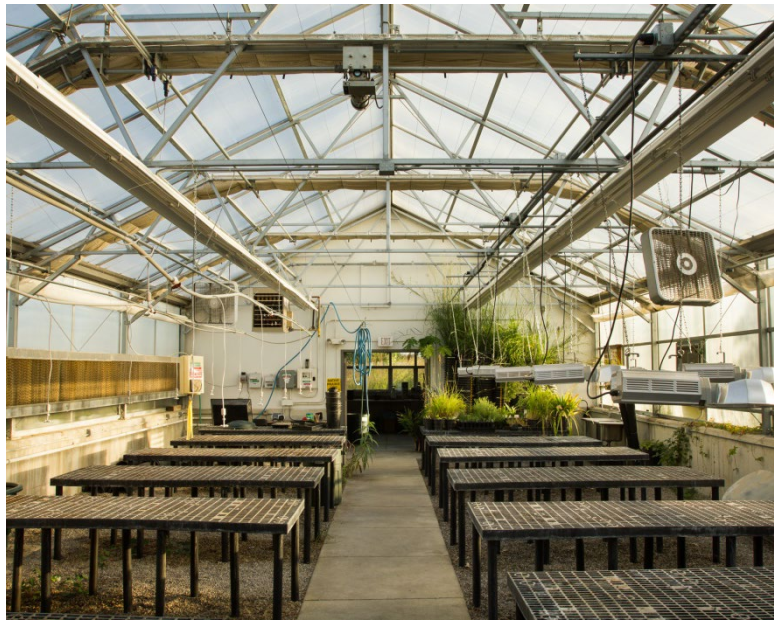
Tallgrass Prairie Center

University of Northern Iowa

The Tallgrass Prairie Center empowers people to value and restore resilient, diverse tallgrass prairie

Programs

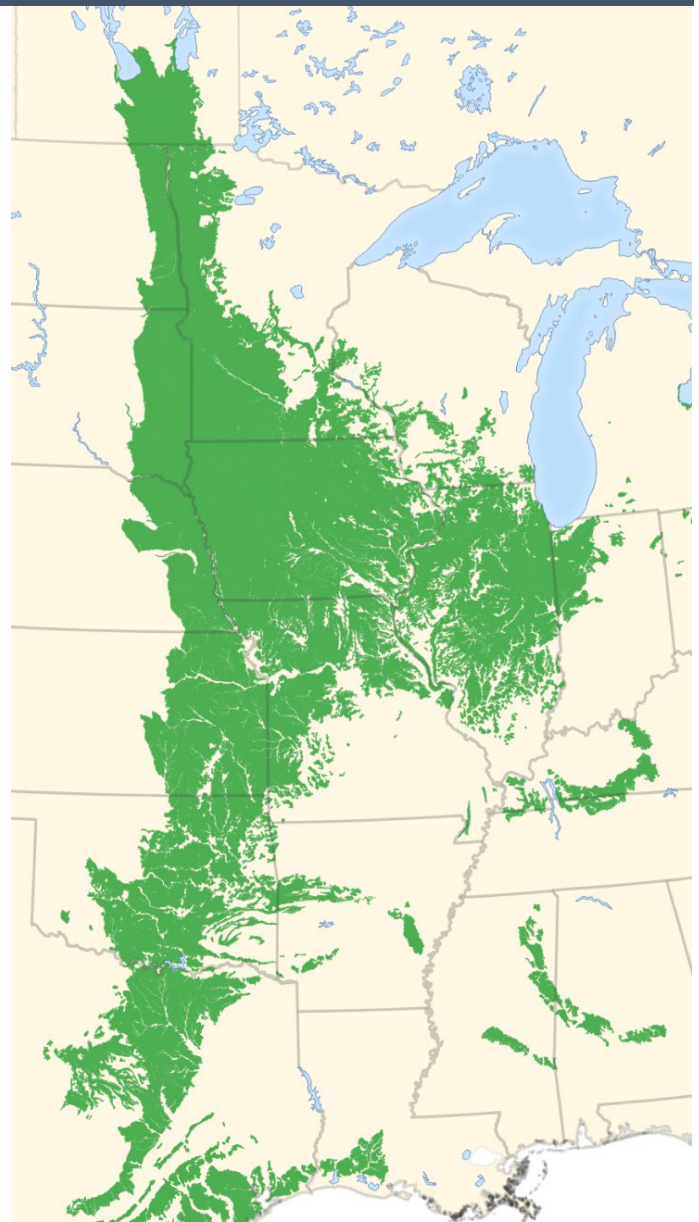
- Research and Restoration
  - Furthering our understanding of prairie restoration
- Natural Selections
  - Native plant materials development
- Iowa Roadside Management
  - Incorporating prairies into Iowa roadsides
- Prairie on Farms
  - Integrating prairie and agriculture



Defining terms

What is a prairie?

Open grown, mixed stand of native grasses and wildflowers

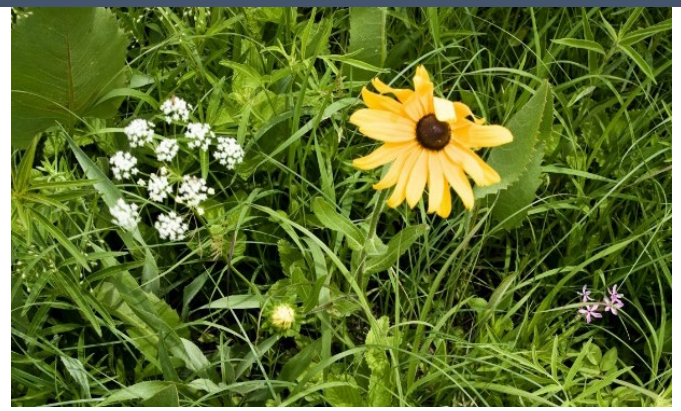


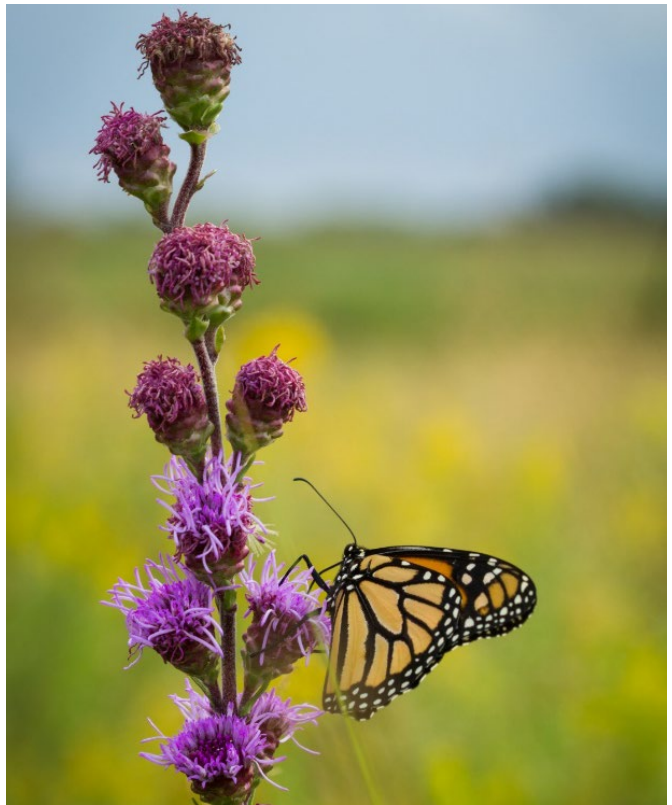
Promise of prairie as conservation tool

Benefits of prairie

Multifunctionality

- Nutrient reduction
- Flood protection
- Pollinators
- Soil conservation
- Wildlife habitat
- Biodiversity





Prairie is becoming more popular

But pressure to be more efficient

Popular conservation initiatives require prairie-like native vegetation

Pollinator Habitat (USDA-NRCS)

- > 200,000 acres planted in IA alone

Prairie Strips (USDA-NRCS)

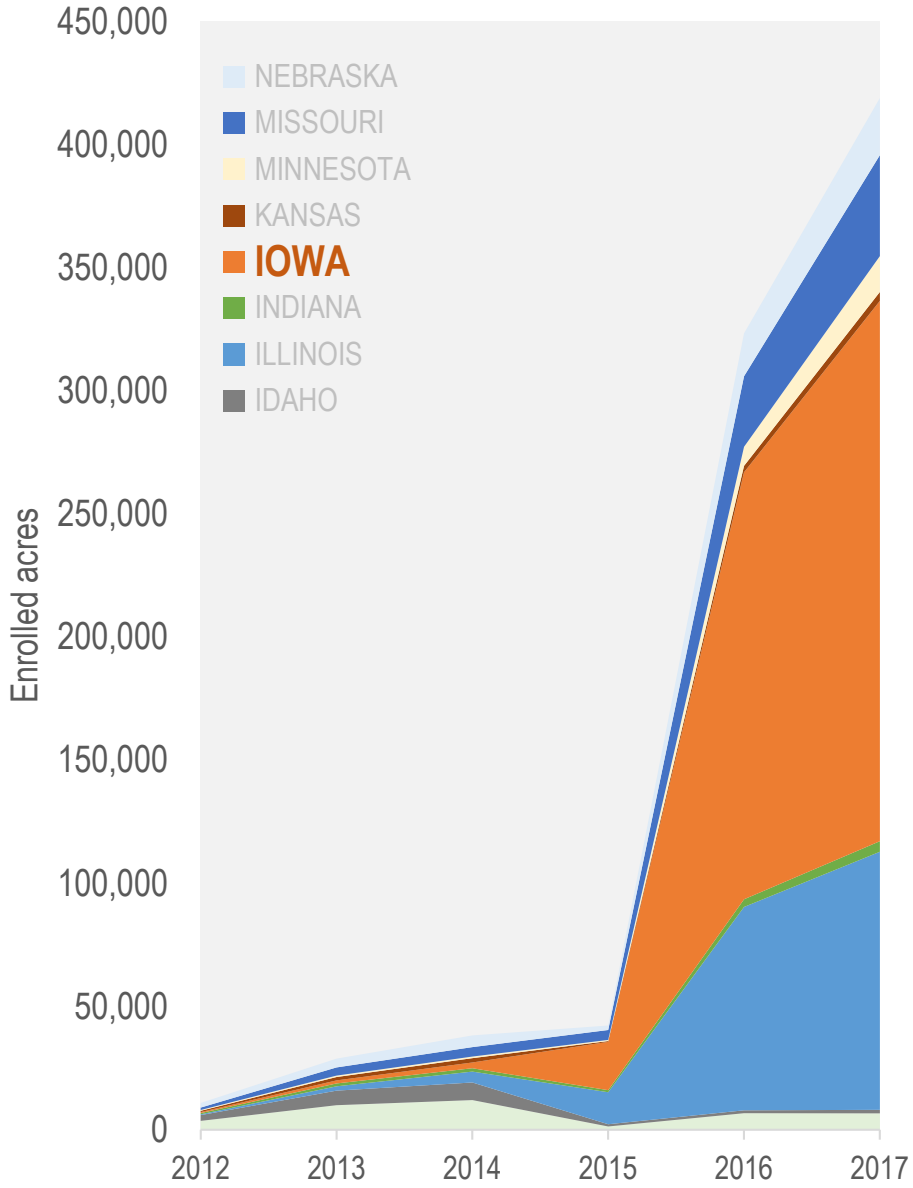
- New conservation practice as of 2020
- Potential for high impact

Iowa Roadside Management Program

- Long standing, native vegetation in road rights-of-way

Increasing scale of implementation but limited funding for conservation

How can conservation initiatives achieve greater impact with limited resources and ensure success?



A need for applied prairie research

Tallgrass Prairie Center's Research and Restoration Program

For prairie vegetation to live up to its promise:

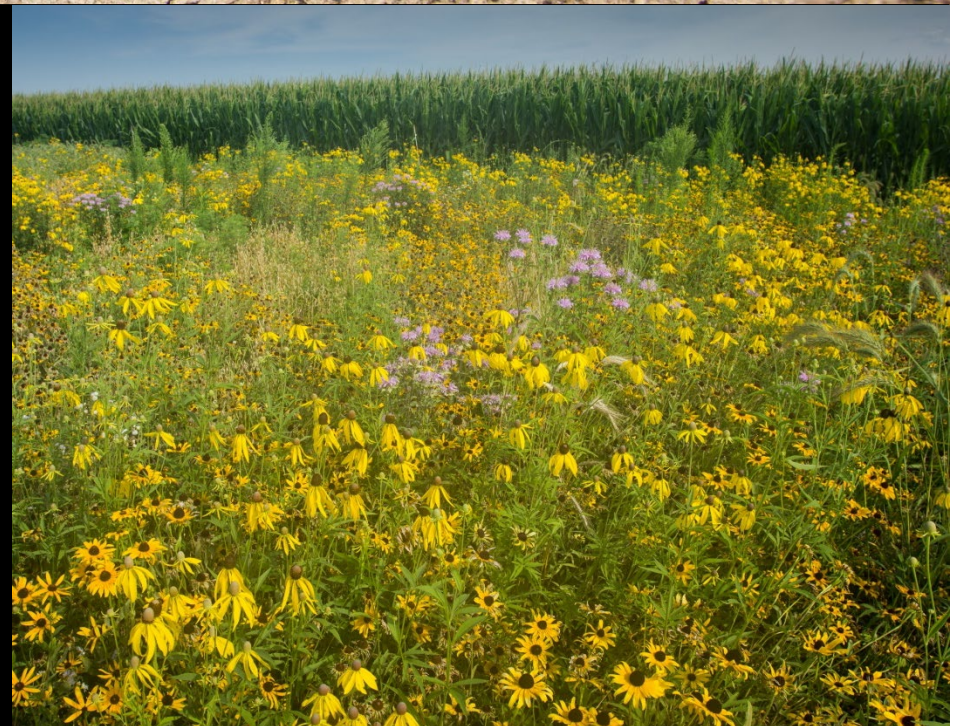
1) Improve the chances of successful implementation
2) Maximize the ability to provide multiple ecological benefits at once
3) Improve cost-effectiveness

Research Approach

- Full field experiments and smaller field trials
- Close collaboration with land managers
- Research at relevant scales and equipment

Highlighted projects

1) Matching Seed Mix to Site Conditions



2) Prairie Implementation and Research Validation

Matching Seed Mixes to Site Conditions

1) How do prairie practices perform on dry marginal lands?

2) What kinds of seed mixes work on these sites?

In depth report:
tallgrassprairiecenter.org/sites/default/files/wapsiprelimreport_2019.pdf

Methods

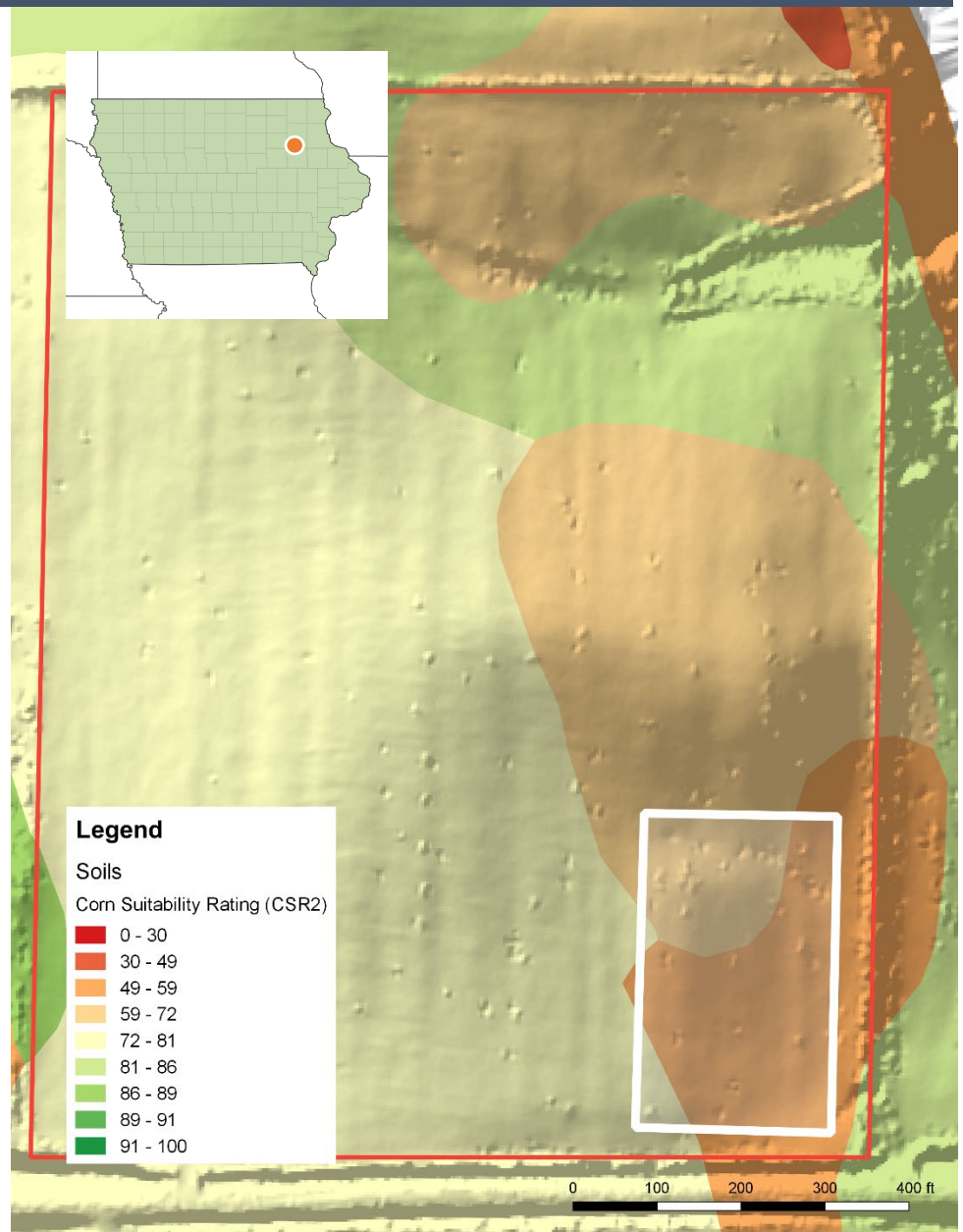
Field trial and demonstration site

2 seed mix treatments

- Dry Soil Mix ($368/ac)
- General Medium Soil Mix ($365/ac)
- Based on Tallgrass Prairie Seed Calculator output
- Replicated randomized trials on driest soils

Data collected 2018-2019

- Perennial weed cover
- Planted native stem density
- Flowering density



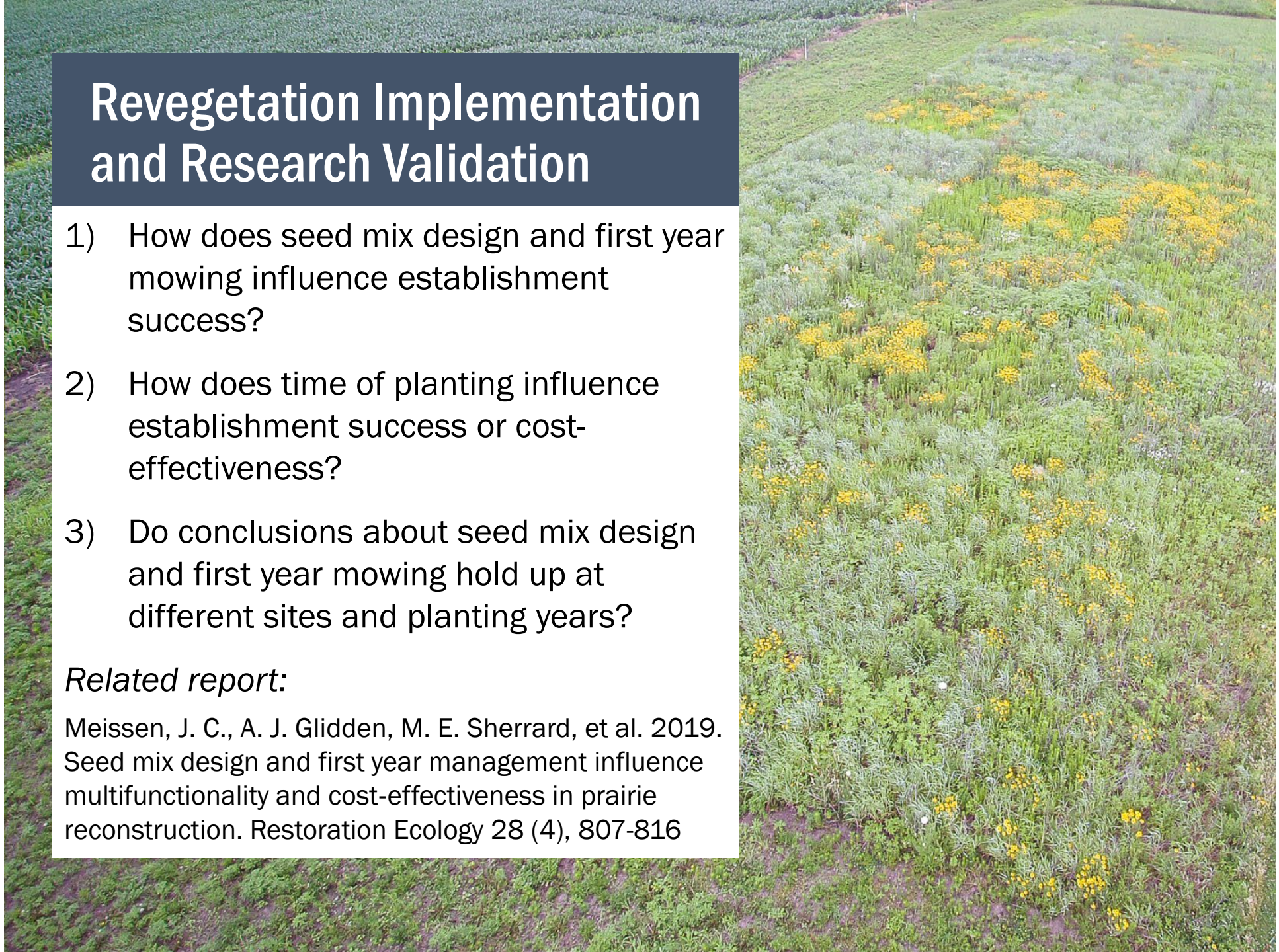
Results Summary

Prairie on dry marginal lands

- Key prairie species establish well even in dry conditions
- More ecological functionality at similar price with mix matched to dry soils
  - Only Dry Soil Mix produced flowers/forbs in all growing seasons
- Cost-effectiveness (stems/$) comparable in productive vs marginal soils


Krista Lundgren


Dan Mullen



Revegetation Implementation and Research Validation

1) How does seed mix design and first year mowing influence establishment success?

2) How does time of planting influence establishment success or cost-effectiveness?

3) Do conclusions about seed mix design and first year mowing hold up at different sites and planting years?

Related report:

Meissen, J. C., A. J. Glidden, M. E. Sherrard, et al. 2019. Seed mix design and first year management influence multifunctionality and cost-effectiveness in prairie reconstruction. Restoration Ecology 28 (4), 807-816

Methods

Field experiment (replicated)

2 field experiments

- Different planting year and site

3 seed mix treatments

- Pollinator: 1:3 grass:forb (forb dom.), $368/ac
- Diversity: 1:1 grass:forb (balanced), $291/ac
- Economy: 3:1 grass:forb (grass dom.), $130/ac

2 mow treatments

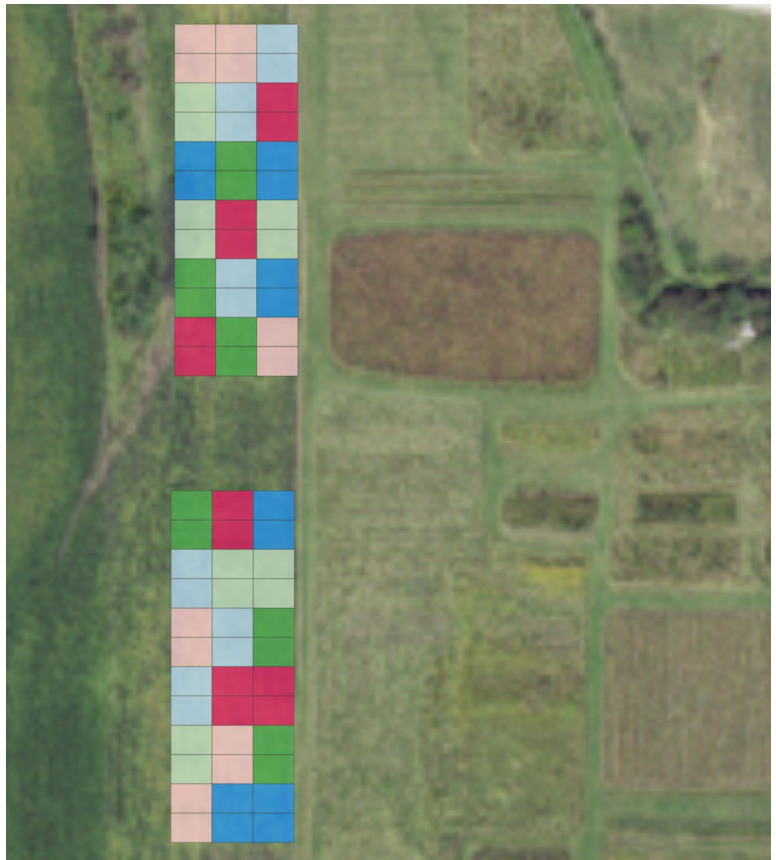
- Unmowed
- Mowed 4 times (~monthly, 5in. tall) year 1

Added planting season treatment

- Dormant (Nov 15, 18') vs spring (Apr 28, 19')

Data collected 2015-2020

- Planted native stem density
- Flowering density



Results Summary *(Preliminary Year 2 Data)*

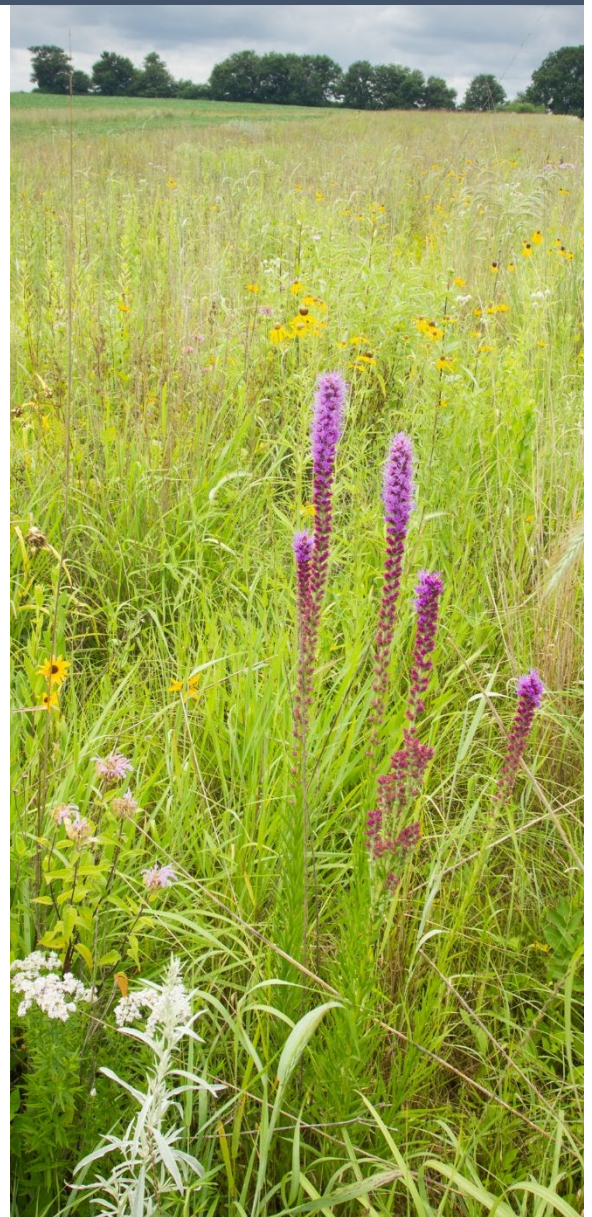
Research validation and planting time

- Seed mix & first year mowing effects hold up at different sites and planting years
  - Mowing increases native stems
  - Most native stems in grass dom. & balanced mixes
  - Most flowers in forb dom. mix
- Overall establishment outcomes similar in spring & dormant seeding
- Dormant seeding more cost effective at providing pollinator resources

Conclusions

Applied prairie reconstruction research is foundational for effective conservation

1. Improves the chances of successful implementation
    - Results repeatable across sites/years
    - First year mowing, match seed mix to soils, dormant season planting
2. Maximizes multiple ecological benefits at once
    - Diverse seed mix with balance of grass/forbs, match right plants with right soils
3. Improves cost-effectiveness
    - Management/design choices to improve establishment



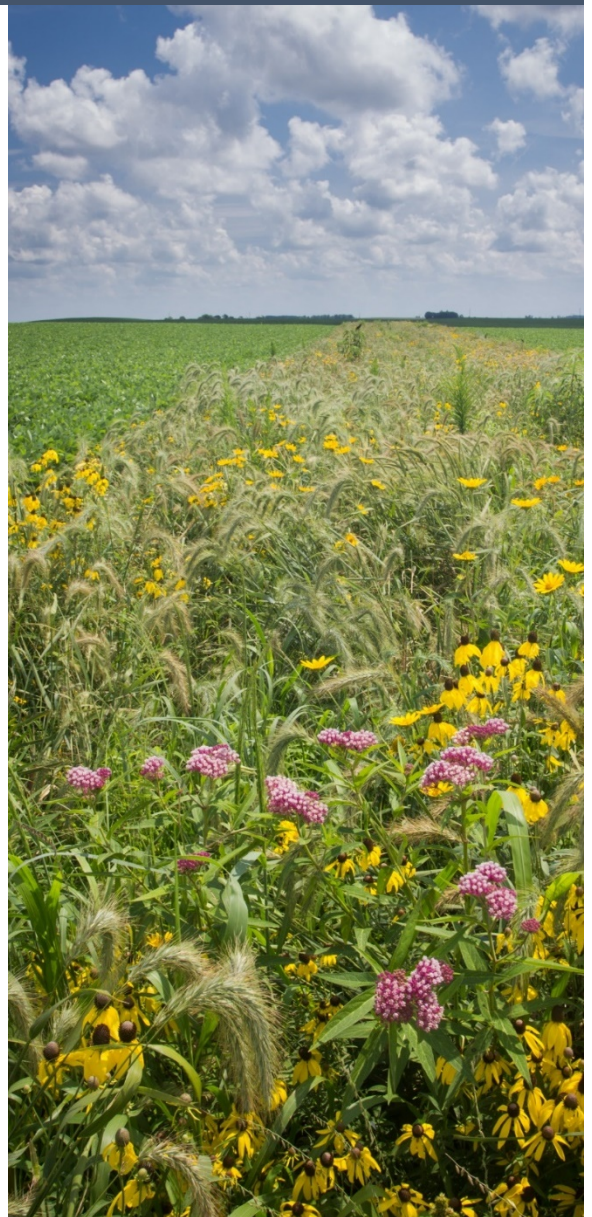
Acknowledgements

Collaborators

- ISU STRIPS
- Pheasants Forever
- Fayette County Conservation Board
- ISU Northeast Research and Demonstration Farm

Funding

- Iowa Nutrient Research Center
- Farm Service Agency



Evaluating Vegetative Cover

Cheryl Daniels

Evaluating Vegetative Cover

EPRI/ TRB Roundtable, March 25, 2021

Cheryl Daniels, Principal Consultant, Davey Resource Group

DAVEY Resource Group

Ohio Department of Transportation Post-Construction Restoration Opportunities

- ODOT has the fourth-largest interstate highway system in the country
- ODOT manages 19,000 miles of roadsides comprising 260,000 acres
- Since 2011, ODOT has constructed 8,000 projects costing $16.4 billion, illustrating potential opportunities for native pollinator habitat

DAVEY Resource Group

Developing and Evaluating Post-Construction Groundcover That Meets Erosion and Sediment Goals and is Beneficial to Pollinators

DRG Researching:

Seed mixes for various vegetation management zones along the right-of-way (ROW)

Establishment and maintenance methods

Updating ODOT specifications for evaluating vegetation coverage

DAVEY Resource Group

Factors Affecting Vegetation Success Along Roadsides

- Highly compacted soils
- High pH
- Salt-laden storm water runoff is typical
- Traffic incidents impact roadside vegetation

DAVEY Resource Group

Factors Affecting Vegetation Establishment

Getting comfortable with change can be difficult

Native vs Non-native

- Price
  - Native species more expensive per pound of seed but use a lower seeding rate
- Mulching practices
  - Native species require less mulch than non-native species

DAVEY Resource Group

Factors Affecting Vegetation Establishment

- Seeding periods
  - Native species should be planted in fall or early spring
  - Non-native species can be seeded year-round
- Root system growth and above ground growth varies between native and non-native species

DAVEY Resource Group

Factors Affecting Vegetation Establishment

- Non-native species germination rates are faster than native species
  - Kentucky Bluegrass (non-native grass)
    - 14 - 30 days to germination
  - Purple Top (native grass)
    - 30 - 50 days to germination

DAVEY Resource Group

ODOT Groundcover Project

Current ODOT Vegetative Cover Evaluation Methods

- 70 % vegetated groundcover
- Visually inspected by EPA and ODOT inspector
- Inspection includes all vegetation for percent cover determination

DRG currently researching methods to determine percent cover for native species

DAVEY Resource Group

Percent Cover Assessment for ODOT Study

DRG Methods

- 1 x 1 meter plots for ODOT vegetative surveys
- Two surveys conducted for every 0.1 acre
- Determine percent cover of invasive vs non-invasive species at each site
- Determine bare ground percent cover visually

DAVEY Resource Group

DAVEY
Resource Group

Percent Cover Importance

Prevents erosion

EPA Construction Regulations

- Acceptance of percent cover required before project completion

Plant coverage goals differ by state

- ODOT
  - 70% coverage within 6-12 months
- Maryland DOT
  - 95% coverage within 12 months
- PennDOT
  - 70% coverage within 90 days

DAVEY Resource Group

Percent Coverage Assessment in the ROW

What is Percent Cover?

- Percent of site covered by vegetation
- Vegetative cover can include:
  - Cover Crop
  - Native species
  - Invasive species
  - Non-native naturalized species
- Survey can also include:
  - Bare Ground
  - Litter
  - Rocks

DAVEY Resource Group

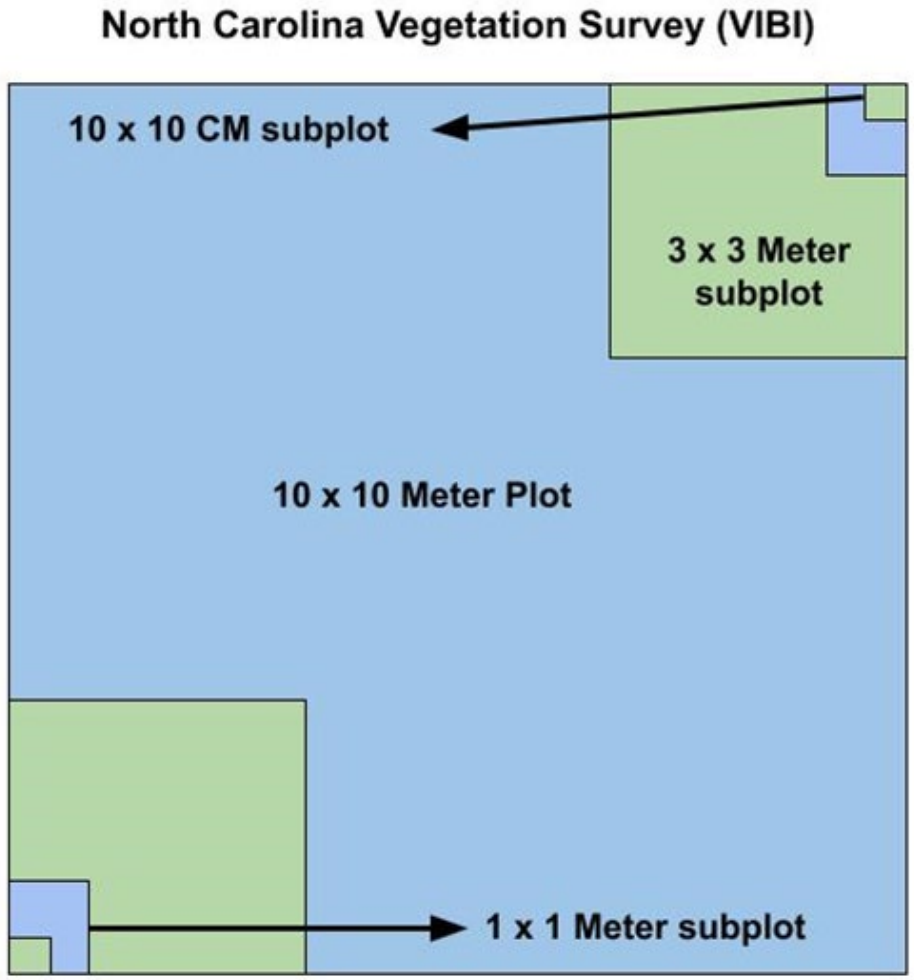
DOT Assessment Methods

Current Percent Cover Evaluation Methods

- Department of Transportations (DOTs)
  - ODOT
    - Visual Inspection
  - Maryland DOT
    - Visual inspection
  - PennDOT
    - Visual Inspection for non-native seedings
    - Nine seedlings per square foot for native seedings

DAVEY Resource Group

Assessment Methods



- **U.S. Environmental Protection Agency**
  - North Carolina Vegetation Survey otherwise known as Vegetative Index of Biotic Integrity (VIBI) is utilized
    - 10 x 10 meter plot with subplots
    - Visual inspection
  - 70% coverage required
    - Percent Cover determined for individual species
- **U.S. Forest Service**
  - 5 - 10 plots per site
  - Plot sizes vary by site size to ensure 2-5% of site is inspected
  - Data collected in plots is averaged to determine overall percent cover

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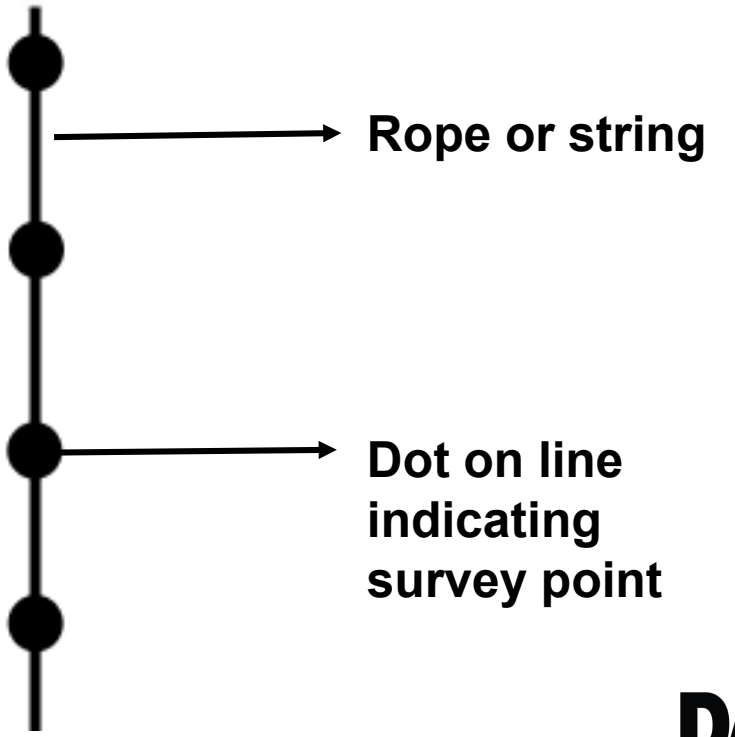
Assessment Methods

- **USDA**
  - Line Intercept Method
  - Step Point Method
  - Point-Intercept Method
  - USDA NRCS density threshold guidelines
    - Minimum requirement of 2.7 plants per square foot
    - Preferred goal of 5 plants per square foot

Point Intercept Method Rope Example



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Percent Coverage Assessment

Complications in the ROW

ROW's frequently consist of linear habitats

Common assessment methods:

- Plot Based or Quadrat Technique
  - 1 meter square plot
    - Hoop method
    - Square plot method
  - (VIBI) uses 10 x 10 meter square plots.
    - ROW habitats can be less than 10 meter (30 feet) wide.
- Transects
  - Lengths will vary from traditional methods due to nature of ROW's

DAVEY Resource Group

Next Steps

Where DRG is Heading

Make determinations for most effective way to determine percent cover along ROW's

- Should type of species (native vs naturalized vs invasive) be included in assessment for final approval?
- Does slower germination effect percent cover approval?

Which native/ naturalized species can survive roadside conditions?

DAVEY Resource Group

Comments or Questions?

Cheryl.Daniels@Davey.com

DAVEY Resource Group

Evaluating the Establishment and Pollinator Value of a Native Seed Mix, LaGrange Solar Array

Aaron Feggestad

Stantec

Evaluating the Establishment and Pollinator Value of a Native Seed Mix

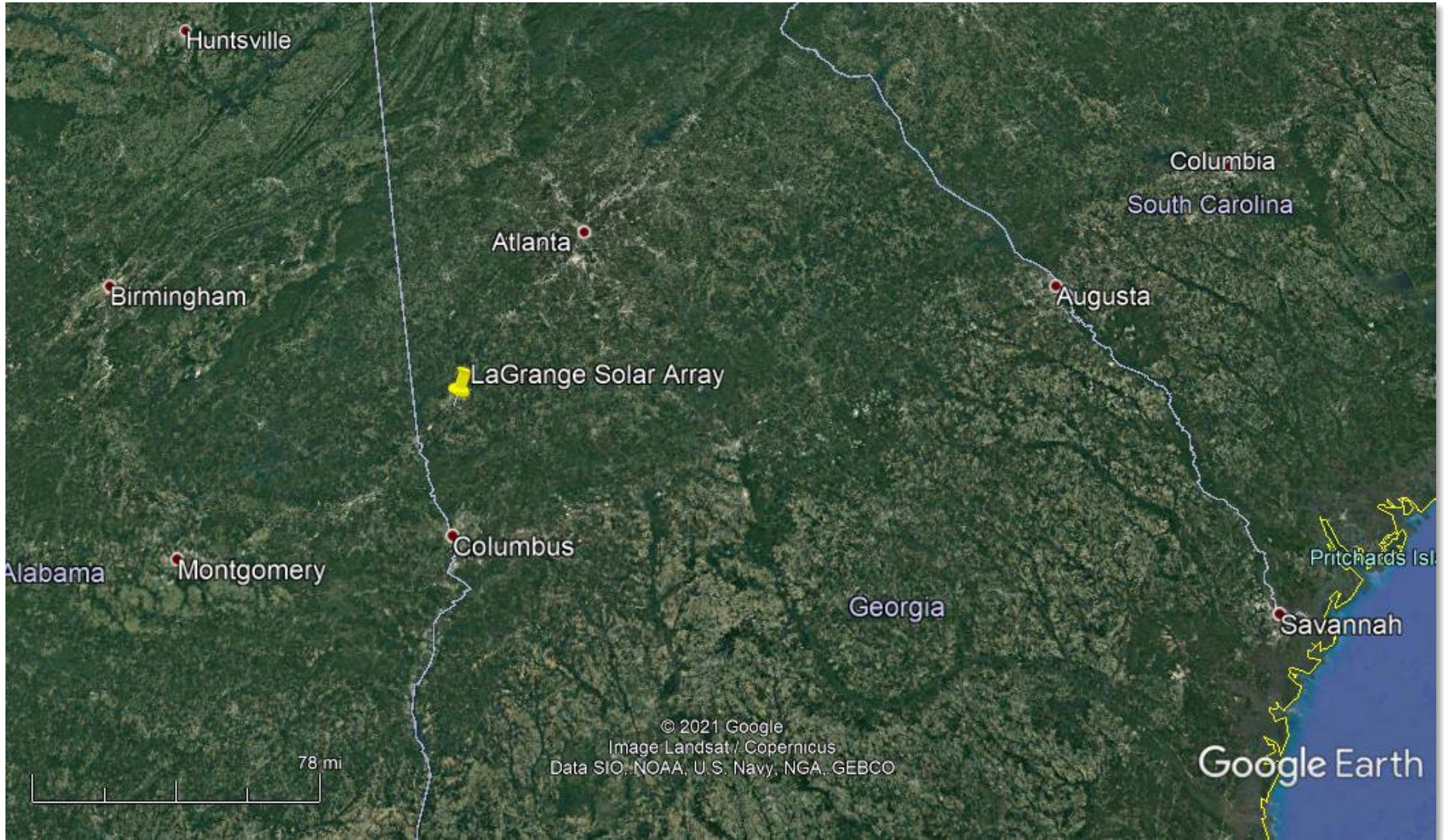
LAGRANGE (GA) SOLAR ARRAY

Research Roundtable, March 25, 2021

Aaron Feggestad, MS, PWS
Principal Ecologist
Stantec

Learn more about Stantec's ecosystem restoration team

Location


Huntsville
Columbia
South Carolina
Atlanta
Birmingham
Augusta
LaGrange Solar Array
Columbus
Alabama
Montgomery
Georgia
Savannah
78 mi
© 2021 Google
Image Landsat / Copernicus
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Google Earth

Purpose

PILOT PROJECT TO DEMONSTRATE

1. Solar Photovoltaic (PV) on DOT right-of-way (ROW)

Georgia is one of a handful of states using DOT lands / ROW for solar

<u>LaGrange Solar Array</u>

- One megawatt on about 5 acres
- Within an interchange of Interstate 85
- Benefits
  - Utilizing unshaded, publicly-owned lands for energy generation
  - Providing interchange lighting
  - Use of emerging technologies
  - **<u>Pollinator habitat</u>** demonstration

Southern Company

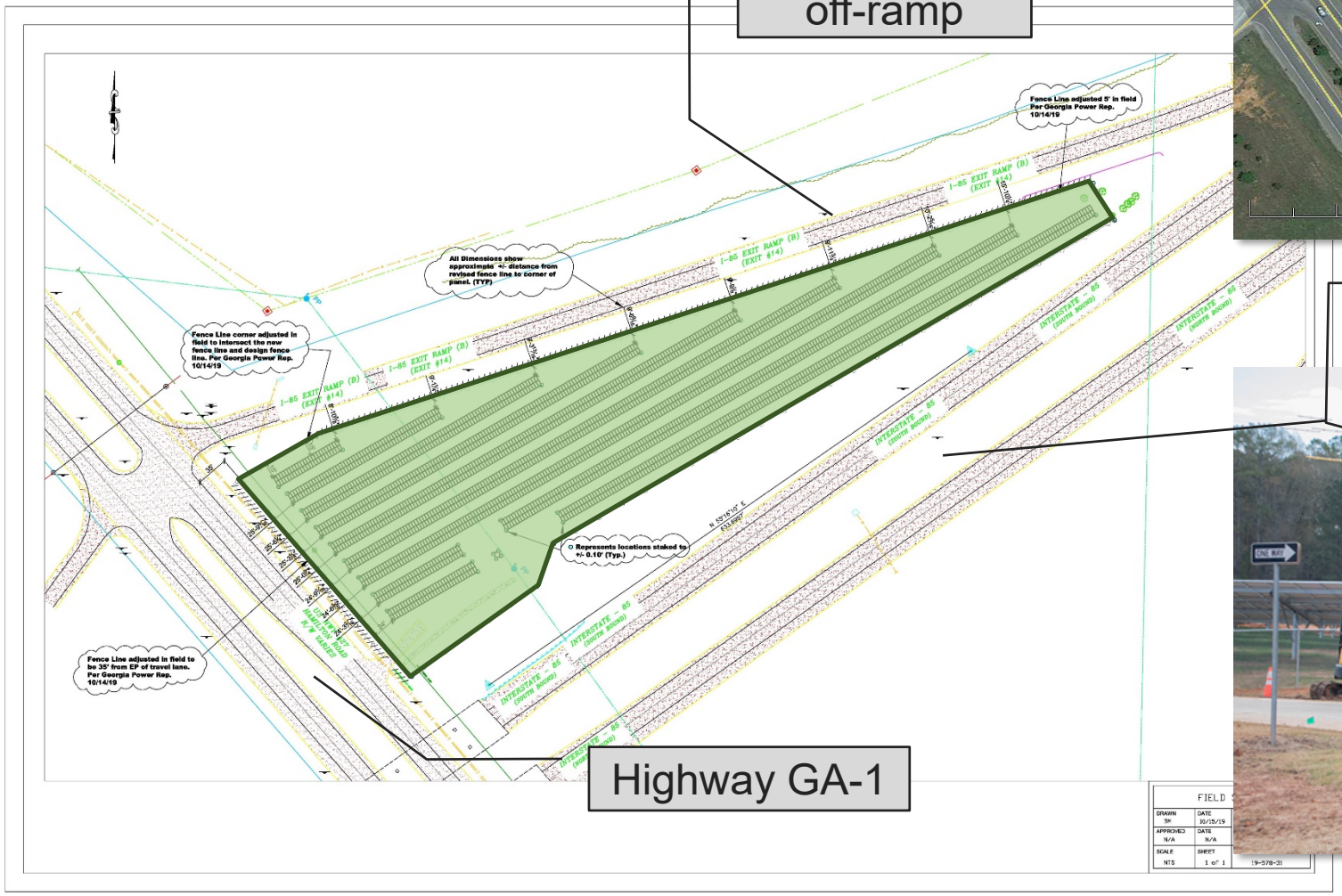
Georgia Power

GDOT
Georgia Department of Transportation

THE RAY

Site Layout

Interstate 85 off-ramp



Interstate 85

Highway GA-1

Purpose

PILOT PROJECT TO DEMONSTRATE

1. Solar Photovoltaic (PV) on DOT right-of-way (ROW)
2. **Use of pollinator-friendly groundcover on solar sites**

Demonstration

- Process: design & planning → implementation → O&M → research and monitoring
- Lessons-learned for future application

Native planting on a solar site.
Photo credit: Patrick Siebert

Southern Company

Georgia Power

EPRI ELECTRIC POWER RESEARCH INSTITUTE

Stantec

RESEARCH

Research Questions

Q1: Can diverse pollinator-friendly native groundcover vegetation be compatible with solar projects and established in conjunction with initial soil erosion prevention measures?

National Pollution Discharge Elimination System (NPDES) permits for Construction Discharges from Construction Activities

Typical process:

Erosion control plan & obtain NPDES construction permit → Construction disturbance and implement erosion control measures (BMPs) → Permanent seeding and NPDES permit termination after vegetation establishment

Non-native turf grasses
Often quick to establish and provide stabilizing cover

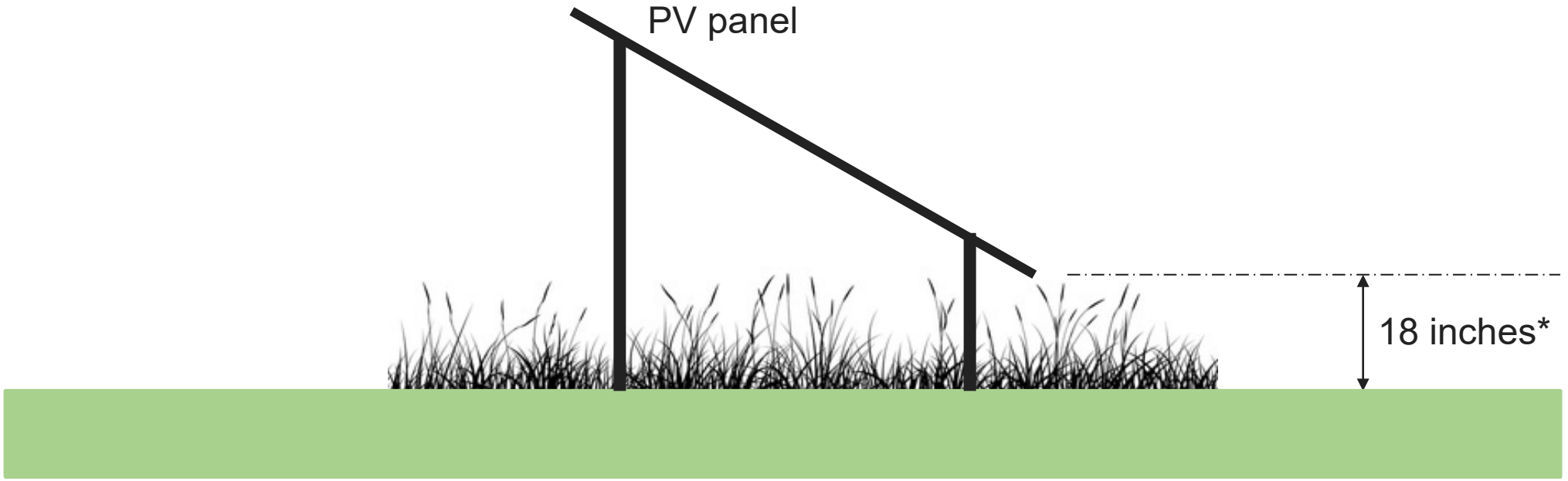
vs.

Native plants
Often slower to establish than non-native grasses

Research Questions

Q1: Can diverse pollinator-friendly native groundcover vegetation be compatible with solar projects and established in conjunction with initial soil erosion prevention measures?

Q2: Which native pollinator-friendly groundcover plants with a height restriction of 18 inches are most compatible with establishment?



** Assessment of as-built conditions allowed for addition of some taller species*

Research Questions

Q1: Can diverse pollinator-friendly native groundcover vegetation be compatible with solar projects and established in conjunction with initial soil erosion prevention measures?

Q2: Which native pollinator-friendly groundcover plants with a height restriction of 18 inches are most compatible with establishment?

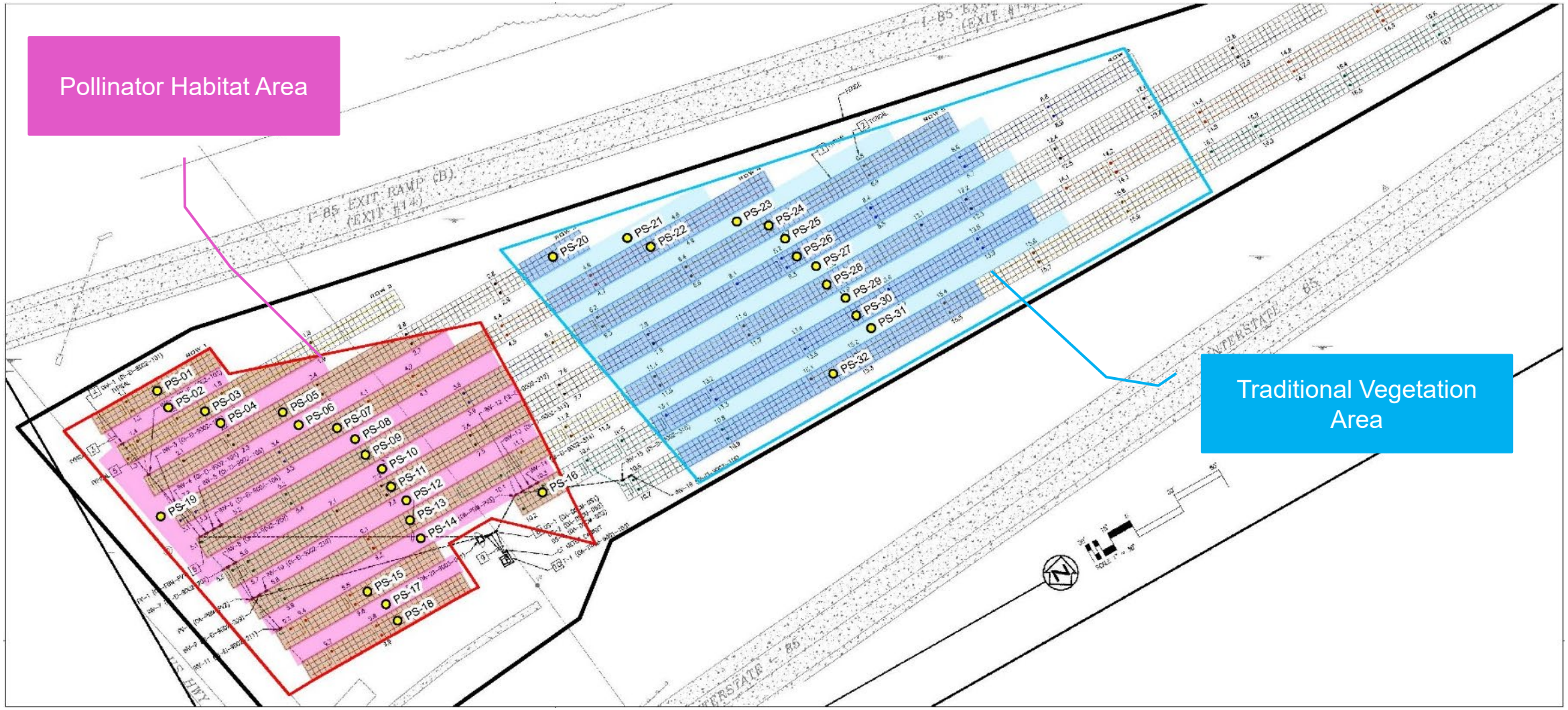
Q3: Will direct seeding and subsequent management of native vegetation increase the abundance and richness of flower species capable of supporting pollinators compared to traditional revegetation techniques?

RESEARCH

Recent prairie seeding

Turf grass with volunteer weedy flowers

Vegetation Treatments and Monitoring



Final Seed Mix Specifications

Pollinator Habitat Area
Native, low-growing species

- 32 total species
  - 4 graminoids, 28 wildflowers
  - 28 perennial, 4 annual / short-lived perennial (all wildflowers)
- 95 seeds per square foot
  - 81 (85.25%) perennial
  - 14 (14.75%) annual / short-lived perennials
  - 30% graminoids, 70% wildflowers
- 2 annual cover crops (millet and oats)

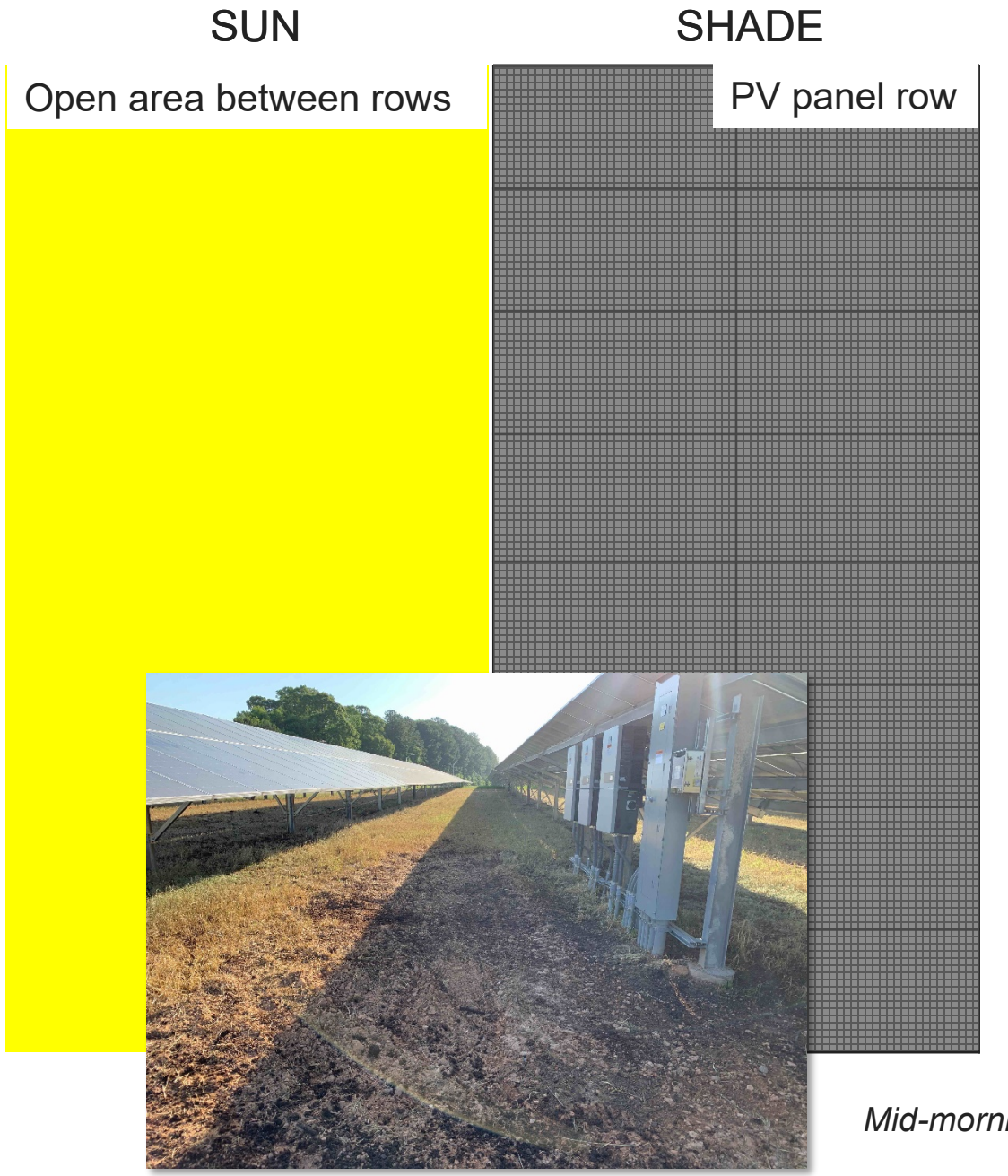
Traditional vegetation area
Traditional non-native turf

- Traditional DOT-type 'Contractor Mix'
- Non-native cool season grasses (fescues and ryes)
- Annual rye cover crop

Native status based on:

USDA Plants
https://plants.sc.egov.usda.gov/java/

North American Plant Atlas
http://www.bonap.org/



Mid-morning photo at project site

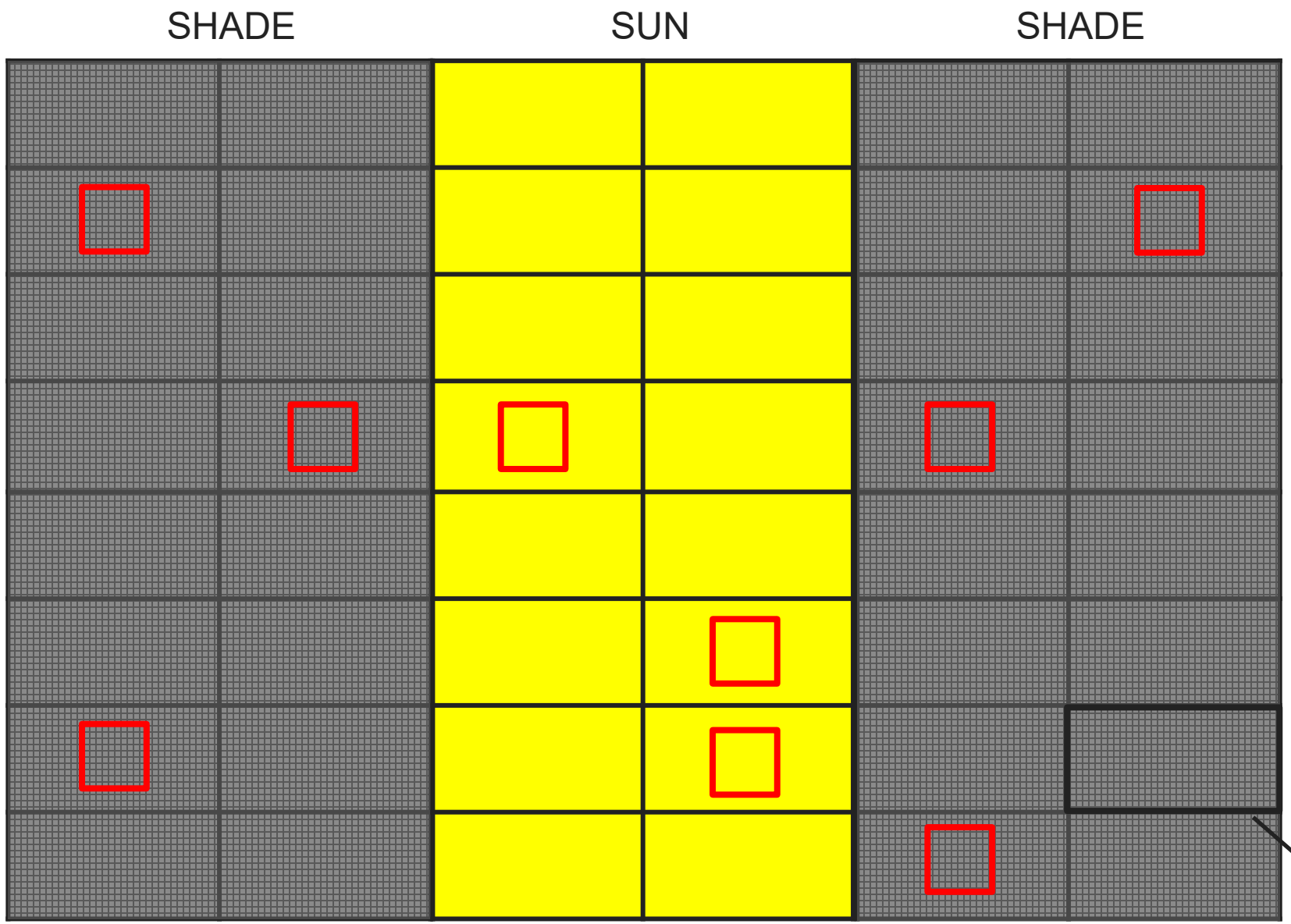
LIGHT TREATMENT

PV panel rows create sharp environmental gradients on solar sites.

The pollinator and traditional vegetation treatments were split into alternating sun and shade strata corresponding with PV panel rows.

Four Resulting Strata

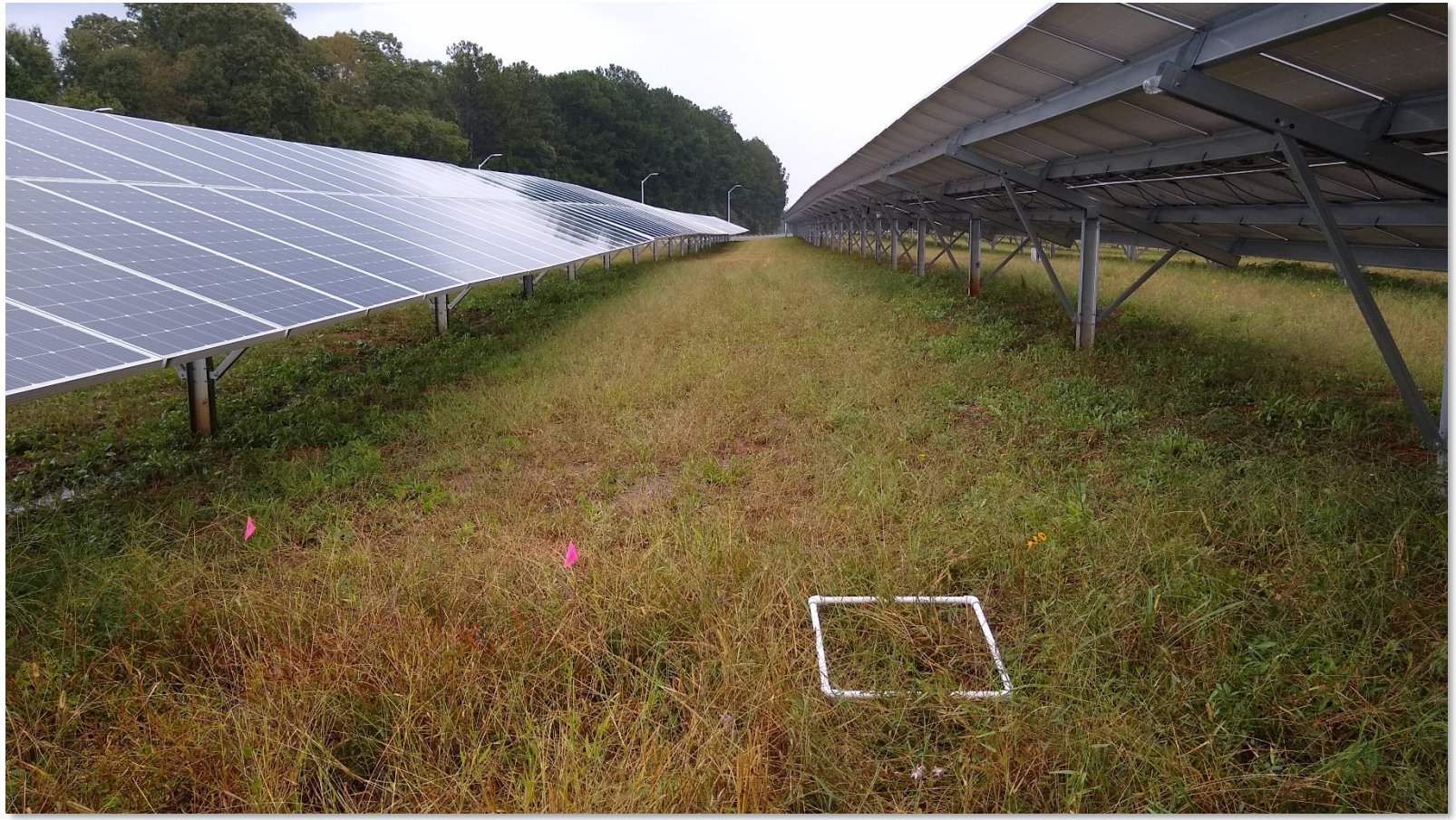
1. Pollinator-Sun
2. Pollinator-Shade
3. Traditional-Sun
4. Traditional-Shade



SAMPLE SELECTION

A grid was overlain on the four strata using a GIS tool:

- Grid cells were set to the size of one PV panel to establish a sampling grid
- Grid cells within each strata were randomly selected for sampling



Quadrat sampling in Pollinator Habitat Area

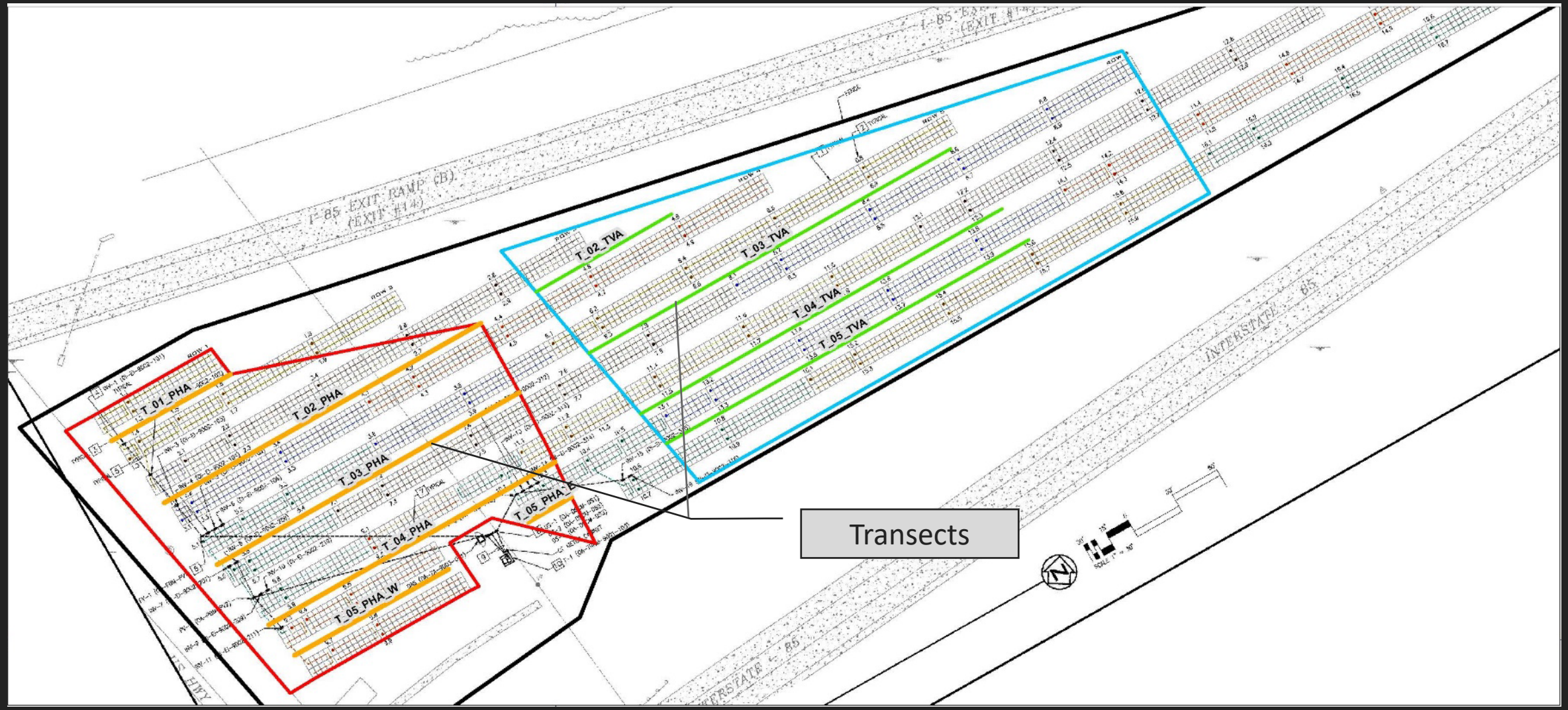
SAMPLING & ANALYSIS

- Cells located with GPS and marked with flags
- Sampled an equal number of 0.25-m^2 quadrats in all 4 strata
- Recorded species, percent cover, height (if >18 inches), and flowering
- 2020 (year 1 of 5): sampled in August and September
- Statistical analyses: t-tests, Chi-Square, ANOVA using R statistical software

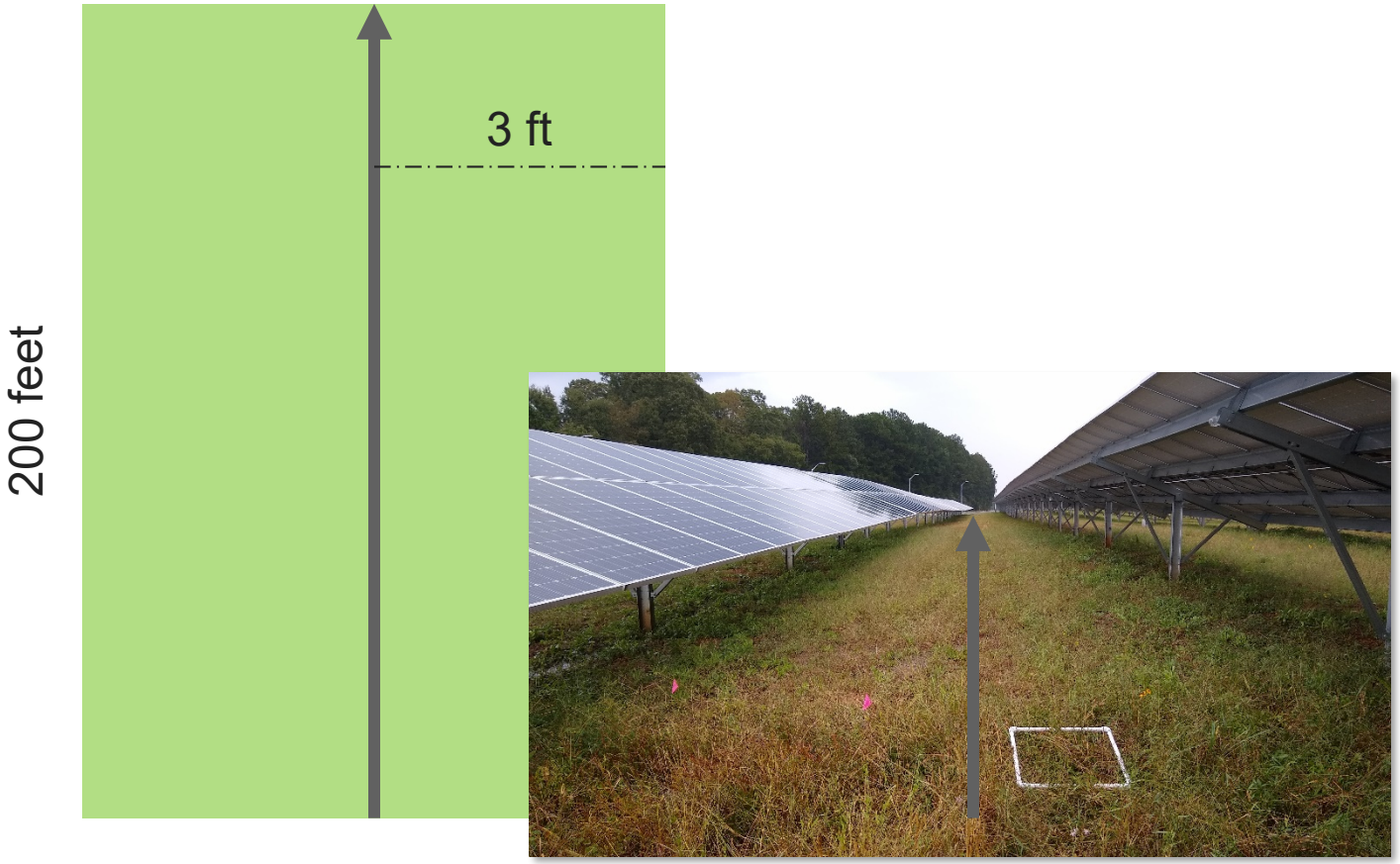
Pollinator Monitoring

Xerces Society Streamlined Bee Monitoring Protocol for Assessing Pollinator Habitat for small planting blocks

Source: https://xerces.org/publications/id-monitoring/streamlined-bee-monitoring-protocol



XERCES STREAMLINED PROTOCOL



15 minutes of survey time per 200 feet of transect

Recorded pollinators by major groups:

- Bumble bees
- Honeybees
- Large carpenter bees
- Blue-green metallic: small carpenter bees and green sweat bees
- Dark blue metallic: Mason bees
- Other bees & dark-striped bees
- Butterflies / moths
- Wasps (predatory & parasitic)
- Lady beetles
- Syrphid flies

RESULTS

Early findings: Year 1 Takeaways

Q1: Can diverse pollinator-friendly native groundcover vegetation be compatible with solar projects and established in conjunction with initial soil erosion prevention measures?

- Goal was 70% absolute cover within 3 months of seeding to meet NPDES standards and submit NOT
- Both the pollinator (58% avg. absolute cover) and traditional (62% avg. absolute cover) vegetation treatments failed to meet this standard
  - No significant difference between treatments (P=0.306)

Early findings: Year 1 Takeaways

RESULTS

Q1: Can diverse pollinator-friendly native groundcover vegetation be compatible with solar projects and established in conjunction with initial soil erosion prevention measures?

Q2: Which native pollinator-friendly groundcover plants with a height restriction of 18 inches are most compatible with establishment?

Seed mix establishment

Within the overall Pollinator Habitat Area:

- 14 seeded species germinated from the seed mix within 3 months of installation (13 in sun, 14 in shade)
  - 10 perennials and 4 annuals / short-lived perennials
  - 5 of the germinated species flowered by September
- Seeded species contributed 38.3% relative cover across the 2020 monitoring period
- Seeded natives were observed in 55% of all 2020 plots
- Only one of the seeded species (a grass, Splitbeard Bluestem) exceeded 18 inches in height

Plains Tickseed in flower at project site

Q1: Can diverse pollinator-friendly native groundcover vegetation be compatible with solar projects and established in conjunction with initial soil erosion prevention measures?

Q2: Which native pollinator-friendly groundcover plants with a height restriction of 18 inches are most compatible with establishment?

Early establishing species

Relative cover values in Pollinator Habitat Area:

- Native plants
  - Seeded native species: 38.3%
    - Seeded annual/short-lived perennials: *25.9%*
    - Other seeded perennial *12.4%*
  - Other native (volunteer): 8.4%
- Non-native / invasive plants
  - Non-native, non-invasive*: 49.6%

    Mostly from Southern Crabgrass, an annual weed
  - Invasive (8 species)*: 3.7%

100%

Plains coreopsis

Sensitive Partridge Pea

Indian Blanket

Lemon Beebalm

* *Per Federal Noxious Weed List and/or Georgia Invasive Species Task Force List*

RESULTS

Q1: Can diverse pollinator-friendly native groundcover vegetation be compatible with solar projects and established in conjunction with initial soil erosion prevention measures?

Q2: Which native pollinator-friendly groundcover plants with a height restriction of 18 inches are most compatible with establishment?

Panel effects (sun-shade strata)

- Plant richness (# of species)
  - No significant interaction between light treatment and total plant richness ($P>0.1$) and native species richness ($P>0.1$)
  - Greater number of non-native species in sun stratum ($P<0.001$)
- Absolute percent cover
  - Greater cover of non-native species in sun ($P<0.001$)
- Flowering: highest frequencies in pollinator habitat sun stratum ($P=0.032$)
- > 18 inches height: highest frequencies in pollinator habitat in sun stratum ($P=0.038$)

Southern Crabgrass, a sun-loving annual weedy grass

RESEARCH

Q1: Can diverse pollinator-friendly native groundcover vegetation be compatible with solar projects and established in conjunction with initial soil erosion prevention measures?

Q2: Which native pollinator-friendly groundcover plants with a height restriction of 18 inches are most compatible with establishment?

Q3: Will direct seeding and subsequent management of native vegetation increase the abundance and richness of flower species capable of supporting pollinators compared to traditional revegetation techniques?

Vegetation perspective

- Pollinator Habitat Area
  - 63 total plant species observed
    - 43 native (14 seeded) & 20 non-native
    - 40 wildflowers; higher frequency of flowering plants
- Traditional Vegetation Area
  - 47 total plant species observed
    - 31 native & 16 non-native
    - 26 wildflowers; lower frequency of flowering plants
  - Flowering largely restricted to low-growing species tolerant of regular mowing (clovers, *Trifolium* spp.)

Four native wildflower species in bloom in Pollinator Habitat Area (September)

RESEARCH

Q1: Can diverse pollinator-friendly native groundcover vegetation be compatible with solar projects and established in conjunction with initial soil erosion prevention measures?

Q2: Which native pollinator-friendly groundcover plants with a height restriction of 18 inches are most compatible with establishment?

Q3: Will direct seeding and subsequent management of native vegetation increase the abundance and richness of flower species capable of supporting pollinators compared to traditional revegetation techniques?

- Seed mix had a significant effect on the abundance of pollinators
  - Greater abundance of pollinators in the Pollinator Habitat Area ($P<0.05$)
- 79.6% (218 of 274) of all pollinators observed within the site were observed in the Pollinator Habitat Area:
  - 85.2% (n=52) of all bees
  - 76% (n=38) of all butterflies and moths on site
  - 83.9% (n=104) of all predatory wasps
  - 24 other (parasitic wasps, lady beetles, syrphid flies)
- All bumble bees were observed in the Pollinator Habitat Area

Monarch ovidepositing on Butterfly Milkweed seedling at project site (September 2020)

RESULTS

Year 1 Takeaways

Flexibility: have a plan but be willing to adapt

- As-built data was used to justify increased native plant height tolerance and higher seed mix diversity
- Seedbed preparation was necessary to remove incompatible plants and reduce surface compaction resulting from erosion control compliance and construction

Vegetation Indicators: what can early monitoring tell us about potential future success?

- Annual / short-lived perennials provided early flowering cover
  Will this be an indicator of overall seeding success? How will slower-growing / longer-term perennials fair in future years with establishment of annuals / short-lived perennials and weedy species?
- All three species of Milkweed germinated in year one (Butterfly, Whorled, Antelope)
- Monitor for invasive species early and be prepared to manage

Pollinator Usage: "if you build it, they will come"

- 118% more pollinators in the Pollinator Habitat Area
- Species in 10 of 12 pollinator groups were observed in the Pollinator Habitat Area in year 1 (compared to 7 of 12 in the Traditional Vegetation Area)

Thank You!

Questions?

Aaron Feggestad, MS, PWS
Principal Ecologist

Stantec Consulting Services Inc.
aaron.feggestad@stantec.com

BREAKOUT SESSIONS

Breakout Session Recap

Key Take-Aways by Topic

- Transitioning to Native Vegetation
- Tailoring Designs to Meet Site Objectives
- Site Preparation
- Establishment and Maintenance Methods

Thank you for joining us!

Coming up next….

Rights-of-Way & Pollinator Habitat – June 2021

Milkweed Establishment & Monitoring – Aug 2021

Solar Power & Pollinators – Nov 2021