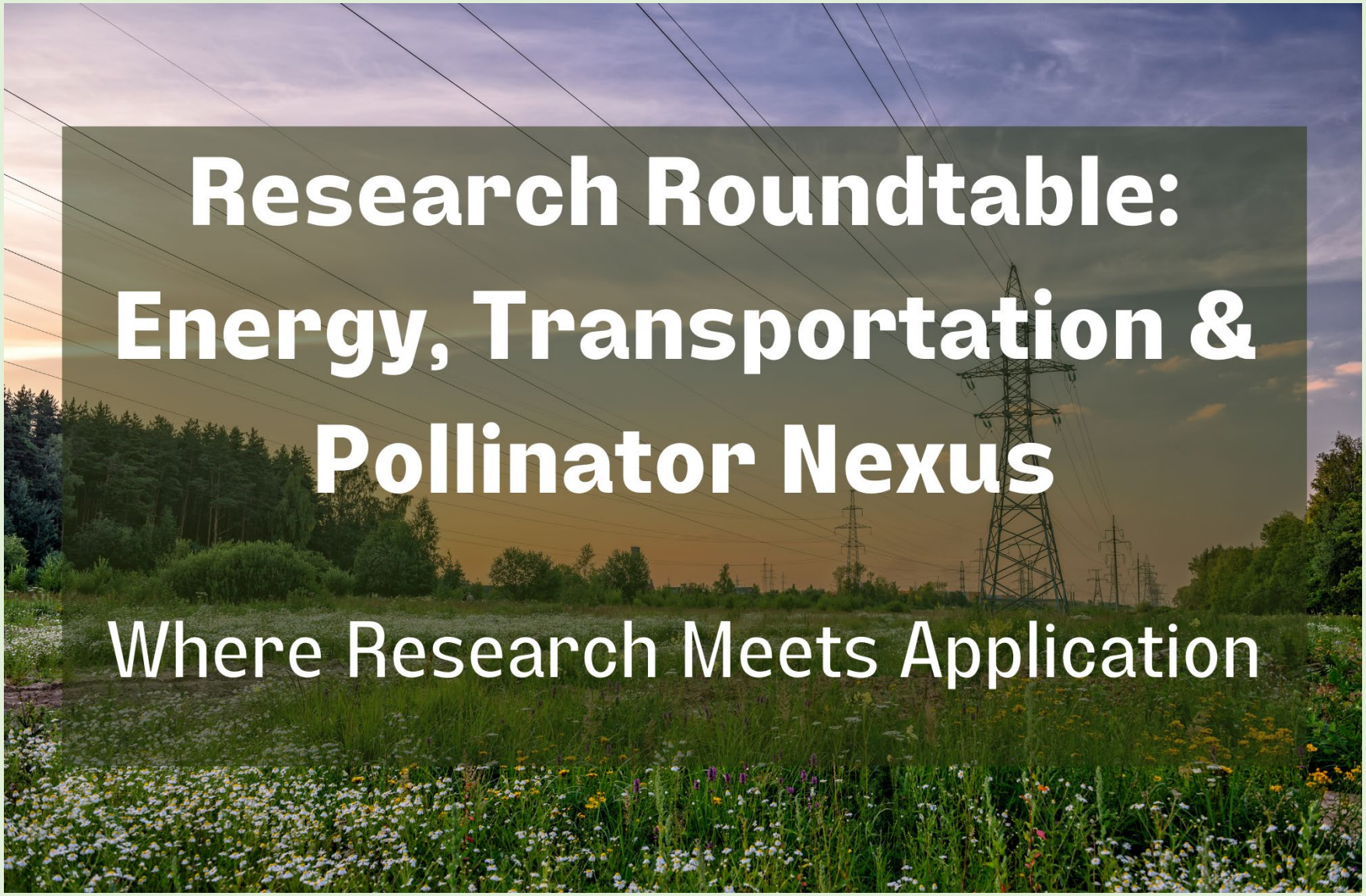


UIC

ROW HWG

Southern Company

Welcome!

Today's Webinar:

Rights-of-Way & Pollinator Conservation

Today's Hosts

Claire Ike
Southern Company

Ashley Bennett
EPRI, T&D ROW

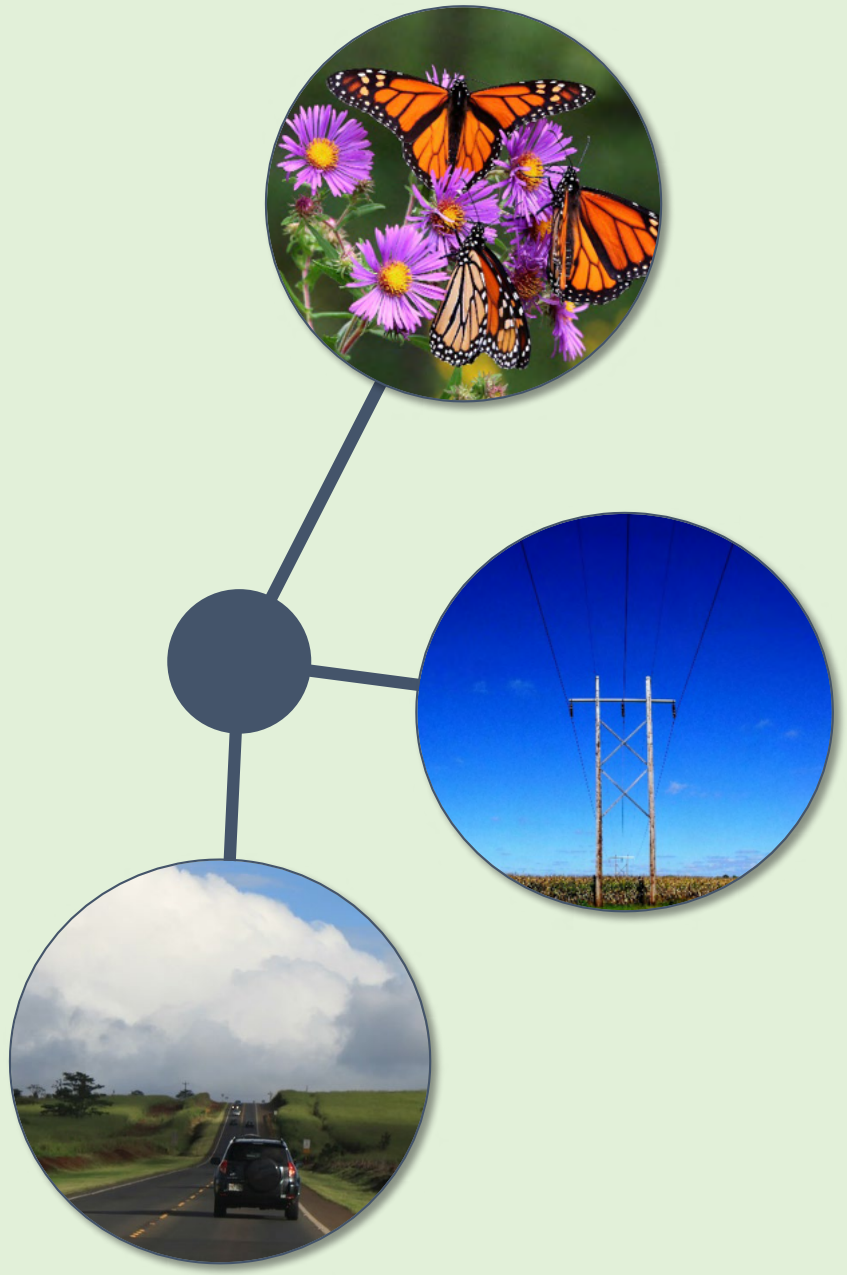
Iris Caldwell
UIC

Caroline Hernandez
UIC

Klaudia Kuklinska
UIC

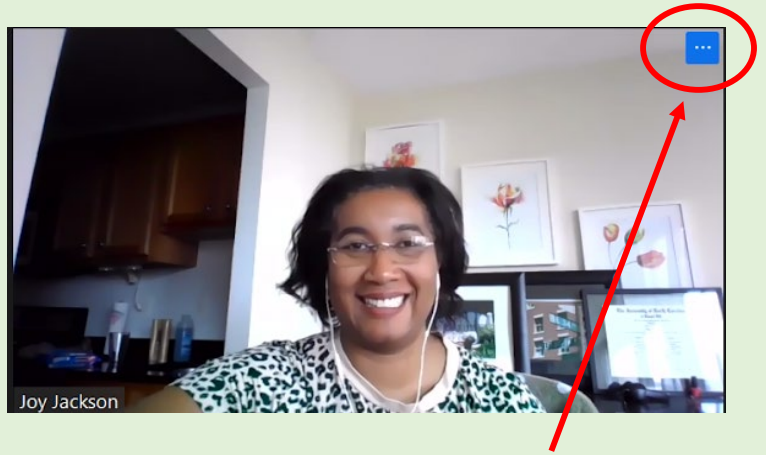
Introduction

- Second 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:**
  - Three Research Lightning Presentations

- **Second half:**
  - Breakout Sessions (40 min)
  - Large group recap

Today's Speakers

Laura Russo
Assistant Professor
University of Tennessee

Emilie Snell-Rood
Associate Professor
University of Minnesota

Ashley Bennett
Research Lead, EPRI

Powerline Right-of-Way Management and Flower-Visiting Insects: How Vegetation Management Can Promote Pollinator Diversity

Dr. Laura Russo

Powerline right-of-way management and flower-visiting insects:

How vegetation management can promote pollinator diversity

Laura Russo

Department of Ecology and Evolutionary Biology
University of Tennessee, Knoxville

Acknowledgements and Project Partners

Project Lead: Carolyn G. Mahan, PhD, Prof. Biology and Env. Studies, Penn State Altoona, PA, cgm2@psu.edu

Co-authors: Hannah Stout, Dana Roberts, Bradly Ross

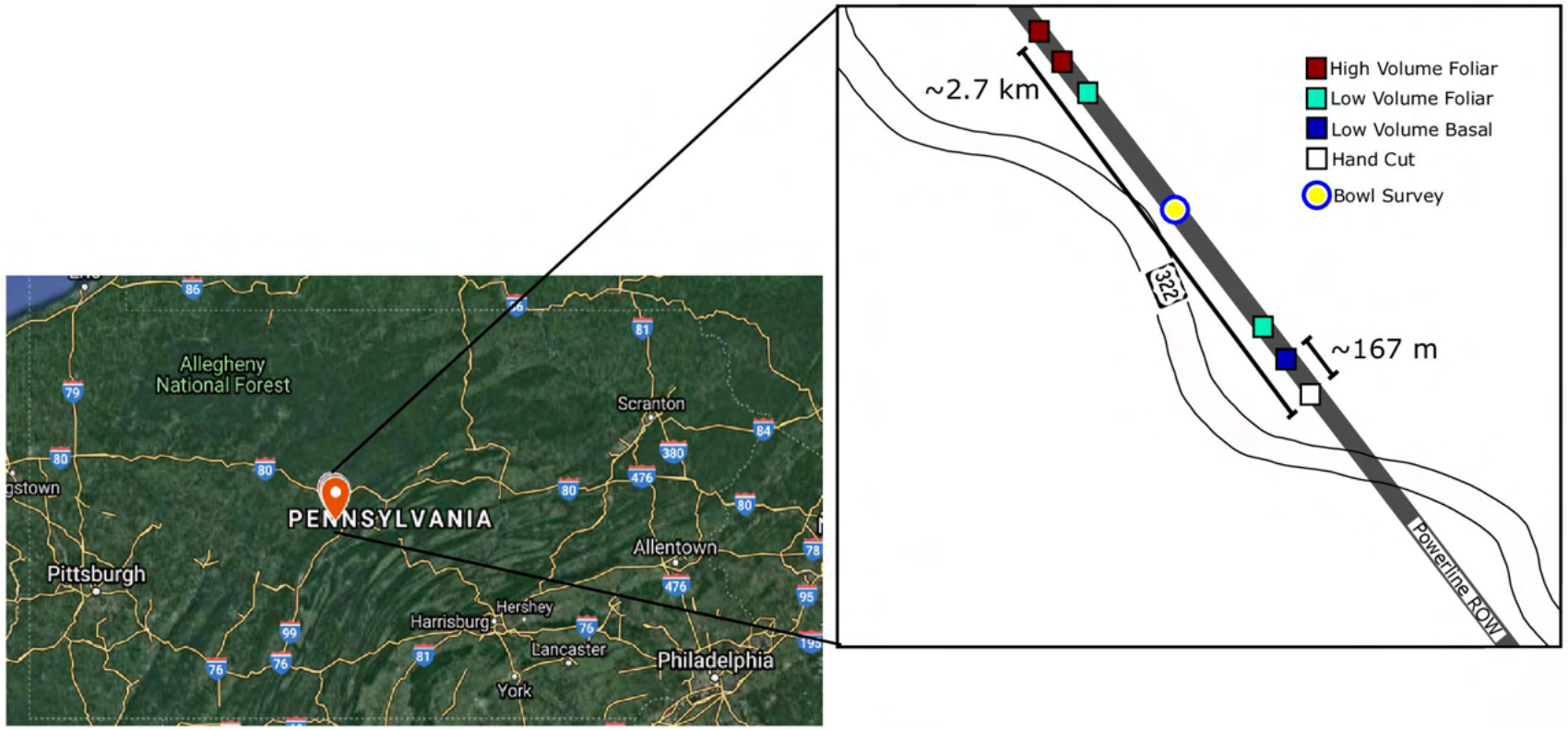
In cooperation with Asplundh (David Krause), First Energy (Shawn Standish) , PECO (Alexander Brown), Dow AgroSciences (Travis Rogers), PA Game Commission, Penn State

IDs from Sam Droege (USGS), Andy Dean (PSU)

sites.psu.edu/transmissionlineecology/

sites.psu.edu/rightsofway

Site location and sampling design



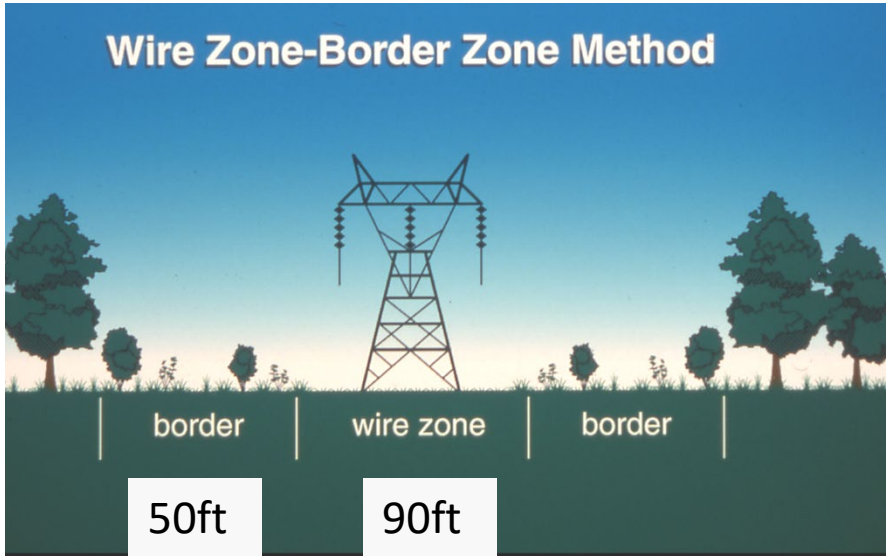
Integrated vegetation management—create stable, early successional plant community

This powerline ROW (SGL33) is a research area that has been studied continuously since 1953.

It started as a demonstration area because hunters were opposed to use of herbicides.

The intent was to show how selective use of herbicides does not cause damage to wildlife value of land (game and non-game).

Vegetation management scheme



Hand-cutting: no herbicide use

Combined mechanical and herbicidal treatments used by utilities:

- Low-volume foliar (LVF)
- High-volume foliar (HVF)
- Low volume basal (LVB)

Ha	Litres/Ha 2016	Application	Herbicides Used
1.14	249.66	High Volume Foliar	Aminopyralid, Imazapyr, Triclopyr, Picloram, Glyphosate
1.34	70.65	High Volume Foliar	Aminopyralid, Imazapyr, Triclopyr, Picloram, Glyphosate
0.81	2.32	Low Volume Foliar	Glyphosate, Imazapyr
0.81	9.31	Low Volume Foliar	Glyphosate, Imazapyr
1.12	9.74	Low Volume Basal	Aminopyralid, Imazapyr, Triclopyr
1.19	0	Hand Cut Only	NA

Other research

The ROW has been studied for wildlife intensively since 1987: birds, mammals, reptiles, amphibians, butterflies, and plants

Long-term study of the ROW as early successional habitat for breeding birds

Our objective was to extend this research to pollinating insects

Sampling pollinators

Sampling Effort

2,344 bee specimens

126 species

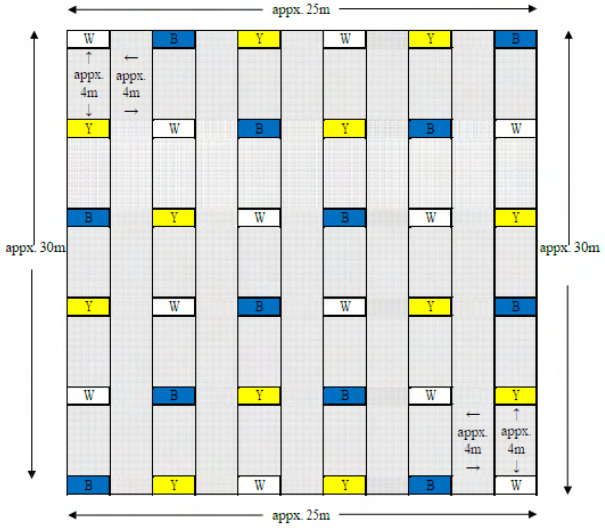
2 years

192 hours

744 non-bee specimens

179 morphospecies

1 year



36 bee specimens

19 species

1 sample

49 non-bee specimens

27 morphospecies

Russo et al 2021, *PLoS ONE*

Sampling bees

Sampling Effort

2,344 bee specimens

126 species

2 years

192 hours

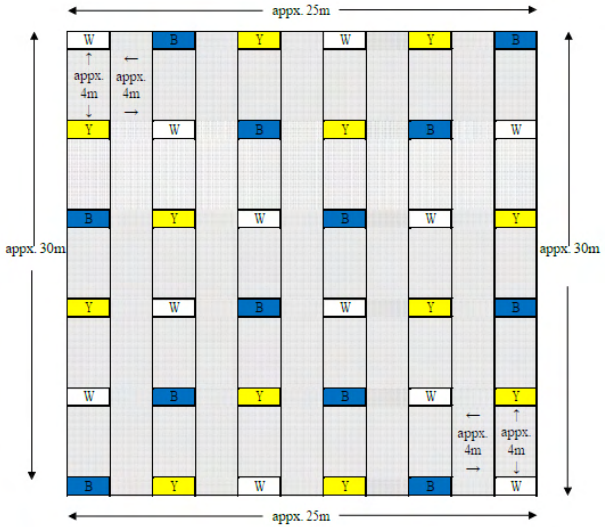
Bee Abundance

14.5%
Bombus impatiens

10.5%
Apis mellifera

7.6%
Ceratina dupla

All other bee species individually represented less than 5% of the sample.



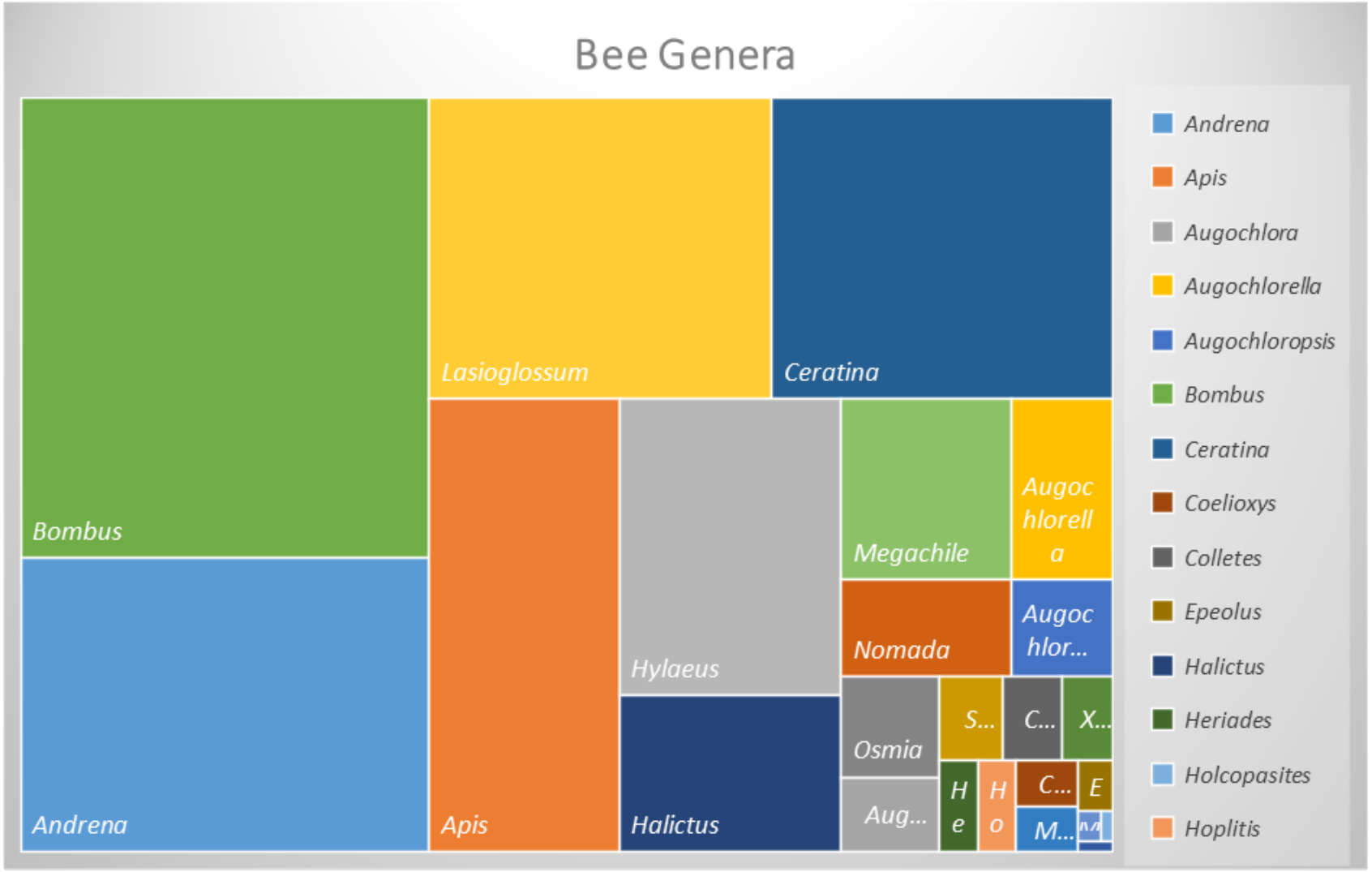
36 bee specimens

19 species

1 year

Russo et al 2021, *PLoS ONE*

Bee diversity



Bee Abundance

14.5%
Bombus impatiens

10.5%
Apis mellifera

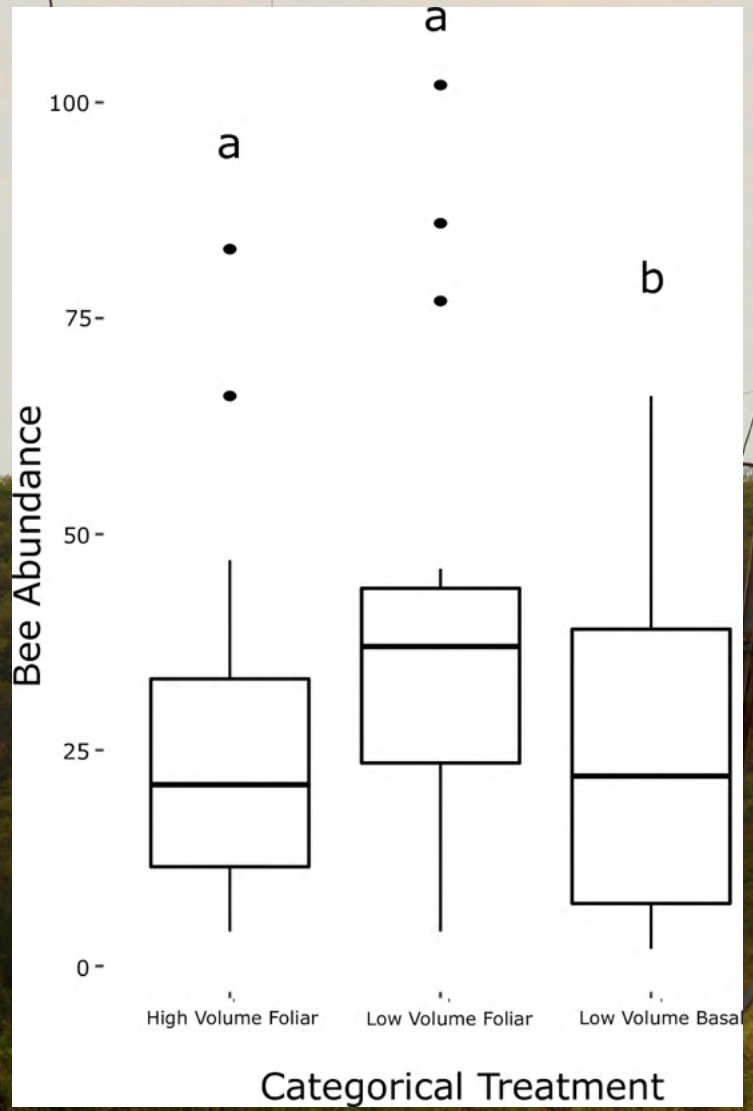
7.6%
Ceratina dupla

All other bee species individually represented less than 5% of the sample.

28.8% (126 of 437) of the bee species of Pennsylvania (Kilpatrick et al 2020)

Russo et al 2021, *PLoS ONE*

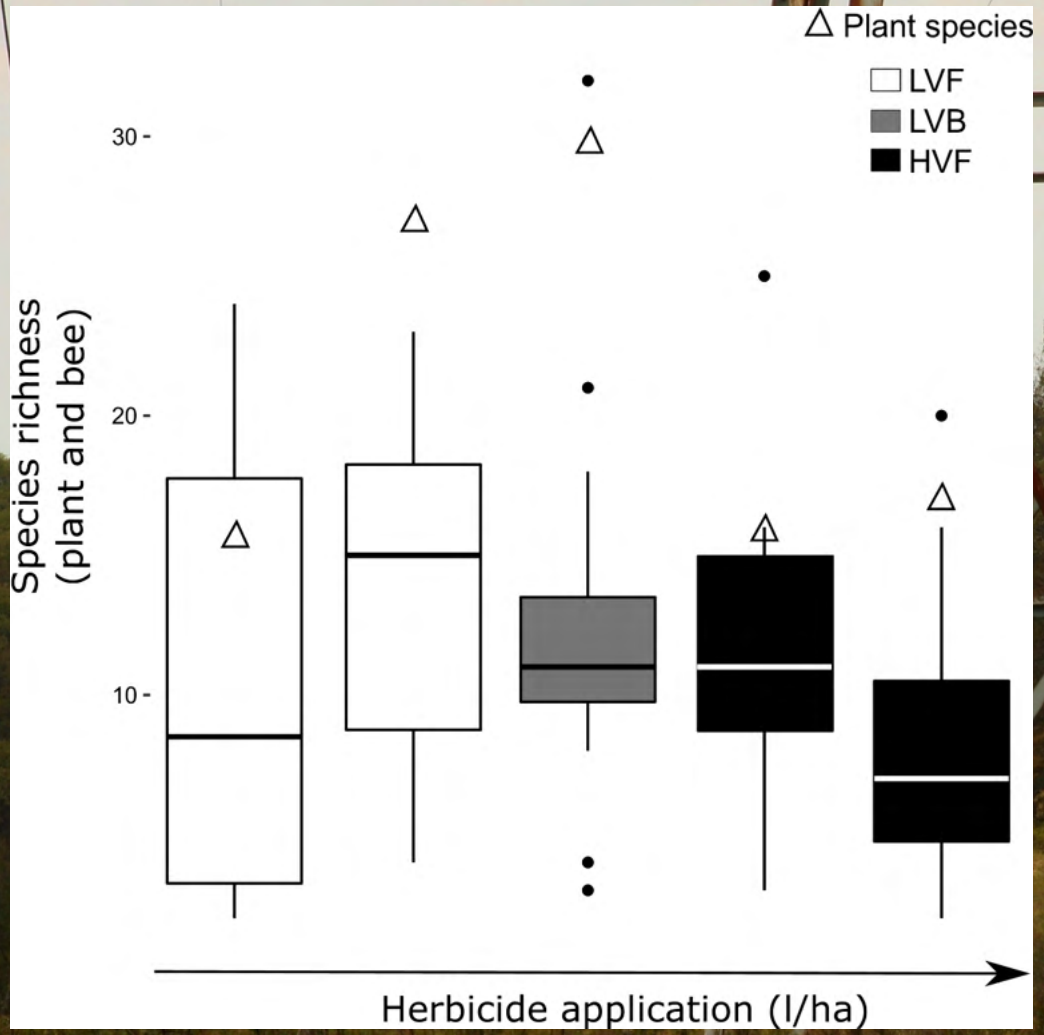
Effects of vegetation management on bee abundance



The **low volume basal herbicide** *(9.74 liters/ha Aminopyralid, Imazapyr, Triclopyr)* treatment had a significant **negative** effect on bee abundance in the plots.

Russo et al 2021, *PLoS ONE*

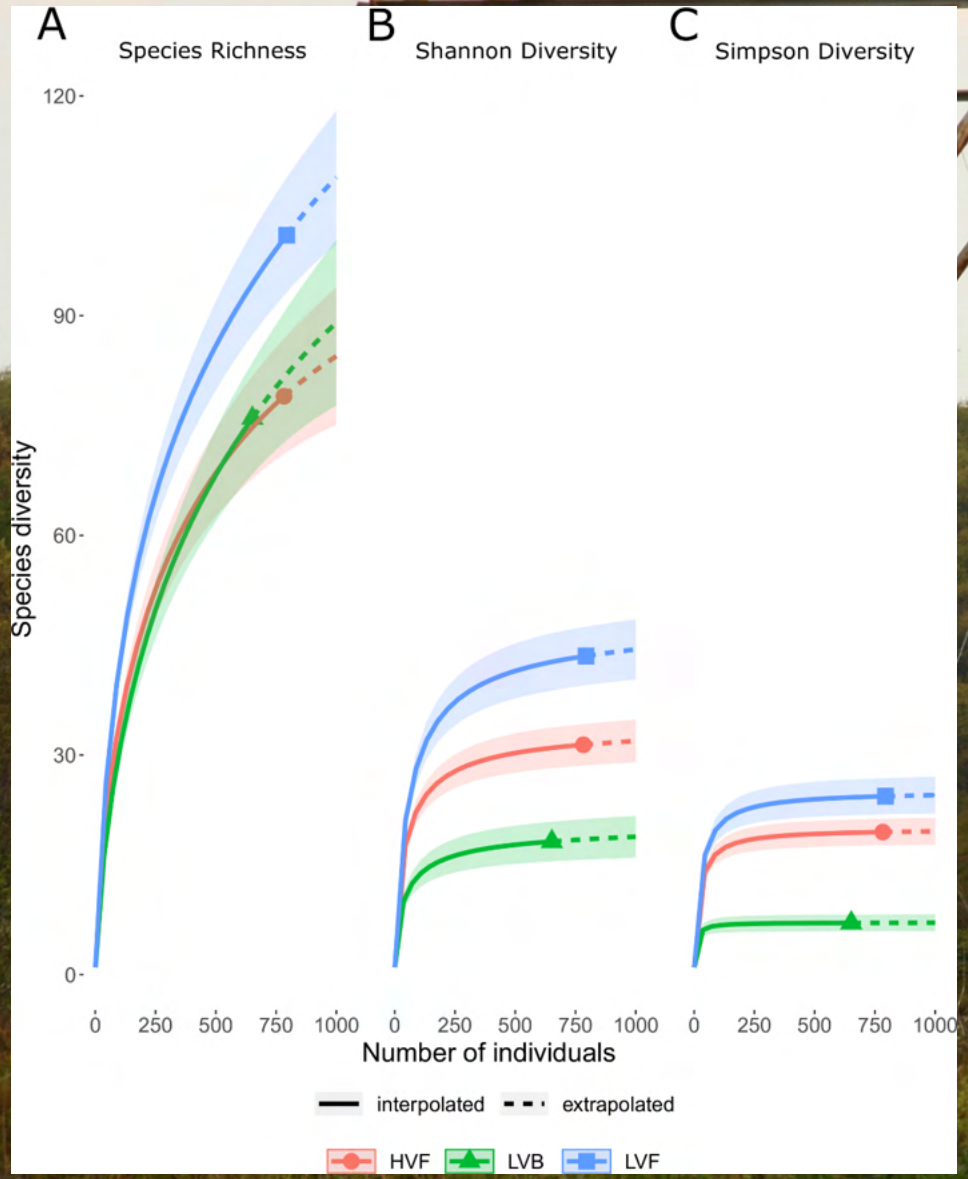
Effects of vegetation management on bee species richness



Increasing herbicide application (in l/ha) had a significant **negative** effect on bee species richness and plant species richness in the plots.

Russo et al 2021, *PLoS ONE*

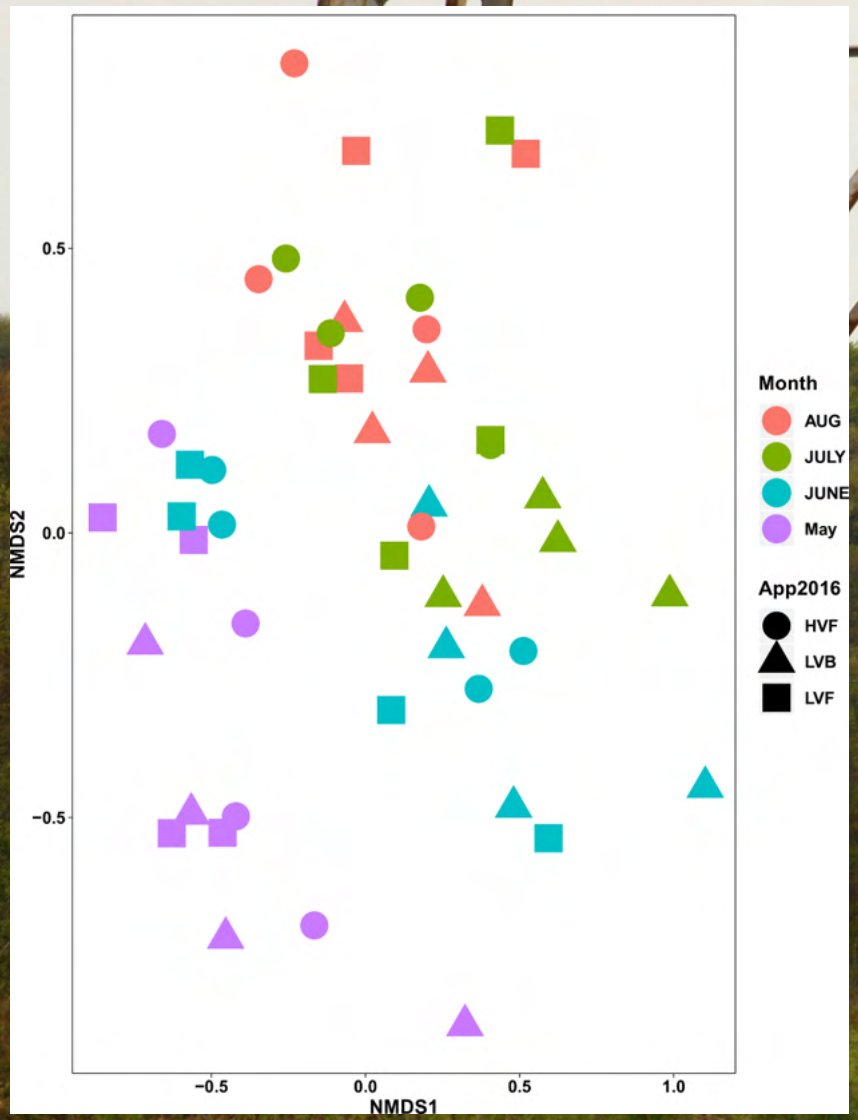
Effects of vegetation management on bee diversity



Low volume foliar applications tend to have the highest (and low volume basal the lowest) bee diversity metrics.

Russo et al 2021, *PLoS ONE*

Vegetation management and community composition



The month of the year has a bigger effect on bee community composition than the vegetation management.

Russo et al 2021, *PLoS ONE*

Challenges

1. The hand-cutting plot was nearly impossible to sample because of brambles

Challenges

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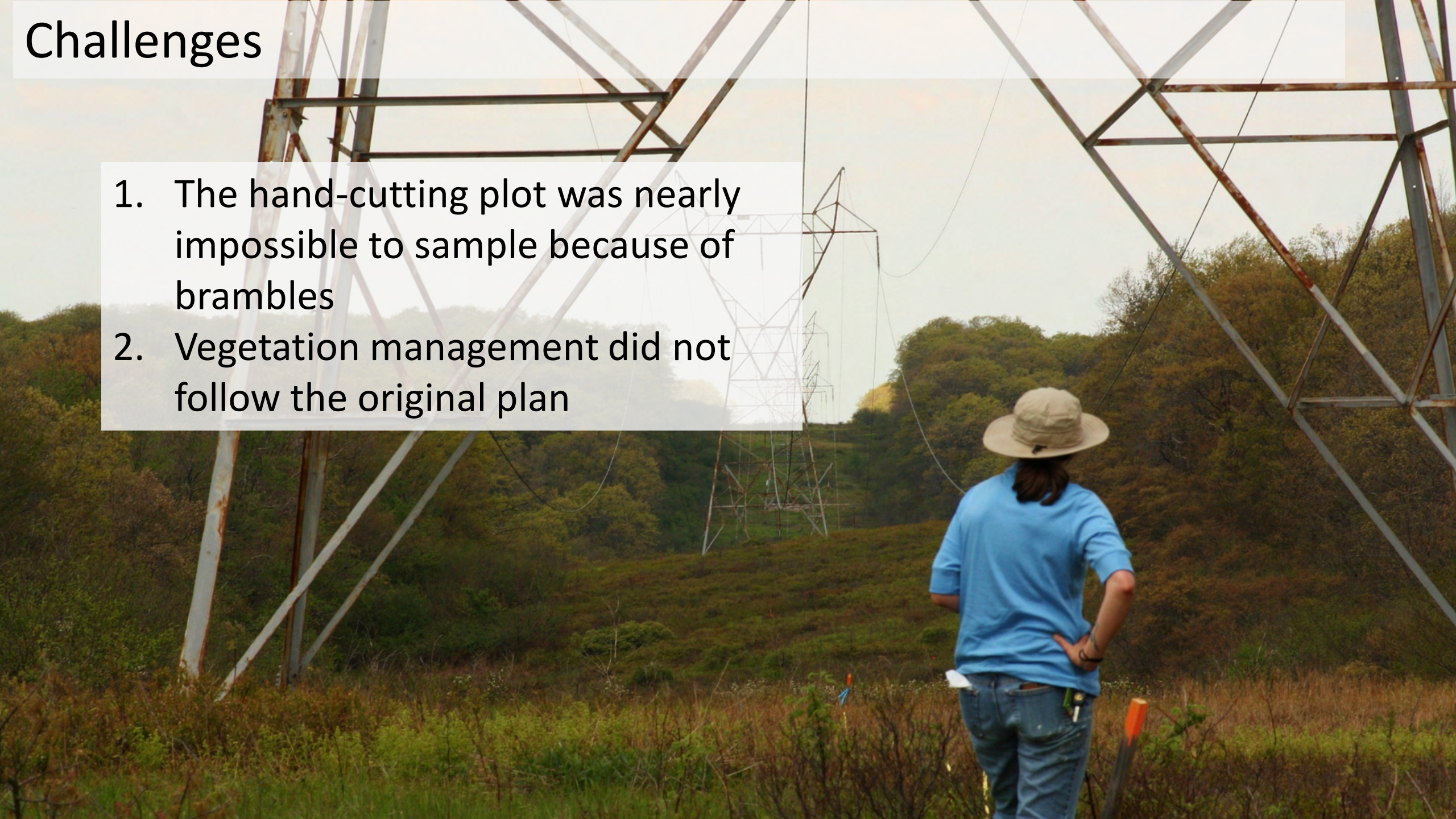
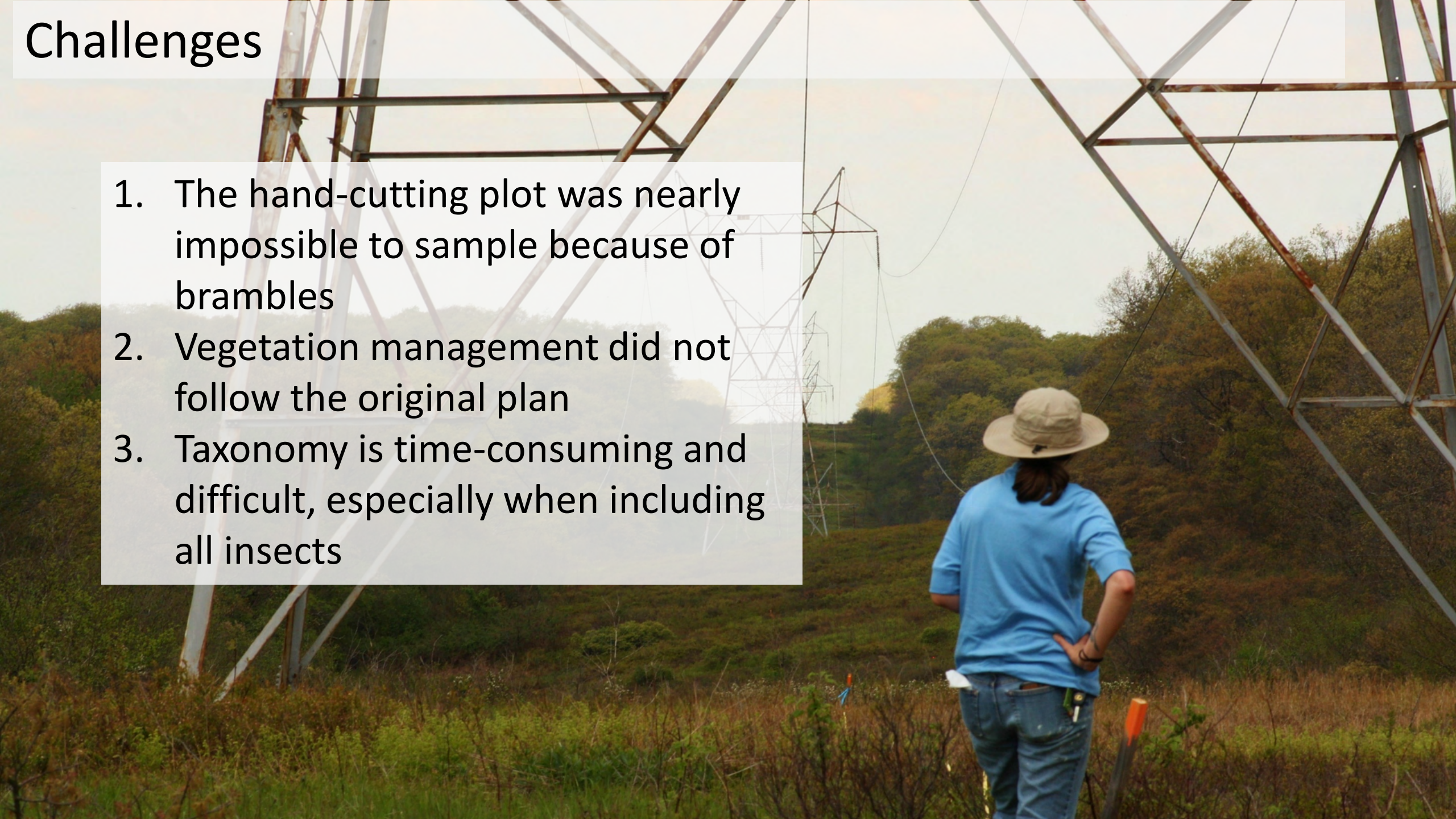
2. Vegetation management did not follow the original plan



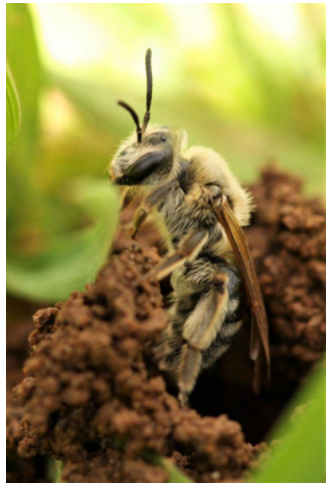
Challenges

1. The hand-cutting plot was nearly impossible to sample because of brambles
2. Vegetation management did not follow the original plan
3. Taxonomy is time-consuming and difficult, especially when including all insects



Take away messages

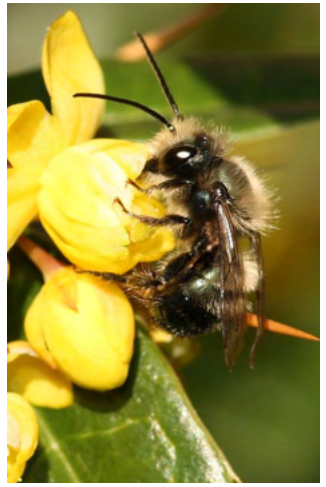
- No consistent negative effect of the herbicide on bee abundance
- Significant negative effect of increasing litres/ha herbicide application on bee species richness
- Negative correlation between plant species richness and herbicide application
- 126 bee species and 179 non-bee morphospecies; representatives of all 6 bee families of North America (2 new state records)









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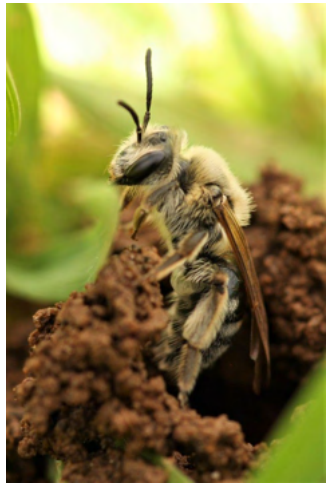







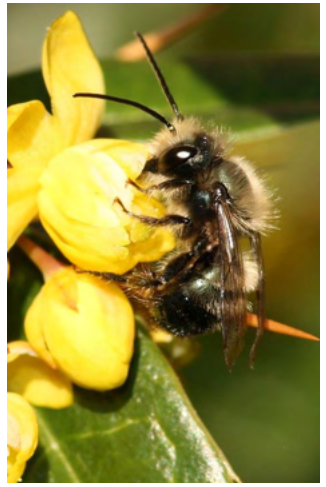


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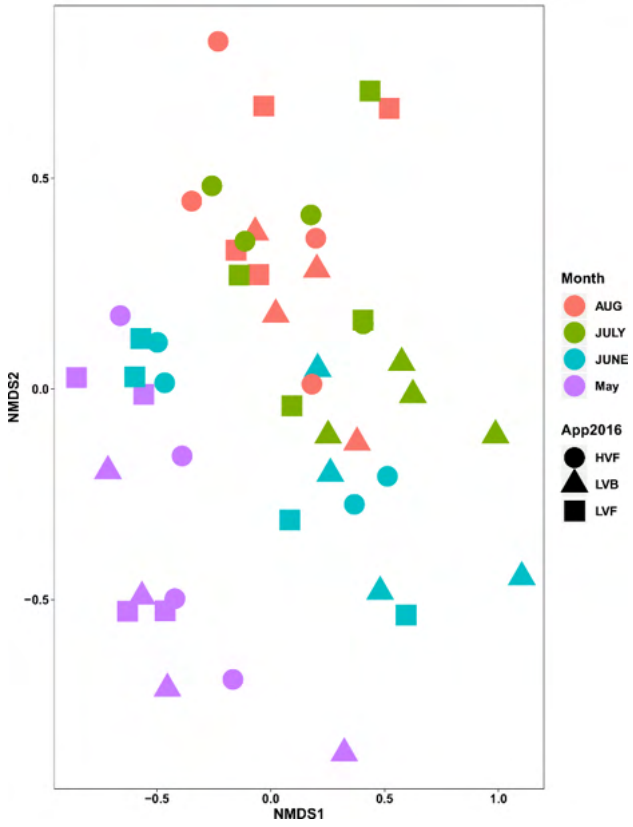
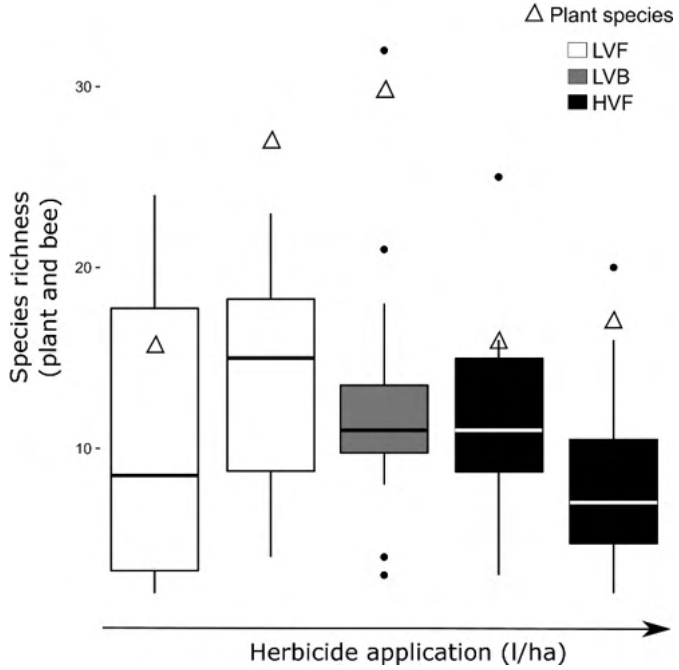
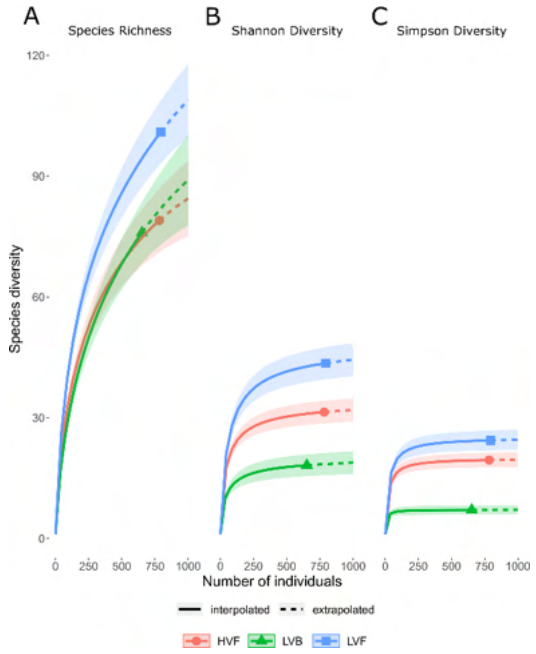
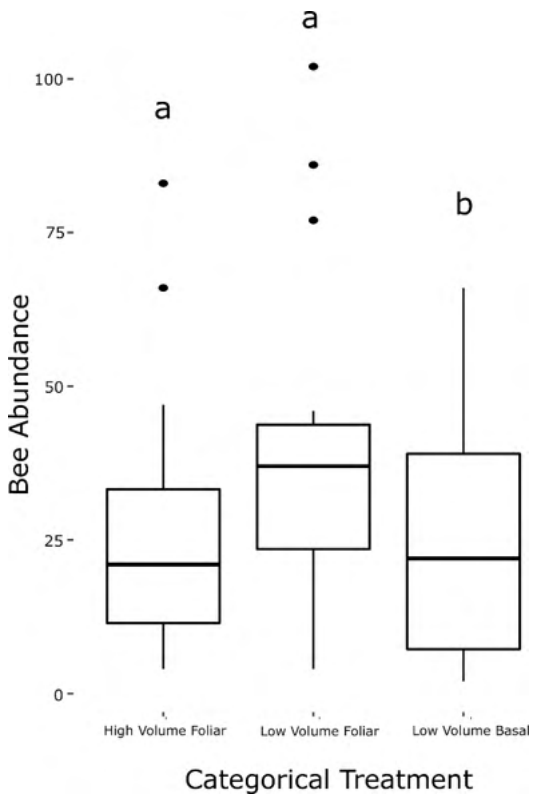
Questions


NMDS2
NMDS1
0.5
0.0
−0.5
−0.5
0.0
0.5
1.0
Month
AUG
JULY
JUNE
May
App2016
HVF
LVB
LVF


Plant species
LVF
LVB
HVF
Species richness (plant and bee)
30
20
10
Herbicide application (l/ha)


A
Species Richness
B
Shannon Diversity
C
Simpson Diversity
Species diversity
120
90
60
30
0
0
250
500
750
1000
Number of individuals
interpolated
extrapolated
HVF
LVB
LVF


a
a
b
Bee Abundance
100
75
50
25
0
High Volume Foliar
Low Volume Foliar
Low Volume Basal
Categorical Treatment

Treatment (Size, 3 replicates)	Description
Hand-cutting	Individually cutting of target (non-compatible) woody vegetation usually with chainsaw; no herbicide application
Mowing	Mechanical mowing cuts and mulches vegetation; no herbicide application
Mowing + Herbicide (Cut Stubble)	Mowing followed by dilute, selective broad-leaf herbicide applied to woody stems and soil
Stem Foliar (Ultra Low Volume)	Selective, Thinvert application (oil-based) of broad-leaf herbicide using nozzle application
High Volume Foliar	Broadcast application of dilute, selective, broad-leaf herbicide using hydraulic equip.
Low Volume Basal Bark	Herbicides applied selectively to individual target woody vegetation up to 6 inches in diameter; oil-based herbicide and carrier

The Nutrition of Roadside Plants for Pollinators and Implications for Managing Roadside Habitat

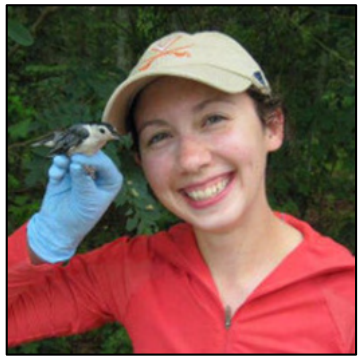
Dr. Emilie Snell-Rood

Roadside habitat for pollinators:
a great opportunity or salty death traps?

Emilie Snell-Rood

Ecology, Evolution & Behavior, University of Minnesota

Tim Mitchell



Megan Kobiela

Alex Shephard

Lauren Agnew

Marla Spivak

Karen Oberhauser

Elizabeth Borer

Clay Carter

Dan Cariveau

Alison Cariveau


ENVIRONMENT
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A. Cariveau… Snell-Rood 2019 Frontiers Ecology & Evolution

Not Bombus affinis just has a truck in the background!*


WELLS


Zn, Ni, Cd


FOR USE AS A
MOTOR FUEL ONLY
CONTAINS
LEAD

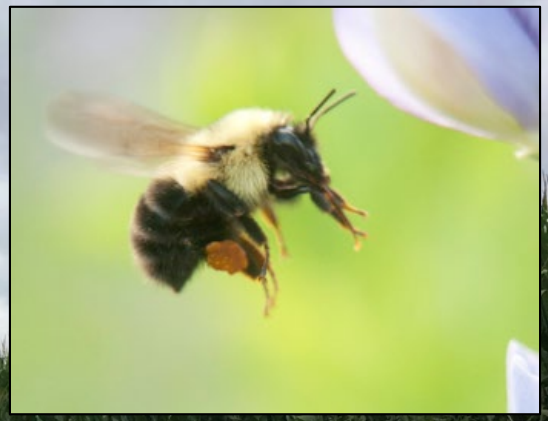
Potential of roadside habitat: toxic or trap?

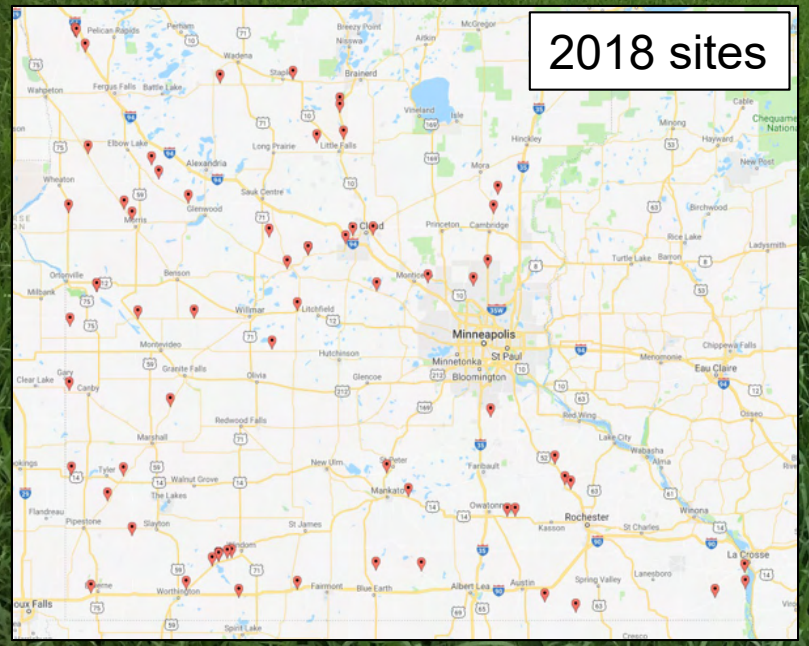
- How are toxins moving to monarch & bee plants?
- When do things start to get toxic?

Potential of roadside habitat: toxic or trap?

- How are toxins moving to monarch & bee plants?
  - How much do road traits matter?
  - How much do landscape traits matter?
- When do things start to get toxic?

Roadside surveys

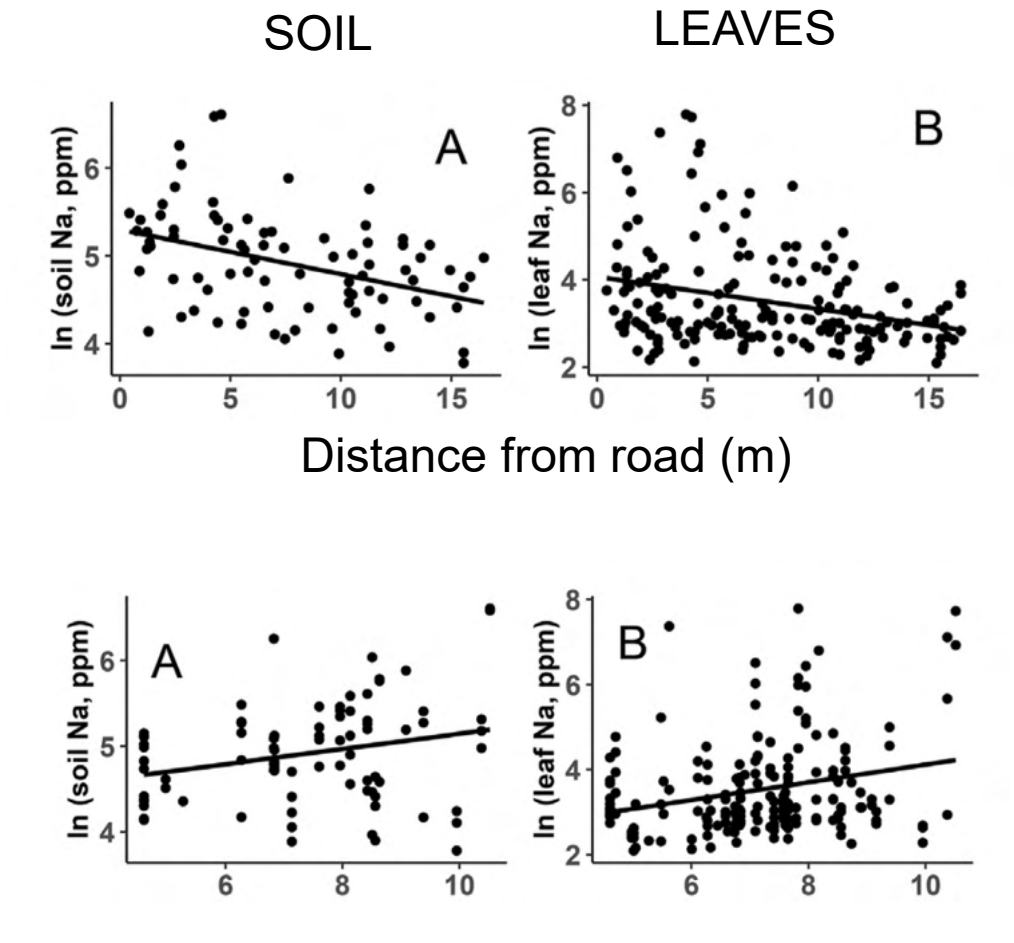




Field manipulations

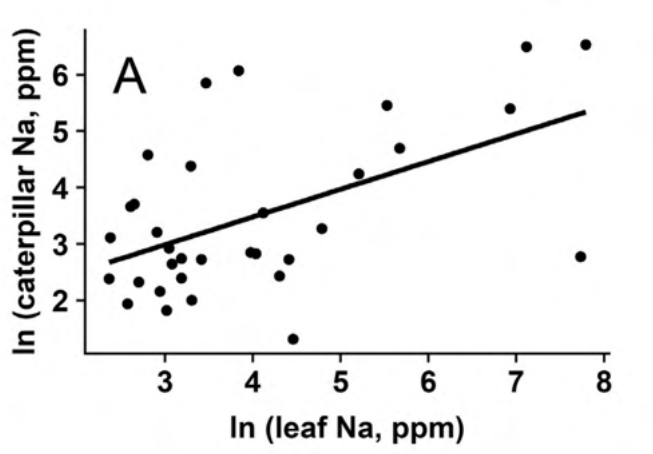
Greenhouse manipulations

Sodium moves from road to soil to milkweeds…



Mitchell et al. 2020 Sci Tot Env

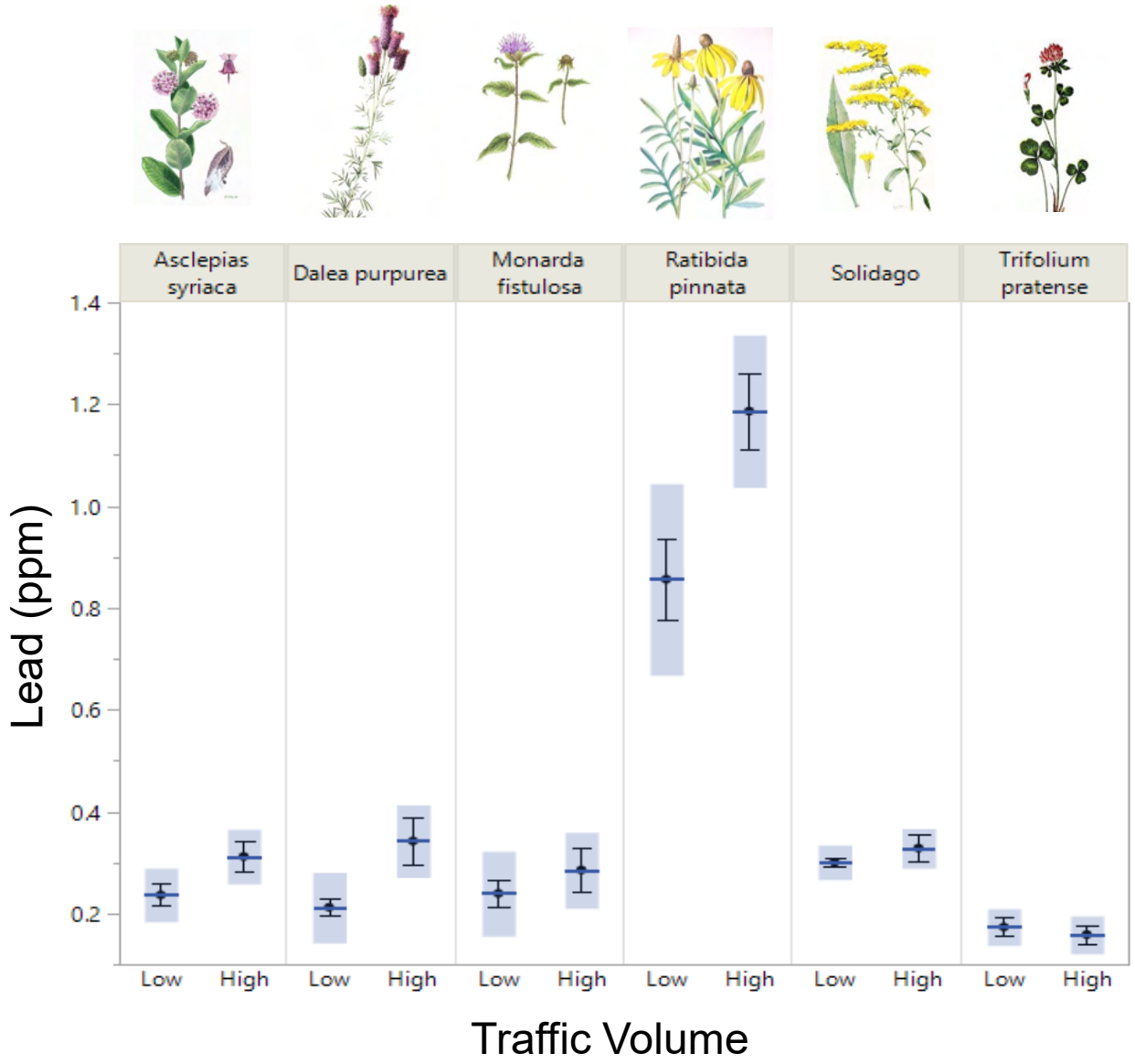
Sodium moves from milkweeds to caterpillars…



Similar patterns for metals like Zinc

Mitchell et al. 2020 Sci Tot Env

What about other species used by pollinators?



Traffic signature for lots of metals

(and distance from road as well, although traffic seems to be more important)

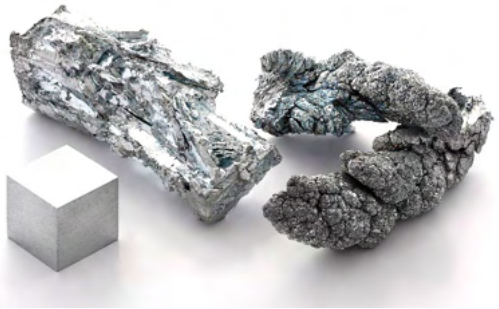
Lead

Iron

Copper

Chromium

Nickel

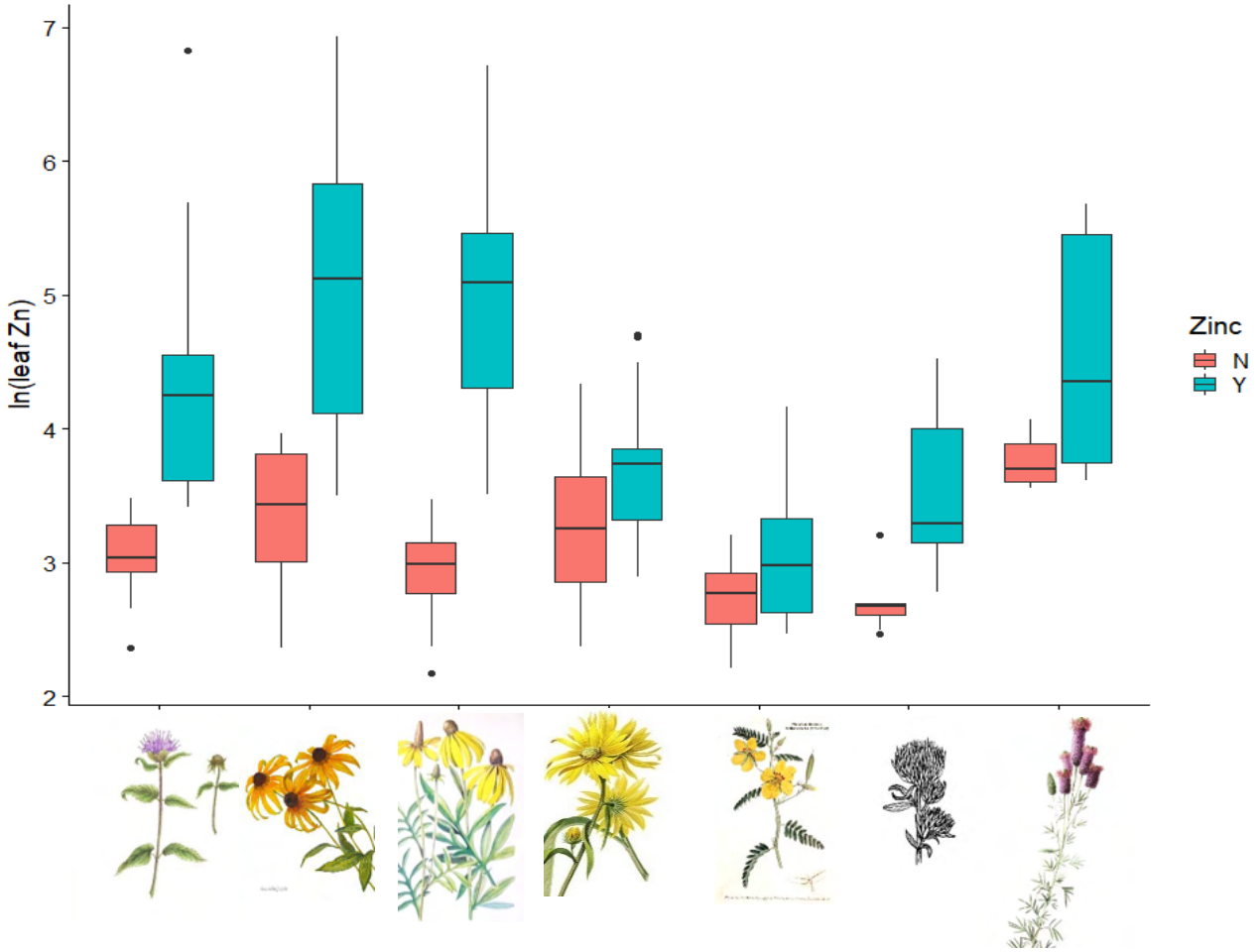


Zinc

Shephard et al. in review

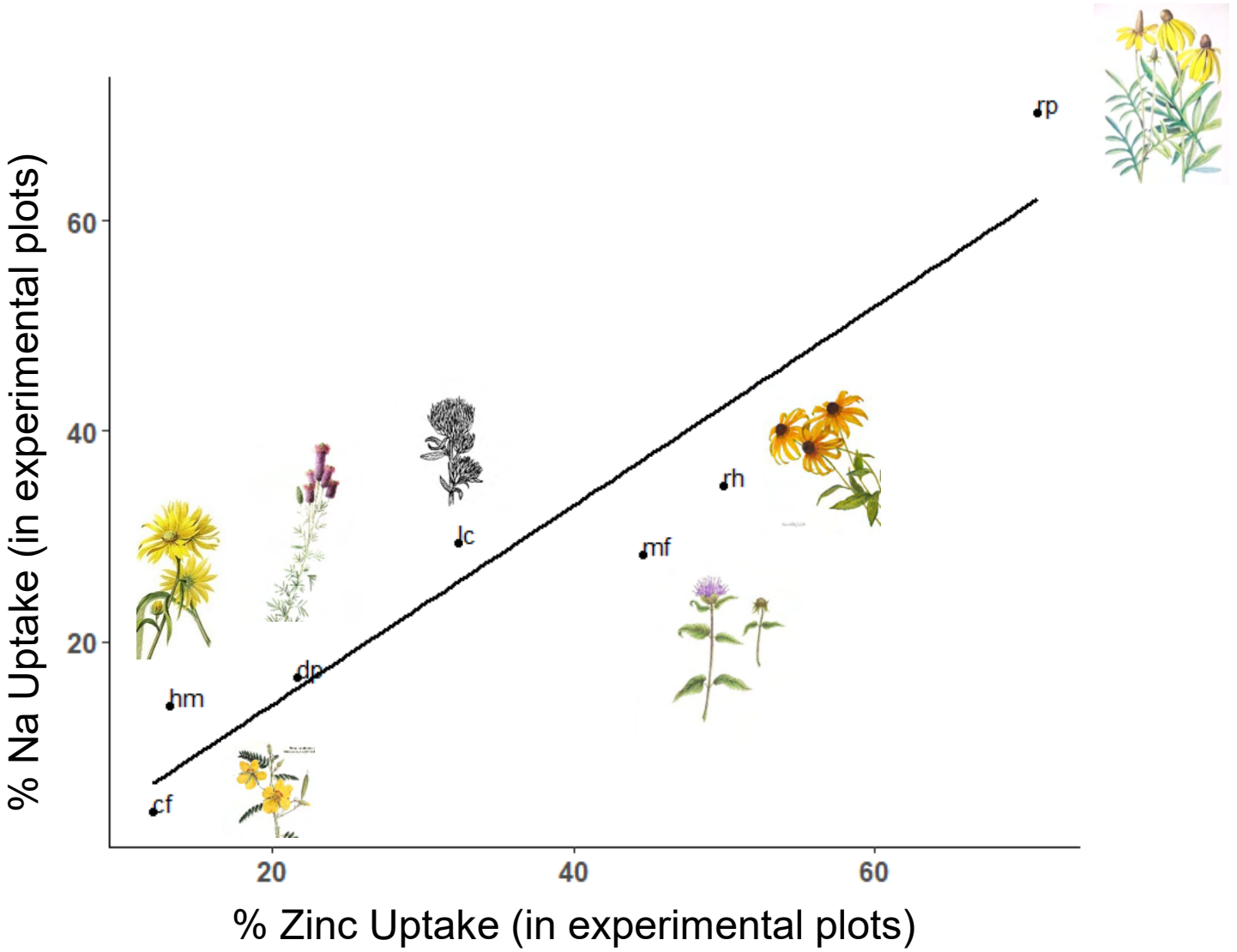
Is this plant uptake of salts & metals?

At least somewhat (although dust will be eaten by a caterpillar too)



Mitchell, Borer and Snell-Rood in prep

Plant species matter too…



Mitchell, Borer and Snell-Rood in prep

Potential of roadside habitat: toxic or trap?

- How are toxins moving to monarch & bee plants?
  - How much do road traits matter? *a fair amount*
  - How much do landscape traits matter?
- When do things start to get toxic?

Railroad

No negative effect of adjacent RR
(e.g., on plant metal content)

Shephard et al. in review

Agriculture

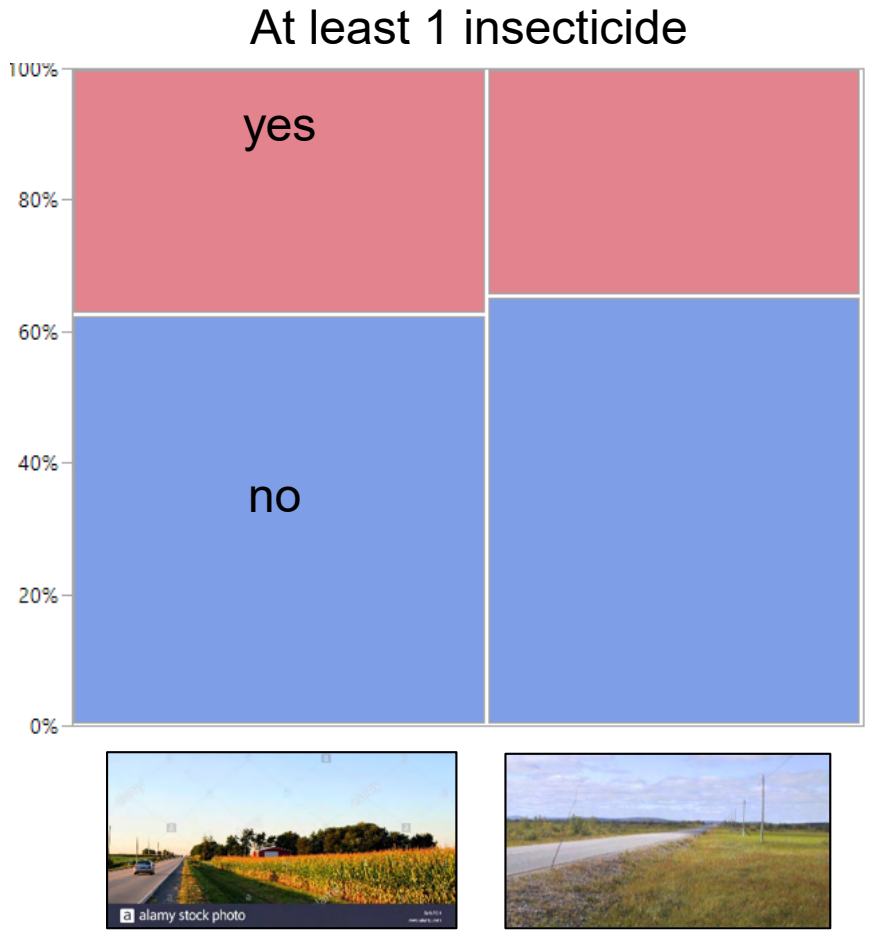
Pesticides?

compound	2017 total samples	2018 total samples	action
Azoxystrobin	5	15	fungicide
Boscalid	2	4	fungicide
Carbendazim		1	fungicide
Chlorothalo			ide
Difenocona			ide
Fluopyram			ide
Metconazole		1	fungicide
Propiconazole	2	6	fungicide
Pyraclostrobin	4	4	fungicide
Pyrimethanil		1	fungicide
Tetraconazole	3	3	fungicide
Thymol		1	fungicide
Trifloxystrobin	4	4	fungicide
Atrazine		7	herbicide
Bensulide	1		herbicide
Bifenthrin	1		insecticide
Chlorantraniliprole		1	insecticide
Chlorpyrifos	4	14	insecticide
cyhalothrin lambda		2	insecticide
Dimethoate	1		insecticide
Esfenvalerate		1	insecticide
Novaluron		1	insecticide

69% of milkweed samples have at least 1 detected residue
(36% contain an insecticide)

Kobiela et al. in prep

Insecticides not predicted by adjacent crops



$X^2 = 0.06$, $P = 0.81$

Analyses pending on distance to nearest crop…

Kobiela et al. in prep

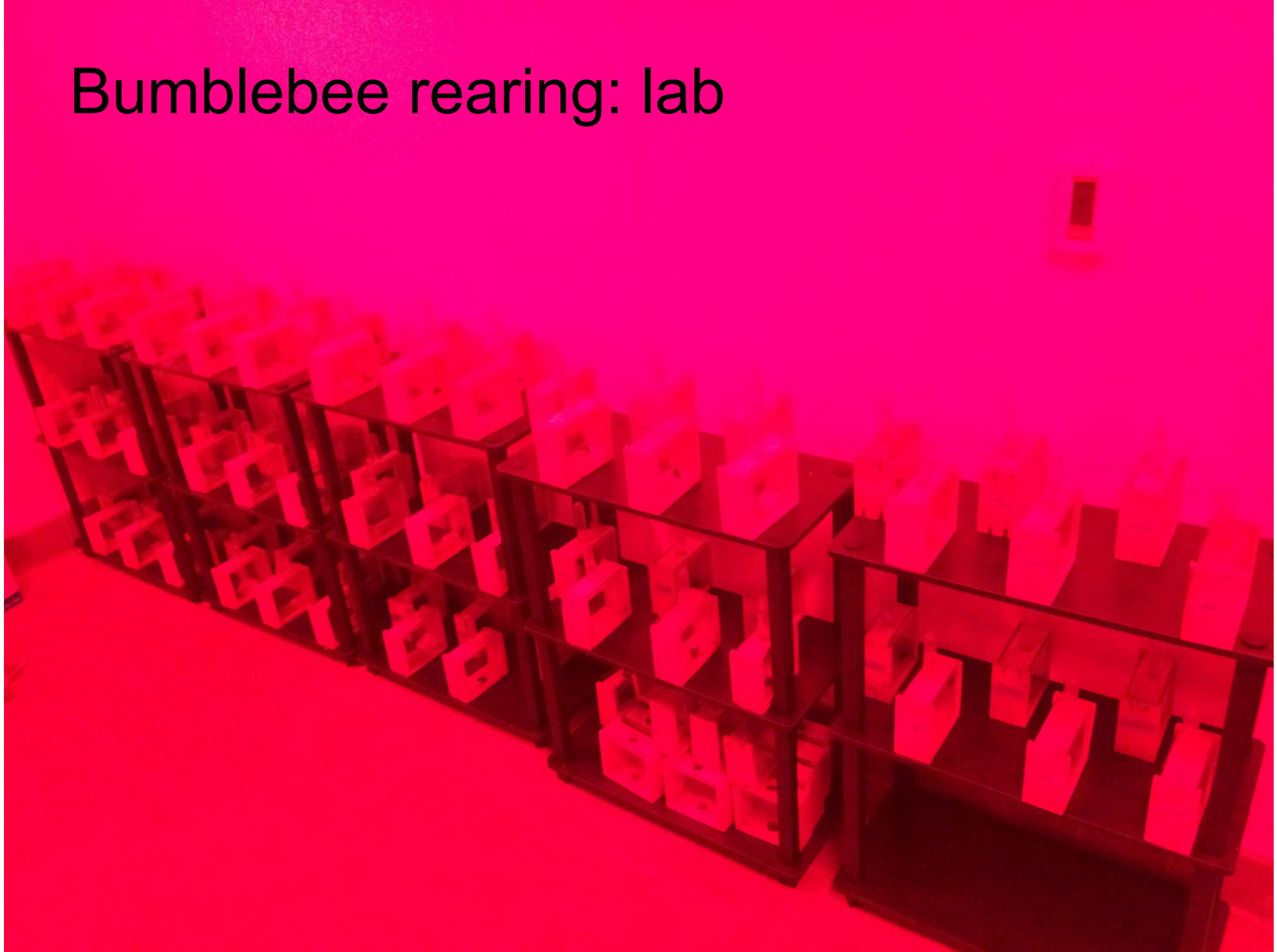
Potential of roadside habitat: toxic or trap?

- How are toxins moving to monarch & bee plants?
  - How much do road traits matter? *a fair amount*
  - How much do landscape traits matter? *not as much*
- When do things start to get toxic?

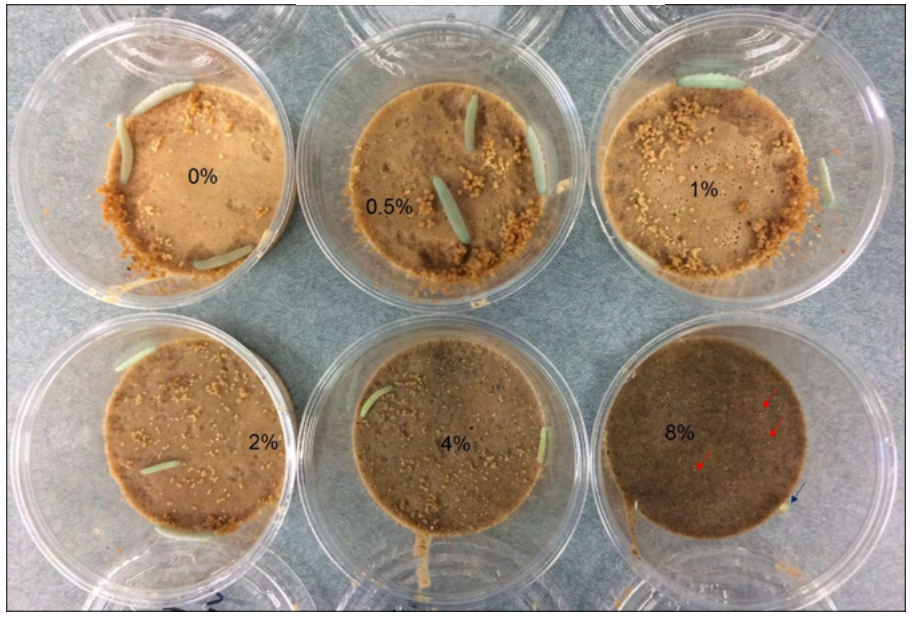
Potential of roadside habitat: toxic or trap?

- How are toxins moving to monarch & bee plants?
  - How much do road traits matter? *a fair amount*
  - How much do landscape traits matter? *not as much*
- When do things start to get toxic?
  - How toxic are the metal levels?
  - How toxic are the insecticides?
  - How toxic are the sodium levels?

Bumblebee rearing: lab



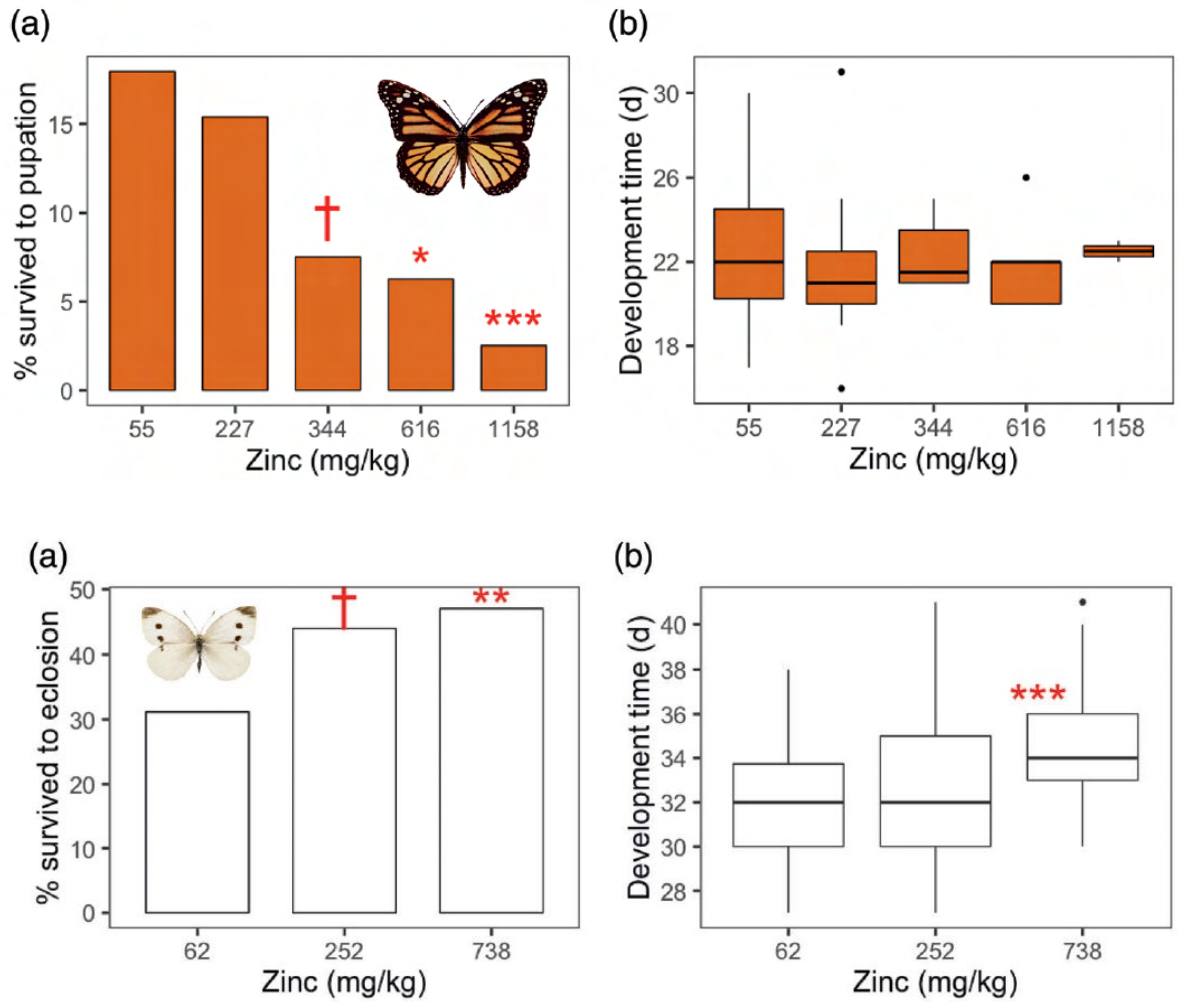
Butterfly rearing: lab and field

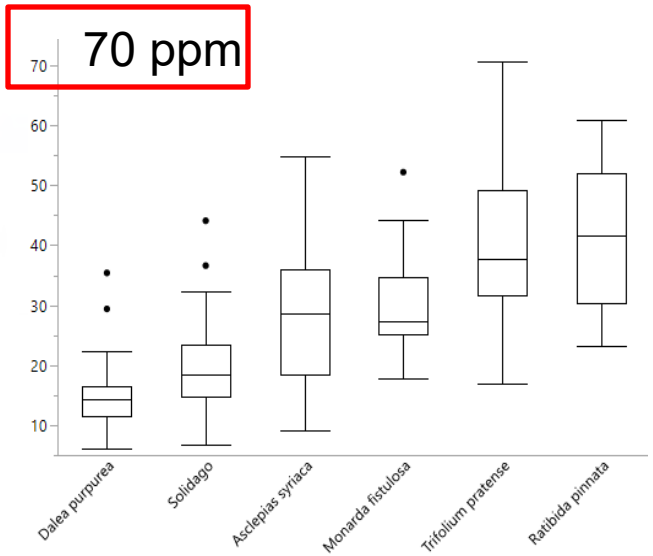


***Just** presenting butterfly work today…*

Zinc toxicity varies with species

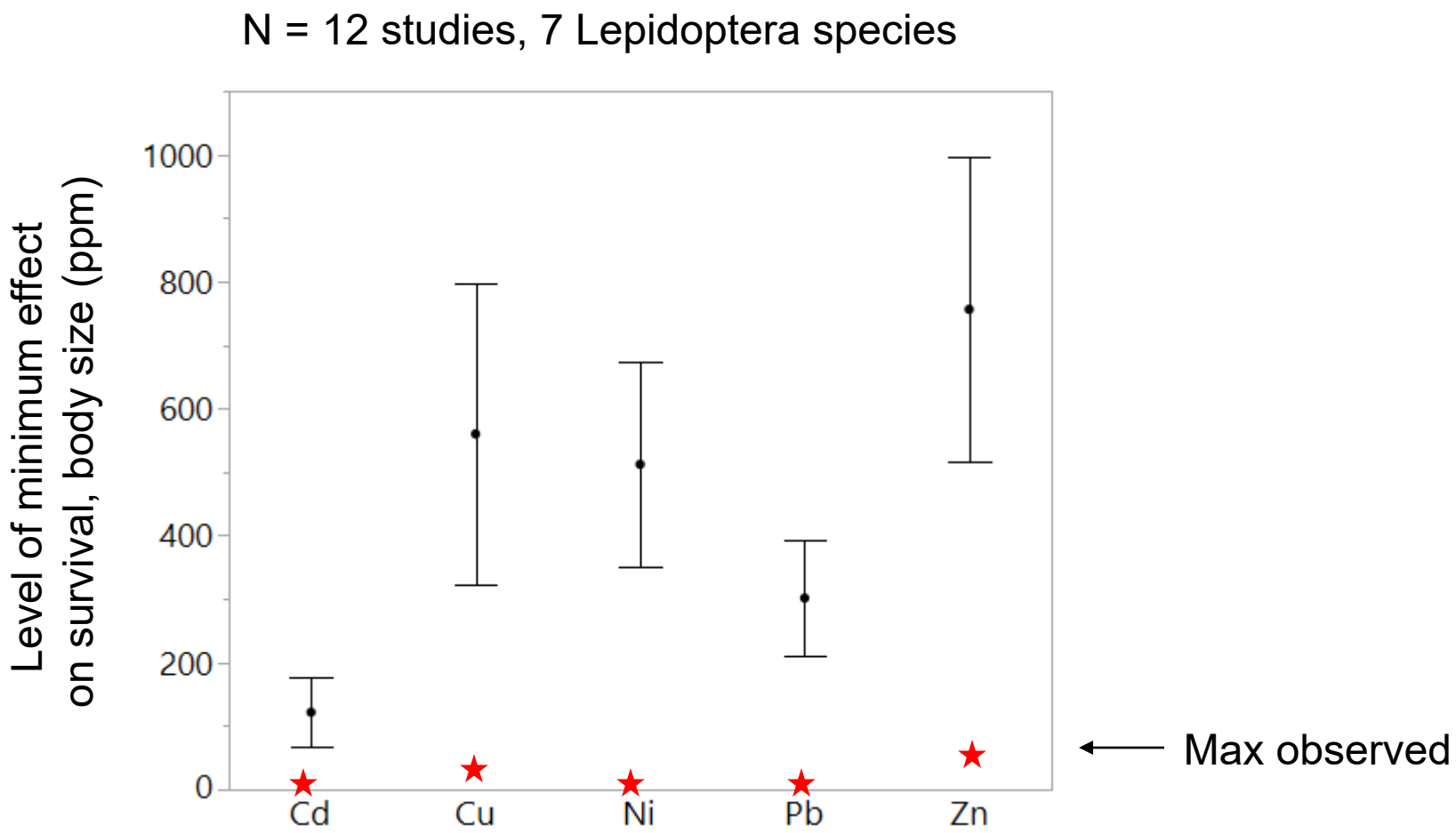
But zinc toxicity generally much lower than zinc levels seen in the field





Shephard et al. 2020 Ins Cons and Diversity

Overall, levels are below toxicity



Potential of roadside habitat: toxic or trap?

- How are toxins moving to monarch & bee plants?
  - How much do road traits matter? *a fair amount*
  - How much do landscape traits matter? *not as much*
- When do things start to get toxic?
  - How toxic are the metal levels? *not much*
  - How toxic are the insecticides?
  - How toxic are the sodium levels?

Our most common insecticide: *chlorpyrifos*

Ann. appl. Biol. (1997), **131**:197–212
Printed in Great Britain

Susceptibility of the summer fruit tortrix moth, *Adoxophyes orana* (Lepidoptera: Tortricidae), to chlorpyrifos and strategies for insecticidal control in orchards

By J V CROSS

Horticulture Research International, East Malling, West Malling, Kent ME19 6BJ, UK

(Accepted 12 August 1997)

these toxicity estimates
+ estimates of mass consumed

5-10% of roadside milkweeds have residues that would kill a monarch

Trump Administration Refuses to Ban Neurotoxic Pesticide

EPA Science Says Chlorpyrifos Exposure Threatens Public Health

Cara Schulte
Senior Associate, Environment and Human Rights
@CE_Schulte

Potential of roadside habitat: toxic or trap?

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- When do things start to get toxic?
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  - How toxic are the insecticides? *a fair amount*
  - How toxic are the sodium levels?

♀

♂

Low traffic roads

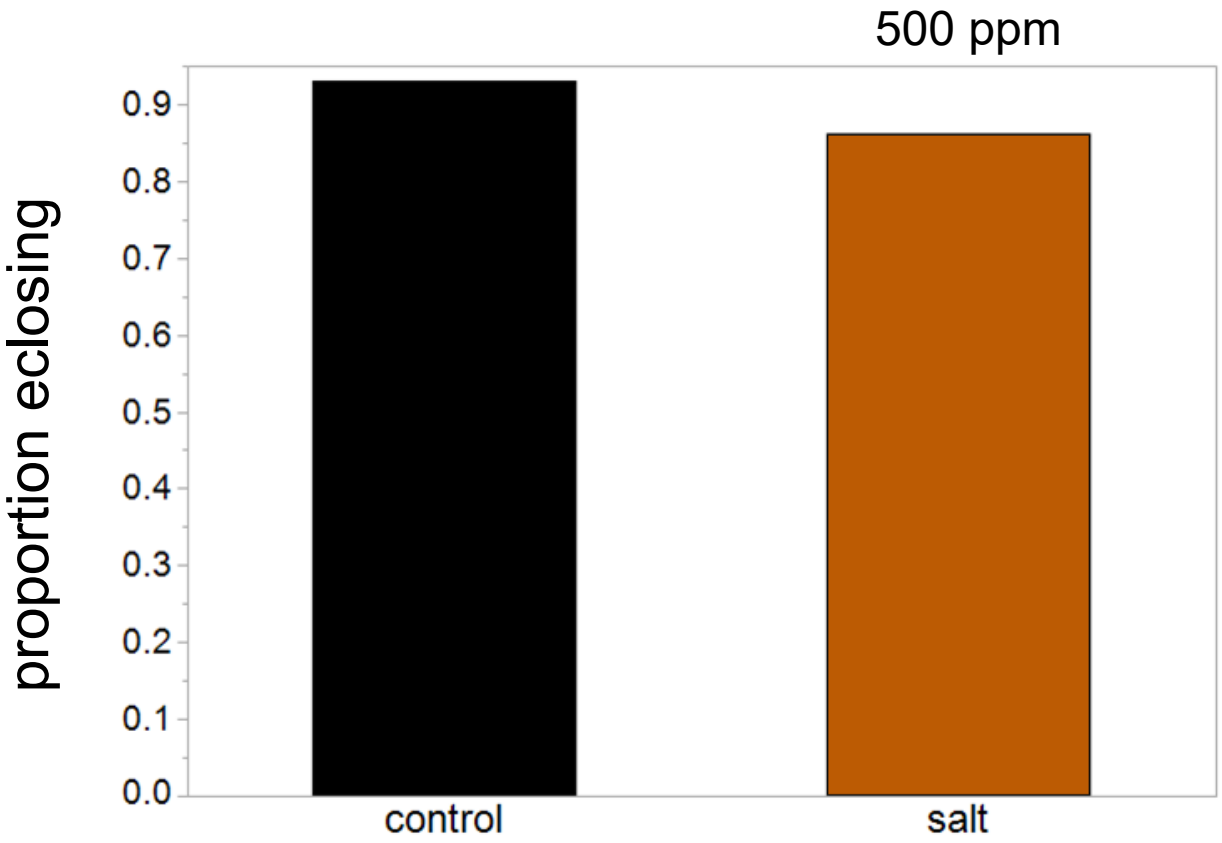
Lots

High traffic roads

Snell-Rood et al. 2014

Additional lab studies

To isolate the effects of [Na]



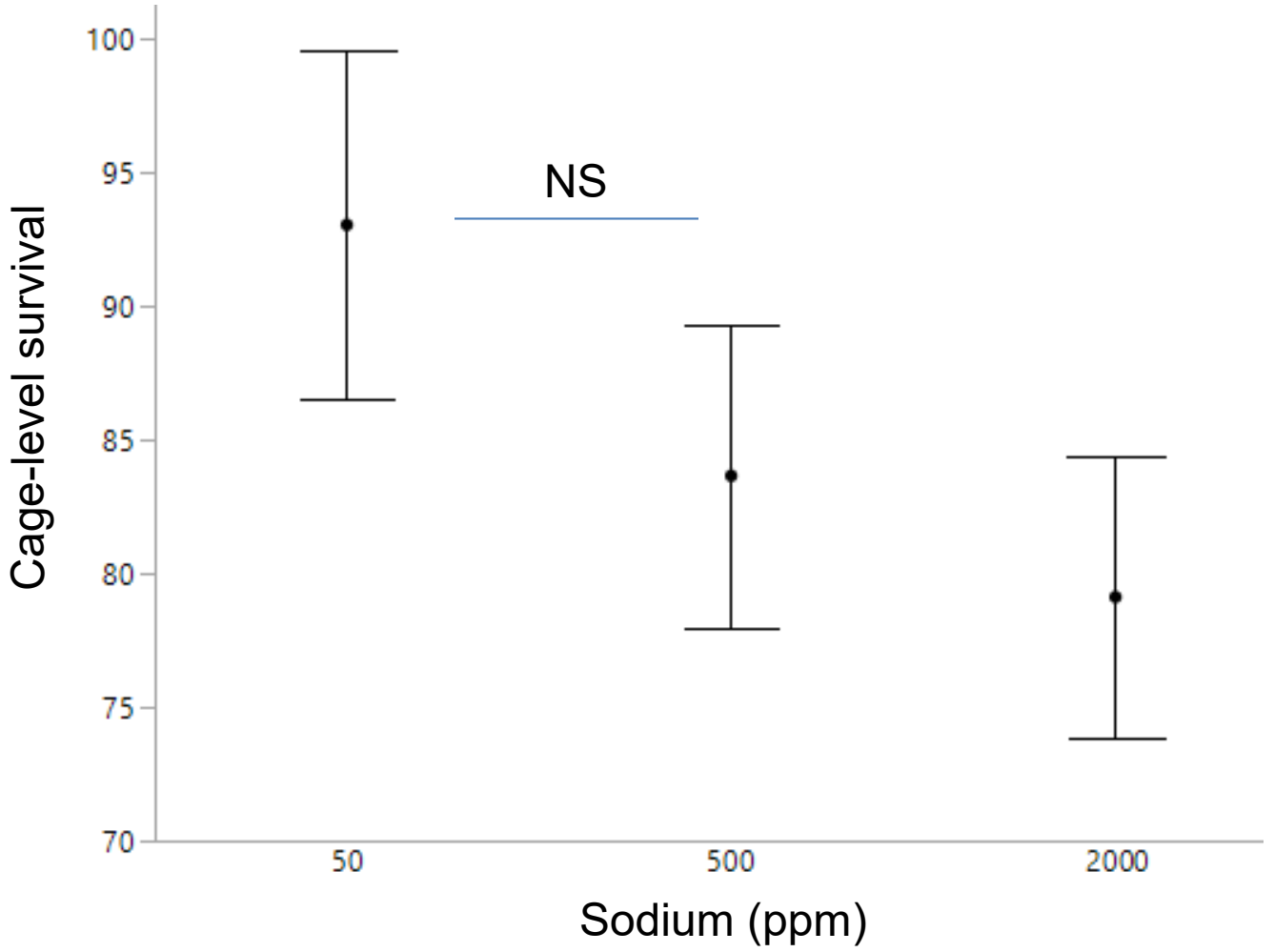
Kobiela et al in prep

n = 629, p = 0.005

How does this translate into performance in the wild?


MIGLOG.ORG
AACN 255

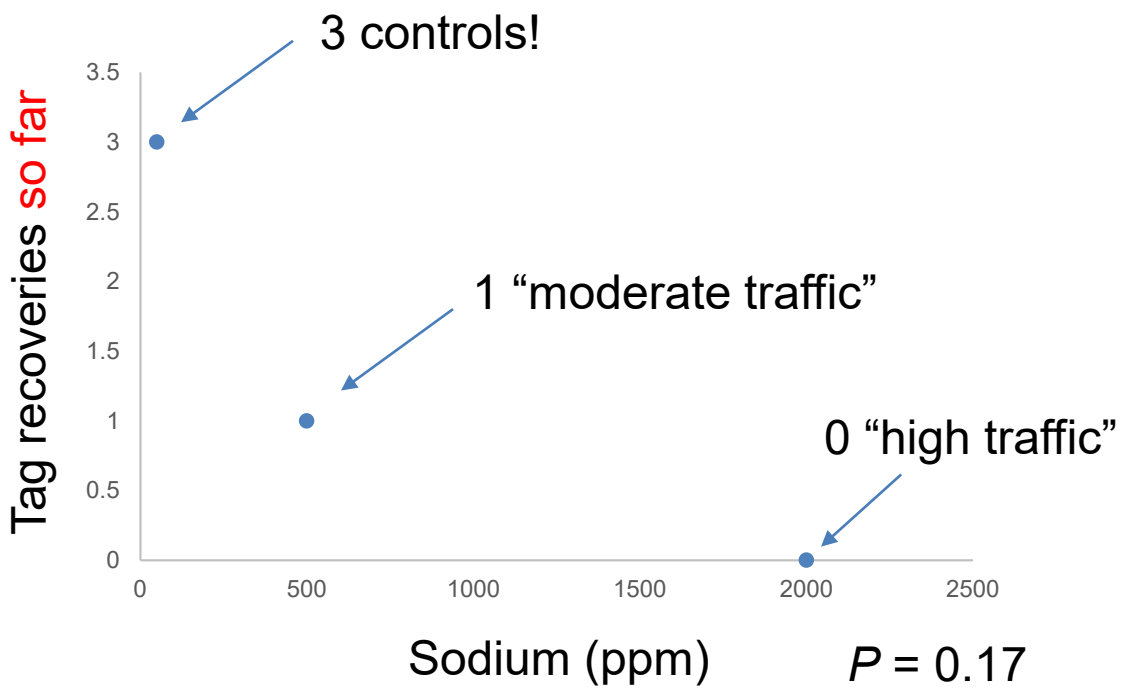
Lab and field results parallel



Reductions in field survival almost exactly parallel lab results (16 vs 18%)

Who makes it to Mexico?

recovered 12/26/19



Potential of roadside habitat: toxic or trap?

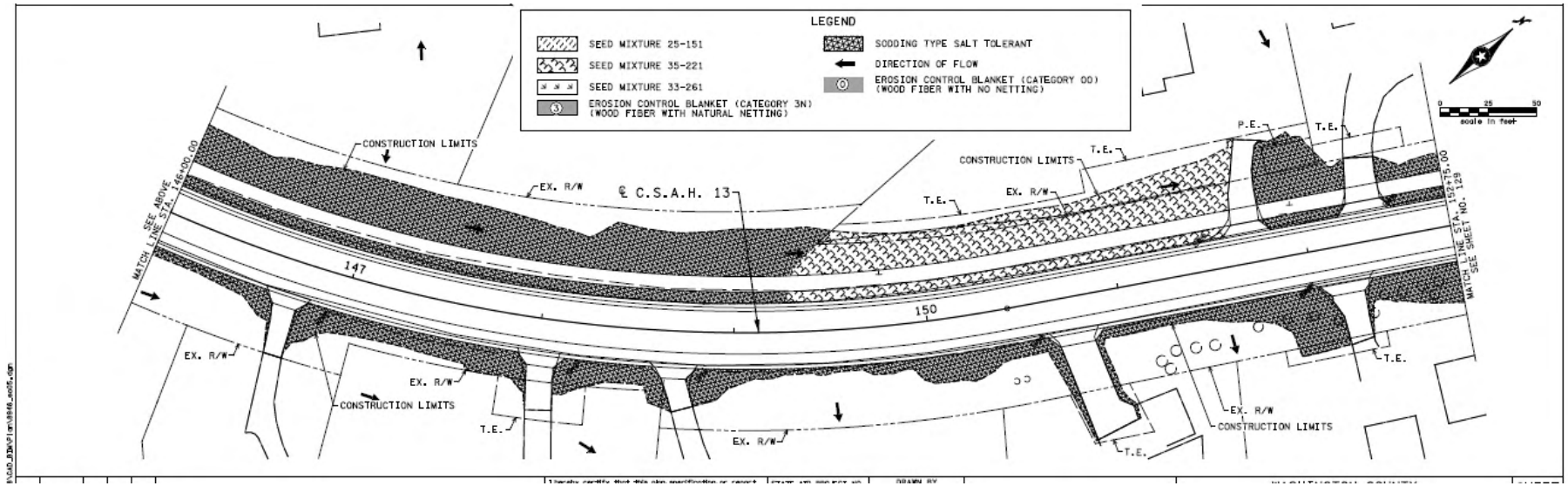
- How are toxins moving to monarch & bee plants?
  - How much do road traits matter? *a fair amount*
  - How much do landscape traits matter? *not as much*
- When do things start to get toxic?
  - How toxic are the metal levels? *not much*
  - How toxic are the insecticides? *a fair amount*
  - How toxic are the sodium levels? *the majority are ok*

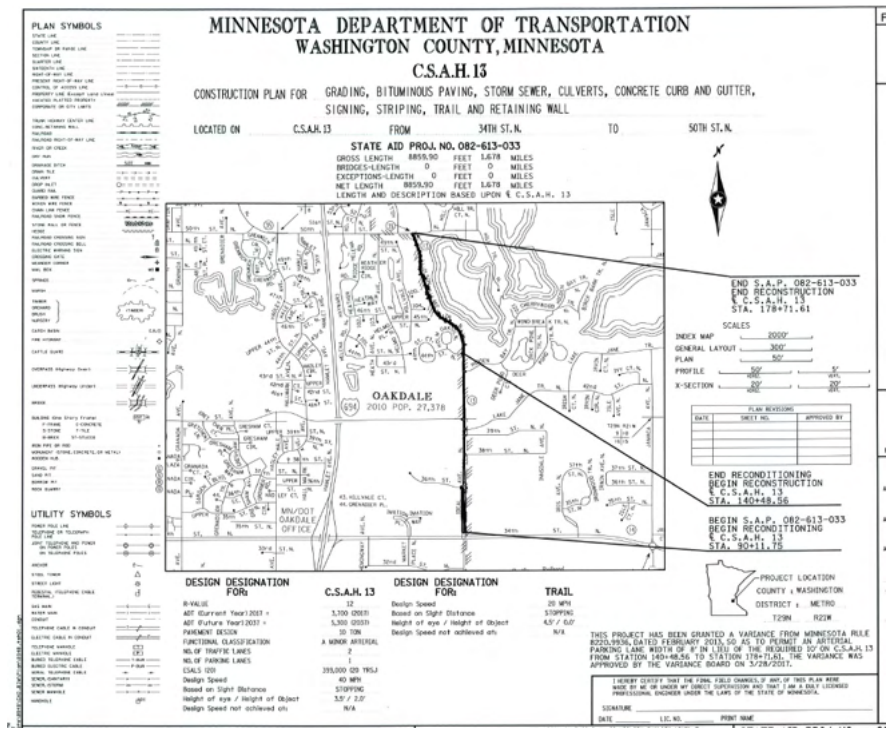
What does this all mean for roadside habitat for pollinators?

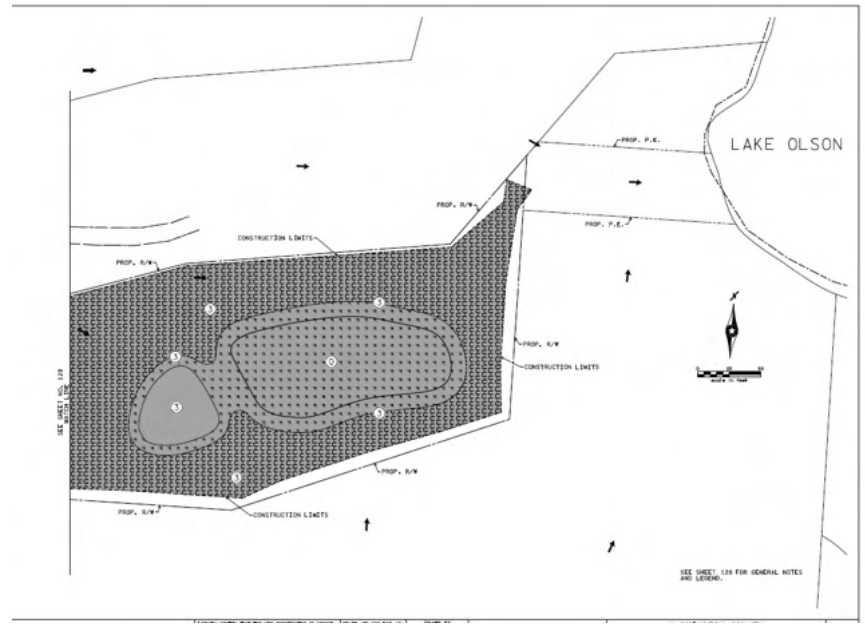
Remarkably promising with respect to nutrition!

Recommendations for Roadside Habitat for Pollinators

- Prioritize low-moderate traffic roads (>20K cars/day are likely producing toxic plants)
- Mowing adjacent to the roadside is likely beneficial in terms of eliminating the most toxic plants
- Plant a diversity of plants as they accumulate toxins to different degrees
- Support efforts to ban chlorpyrifos
- Continue research on open questions…
  - Impacts of collisions…
  - Methods for cost-effective restoration…


LEGEND
SEED MIXTURE 25-151
SEED MIXTURE 35-221
SEED MIXTURE 33-261
EROSION CONTROL BLANKET (CATEGORY 3N) (WOOD FIBER WITH NATURAL NETTING)
SODDING TYPE SALT TOLERANT
DIRECTION OF FLOW
EROSION CONTROL BLANKET (CATEGORY 00) (WOOD FIBER WITH NO NETTING)
CONSTRUCTION LIMITS
EX. R/W
℄ C.S.A.H. 13
T.E.
P.E.
MATCH LINE STA. 146+00.00 SEE ABOVE
MATCH LINE STA. 158+75.00 SEE SHEET NO. 129
147
150
0 25 50
scale in feet


MINNESOTA DEPARTMENT OF TRANSPORTATION
WASHINGTON COUNTY, MINNESOTA
C.S.A.H. 13
CONSTRUCTION PLAN FOR GRADING, BITUMINOUS PAVING, STORM SEWER, CULVERTS, CONCRETE CURB AND GUTTER, SIGNING, STRIPING, TRAIL AND RETAINING WALL
LOCATED ON C.S.A.H. 13 FROM 34TH ST. N. TO 50TH ST. N.
STATE AID PROJ. NO. 082-613-033
GROSS LENGTH 8859.90 FEET 1.678 MILES
BRIDGES-LENGTH 0 FEET 0 MILES
EXCEPTIONS-LENGTH 0 FEET 0 MILES
NET LENGTH 8859.90 FEET 1.678 MILES
LENGTH AND DESCRIPTION BASED UPON ℄ C.S.A.H. 13
PLAN SYMBOLS
UTILITY SYMBOLS
OAKDALE
2010 POP. 27,378
MN/DOT OAKDALE OFFICE
END S.A.P. 082-613-033
END RECONSTRUCTION
℄ C.S.A.H. 13
STA. 178+71.61
SCALES
INDEX MAP 2000'
GENERAL LAYOUT 300'
PLAN 50'
PROFILE 50' 5'
X-SECTION 20' 20'
END RECONDITIONING
BEGIN RECONSTRUCTION
℄ C.S.A.H. 13
STA. 140+48.56
BEGIN S.A.P. 082-613-033
BEGIN RECONDITIONING
℄ C.S.A.H. 13
STA. 90+11.75
PROJECT LOCATION
COUNTY - WASHINGTON
DISTRICT - METRO
T29N R20W
DESIGN DESIGNATION FOR: C.S.A.H. 13
R-VALUE 12
ADT (Current Year) 2013 = 3,700 (2013)
ADT (Future Year) 2037 = 5,300 (2033)
PAVEMENT DESIGN 10 TON
FUNCTIONAL CLASSIFICATION A MINOR ARTERIAL
NO. OF TRAFFIC LANES 2
NO. OF PARKING LANES 1
CSAS 120 395,000 120 YRSJ
Design Speed 40 MPH
Based on Sight Distance STOPPING
Height of eye / Height of Object 3.5' / 2.0'
Design Speed not achieved oh N/A
DESIGN DESIGNATION FOR: TRAIL
Design Speed 20 MPH
Based on Sight Distance STOPPING
Height of eye / Height of Object 4.5' / 0.0'
Design Speed not achieved oh N/A
THIS PROJECT HAS BEEN GRANTED A VARIANCE FROM MINNESOTA RULE 8220.9936, DATED FEBRUARY 2013, SO AS TO PERMIT AN ARTERIAL PARKING LANE WIDTH OF 8' IN LIEU OF THE REQUIRED 10' ON C.S.A.H. 13 FROM STATION 140+48.56 TO STATION 178+71.61. THE VARIANCE WAS APPROVED BY THE VARIANCE BOARD ON 3/28/2017.
I HEREBY CERTIFY THAT THE FINAL FIELD CHANGES, IF ANY, OF THIS PLAN WERE MADE BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.
SIGNATURE
DATE LIC. NO. PRINT NAME


LAKE OLSON
PROP. P.E.
PROP. R/W
CONSTRUCTION LIMITS
SEE SHEET 128 FOR GENERAL NOTES AND LEGEND.


THANK YOU!
Lauren Agnew

How the Utility Industry is Using IVM to Support Pollinators on Rights-of-Way: Research Highlights from Tennessee, Arizona, and Alabama

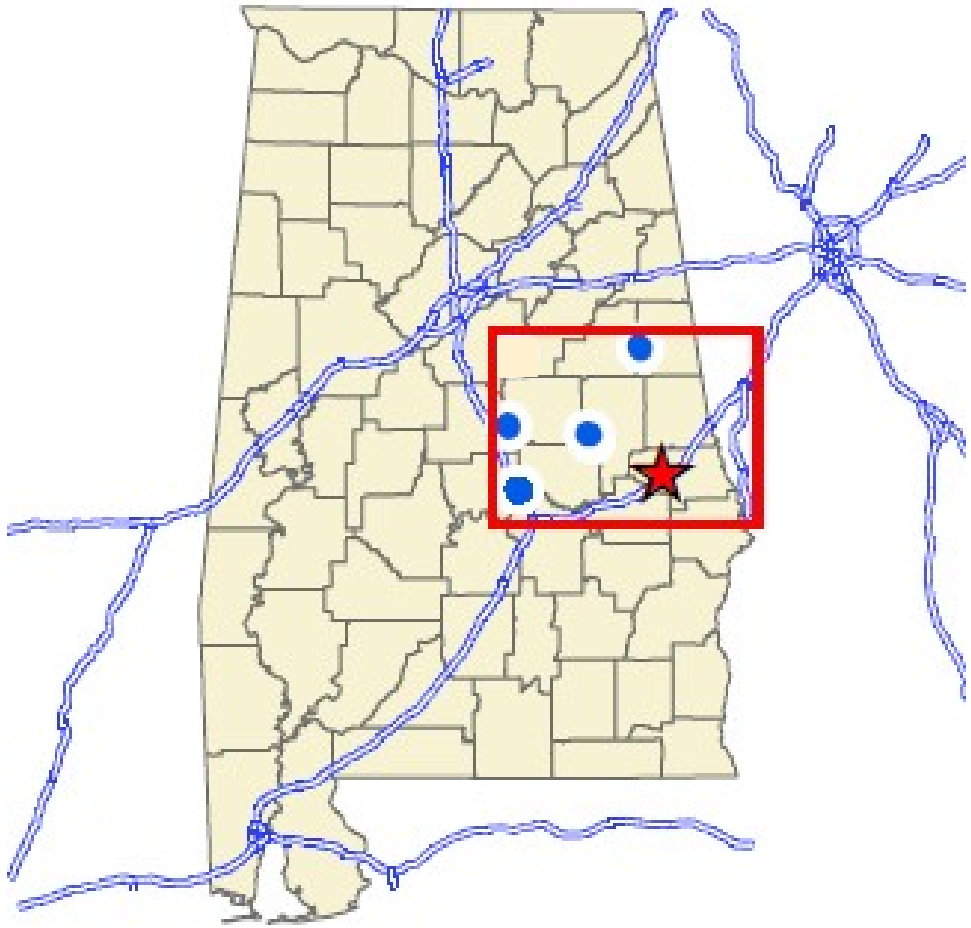
Dr. Ashley Bennett

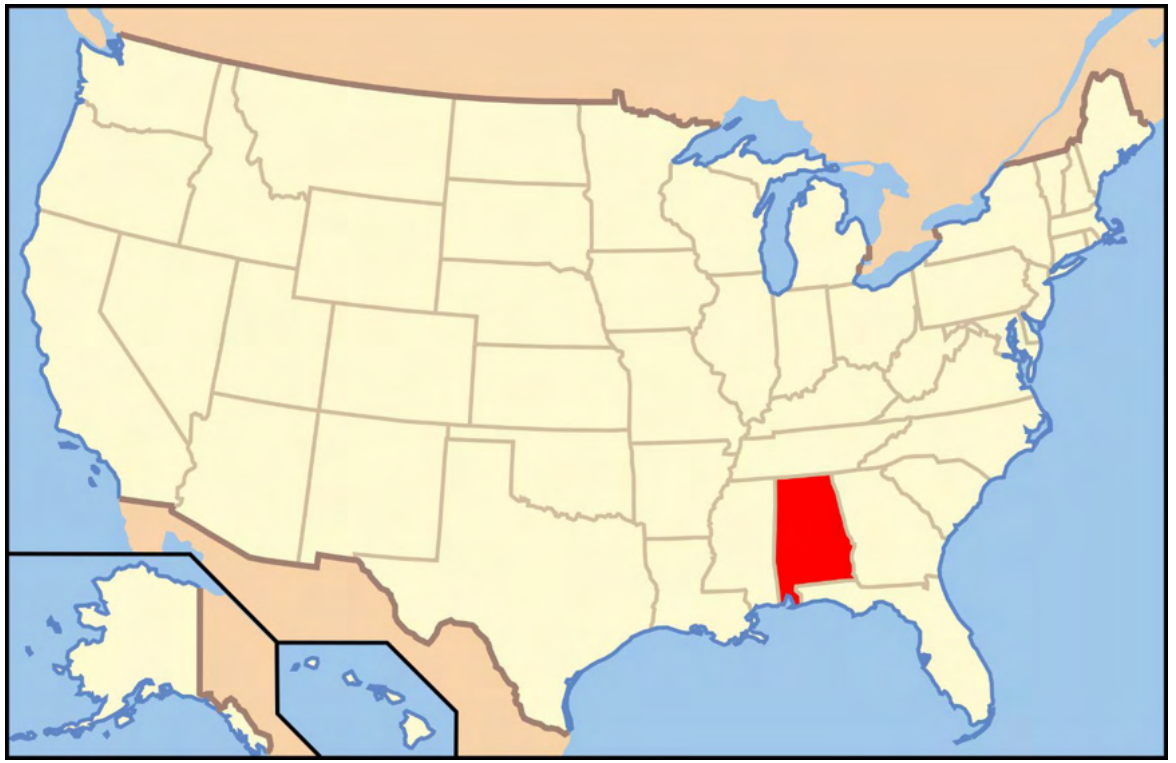
How the Utility Industry is Using IVM to Support Pollinators on Rights-of-Way: Research Highlights from Alabama, Tennessee, & Arizona

Dr. Ashley Bennett, EPRI
June 9th, 2021

Using IVM to Support Pollinators on ROW
Southern Company, Auburn University, EPRI

Study Sites – 4 ROWs in Alabama





Blue Dots = ROWs under evaluation

Star = Auburn University


Photo: C. Ike

Project Objectives:

- Determine impact of IVM treatments on
  - ROW plant and pollinator abundance & richness
- Track cost of vegetation management practices
- Develop Best Management Practices


Photo: A. Bennett


Photo: A. Bennett

Study Design

Experimental Design

- Randomized block design
- 3 Treatments / Block
- Blocks = 1 mile
- Similar landscape context
- Sampled on and off ROW

Treatments:

- T1 – High volume broadcast / broad spectrum
- T2- Low volume broadcast / broad spectrum
- T3 - Low volume broadcast / grass friendly

Right-of-Way

Edge

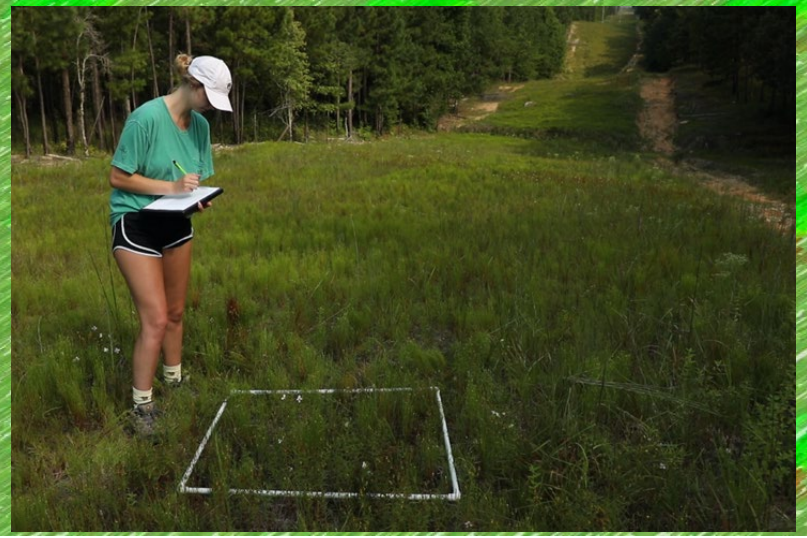
Forest

Trap set #1

Trap set #2

50 meters

25 meters



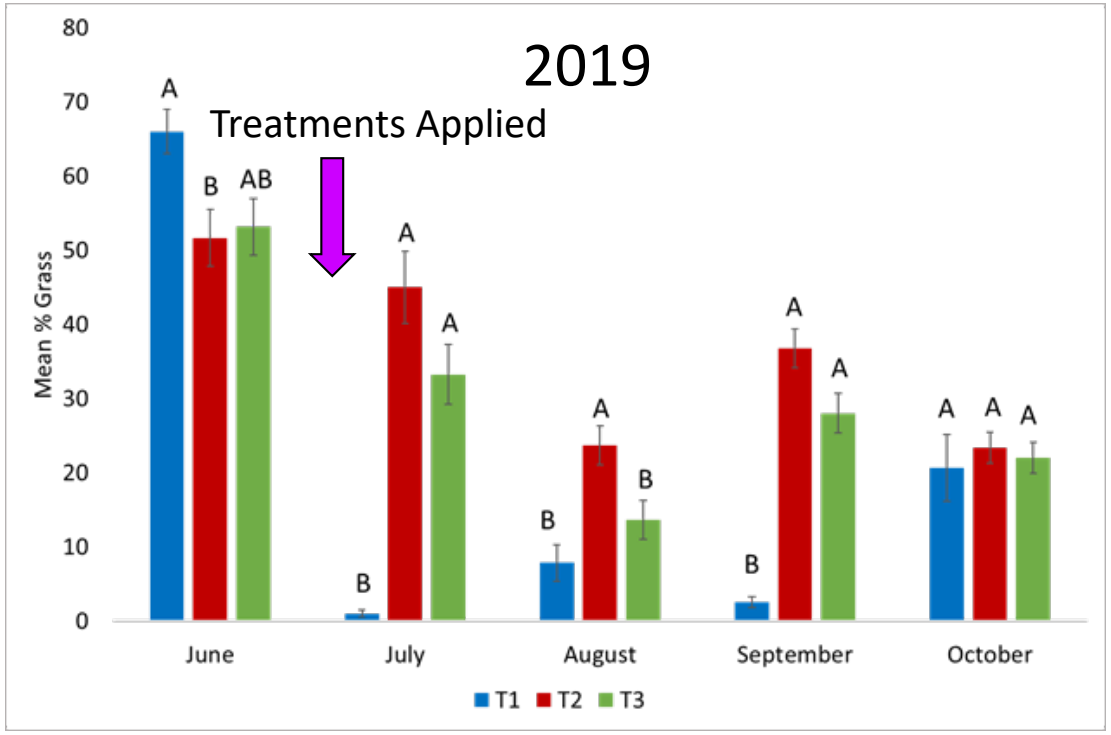
Schematic example of trap set-up on one ROW. Each ROW will have three treatments

One colored bowl and vane trap location

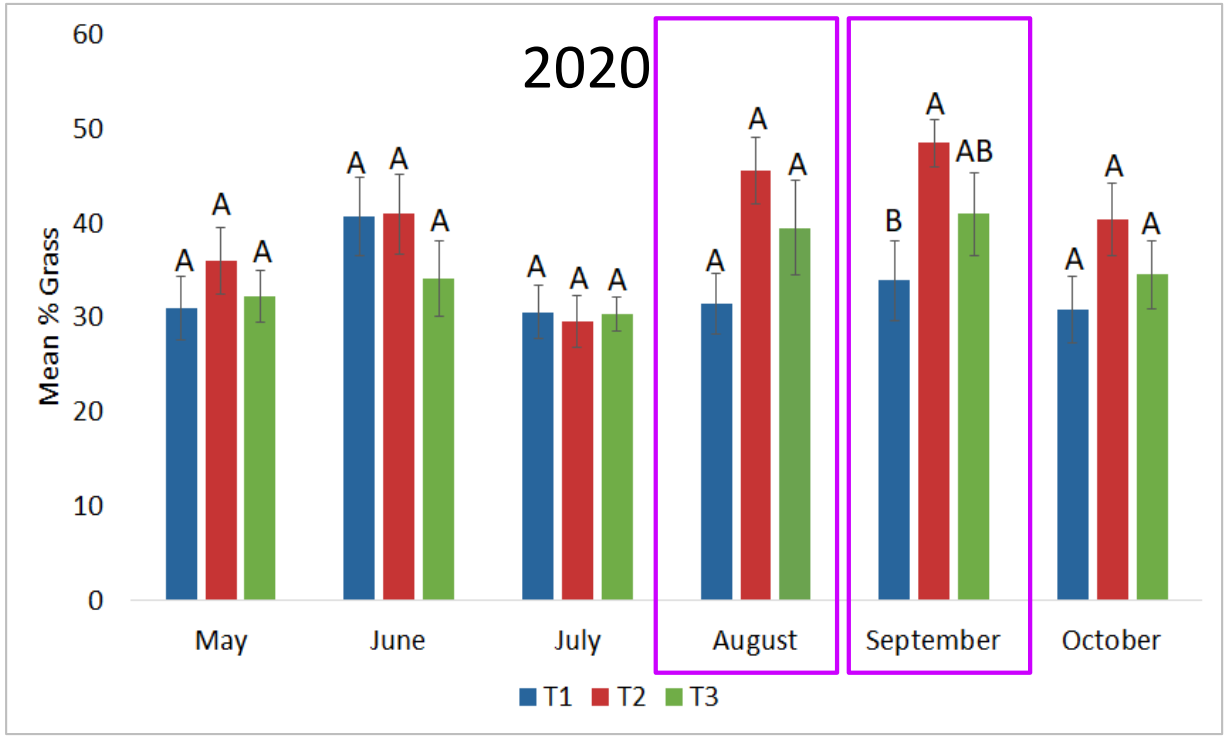
Results – Vegetation 2019 vs 2020

- Percent grass cover significantly declined after treatments were applied
- Treatment 1 had largest decline of 88%
- Treatment 1 recovered in early 2020 but lower cover observed in late summer

Grass



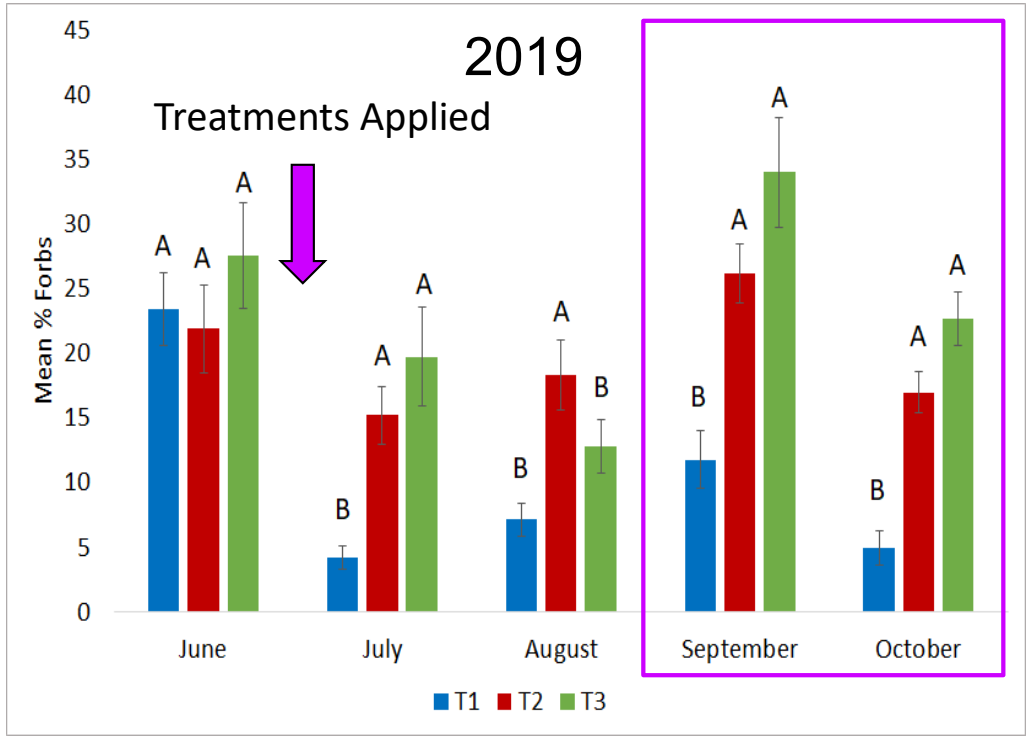
Grass



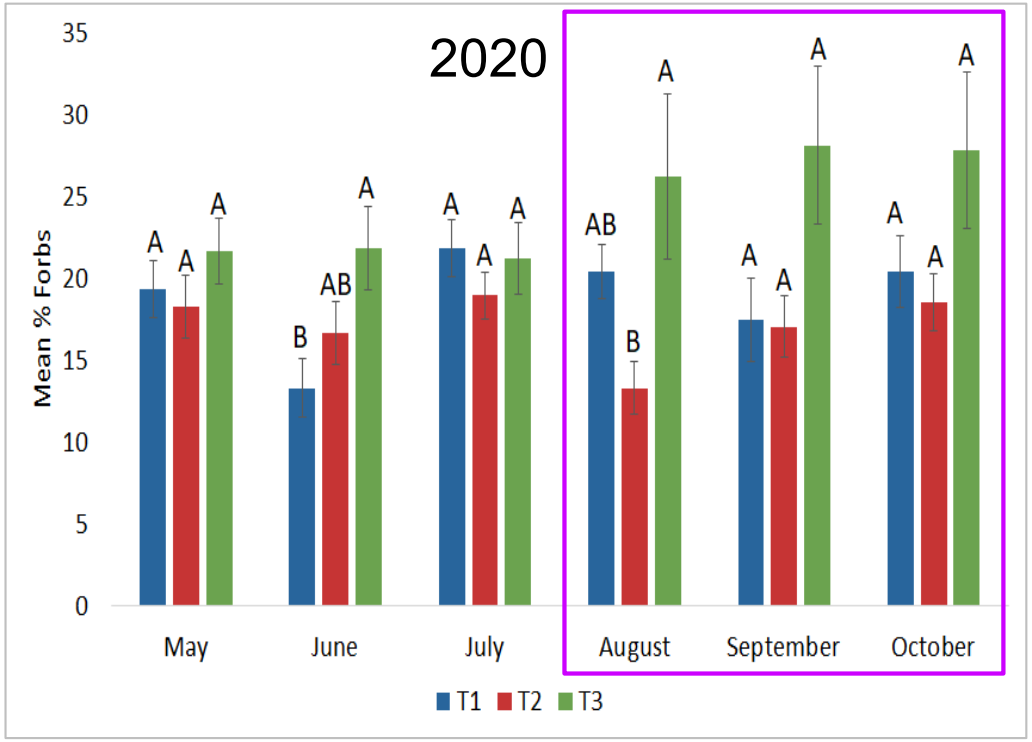
Results – Forbs 2019 vs 2020

- 2019 forbs declined by 84% in T1 but less of an impacted in T2 & T3
- 2020 some forb recovery in T1 but still lower than T2 & T3
- Grass-friendly treatment, T3, higher forbs at end of season

Forbs



Forbs

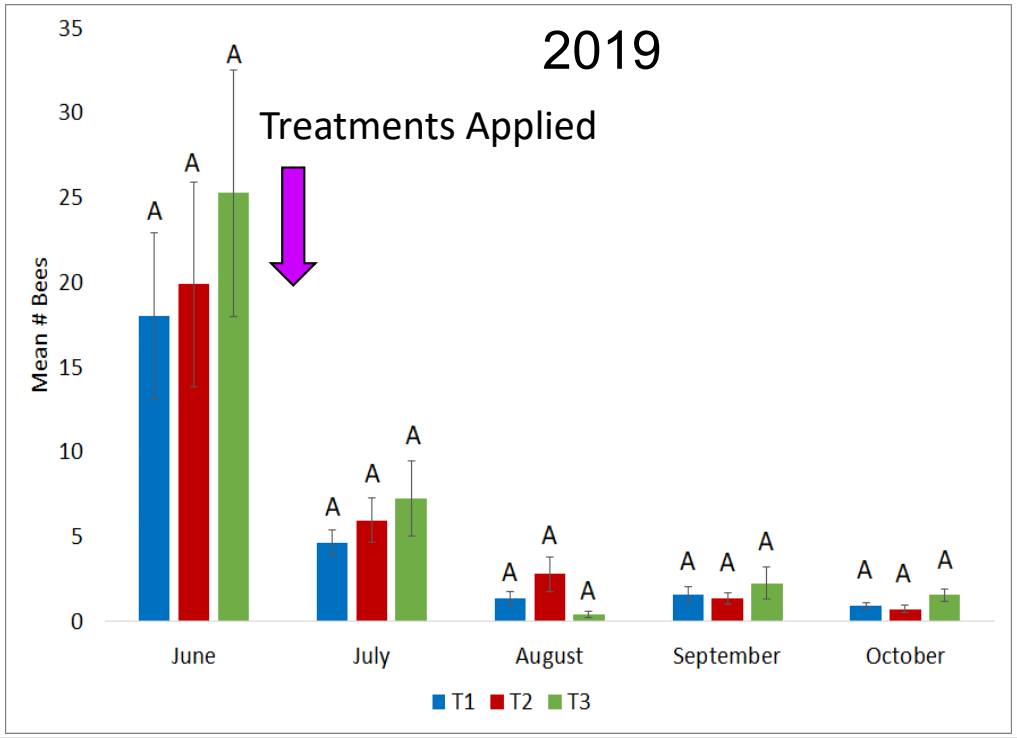


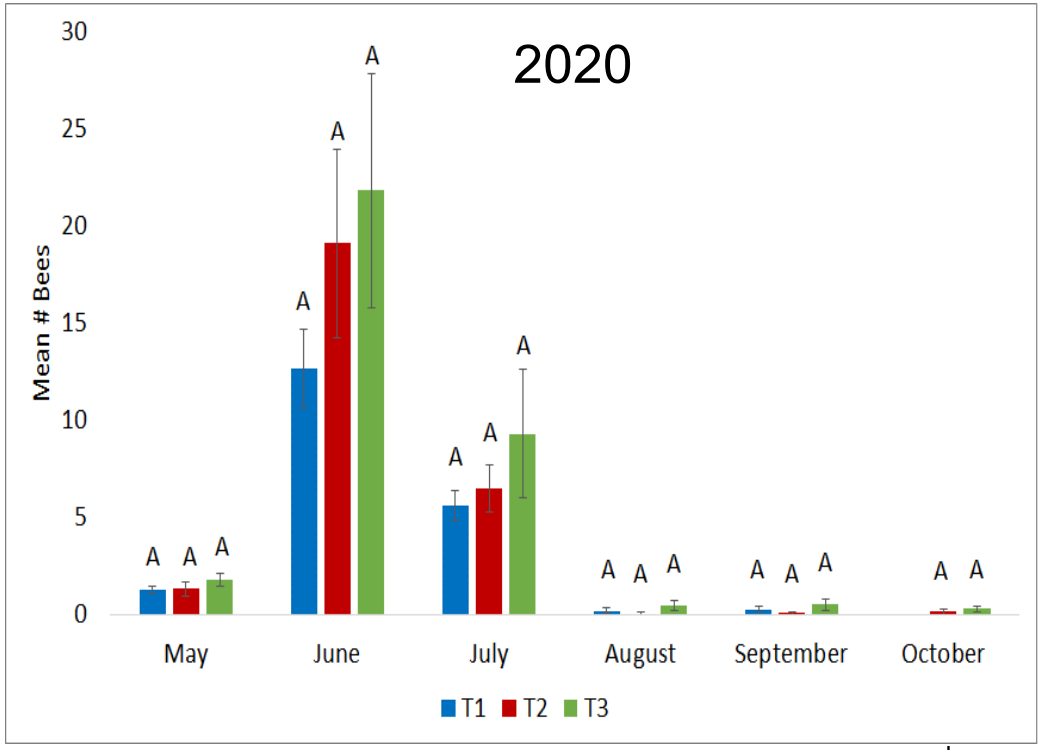
Results – Pollinators

- ROWs support pollinators
  - 91% of bees came from the ROW
  - 9% came from forested habitat adjacent to the ROW
- No differences across treatments in 2019 or 2020
- Lower bee abundances mid to late summer

Photo: A. Bennett

Bees





Key Findings

- ✓ ROWs support more bees than adjacent forest
- ✓ T1 largest impact on grass and forb cover in 2019 but recovery in 2020
- ✓Suggests benefits of targeted grass friendly herbicide
  - ➢ Less non-target impacts on grasses / forbs, less applied = costs savings
- ✓ No significant treatment differences for bees
- ➢ 2021 – Year 4 sampling
- ➢ 2022 – Final data analysis, communication of results, & application of BMPs

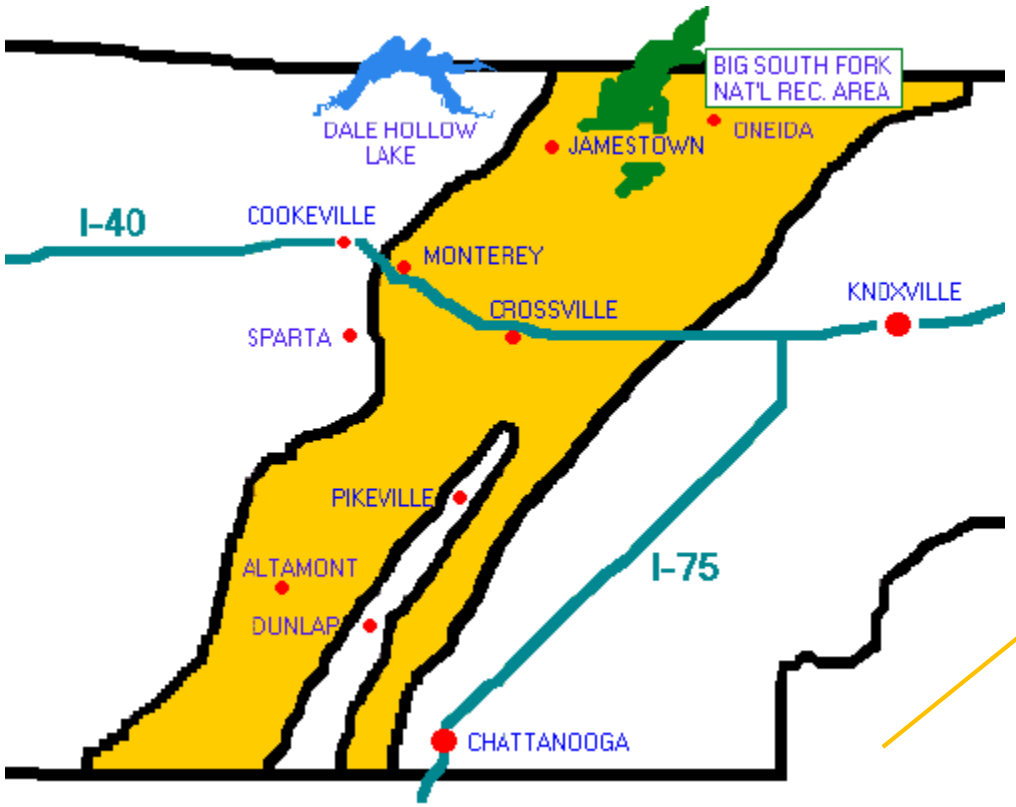
Photos: Auburn University

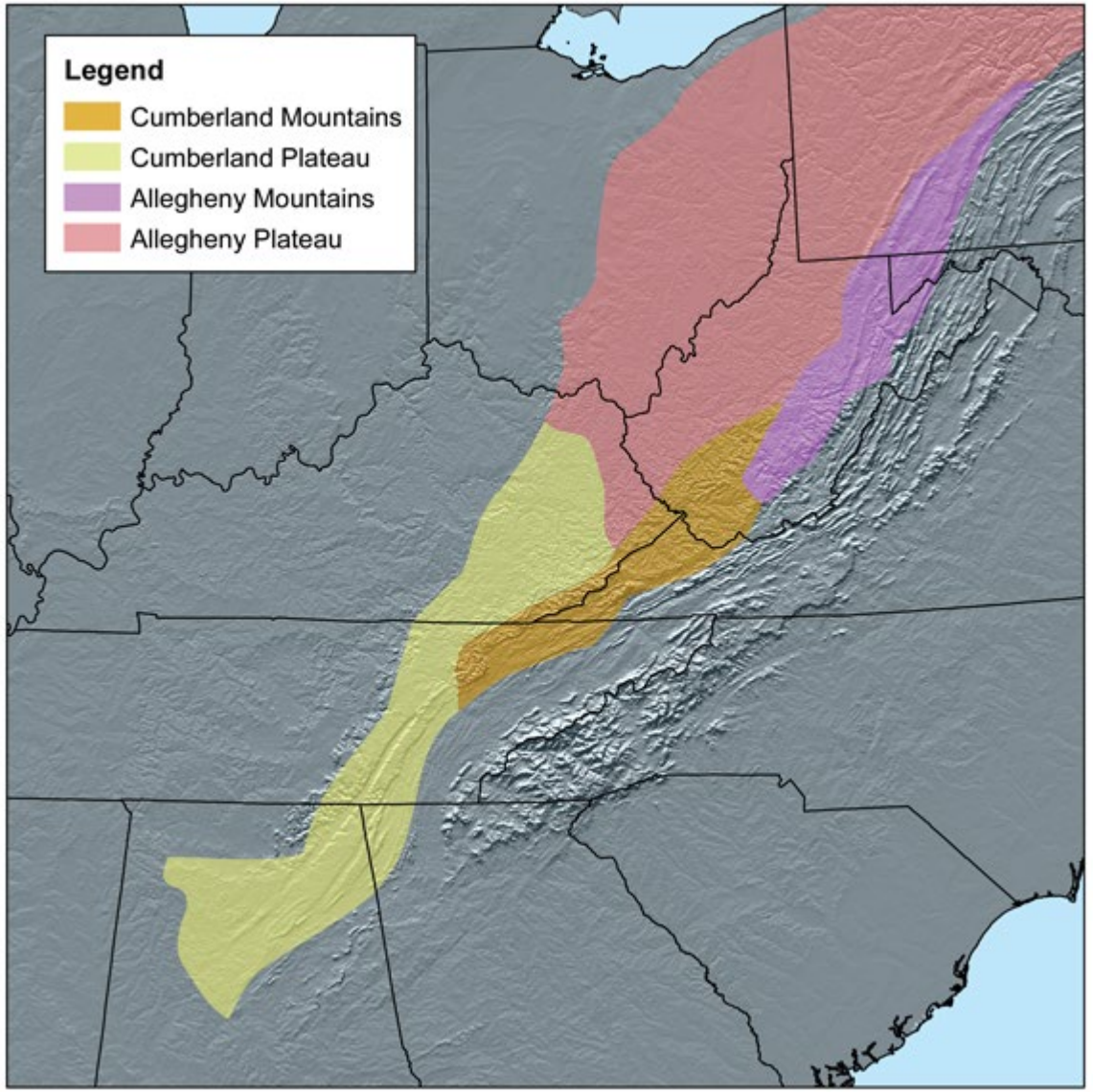
Tennessee ROW Study

TVA, EPRI, SGI, and MS State Entomological Museum

Southeastern Grasslands

- Once covered 100 million acres across SE US
- Cumberland Plateau was savannas & prairies
- Grassland habitat lost to forest succession





Study Area: TN

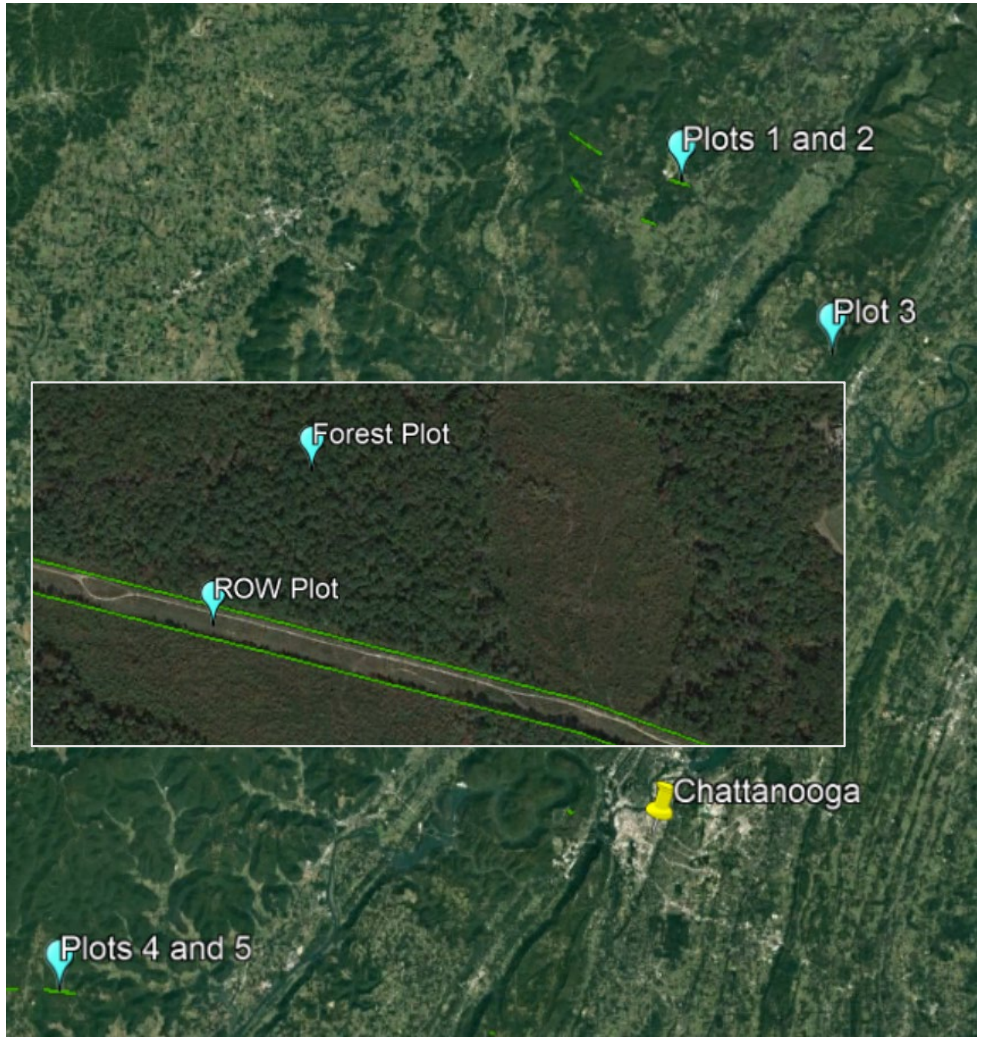


Photo: T. Witsell

Photo: B. Georgic

Photo: A. Bennett

- 5 ROW sites in 2021

TVA Rights-of-Way

Study Questions:

1. How compatible is TVA's IVM management with conservation?
2. What native plants and pollinators are supported on ROWs in TN?


Photo: Dwayne Estes


Photo: Dwayne Estes


Photo: Brittney Georgic

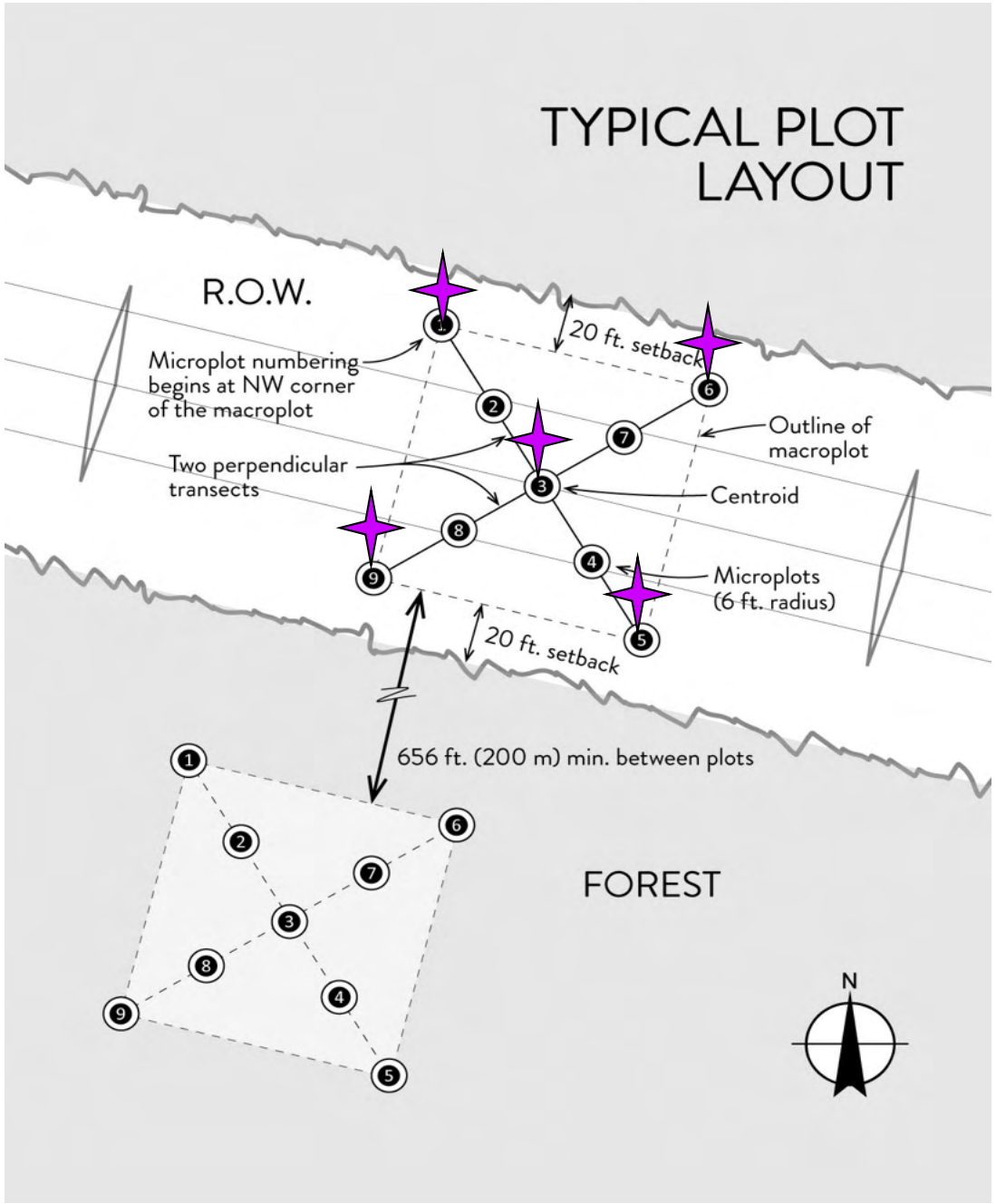
Sampling Methods

Plants:

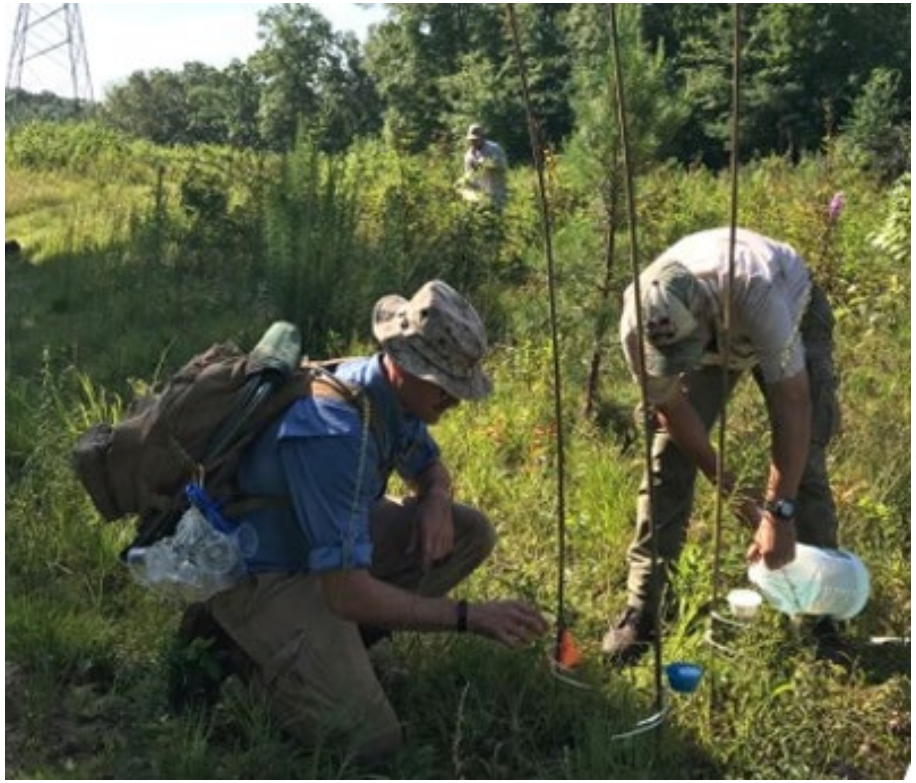
- Transect and Quadrat sampling

Pollinators:

- Bee Bowls, Netting, Malaise traps



Bee Bowls



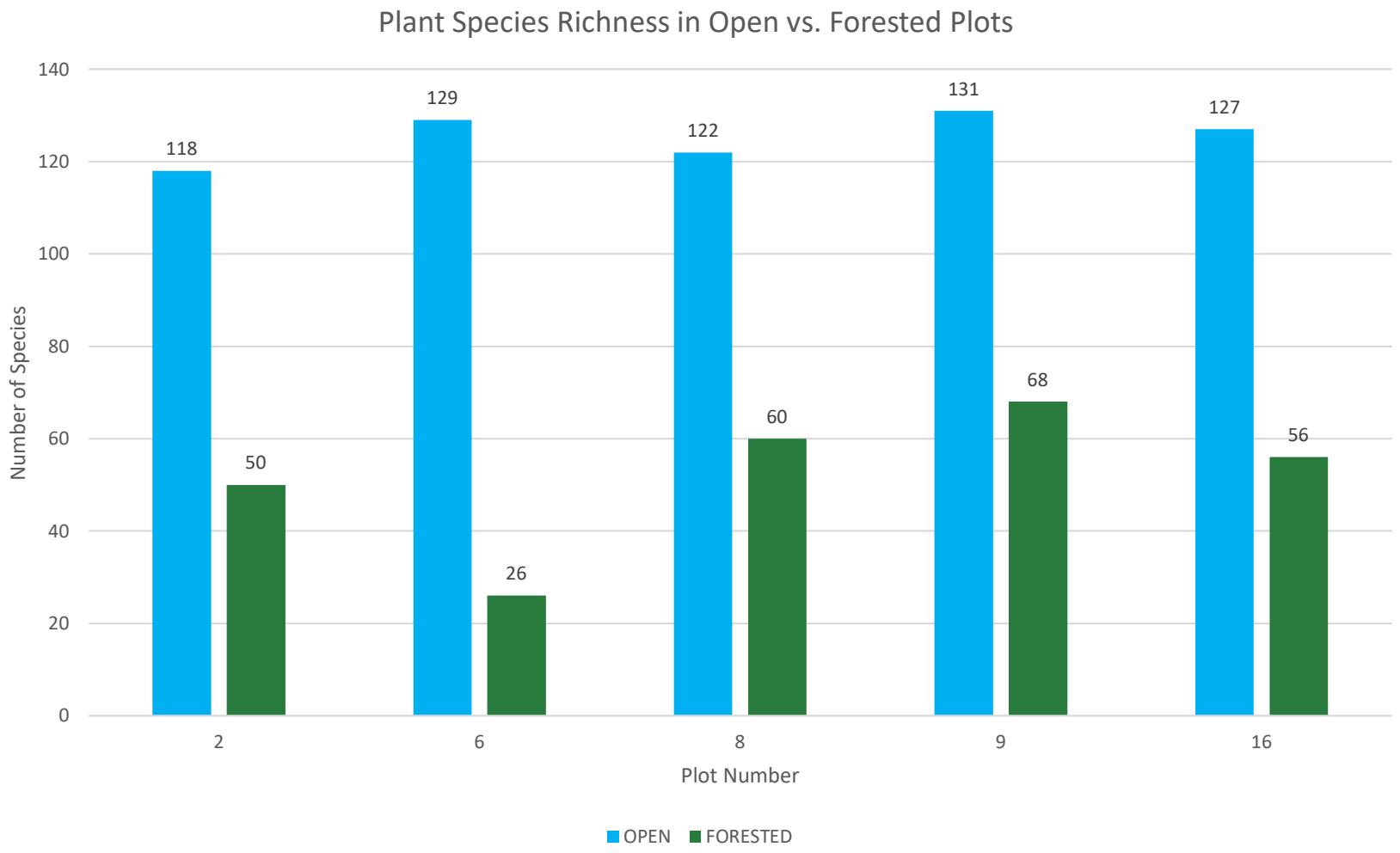
Photos: MS Entomological Museum

Malaise Trap

Sweep Netting

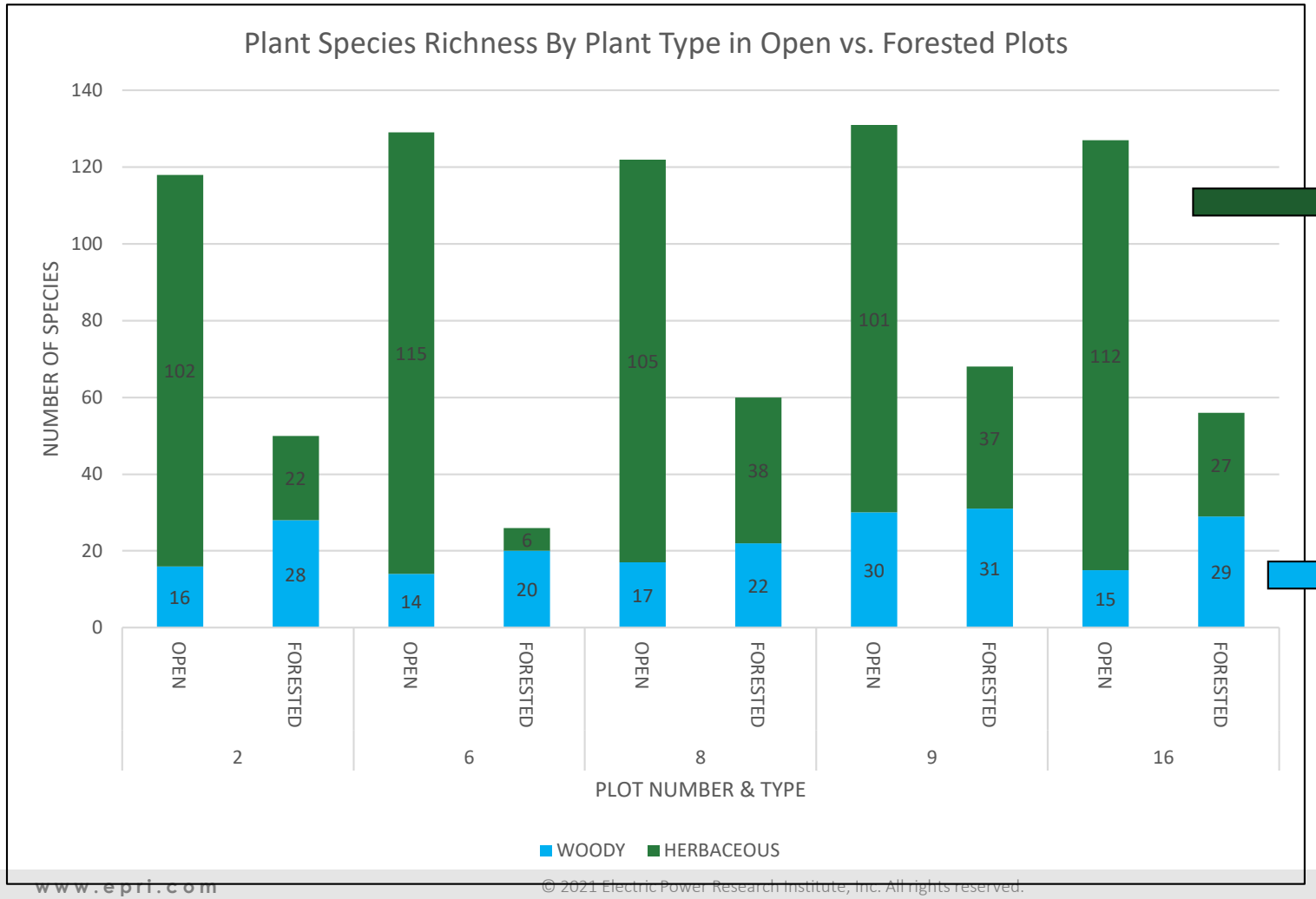
Plant Results

- Average plant richness was 2.5 times greater in ROW vs forested plots



Plant Results

- Ratio of herbaceous (forbs; graminoids) and woody (trees; shrubs) plant in ROW was 6:1
- Ratio of herbaceous vs woody in forested plots was 1:1



Grasses / Forbs

Trees / Shrubs

Plant Results

- 1 ROW in Van Buren County, TN had 7 orchid species

Photo: Illinois Wildflowers

White fringeless orchid. Credit - USFWS

Photos: Britney Georgic unless otherwise notes

Slender Ladies Tresses

Pollinator Results

- Bees
  - Bowls – 16x more bees on ROW
  - Netting – 14x more bees on ROW

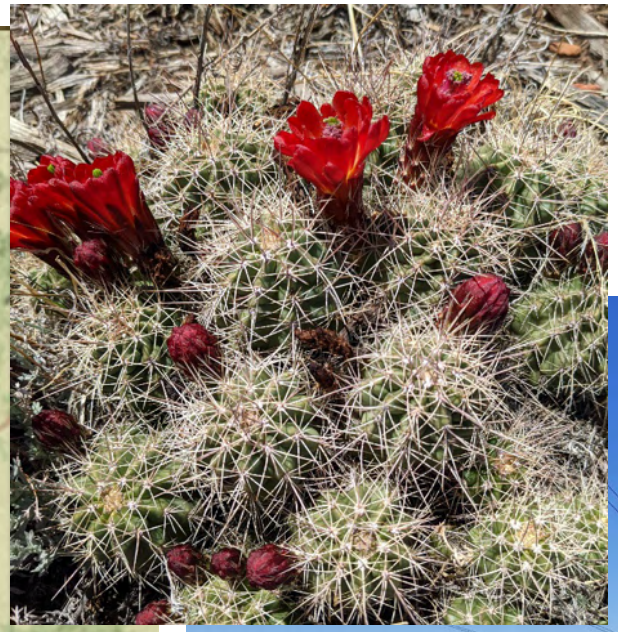
- Butterflies
  - 4x higher abundance & richness on ROW vs forested plots
  - Leonard Skipper vulnerable sp.

Photo: B. Georgic

Photo: MS Entomological Museum

Evaluating ROW IVM Practices on Plants & Pollinators in AZ
SRP, NAU, USGS, EPRI

Study Sites: ROWs in Arizona



Photos: K. Laushman

Project Goals

- Determine the value of IVM ROW practices to native plants & pollinators across 3 AZ ecoregions
- Compare different IVM treatments for:
  1. Best control of woody vegetation
  2. Largest increase of grasses, forbs, & pollinators


Photo: K. Laushman


Photo: K. Laushman


Photo: J. Hayden


Photo: Pam Reschke


Photo: A. Bennett

Sonoran Desert

Lowest Elevation: <3500

Photo: K. Laushman

Pinyon Juniper

Mid Elevation

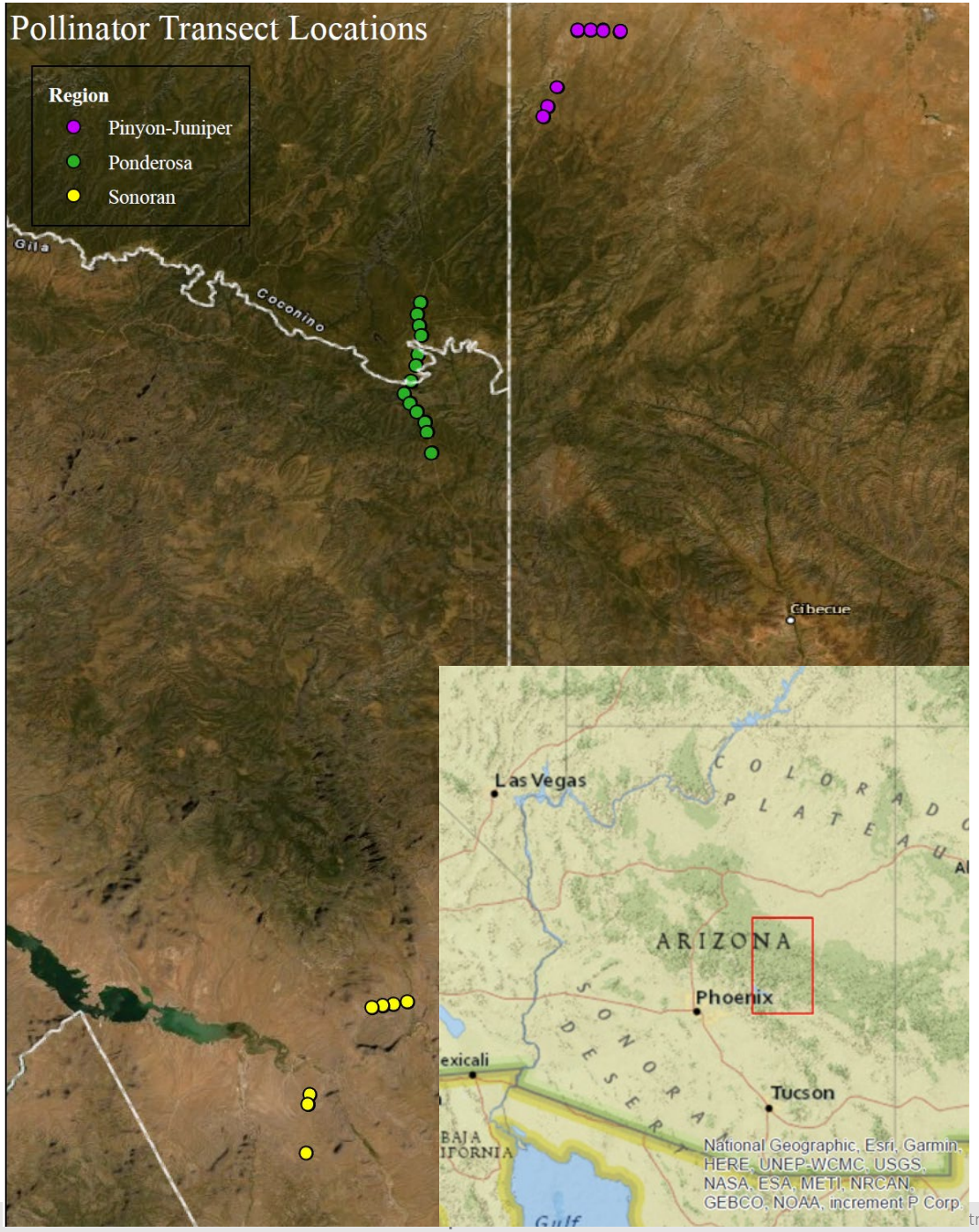
Photo: K. Laushman

Photo: K. Laushman

Ponderosa Pine

Highest Elevation: >5000’

Location of Study Sites



Photos: K. Laushman

IVM Treatments – Ponderosa Pine

Photos: K. Laushman

- The Problem
  - Current management mowing only
  - Mowing causes increased growth of some woody plants

- Question
  - Can an integrated approach that uses targeted herbicide applications provide better control of woody plants while encouraging grasses and forbs

<u>Treatments:</u>

1. Control – No treatment (2 years post mowing)
2. Herbicide – Foliar Application
3. Mechanical – Mowing
4. Mechanical + Herbicide - Stump Application

Sampling Methods

Vegetation Surveys

- Quadrat Sampling
- Species level ID
- Pre-treatment survey

Pollinator Surveys

- Netting along transects
  - On & Off ROW
    - Sonoran Desert - 7
    - Pinyon Juniper - 7
    - Ponderosa – 13
  - Flower cover by transect
- Timed quadrat counts
  - 5 1x1m quads / transect
  - IVM treatments

Photos: Katie Laushman

Preliminary Results – Sonoran Desert

- 48 species of flowering plants
- Similar abundance & richness on and off ROW
- Most common species
  - *Acmispon brachycarpus* – Foothill Deervetch
  - *Cryptantha pterocarya* – Winged Pick-Me-Not
  - *Erigeron divergens* – Spreading Fleabane
  - *Erodium cicutarium* – Redstem Stork's Bill
  - *Euphorbia pediculifera* – Carrizo Mountain Sandmat
  - *Larrea tridentate* – Cresosote Bush
  - *Plantago patagonica* – Woolly Plantain

	On ROW	Off ROW	% On ROW	% OFF ROW
Abundance	1635	1485	52%	48%
Richness	41	34	55%	45%

Next Steps

- Continue 2021 pollinator sampling
  - Pinyon Juniper
  - Ponderosa Pine
- Implement IVM treatments fall 2021
- 2021-2023
  - Plant & Pollinator Surveys


Photo: A. Bennett


Photo: K. Laushman


Photo: A. Bennett

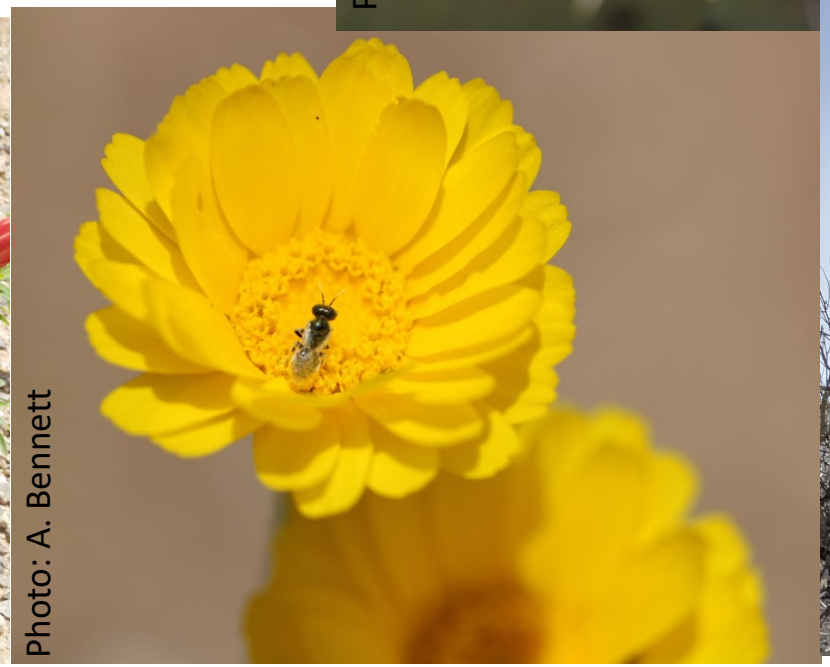


Photo: A. Bennett

BREAKOUT SESSIONS

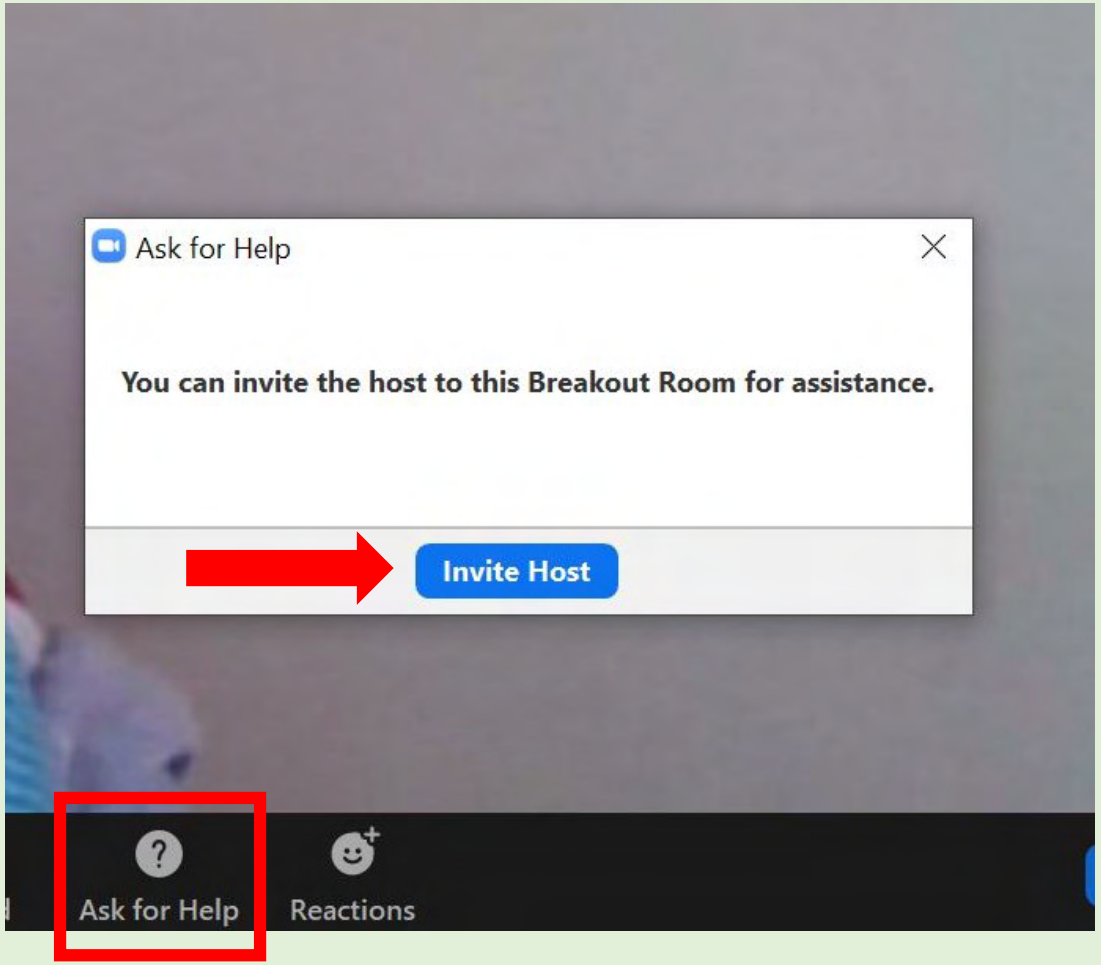
- Breakout facilitator coming soon!
- Breakout sessions will end after 40 minutes of discussion
- Short recap at end of breakout

Research Roundtable: Where Research Meets Application

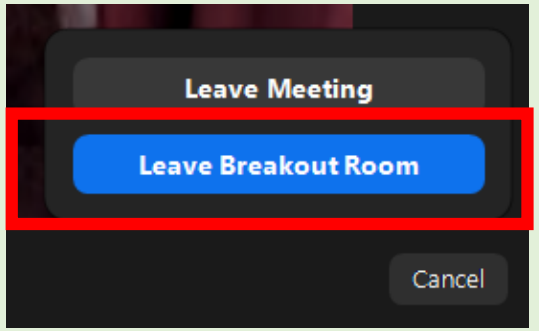
1. Ask for help through **Help** button and Invite a Host

2. At end of the breakout session, you will be automatically returned to the main room.
If you would like to join the main room (to ask for help etc.) early, select **Leave** then **Leave Break out Room**

1.



2.



Breakout Session Questions

- Quick Introductions…
  - Name, role, organization, geographic region, sector
- What research are you currently doing / planning?
  - What pollinators are you targeting?
- What additional research is needed to expand pollinator habitat on ROWs?
  - Are you interested in collaborating in research?
- What barriers do you face in scaling up acreage planted to pollinator habitat?

Breakout Session Recap

Key Take-Aways by Topic

- Current Research
- New Research
- Barriers to scaling up

Thank you for joining us!

Coming up next….

Milkweed Establishment & Monitoring – Aug 2021

Solar Power & Pollinators – Nov 2021