

Evaluating the Use of eDNA to Detect Pollinators on Rights-of-Way



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Introduction

Background

- Utility lands managed with IVM provide biodiversity benefits to pollinators
- Utilities would like to monitor, measure, & track changes over time
- Field surveys are costly
- New rapid assessment methods are needed
- Is eDNA a possible solution?



LGE-KU Solar Site

EPRI Research Sites



AEP – ROW

Photos: A. Bennett

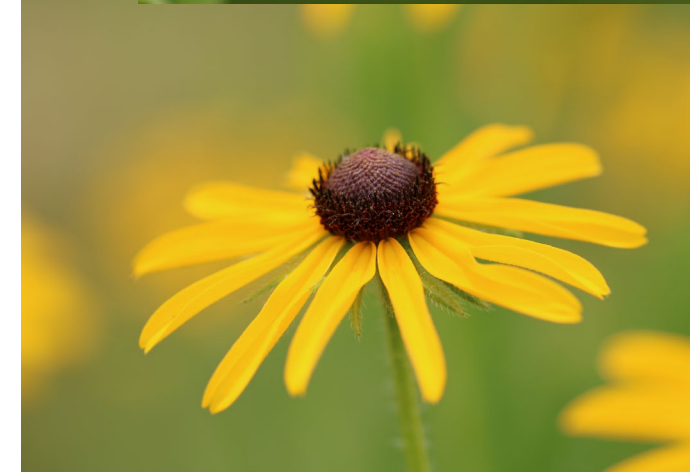
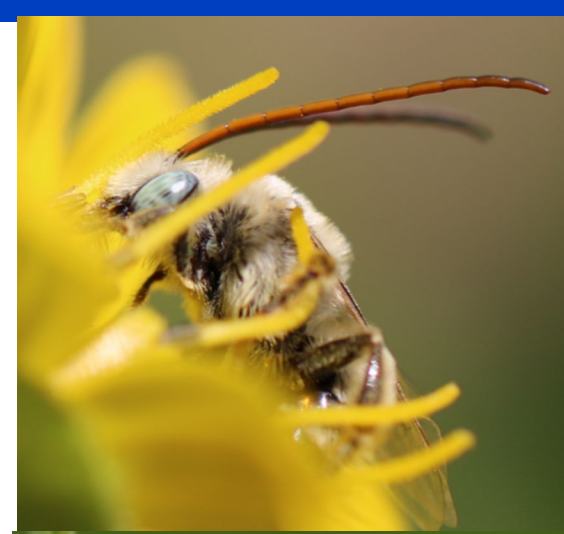
Introduction: Environmental DNA

Study Questions:

1. Can eDNA assess pollinator communities along ROWs?
2. Does flower morphology impact detection of pollinators?
3. How does eDNA compare to field collections?

Methods Overview:

1. Field collected pollinators, timed transects
 - ROW in New York State
 - Sampling method netting
 - Bees ID to species
2. Field collected flower heads from 7 different species
 - 6 native and 1 non-native; 4 open and 3 tubular
3. 10 replicates / flower species with 10 flower heads / replicate
4. DNA metabarcoding was used to detect pollinator species
 - Trying to detect eDNA left by pollinators visiting flowers



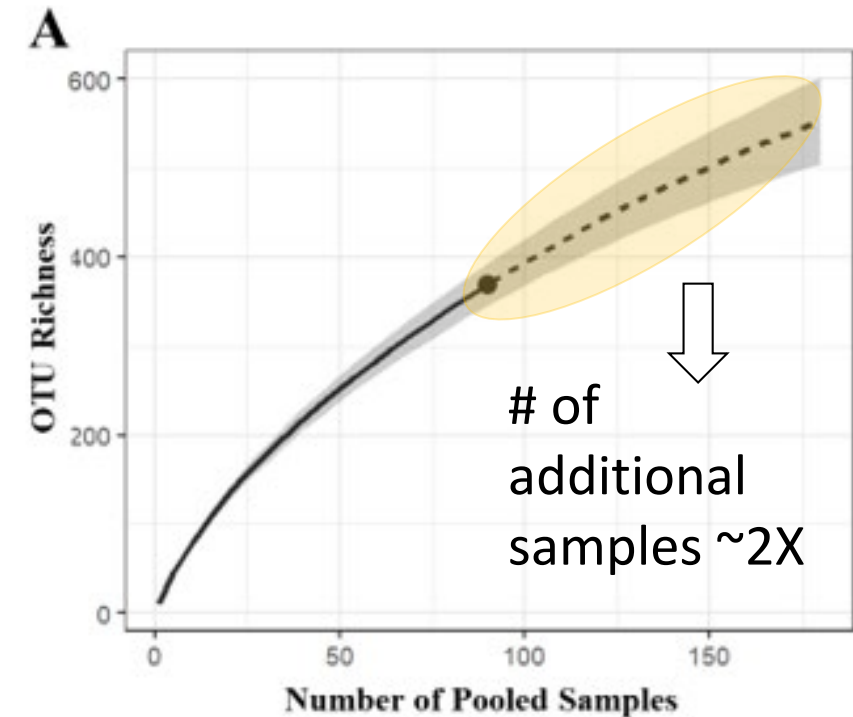
Photos: A. Bennett

Results

Order	Number of OTUs	Number of Occurrences
Blattodea	1	1
Coleoptera	46	115
Diptera	143	386
Ephemeroptera	4	4
Hemiptera	42	141
Hymenoptera	42	93
Lepidoptera	36	100
Mantodea	1	1
Mecoptera	1	1
Odonata	2	3
Orthoptera	17	38
Phasmatodea	4	5
Psocoptera	8	17
Thysanoptera	2	2

- High diversity of insect taxa detected
- Most detections were for flies followed by beetles
- Richness curves estimated more sampling was needed

Syrphid Fly



Results: Transects vs eDNA

Bees & Butterflies

➤ Bees

- Higher with netting
- Apidae highest followed by Andrenid (miner) & Halictid (sweat bees)
- Very low eDNA detections

➤ Butterflies

- Higher with netting
- Nymphalid (brush-footed) Pierid (whites / sulphurs), & Hesperid (skippers) highest with netting
- No eDNA detections for top 3
- Only 1 butterfly detected with eDNA

Order	Family	Count with Ground	Occurrences with eDNA
Hymenoptera	Andrenidae	131	1
	Apidae	1672	24
	Chrysididae	1	0
	Cimbicidae	1	2
	Colletidae	30	0
	Crabronidae	26	0
	Halictidae	116	15
	Ichneumonidae	3	0
	Megachilidae	38	3
	Mellitidae	4	0
	Pompilidae	2	0
	Sphecidae	3	0
	Tenthredinidae	1	2
	Vespidae	8	3
Lepidoptera	Erebidae	17	4
	Geometridae	1	15
	Hesperiidae	98	0
	Lycaenidae	36	0
	Noctuidae	1	14
	Nymphalidae	231	0
	Papilionidae	41	1
	Pieridae	129	0



Photos: A. Bennett

Results

Ground counts for Hymenoptera by flower species

Red = Families undetected with eDNA; **Green** = Families detected with eDNA

Flower	Andrenidae	Apidae	Cimbicidae	Halictidae	Megachilidae	Tenthredinidae	Vespidae
<i>Open Flowers</i>							
Common Boneset	-	92	-	-	-	-	0
Swamp Candles	-	1	-	2	-	-	-
Black-eyed Susan	-	-	-	1	2	-	-
White Meadowsweet	10	41	1	2	2	1	1
<i>Tubular Flowers</i>							
Allegheny Monkeyflower	-	2	-	0	-	-	-
Bird Vetch	-	21	-	7	2	-	-
Blue Vervain	7	56	-	2	3	-	-

- High Apidae (bumble bee) eDNA detections
- Bees highly attracted to blue vervain and meadowsweet



Photo: Roundstone native Seed



Photo: Truelove Seed



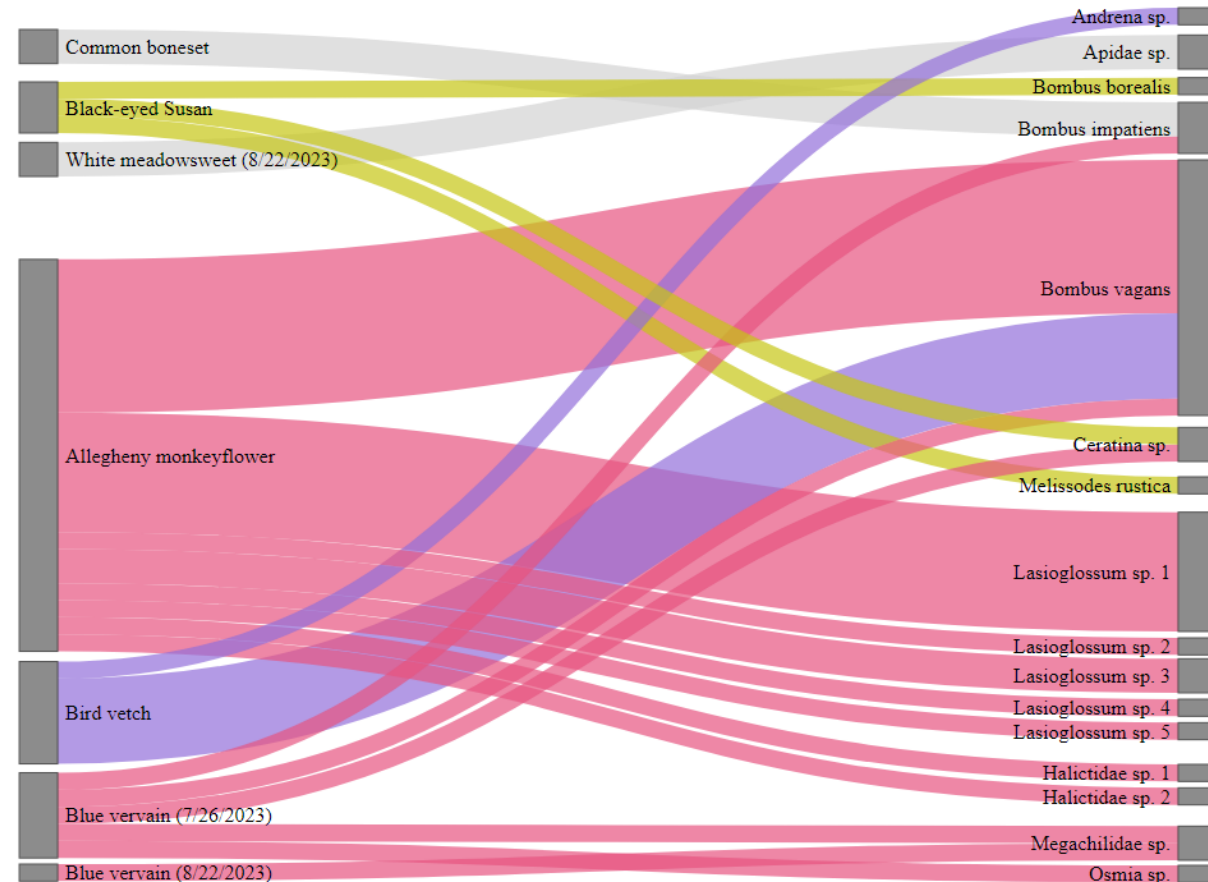
Photo: Prairie Moon Nursery

Key Findings

1. eDNA resulted in high detections of insect richness
 - Mostly non-pollinator groups; Hymenoptera ~10%
 - 15 of 27 insect families were detected with eDNA
2. Species richness curves estimated more sampling
 - 2x more to increase richness by 50%
3. Insect richness differed by flower
 - Black-eyed Susan highest observed richness
 - Allegheny monkeyflower highest eDNA richness
4. eDNA bee detections
 - 4 bee families detected
 - *B. vagans* most commonly detected
 - Honey bees not detected by eDNA
5. Flower morphology
 - 84% of bee detections were on tubular flowers
6. Aerial netting vs eDNA sampling
 - Overlap between methods was low
 - Halictid bees under-detected by eDNA

Next Steps

- Refine field & lab methods
- Increase bee detections
- 2024 study underway





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Methods: eDNA Field & Lab

7 Flowers

