

Utility-Scale Solar and Pollinator Ecosystem Services

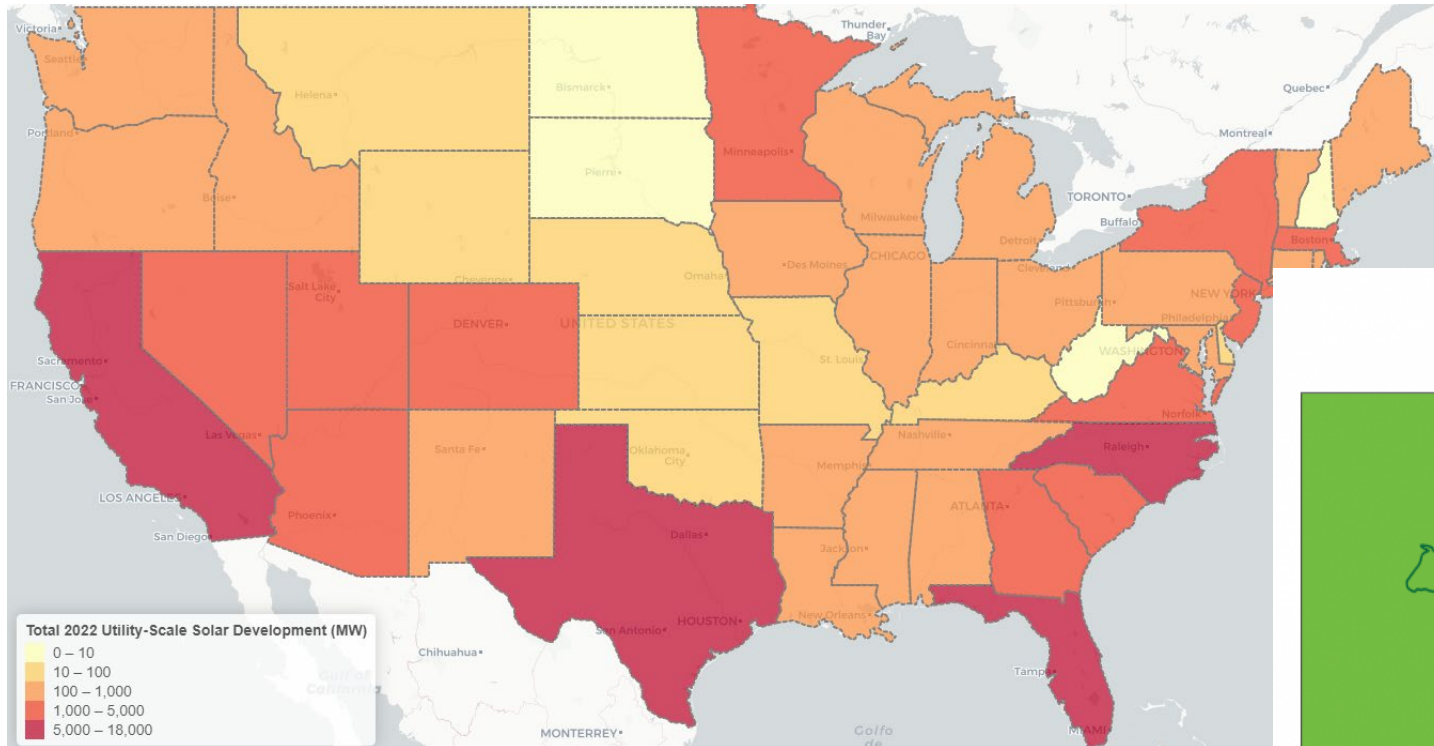


Heidi Hartmann, Lee Walston & Laura Fox

March 6, 2024

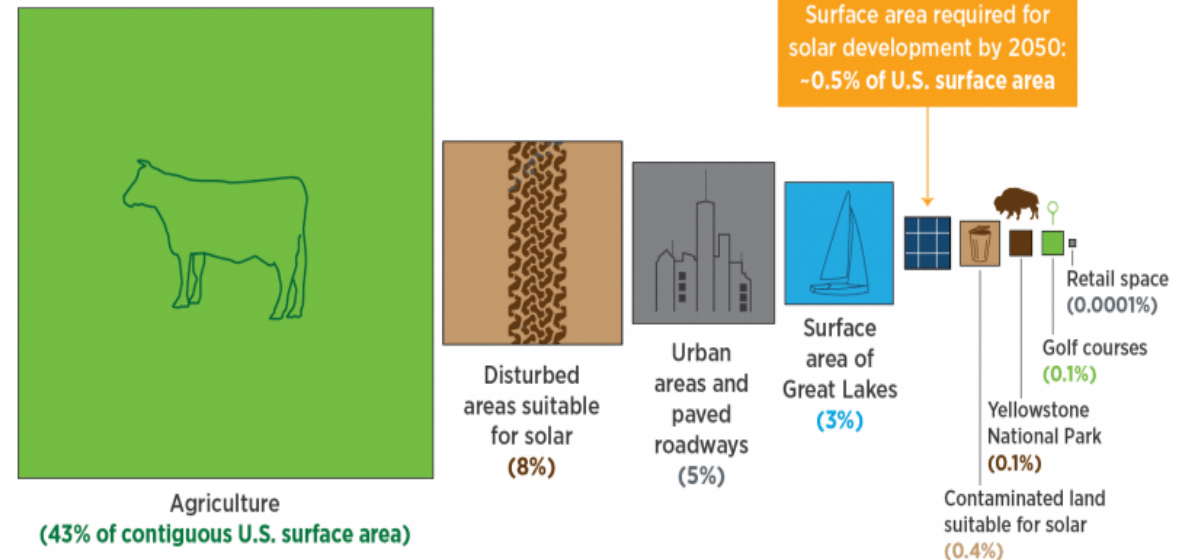
*Monarchs and More
Austin, Texas*

Utility-Scale Solar and Land Use



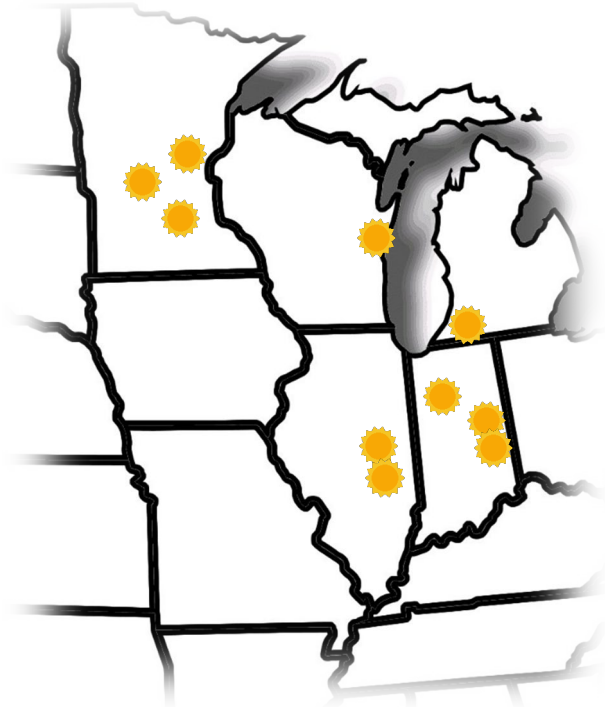
DOE Solar Futures Study found that for solar to contribute about half of net zero GHG emissions goal by 2050, about 11 million acres are needed.

U.S. Land Needed for Solar Development by 2050



Background

Two DOE SETO-funded Projects



(Innovative Solar Practices Integrated with Rural Economies and Ecosystems)



(Pollinator Habitat Aligned with Solar Energy)



2018 - 2022 Insect Responses to Solar-Pollinator Habitat

Does pollinator abundance and diversity increase with establishment of solar-pollinator habitat?



Transect-based
Monitoring conducted
4X each summer



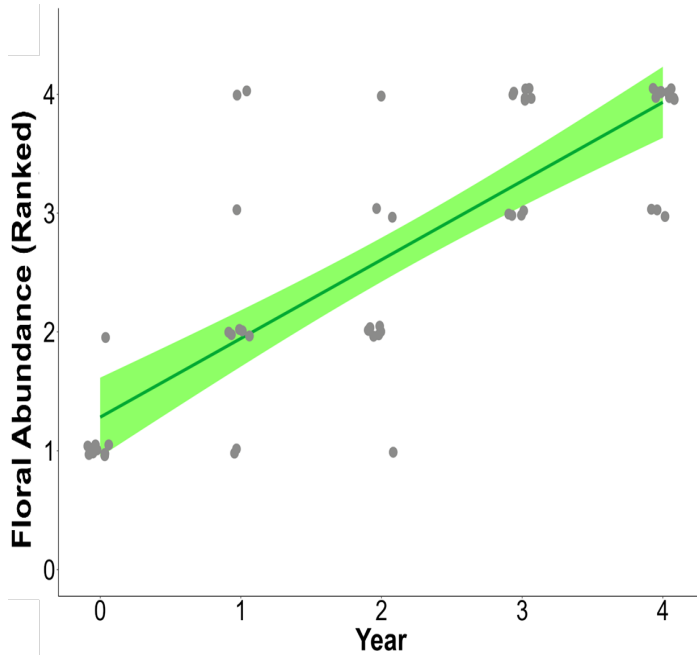
Habitat & Biodiversity Metrics:

1. **Floral Abundance**
2. **Flowering Species Richness**
3. **Pollinator Diversity**
4. **Total Pollinator Abundance**
5. **Native Bee Abundance**
6. **Pollinator Visitation (offsite ag fields)**



2018-2022: Onsite flower abundance and diversity increased

Floral Abundance



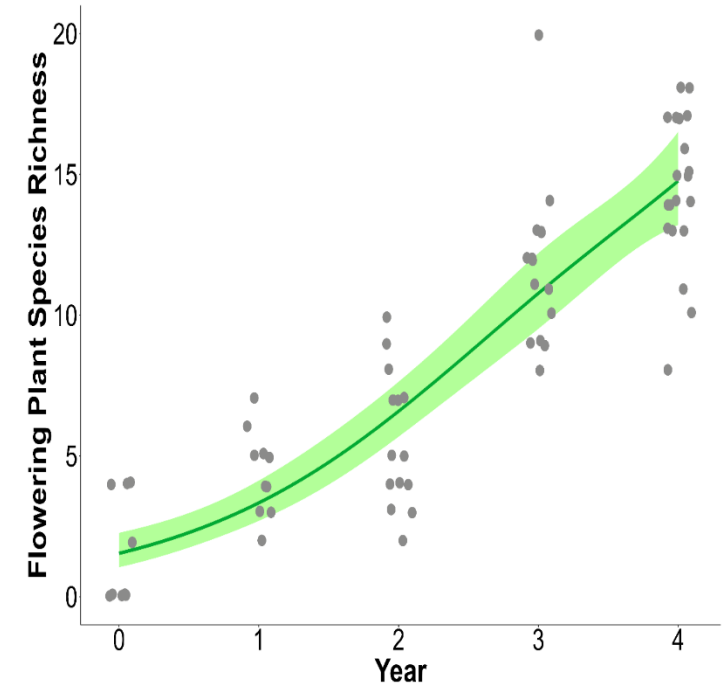
- 1: <50 flowers
- 2: 0-100 flowers
- 3: 100-250 flowers
- 4: >250 flowers



(this is what some sites look like today)

- | | |
|-------------------------|-------------------------|
| <i>Black-eyed Susan</i> | <i>Golden Alexander</i> |
| <i>Penstemon</i> | <i>Common Yarrow</i> |
| <i>Bee Balm</i> | <i>Wild Bergamot</i> |
| <i>Milkweed</i> | <i>Prairie Clover</i> |
| <i>Partridge Pea</i> | <i>Goldenrod</i> |

Flowering Plant Species Richness



Walston et al. (2024). [Environmental Research Letters](#)



2018 - 2022 - Pollinator Results

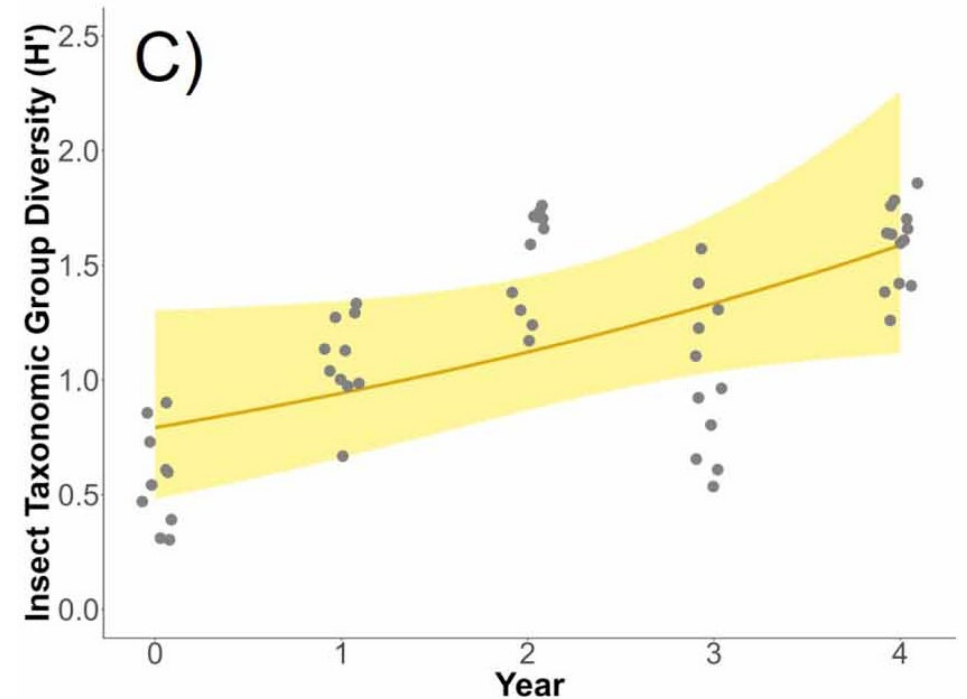
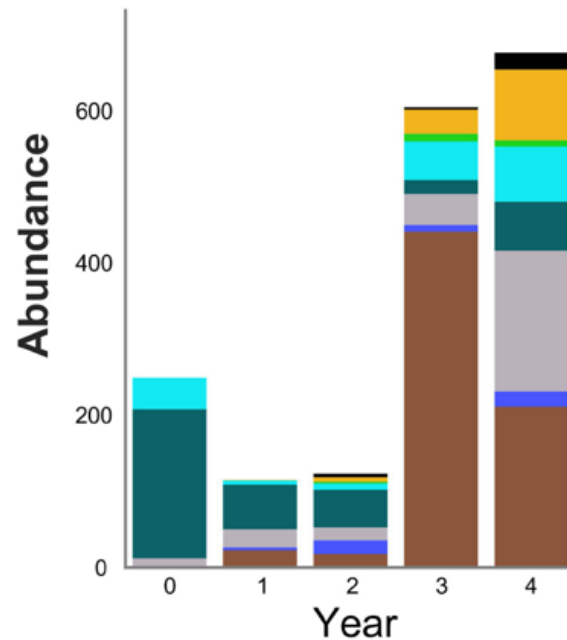
- Over 358 onsite transect observations
- Detected almost 11,000 insects to pollinator or beneficial insect groups
 - 4 Orders: Hymenoptera, Diptera, Lepidoptera, Coleoptera
- The most numerous groups were:
 - Beetles (mostly goldenrod soldier beetles), 35.1%
 - Syrphid flies, 19.5%
- Observed distinct increase in pollinator diversity over time



Syrphid fly
(*Toxomerus* sp.)

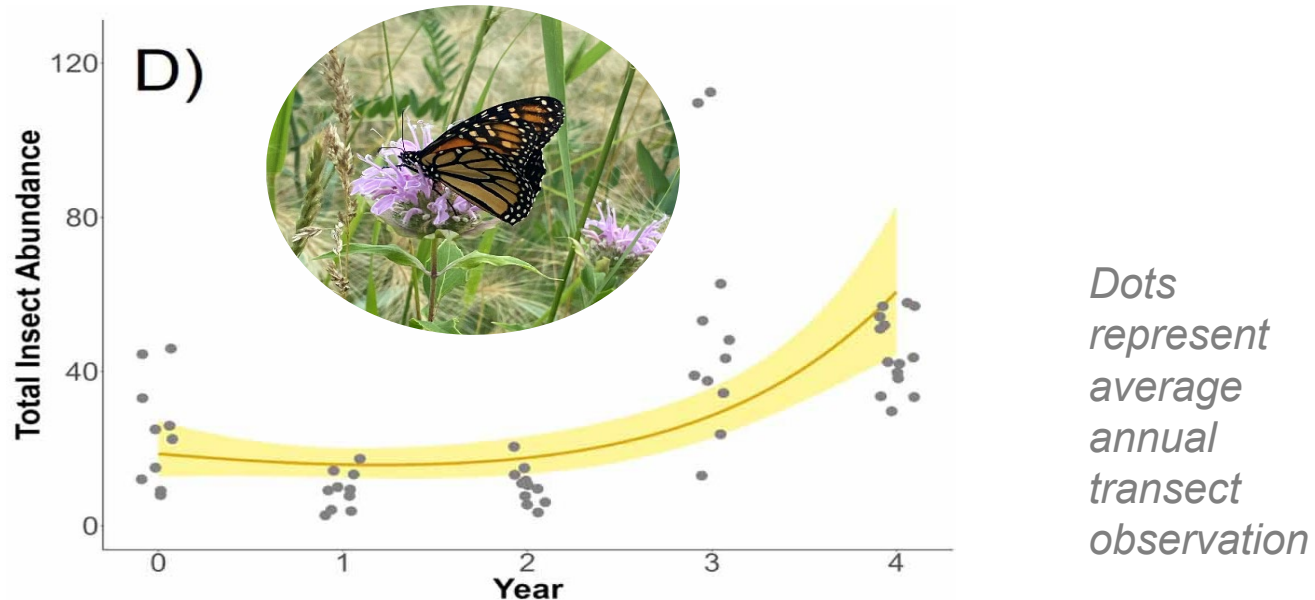


Soldier beetle
(*Chauliognatha* sp.)

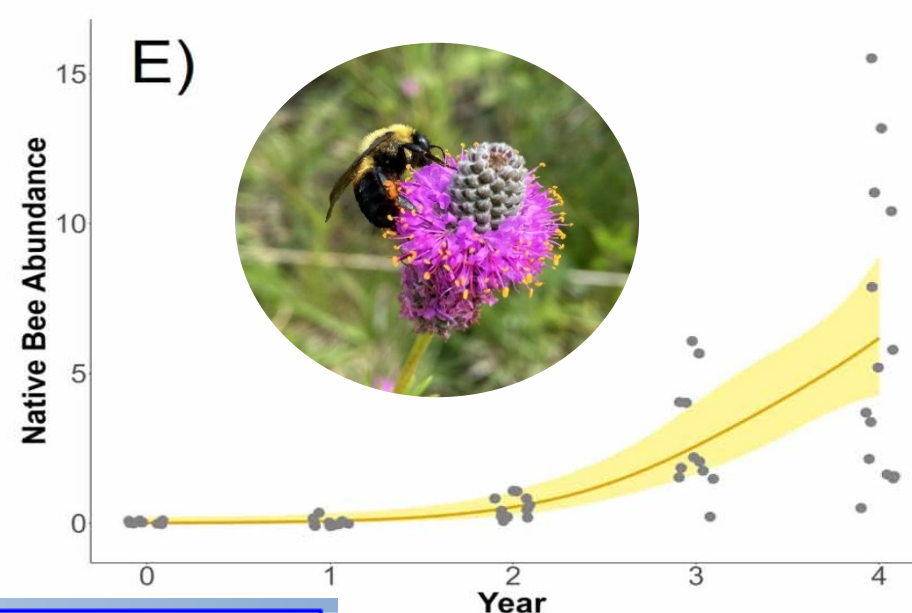


2018 - 2022 Results - Pollinator Abundance Also Increased

Total Pollinator Abundance



Native Bee Abundance



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ENVIRONMENTAL RESEARCH LETTERS

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LETTER

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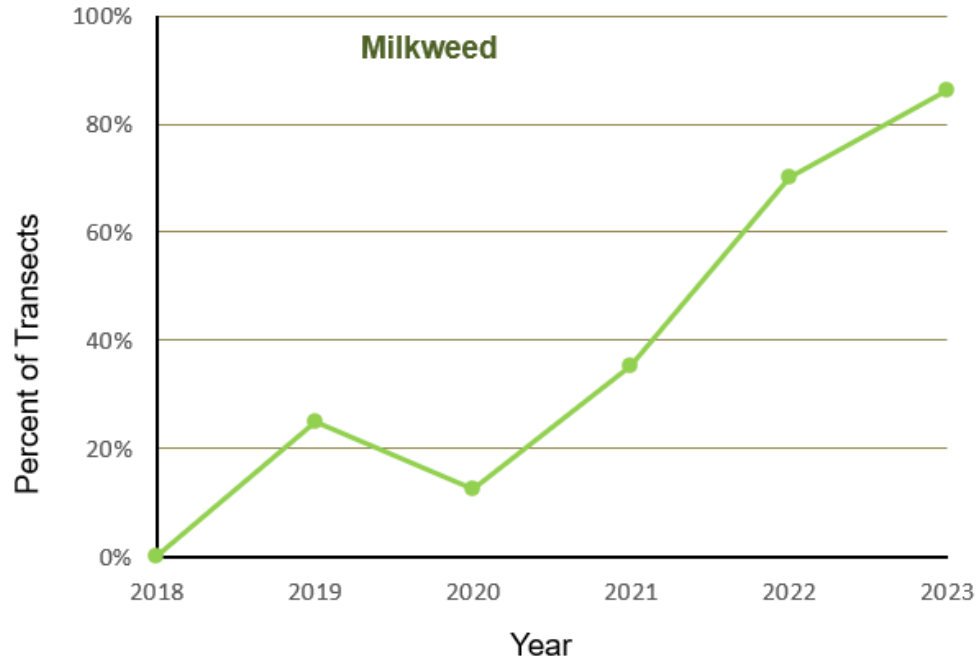
If you build it, will they come? Insect community responses to habitat establishment at solar energy facilities in Minnesota, USA

Leroy J Walston^{1,*}, Heidi M Hartmann¹, Laura Fox¹, Jordan Macknick², James McCall³, Jake Janski¹ and Lauren Jenkins⁴

¹ Argonne National Laboratory, Environmental Science Division, Lemont, IL, United States of America
² National Renewable Energy Laboratory, Golden, CO, United States of America
³ Minnesota Native Landscapes, Otsego, MN, United States of America
⁴ Duke University, Durham, NC, United States of America
* Author to whom any correspondence should be addressed.

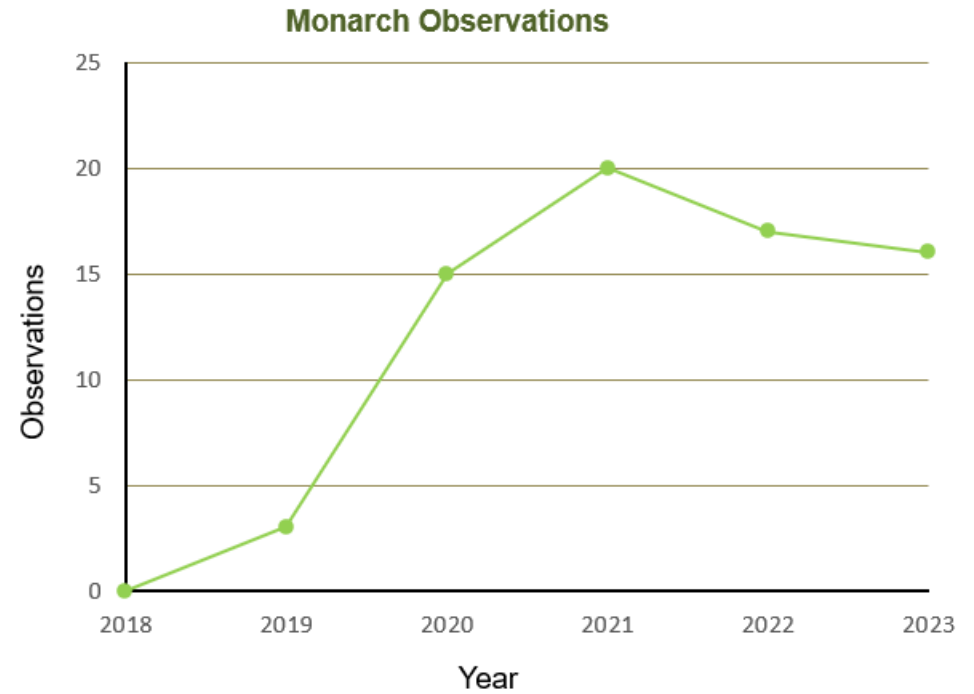
Results recently published

Milkweed and Monarchs



By 2023, over 80% of transects contained milkweed

Data from three Minnesota InSPIRE Sites



Adult & larvae monarch observations increased and peaked in 2021

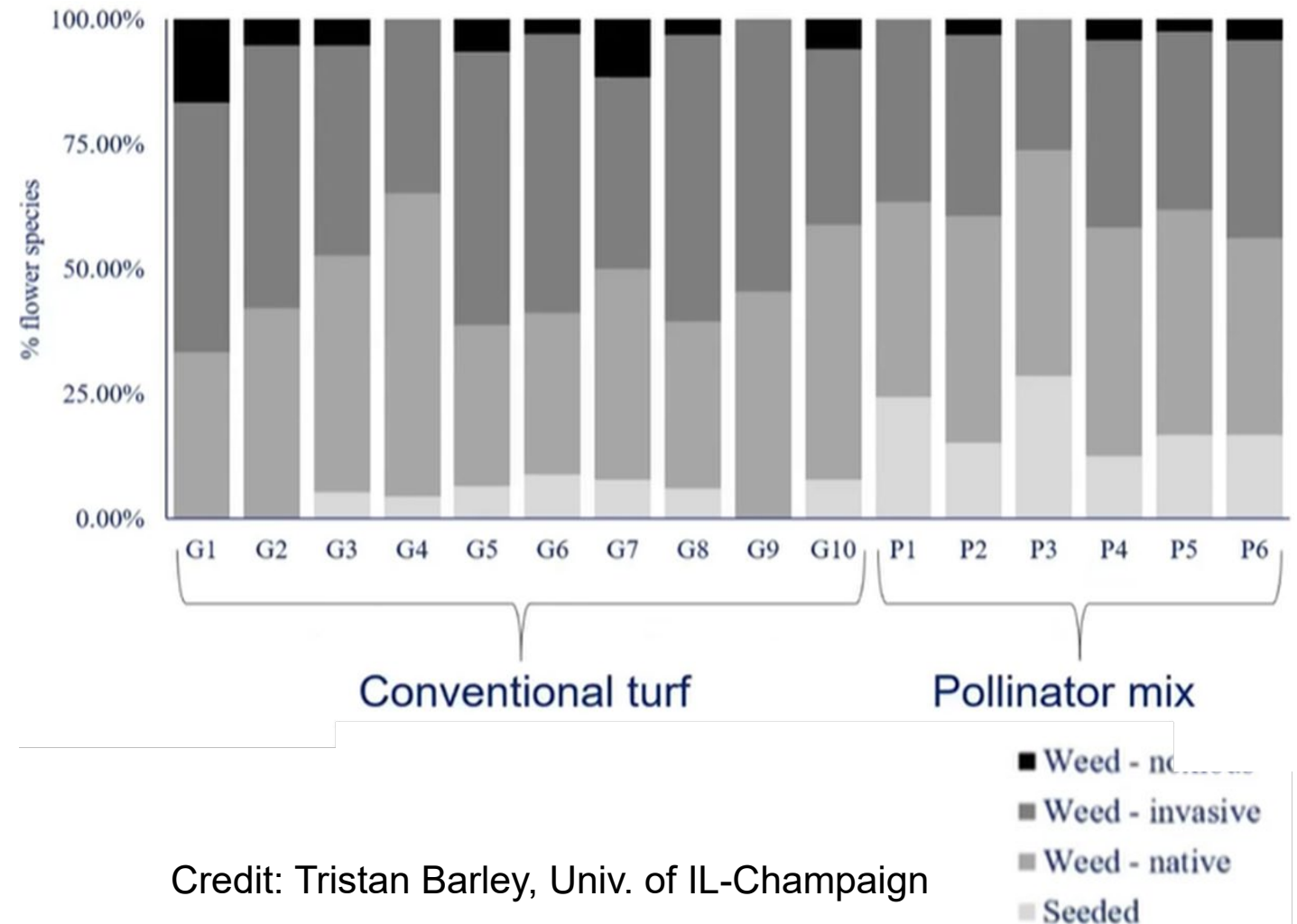


Determinants of Success

1. Panel Height / Vegetation Height
2. Site Preparation (soils)
3. Pollinator Value
4. Management Needs
5. Mowing Regime
6. Budget
7. Seed Availability
8. Shade Tolerance
9. ...and more...



Preliminarily, most flowers at the PHASE solar sites are weeds (not planted)



Credit: Tristan Barley, Univ. of IL-Champaign

Thank You!



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Questions/Comments: Contact Heidi at hnhartmann@anl.gov