



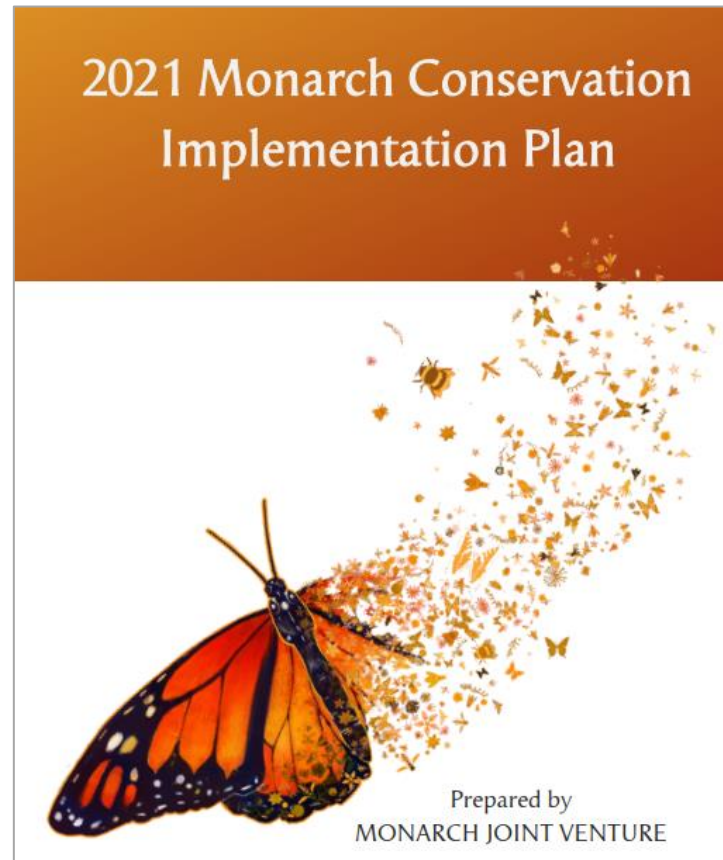
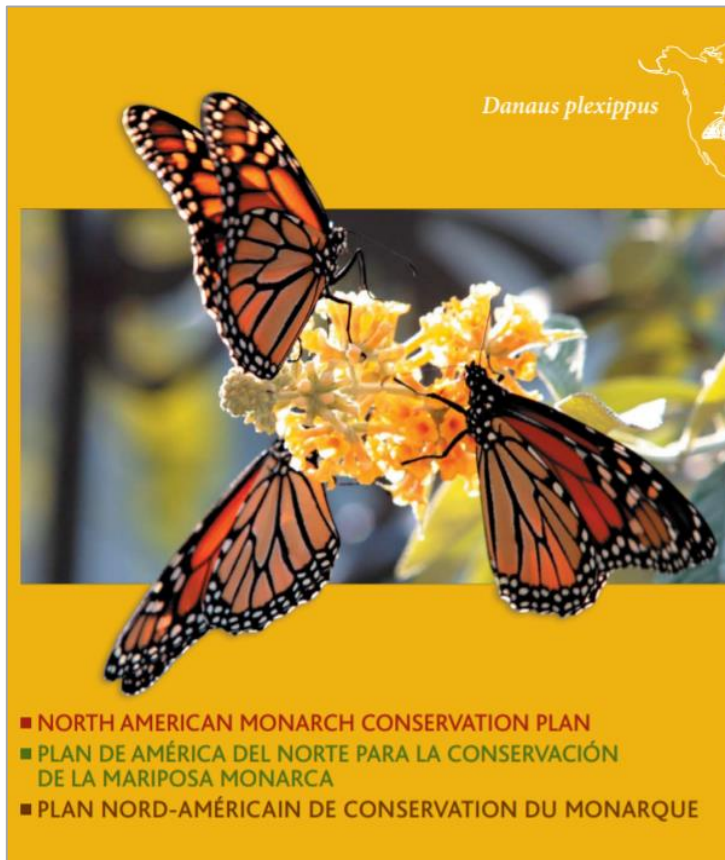
Minnesota's Habitat Friendly Solar Program: Pollinator Benefits



MONARCH
JOINT VENTURE

Laura Lukens, Monarch Joint Venture

How We Work



- Joint Venture Model
- Voluntary Conservation
- Monarch Conservation Implementation Plan
 - Pillars
 - Partnership
 - Education
 - Habitat Conservation
 - Science



Insect decline in the Anthropocene: Death by a thousand cuts

David L. Wagner  , Eliza M. Grames , Matthew L. Forister , , and David Stopak [Authors Info & Affiliations](#)

Global pollinator declines: trends, impacts and drivers

Simon G. Potts ¹ , Jacobus C. Biesmeijer ², Claire Kremen ³, Peter Neumann ⁴, Oliver Schweiger ⁵, William E. Kunin ²








Articles / Reviews


Insect decline: immediate action is needed

Hervé Jactel ¹ ; Jean-Luc Imler ²; Louis Lambrechts Maho ^{6, 7}; Jean-Claude Duplessy ⁸; Pascale Cossart ⁹;]

Western Monarch Population Plummet: Status, Probable Causes, and Recommended Conservation Actions

 Emma M. Pelton¹,  Cheryl B. Schultz²,  Sarina J. Jepsen¹,  Scott Hoffman Black¹ and  Elizabeth E. Crone^{3*}

More than 75 percent decline over 27 years in total flying insect biomass in protected areas

Caspar A. Hallmann , Martin Sorg, Eelke Jongejans, Henk Siepel, Nick Hofland, Heinz Schwan, Werner Stenmans, Andreas Müller, Hubert Sumser, Thomas Hörrn, Dave Goulson, Hans de Koon

Worldwide occurrence records suggest a global decline in bee species richness

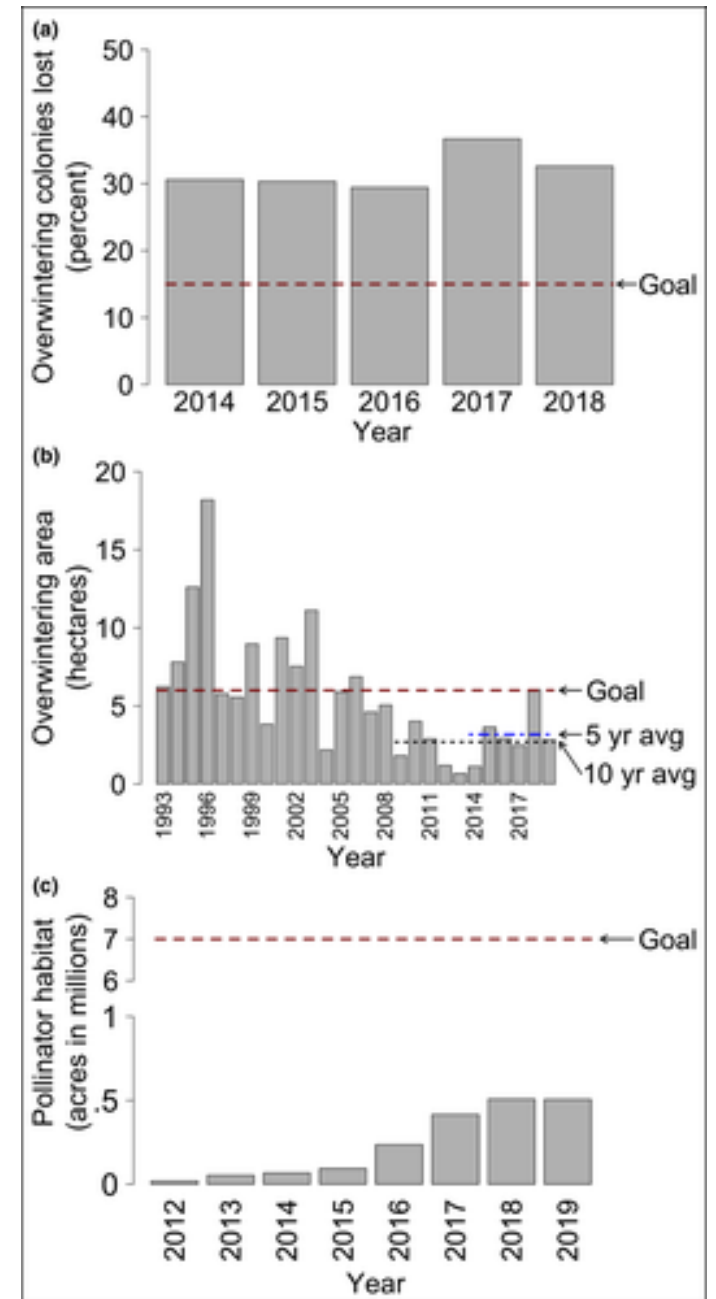
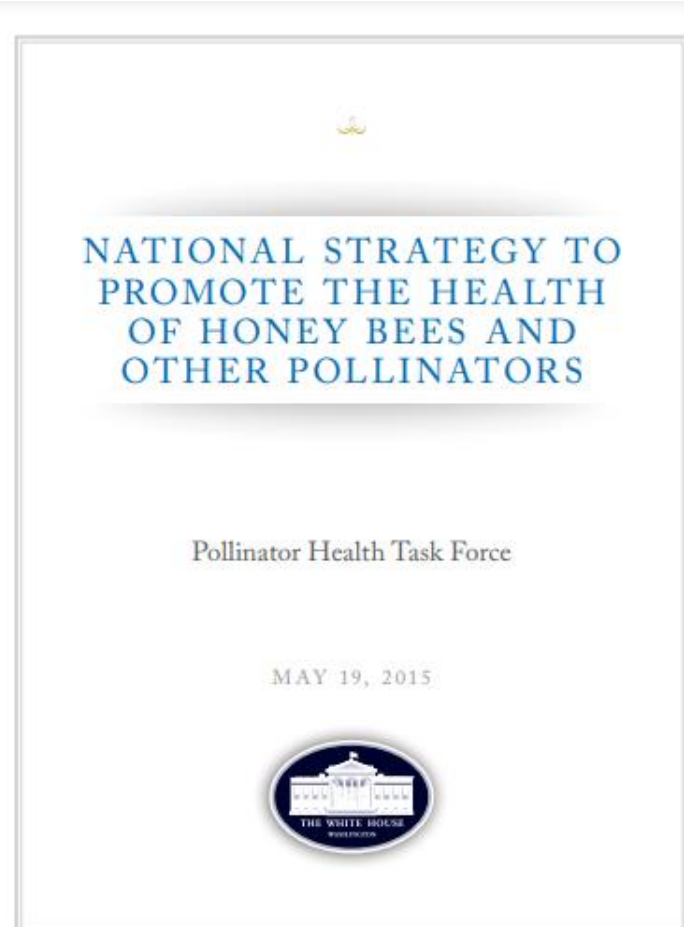
Eduardo E. Zattara ^{1, 2, 3, 5}  , Marcelo A. Aizen ^{1, 4}

Cascading extinctions as a hidden driver of insect decline

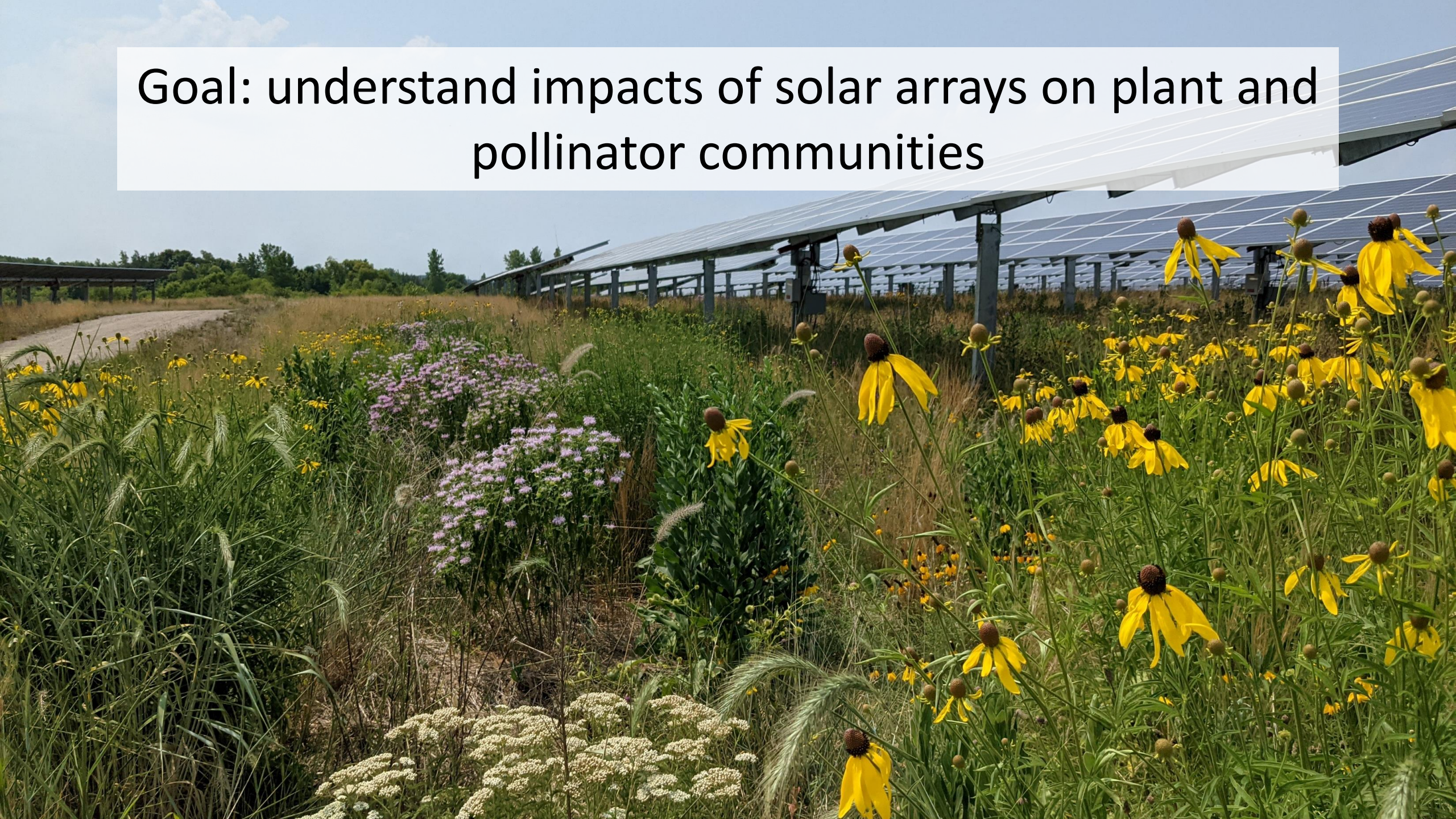
Rachel Kehoe, Enric Frago, Dirk Sanders 

First published: 30 November 2020 | <https://doi.org/10.1111/een.12985> | Citations: 3

Failing to meet honeybee, monarch butterfly, and pollinator habitat conservation goals



Goal: understand impacts of solar arrays on plant and pollinator communities



Methods

- 4 PV sites in MN, Jun - Aug
- Series of transects in:
 - Area outside of arrays = “full-sun”
 - Solar array rows = “partial-shade”
- Milkweed, flowering plants, insect pollinators, monarch eggs & caterpillars





Survey Protocols - Plants

Relative Abundance and Richness of Milkweed and Blooming Plants

- 1-m² quadrats along transects (42 per survey)
- Integrated Monarch Monitoring Program protocols



Survey Protocols - Monarchs

Immature Monarch Presence/Absence and Per Plant Density

- Examined milkweed plants within 1-m of each side of transects
- Integrated Monarch Monitoring Program protocols



Survey Protocols - Pollinators

Pollinator Abundance by Order

- Transect surveys (8 mins/2-m width per transect)
- Focal monitoring (5 minutes/1-m radius per transect)
- Argonne National Laboratory, Ward et al. 2014





RESULTS

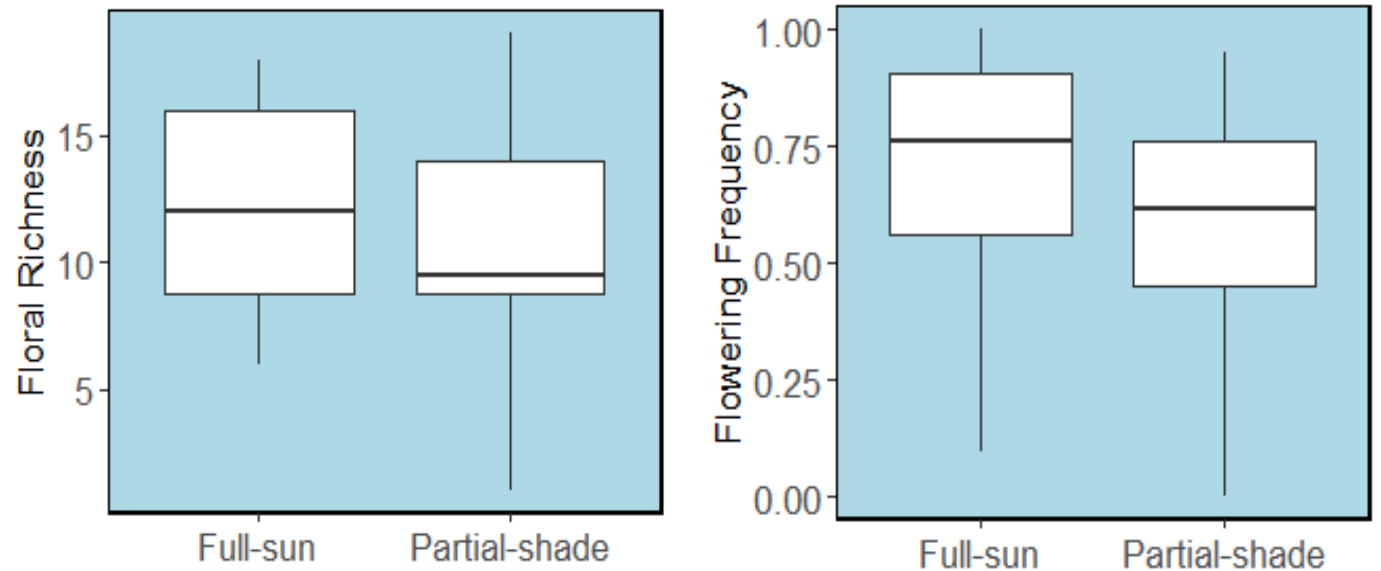


Flowering Plants

- 72 plant species observed in bloom (45 = native)
- 39 blooming species per site (range = 32-51) (23 = native)
- 23 blooming species per visit (range = 10-35) (13 = native)



Flowering Plants



*Mean richness and relative abundance tended to be higher on full-sun transects but difference was **not** statistically significant.*



Common Species

- *Achillea millefolium* (common yarrow, native)
- *Berteroa incana* (hoary alyssum, non-native)
- *Erigeron annuus* (daisy fleabane, native)
- *Lotus corniculatus* (bird's foot trefoil, non-native)
- *Medicago lupulina* (black medic, non-native)
- *Melilotus officinalis* (sweetclover, non-native)
- *Ratibida pinnata* (prairie coneflower, native)
- *Rudbeckia hirta* (blackeyed susan, native)
- *Silene latifolia* (bladder campion, non-native)
- *Verbena stricta* (hoary vervain)
- *Zizia aurea* (golden alexander, native)



Milkweed

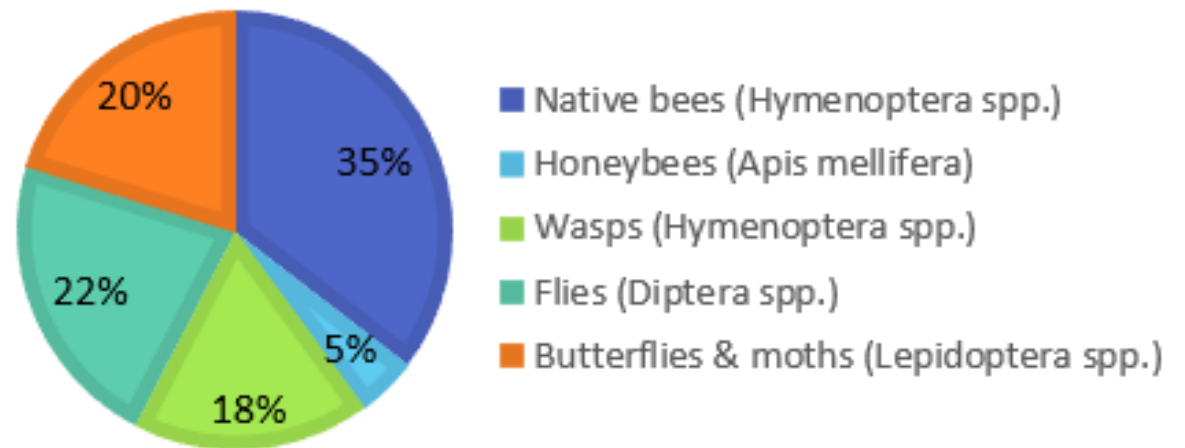
- Present at every site
- *Asclepias syriaca*, *A. tuberosa*, & *A. incarnata*

No significant difference in milkweed density on full-sun vs partial-shade transects.



Insect Pollinators

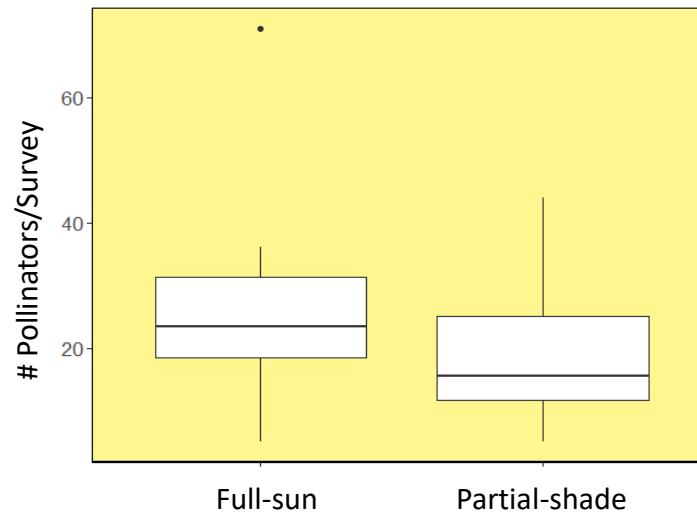
- 644 recorded on transect + focal surveys
 - Avg of 45 during transect sampling per site visit
 - Avg of 9 during focal surveys per site visit



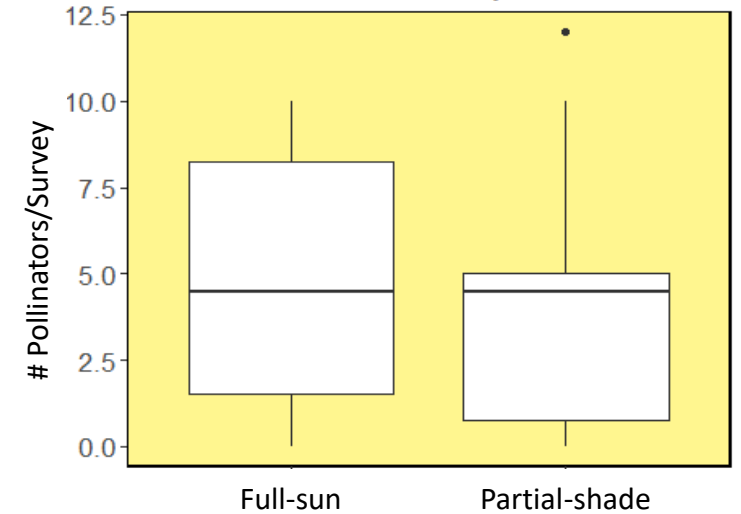


Insect Pollinators

Transect Surveys



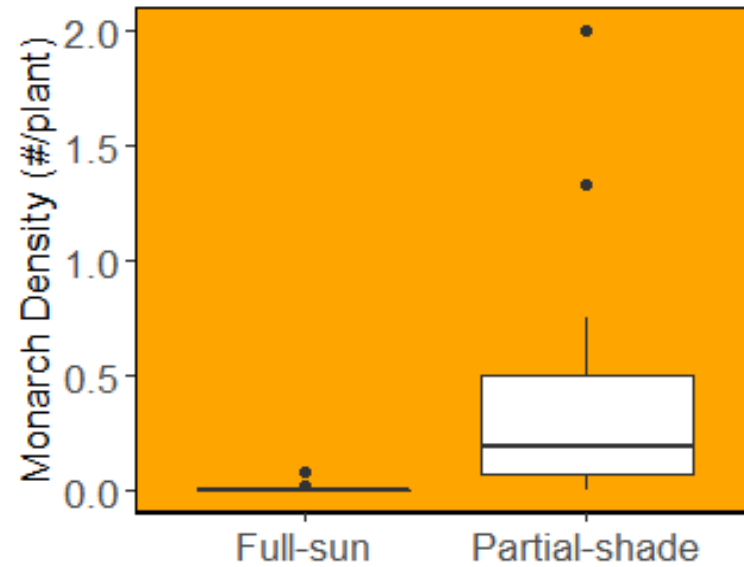
Focal Surveys



*Though the mean # pollinators observed on transects was a bit higher in full-sun than in partial-shade, the difference was **not** statistically significant. No difference on focal surveys.*



Monarch Reproduction



Monarch abundance and per plant density were significantly higher on partial-shade transects than full-sun.

Summary

No detectable differences in plant and pollinator communities within and outside of solar arrays, except for immature monarchs

- Pollinators used habitat regardless of panel presence
- High number of flowering species (including some invasives)
- More monarchs on milkweed within solar arrays



Study Limitations

- Small sample size
- Morning & early afternoon surveys only
- Varying seed mixes across each site





Long-term Considerations

- Planning & management
- Follow-up monitoring and assessments



THANK YOU!

Laura Lukens
llukens@monarchjointventure.org
www.monarchjointventure.org



MONARCH
JOINT VENTURE

*Funders & Collaborators: Fresh Energy,
Enel Green Power North America, and
ENGIE Distributed Solar*