



**Fresh Energy**

**Rob Davis**

Director, Center for Pollinators in Energy

**[davis@fresh-energy.org](mailto:davis@fresh-energy.org)**











Solar array, Ohio



Photo: Janelle Patterson, *Marietta Times*







RICHARD BEAVER FOR THE WALL STREET JOURNAL

Energy from more than 1,200 solar panels powers Benjamin Freund's 650-acre dairy farm and home in East Canaan, Conn.

# Solar Projects Sow Tension

As panels supplant crops on more farms, states weigh limits on big renewable fields

By JOSEPH DE AVILA

The boom in solar energy is forcing states and farming communities to grapple with where large renewable-energy projects should be built.

In Connecticut, a state sena-

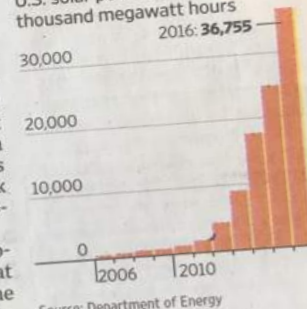
tion of Counties.

The pressure in rural areas stems, in part, from simple economics. Some farmers are installing solar panels on a patch of their land to help offset energy costs. Other farmers are renting out entire fields to solar companies that can afford to pay premium prices for access to clear fields that don't require much work or money to prepare for a solar project.

"Of course, there can be local tension in terms of what are used to on the

## On the Bright Side

U.S. solar power generation in thousand megawatt hours



whelming opposition," said Mr. Scanlon. The county denied the application.

Benjamin Freund, who has a dairy farm in East Canaan, Conn., in recent years installed more than 1,200 solar panels on a patch of his land and on top of his dairy barn. The generated power offsets his entire \$6,000 monthly energy bill.

He said he doesn't like competing with solar companies when he needs access to other farmland, but he also doesn't like being told what he can build on his property.

"From a property rights standpoint, this is a heavy-





**Fresh Energy**



Sarah Sphar CC



































September 2016



SoCore Energy & Prairie Restorations



# September 2017



SoCore Energy & Prairie Restorations Inc.







**Aurora Solar**  
**100 MW distributed**  
**solar array**  
**16 sites**  
**1,000 acres**

**Pollinator-friendly seed**  
**mix used on all sites**

**Sample General Composition of Seed Mix for use within Solar Panel Array**

<b>No Mow Turf with Forbs; Seeding Rate: 42 seeds per Sq. ft./ac</b>	<b>Height</b>	<b>Bloom Time</b>	<b>oz./acre</b>	<b>Seeds/oz.</b>	<b>Seeds/sq. ft.</b>
<i>Cover Crop</i>					
<i>Avena sativa</i> (Oats) <sup>1</sup>	3'	NA	20lbs/ac	1,100	8.9
<i>Grasses</i>					
<i>Bouteloua curtipendula</i> (Side oats grama) PLS	1-2'	Jun-Nov	8.0	6000.00	1.10
<i>Bouteloua gracilis</i> (Blue grama) PLS	1'	Jul-Oct	4.0	40,000.00	3.67
<i>Buchloe dactyloides</i> (Buffalo grass--BOWIE cultivar) PLS	5"	Apr-Dec	128.0	3,600.00	10.58
<i>Carex bicknelli</i> (Copper shouldered oval sedge) PLS	1-3'	Mar-May	2.0	17000.00	0.78
<i>Koeleria macrantha</i> (Junegrass) PLS	10-20"	Apr-Jun	4.0	200,000.00	18.37
<i>Sporobolus heterolepis</i> (Prairie Dropseed) PLS	2-3'	Jun-Aug	4.0	16,000	1.47
<i>Forbs</i>					
<i>Allium canadense</i> (Wild garlic)	1-2'	May-Jul	8.0	560.00	0.10
<i>Allium stellatum</i> (Prairie onion)	8-18"	Jul-Aug	1.00	11,000.00	0.25
<i>Anemone canadensis</i> (Canada Anemone)	1-2'	May-Jun	1.00	8,000.00	0.18
<i>Anemone patens</i> (Pasqueflower)	3-18"	Apr-May	1.00	18,000.00	0.41
<i>Asclepias tuberosa</i> (Butterfly-weed)	1-2'	Jun-Aug	2.00	4,300.00	0.20
<i>Echinacea angustifolia</i> (Narrow leaved Purple Coneflower)	1-2'	Jun-Jul	2.00	7000	0.32
<i>Sisyrinchium campestre</i> (Prairie blue-eyed grass)	4-16"	May-Jun	1.00	45,000.00	1.03
<i>Solidago nemoralis</i> (Gray goldenrod)	1-2'	Aug-Oct	0.50	300,000.00	3.44

## North Star Solar

# 100 MW solar array

1,000 acres

## Largest single-site array in the Midwest

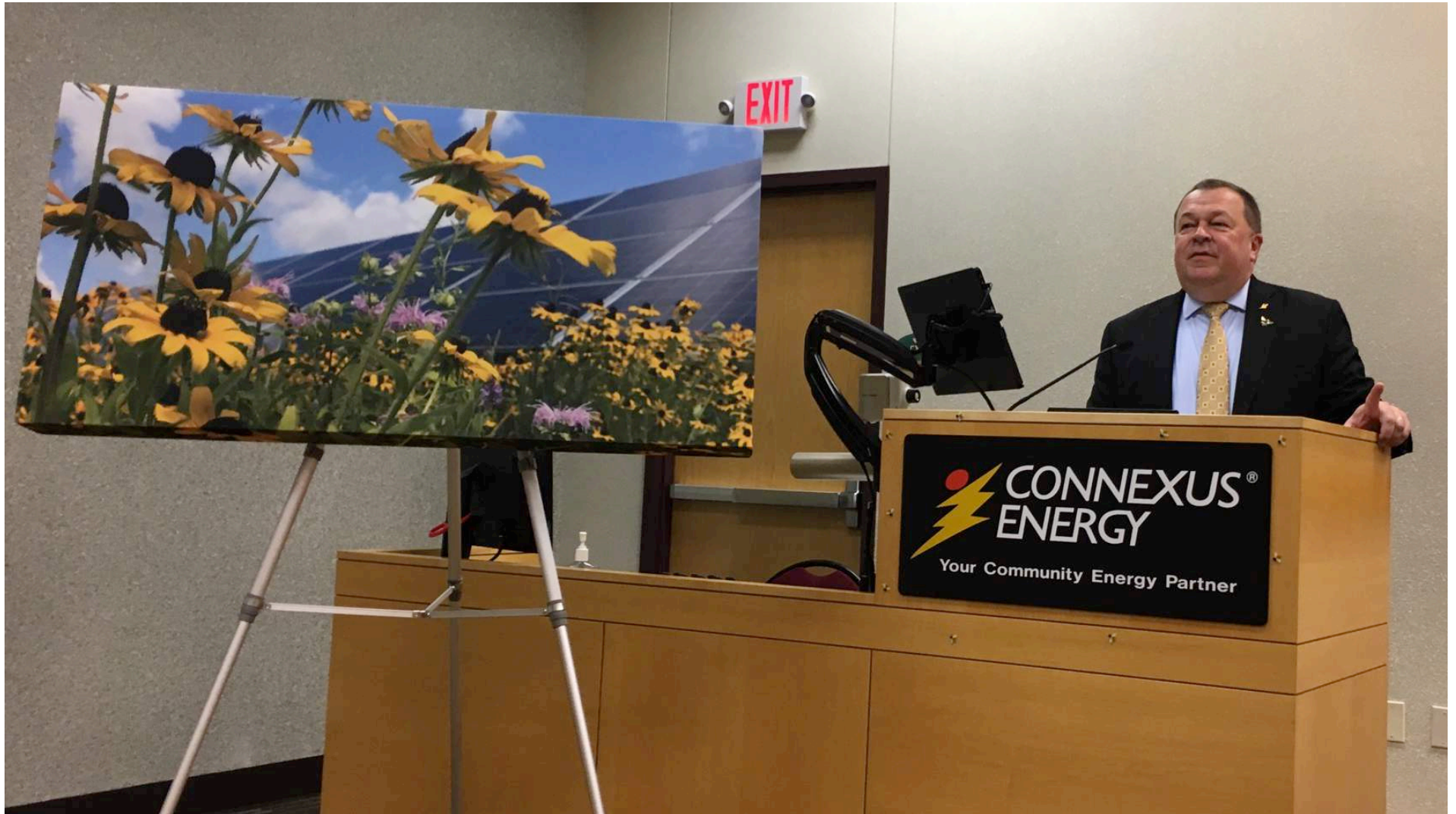
## Pollinator-friendly seed mix from Minnesota

## Native Landscapes used throughout

	Scientific Name	Common Name	% of Mix	PLS lbs/ac	Total PLS lbs	Seeds/ Sq Ft
Grasses:	Bouteloua curtipendula	Side-Oats Grama	35.00	2.80	2.80	10.23
	Bouteloua gracilis	Blue Grama	12.00	0.96	0.96	14.10
	Carex bicknellii	Bicknell's Sedge	1.50	0.12	0.12	0.75
	Carex radiata	Eastern Star Sedge	1.50	0.12	0.12	1.81
	Carex vulpinoidea	Fox Sedge	1.25	0.10	0.10	2.98
	Koeleria macrantha	Junegrass	1.25	0.10	0.10	7.35
	Schizachyrium scoparium	Little Bluestem	14.50	1.16	1.16	6.39
	Sporobolus cryptandrus	Sand Dropseed	4.00	0.32	0.32	23.51
	Sporobolus heterolepis	Prairie Dropseed	5.00	0.40	0.40	2.35
	Forbs:	Achillea millefolium	Yarrow	0.40	0.03	0.03
Agastache foeniculum		Fragrant Giant Hyssop	0.25	0.02	0.02	0.86
Allium stellatum		Prairie Onion	0.50	0.04	0.04	0.16
Anemone canadensis		Canada Anemone	0.25	0.02	0.02	0.06
Aquilegia canadensis		Columbine	0.25	0.02	0.02	0.28
Asclepias syriaca		Common Milkweed	0.75	0.06	0.06	0.09
Asclepias tuberosa		Butterfly Milkweed	0.75	0.06	0.06	0.09
Asclepias verticillata		Whorled Milkweed	0.25	0.02	0.02	0.08
Aster oolentangiensis		Sky-Blue Aster	1.25	0.10	0.10	2.94
Aster laevis		Smooth Blue Aster	0.75	0.06	0.06	1.21
Aster lateriflorus		Calico Aster	0.80	0.06	0.06	5.88
Astragalus canadensis		Canada Milk Vetch	0.75	0.06	0.06	0.37
Coreopsis palmata		Prairie Coreopsis	0.50	0.04	0.04	0.15
Dalea candida		White Prairie Clover	3.00	0.24	0.24	1.67
Dalea purpureum		Purple Prairie Clover	3.00	0.24	0.24	1.32
Desmodium canadense		Canada Tick Trefoil	1.00	0.08	0.08	0.16
Helianthus pauciflorus		Stiff Sunflower	0.40	0.03	0.03	0.05
Monarda fistulosa		Wild Bergamot	0.75	0.06	0.06	1.54
Liatis aspera		Rough Blazing Star	0.75	0.06	0.06	0.35
Lupinus perennis		Wild Lupine	0.25	0.02	0.02	0.01
Penstemon gracilis		Slender Beardtongue	0.40	0.03	0.03	7.05
Potentilla arguta		Prairie Cinquefoil	0.25	0.02	0.02	1.69
Pycnanthemum virginianum		Mountain Mint	0.50	0.04	0.04	3.23
Ratibida columnifera		Long-Headed Coneflower	1.00	0.08	0.08	1.23
Rudbeckia hirta		Black Eyed Susan	1.25	0.10	0.10	3.38
Solidago nemoralis		Old Field Goldenrod	0.50	0.04	0.04	4.41
Solidago rigida		Stiff Goldenrod	1.50	0.12	0.12	1.81
Verbena stricta		Hoary Vervain	1.25	0.10	0.10	1.03
Zizia aurea		Golden Alexanders	0.75	0.06	0.06	0.24
Cover Crop:		Triticum aestivum	Winter Wheat		10.00	10.00

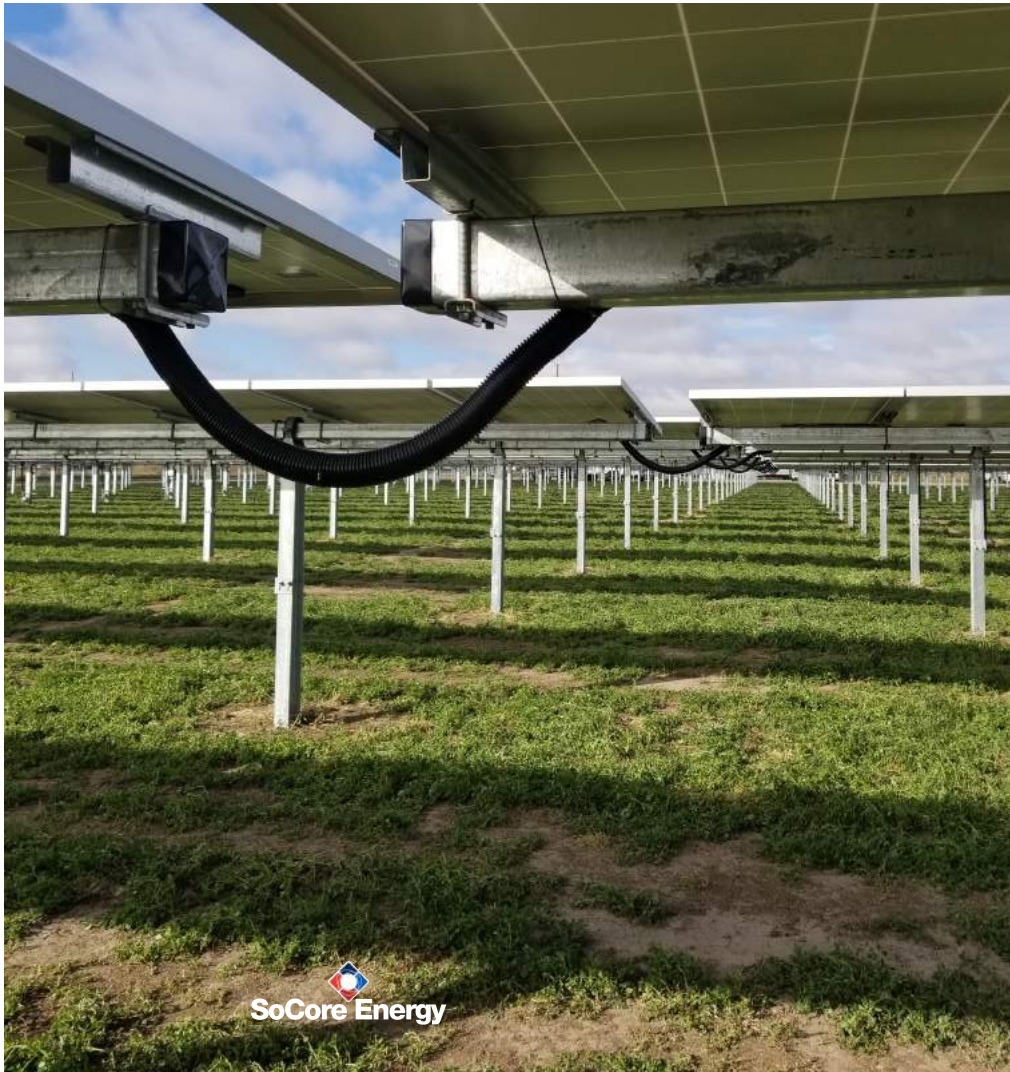
*Species subject to change based on price and availability at the time of planting*











## Nebraska Public Power District Kearney, NE

Solar array seeded with >5 million  
native plants including:

- Purple Prairieclover
- Indian Blanket
- Four Point Evening Primrose
- Scarlet Globemallow
- Heath Aster
- Aromatic Aster
- Dwarf Goldenrod

# Pollinator Habitat Benefits Agriculture

- Economic analysis of wild pollinator contribution to 10 major crops.
- In nearly all cases and especially for tomatoes, blueberries, melons, cucumbers, squash, apples, peaches, and bell peppers,
- Gross revenues increase directly because of the installation of pollinator habitat—and that's even after subtracting out implementation costs.

<http://bit.ly/BeesCrops>



# Incomplete Pollination



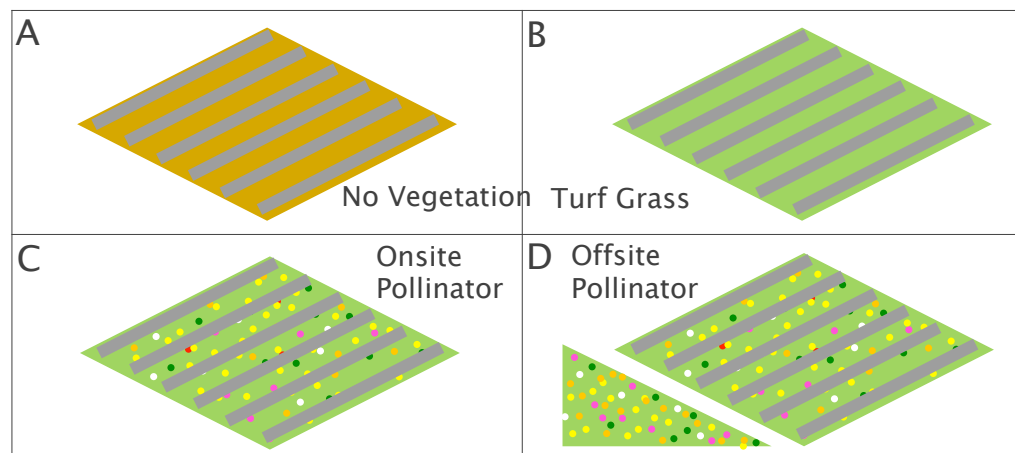
- 70% of crops
- 100's of billions / year



## InSPIRE: Innovative Site Preparation and Impact Reductions on the Environment

- § Interest in restoration of ecosystem services of solar sites
- § What about pollinator services through maintenance of solar-pollinator habitat?

*The establishment of regional flowering plants and soil preparation methods, either within the solar facility footprint area (e.g., beneath PV panels) and/or in offsite areas adjacent to the solar facility, that attract and support insect pollinators.*

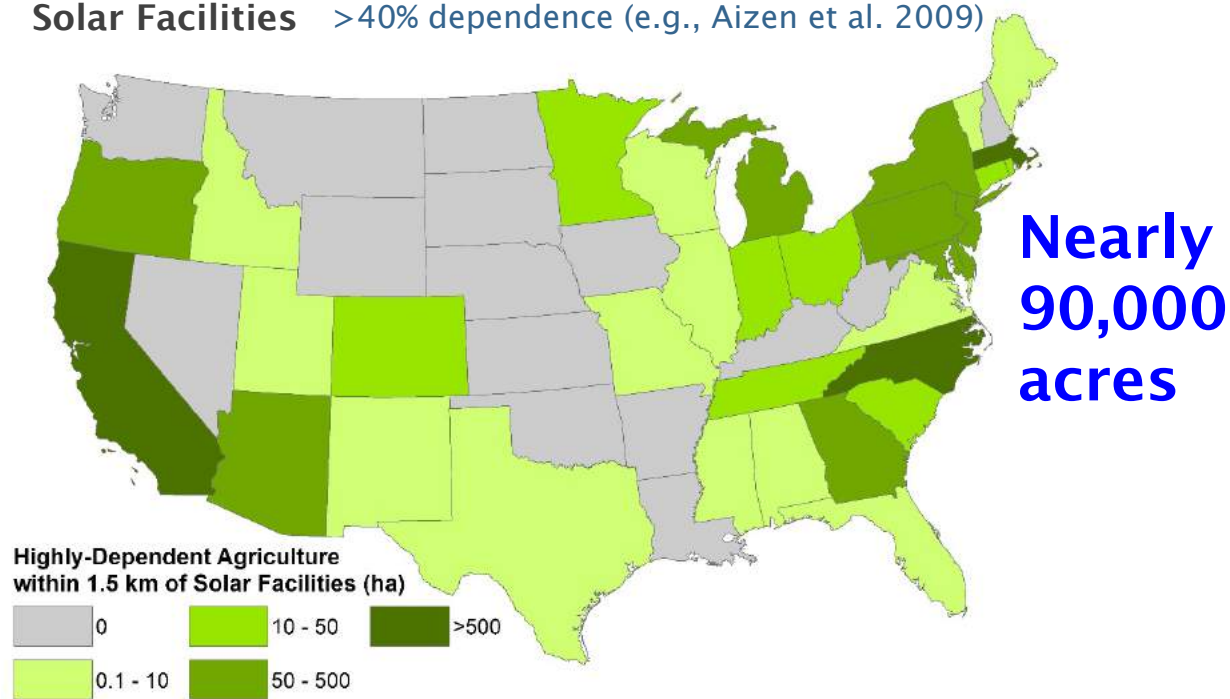


Agricultural Benefits of Solar-Pollinator Habitat



## Quantifying Potential Solar-Pollinator Agricultural Interactions

Total Amount of Highly Pollinator-Dependent Agriculture Near Solar Facilities >40% dependence (e.g., Aizen et al. 2009)



Agricultural Benefits of Solar-Pollinator Habitat



**Co-location of solar & agriculture**





**Co-location of solar & agriculture**

06.25.18 | WORLD CHANGING IDEAS

## This new solar farm combines clean energy and beehives

Using the space around the solar panels as sites for 48 hives, the Eagle Point solar farm is using its land to save pollinators and help local agriculture.





# The business case for pollinator-friendly solar sites

Steve Levitsky, Brian Riddle, Dennis vanEngelsdorp and Albert Todd  
Monday, May 15, 2017 - 1:30am

share this article



Steve Levitsky

Vice President,  
Sustainability  
Perdue Farms

Brian Riddle





## Solar Site Management for Soil, Storm Water, and Pollinator Benefits

Rob Davis, Fresh Energy

Adapted with permission from Heidi Natus, Living Habitats © 1993



## Organic Valley launches community solar partnership to be 100 percent renewably powered by 2019

Farmer-owned cooperative will become the largest food company in the world to source all its electricity from renewable resources within the decade.



**“...will adopt pollinator-friendly solar standards...”**

**Once complete, these meadows, filled with native flowering plants and grasses, will create as much bee and butterfly habitat as if 30,000 families were to each plant six-by-twelve-foot pollinator gardens.**

What constitutes “pollinator-friendly”  
in the context of a solar array?





Dr. Karen Oberhauser

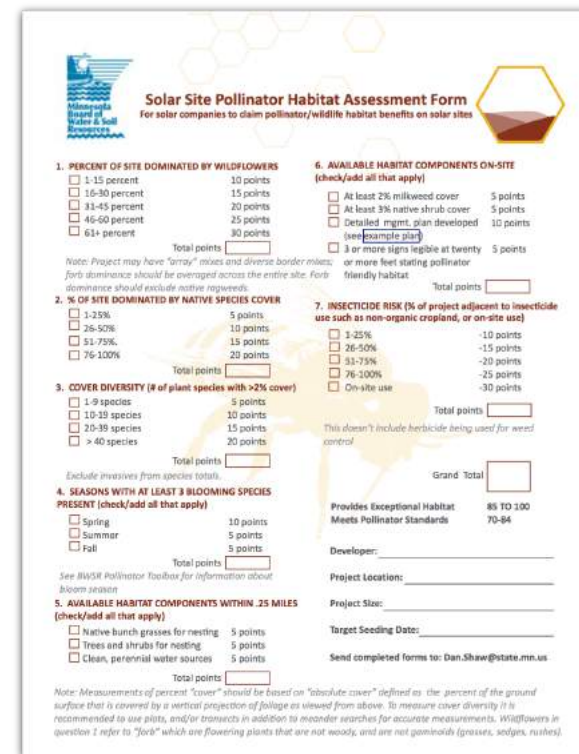
University of Minnesota

Dr. Marla Spivak

University of Minnesota

# Flexible Standard

- Percent wildflowers
- Percent native species
- Diversity of species
- # seasons flowering
- Nearby assets
- Signage? Mgt plan?
- Insecticide risk



**Solar Site Pollinator Habitat Assessment Form**  
For solar companies to claim pollinator/wildlife habitat benefits on solar sites

**1. PERCENT OF SITE DOMINATED BY WILDFLOWERS**

<input type="checkbox"/> 1-15 percent	10 points
<input type="checkbox"/> 16-30 percent	15 points
<input type="checkbox"/> 31-45 percent	20 points
<input type="checkbox"/> 46-60 percent	25 points
<input type="checkbox"/> 61+ percent	30 points

Total points:

**2. % OF SITE DOMINATED BY NATIVE SPECIES COVER**

<input type="checkbox"/> 1-25%	5 points
<input type="checkbox"/> 26-50%	10 points
<input type="checkbox"/> 51-75%	15 points
<input type="checkbox"/> 76-100%	20 points

Total points:

**3. COVER DIVERSITY (# of plant species with >2% cover)**

<input type="checkbox"/> 1-9 species	5 points
<input type="checkbox"/> 10-19 species	10 points
<input type="checkbox"/> 20-39 species	15 points
<input type="checkbox"/> > 40 species	20 points

Total points:

**4. SEASONS WITH AT LEAST 3 BLOOMING SPECIES PRESENT (check/add all that apply)**

<input type="checkbox"/> Spring	10 points
<input type="checkbox"/> Summer	5 points
<input type="checkbox"/> Fall	5 points

Total points:

**5. AVAILABLE HABITAT COMPONENTS WITHIN .25 MILES (check/add all that apply)**

<input type="checkbox"/> Native bunch grasses for nesting	5 points
<input type="checkbox"/> Trees and shrubs for nesting	5 points
<input type="checkbox"/> Clean, perennial water sources	5 points

Total points:

**6. AVAILABLE HABITAT COMPONENTS ON-SITE (check/add all that apply)**

<input type="checkbox"/> At least 2% milkweed cover	5 points
<input type="checkbox"/> At least 3% native shrub cover	5 points
<input type="checkbox"/> Detailed mgmt. plan developed (see example plan)	10 points
<input type="checkbox"/> 3 or more signs legible at twenty or more feet stating pollinator friendly habitat	5 points

Total points:

**7. INSECTICIDE RISK (% of project adjacent to insecticide use such as non-organic cropland, or on-site use)**

<input type="checkbox"/> 1-25%	-10 points
<input type="checkbox"/> 26-50%	-15 points
<input type="checkbox"/> 51-75%	-20 points
<input type="checkbox"/> 76-100%	-25 points
<input type="checkbox"/> On-site use	-30 points

Total points:

*This doesn't include herbicide being used for weed control.*

**Grand Total:**

**Provides Exceptional Habitat:** 85 TO 100  
**Meets Pollinator Standards:** 70-84

Developer: \_\_\_\_\_  
Project Location: \_\_\_\_\_  
Project Size: \_\_\_\_\_  
Target Seeding Date: \_\_\_\_\_  
Send completed forms to: Dan.Shaw@state.mn.us

Note: Measurements of percent "cover" should be based on "absolute cover" defined as the percent of the ground surface that is covered by a vertical projection of foliage as viewed from above. To measure cover diversity it is recommended to use plots, and/or transects in addition to meander searches for accurate measurements. Wildflowers in question 1 refer to "forb" which are flowering plants that are not woody, and are not graminoids (grasses, sedges, rushes).





## Local solar project to turn land into pollinator haven

**“EGP-NA saw the integration of a vegetation plan into the overall site design as an exciting opportunity to proactively support the local farming ecosystem and communities,” EGP-NA representatives wrote in an email interview.**

**“For example, the Aurora solar project uses pollinator friendly seed mix and native plant species and wildlife which results in prairie grasses and flowers throughout the site that contribute to the growth of pollinator species populations. These species like bees and monarch butterflies are critical to supporting the pollination and production of local crops and the preservation and health of farmland and native landscapes.”**

**<http://bit.ly/AuroraEGP>**













Thank you!

Rob Davis  
Director, Center for Pollinators in  
Energy  
Fresh Energy  
[davis@fresh-energy.org](mailto:davis@fresh-energy.org)  
[www.fresh-energy.org](http://www.fresh-energy.org)