Land Use Planning for Large-Scale Solar

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Land Use Planning for Large-Scale PV

Good plans enable good development

- ✓ Solar energy is an economically valuable local resource
- ✓ Valuable resources should benefit the owner and the community
- ✓ Local plans lay the policy foundation for development regulation and programs that enable capture of benefits, while minimizing risks

Solar Ready Communities Comprehensive Plans:

- ✓ Identify and define solar resources
- ✓ Acknowledge solar development benefits and desired co-benefits
- ✓ Identify solar development opportunities and conflicts in the community
- ✓ Set development targets or goals

Photo credit: Fresh Energy/Giving Tree

Table 15: Median Installer Wages

	INSTALLATION	PROJECT DEVELOPMENT	INSTALLATION AND PROJECT DEVELOPMENT
Entry-Level Wage	$15.00	$16.22	$15.00
Mid-Level Wage	$20.00	$25.00	$21.00
Senior/Supervisor Wage	$30.00	$38.00	$30.00

Source: 2017 Solar Jobs Census, Solar Foundation

Addressing Potential Conflicts

Acknowledge perceived nuisances and potential conflicts with other resources or development goals:

- Agricultural practices
- Forested areas
- Historic resources
- Redevelopment and density
- Airports and other infrastructure
- Natural areas

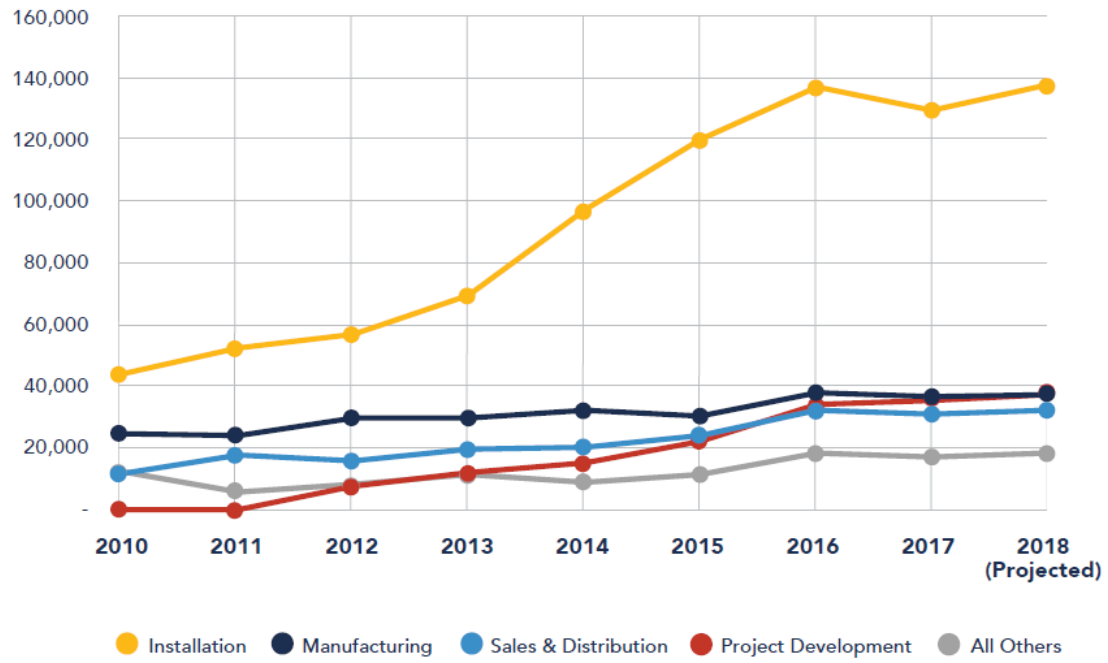
Agricultural protection measures can prevent:

- Loss of prime agricultural soils
- Loss of local productive capacity
- Fragmentation of land
- Secondary development impacts
- Nuisances impacting agricultural practices

Photo credit: juwi Americas

Large-Scale PV Economic Benefits

Figure 1: Solar Employment Growth, 2010-2018 (Projected)



NOTE: *Projections are based on survey responses submitted prior to the trade case decision.*

Source: 2017 Solar Jobs Census, Solar Foundation

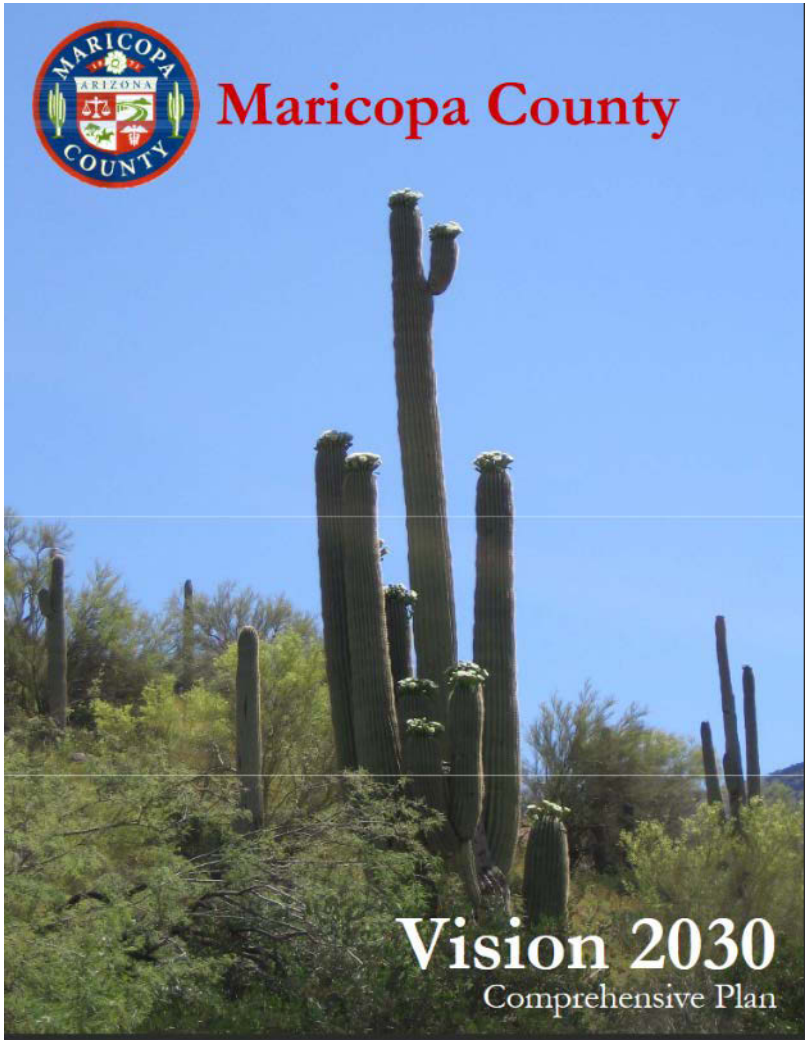
- ✓ Job creation
- ✓ New markets for local contractors
- ✓ Diversity of income to land owners
- ✓ Local resources/Import substitution

Solar Ready Counties

Maricopa County, AZ (SolSmart Bronze)

Economic Growth Policy #10:

"Maricopa County supports leveraging its solar resource potential to attract solar-related industries and alternative energy research and development."



Large-Scale PV Natural Resource Benefits

With appropriate development guidance, large-scale PV facilities can provide:

Water quality protection – Perennial ground cover that reduces runoff, soil conservation, vegetated wetland and waterway buffers

Habitat value – Pollinator ground cover, small mammals, birds, reptiles

Agricultural opportunities – Apiaries, grazing, high-value hand-picked crops, pollinator benefits for nearby crops

Photo credit: Prairie Restorations

Solar Ready Counties

Stearns County, MN (SolSmart Silver)

Environment and Natural Resources

Goal 2. Assure the reasonable and responsible use of natural resources . . .

Objective 4. Encourage use of renewable energy systems, including wind energy and solar energy, which reduce the footprint of development on local and global natural systems.

Photo: Great Plains Institute

Goal 3. Protect agricultural natural resources.

Objective 1. Protect agricultural soils and other agricultural resources by regulating non-agricultural land uses in areas with agricultural soils.

Photo: Great Plains Institute

Defining Large-Scale Solar

Solar Energy System: A **device or** structural **design feature**, a substantial purpose of which is **to provide daylight** for interior lighting or provide for the **collection, storage, and distribution of solar energy for space heating or cooling, electricity generation, or water heating**.

Solar Energy System, Large-Scale: Active Solar Energy System that occupies more than 40,000 square feet of surface area.

Solar Energy System, Medium-Scale: Active Solar Energy System that occupies more than 1,750 but less than 40,000 square feet of surface area.

Solar Energy System, Small-Scale: An Active Solar Energy System that occupies 1,750 square feet of surface area or less.

Further distinguish between rooftop and ground-mounted.

Solar Farms ≠ Industrial Land Use

Industrial zoning and land use characteristics:

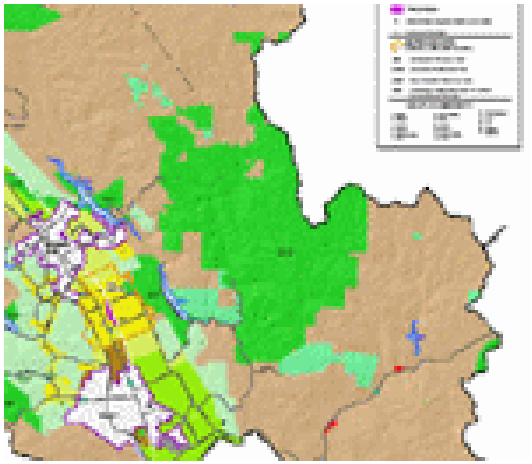
- Access to major transportation corridors, water, sewer = EXPENSIVE
- Often urban, smaller parcels = EXPENSIVE, too small
- Employment
- Nuisances (noise, traffic, pollution)

Tonopah/Arlington Area Plan definition:

INDUSTRIAL: "major employment centers," Uses permitted in this category include warehousing, storage, distribution activities, and manufacturing

Requiring change of land use/zoning for solar amounts to spot zoning and "stranded" industrial zoned land

- PV should not be restricted to Public Utilities zoning
- PV farms ≠ traditional power plants. Do not need:
  - Massive amounts of water for cooling
  - On-site personnel
  - Fuel delivery via rail, road, or pipeline



Regulating Electrons

Adams County, Colorado
4-03-03-02-10 *SOLAR ENERGY SYSTEM*

1. *Property Served:* The solar energy system shall be designed to only provide energy for the property upon which it is located. However, excess energy may be sold as permitted by state and federal law.

Prevents shared or community solar installations and primary use

Regulate impacts, not use

One of 1,500 customer-sited PV systems owned by APS

Photo: Tom Tingle/The Republic
http://www.azcentral.com/story/money/business/consumer/2015/07/11/first-aps-owned-rooftop-solar-installed-phoenix/30002989/

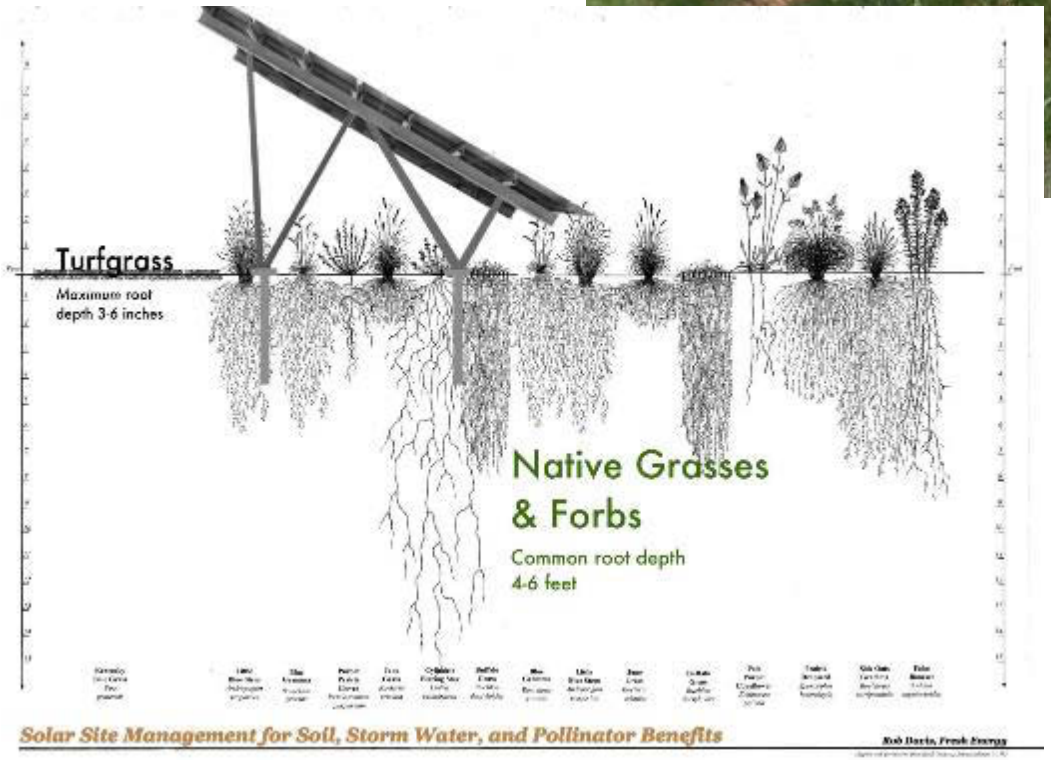
Special Development Sites (e.g. brownfields)

- Offer expedited review as long as project meets certain standards
- Provide exemptions from lot coverage/impervious surface requirements

SolSmart criteria: Encourage or incentivize solar PV development on parking lots, vacant lots, landfills, buffer lands, brownfields, airport safety zones, and non-building structures

Shaffer Landfill, Billerica, MA, Urban Green Technologies
https://www.high-profile.com/wp-content/uploads/2015/04/Shaffer-Landfill_PV-aerial.jpg

Low-Impact Solar Development



NREL's National Wind Technology Center's solar installation where native grasses and revegetation techniques were tested. https://www.nrel.gov/docs/fy17osti/66218.pdf

Pollinator-Friendly Vegetation

State Policy

Minnesota standards for pollinator-friendly solar legislation – Statute 216B.1642

Maryland Department of Natural Resources – Solar Generation Facilities – Pollinator–Friendly Designation

South Carolina – Solar Habitat Act – Voluntary solar best-management practices to establish native vegetation and pollinator habitat

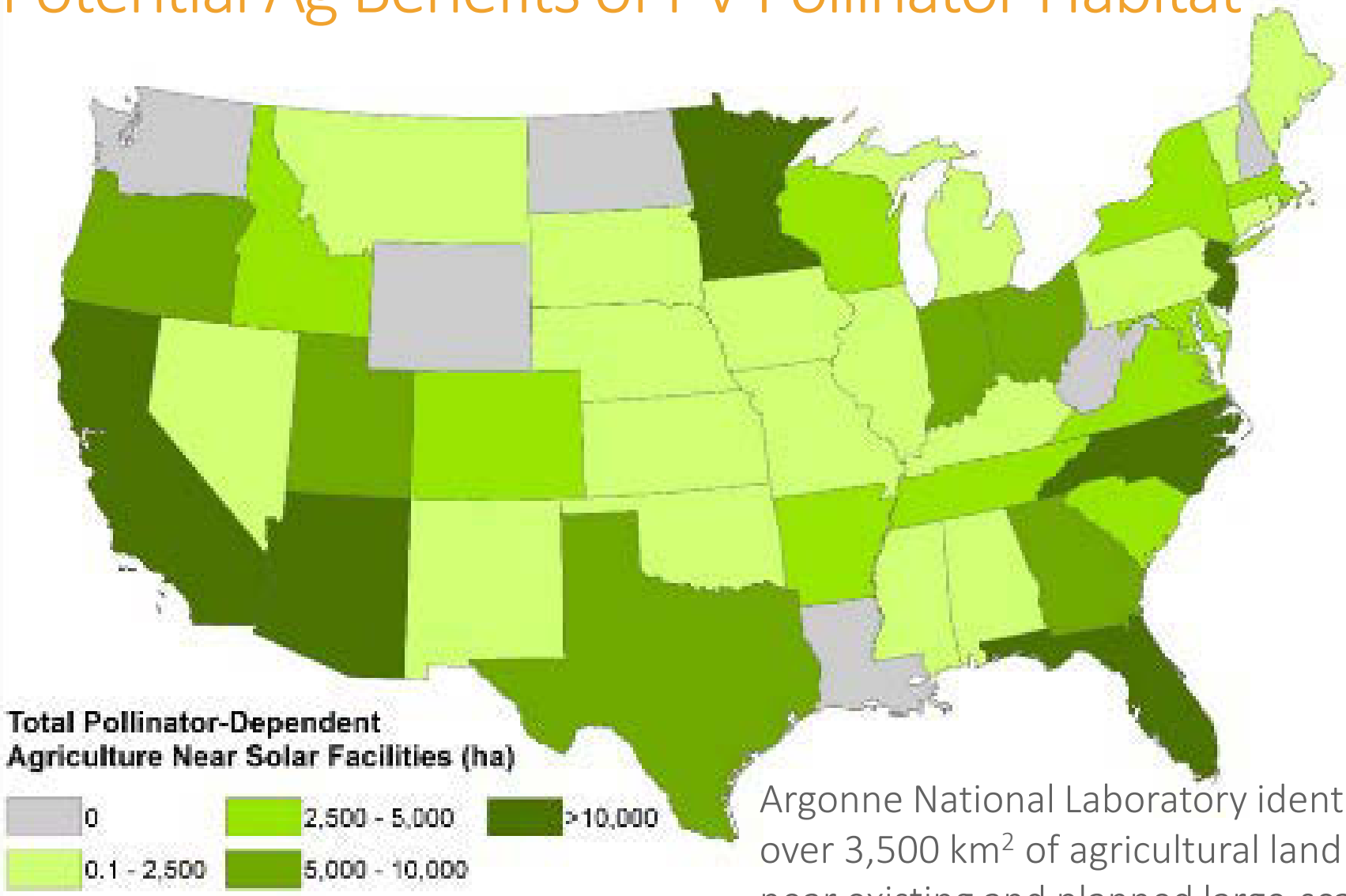
County Policy

Linn County, IA – Amended the Development Code to require solar farms be planted with native grasses and wildflowers and prohibits application of insecticides.

Stearns County, MN – Land Use and Zoning Ordinance requires solar farm ground cover meet above state statute

Photo: Prairie Restorations, Inc.

Potential Ag Benefits of PV Pollinator Habitat



Argonne National Laboratory identified over 3,500 km^2 of agricultural land near existing and planned large-scale PV facilities that may benefit from insect pollinators.

Examining the Potential for Agricultural Benefits from Pollinator Habitat at Solar Facilities in the United States
Leroy J. Walston, Shruti K. Mishra, Heidi M. Hartmann, Ihor Hlohowskyj, James McCall, and Jordan Macknick
Environmental Science & Technology,
https://pubs.acs.org/action/showCitFormats?doi=10.1021%2Facs.est.8b00020

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Potential Ag Benefits of PV Pollinator Habitat

Possible agro-economic benefits of solar-pollinator habitat where there is overlap between solar development and high-value pollinator-dependent crops, especially in areas where pollination is essential for production (e.g., >40% dependence on insect pollination).

Planting and maintenance of native pollinator-friendly vegetation at solar energy developments could offset local impacts to agricultural production through benefits provided by increased pollination services, insect pest management, and storm water and erosion control.

Summary of highly pollinator-dependent agriculture (where insect pollination is essential for production) within solar energy pollinator foraging zones (1.5 km)

Crop	Insect Pollinator Dependence Rank[b]	Total Hectares of USSE Foraging Zones Planted, All States	States with Greatest Crop Area within USSE Foraging Zones[c]
Almonds[d]	3	29,718	California (29,718 ha)
Cranberries	3	1,904	Massachusetts (1,885 ha), New Jersey (11 ha)
Melons (Cantaloupes, Honeydew, Watermelon)	4	1,287	California (1,013 ha), Maryland (106 ha), Arizona (61 ha), North Carolina (36 ha)
Apples	3	867	North Carolina (397 ha), Massachusetts (157 ha), New York (126 ha)
Blueberries	3	521	New Jersey (202 ha), Michigan (93 ha), North Carolina (77 ha), Georgia (44 ha)
Plums	3	477	California (473 ha), New York (2 ha)
Cherries	3	418	California (408 ha), Oregon (5 ha), Michigan (3 ha)
Pumpkins / Squash / Gourds	4	351	New Jersey (115 ha), Massachusetts (106 ha), North Carolina (24 ha)
Peaches	3	189	California (53 ha), Georgia (40 ha), New Jersey (27 ha), North Carolina (22 ha)
Cucumbers	3	100	North Carolina (35 ha), New Jersey (30 ha), Michigan (10 ha)

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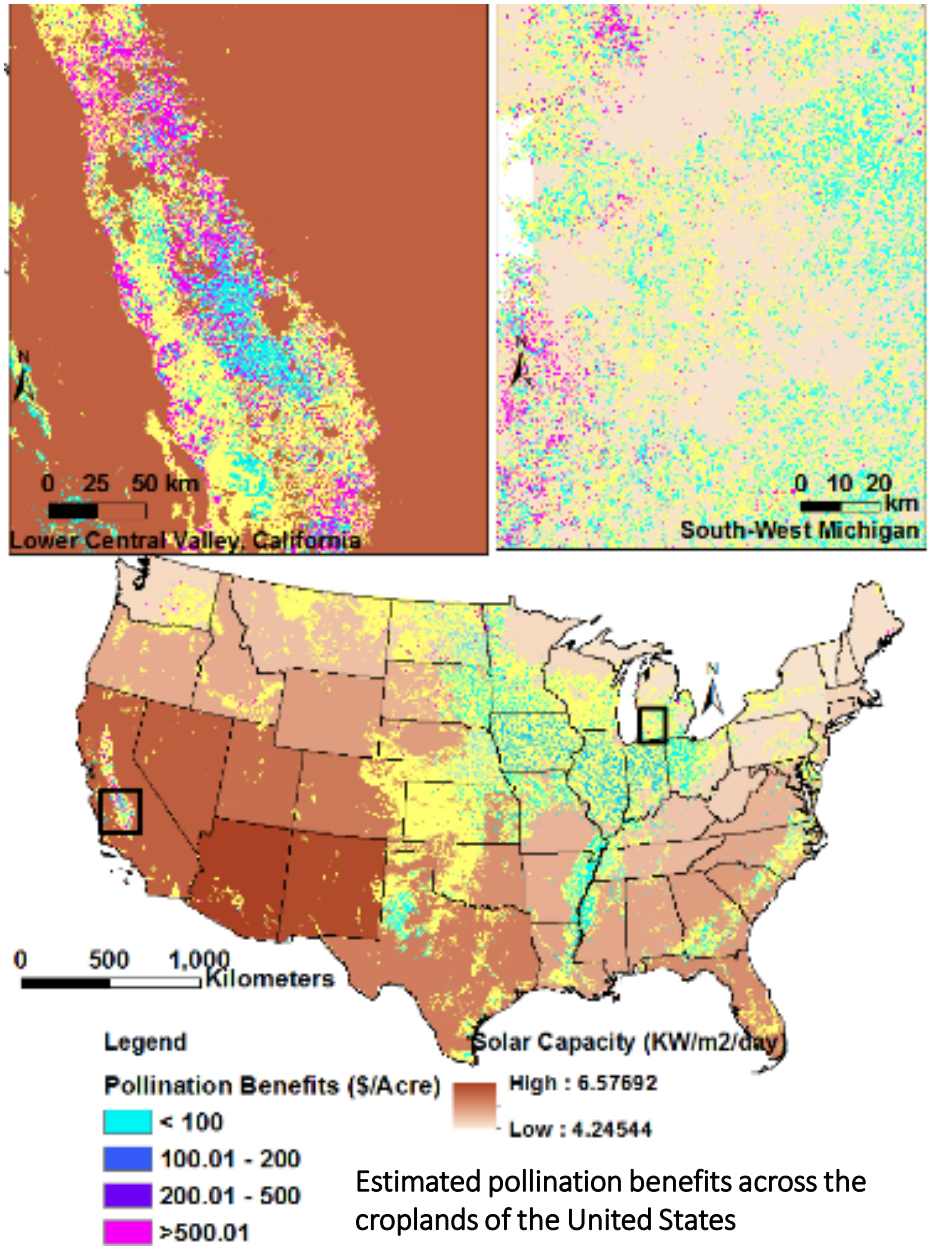
Economic Value of PV Pollinator Habitat to Ag

Integrating national-scale data on crops, pollinators, and solar facilities revealed an estimated value of pollination across the conterminous U.S. of $43 billion.

If 10% to 50% of existing and planned solar facilities were used for pollinator habitat, they would produce $1.9 to 5.7 billion in pollination benefit annually.



Estimated pollination benefits across the croplands of the United States

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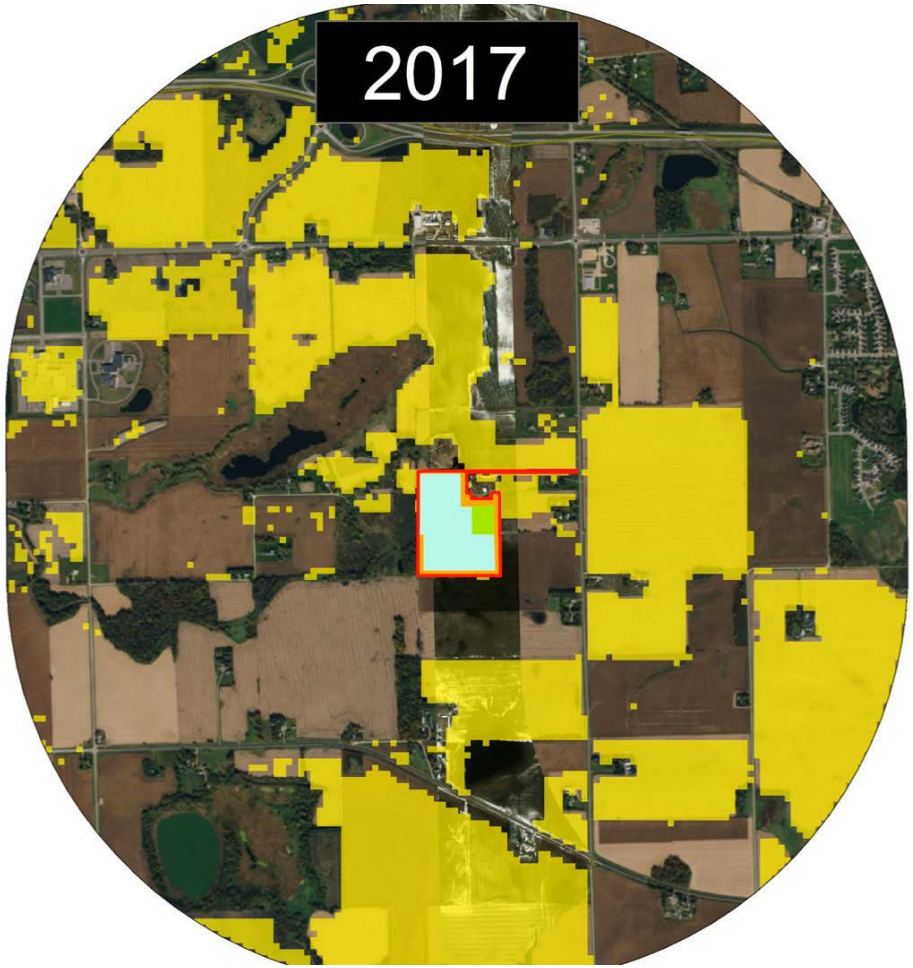
Quantifying the Economic Value of Pollination to Improve Adoption of Solar Facilities in U.S. Agricultural Environments, Argonne National Laboratory 2018, publication pending

Economic Value of PV Pollinator Habitat to Ag

Mapping of partner solar facilities



Eastwood Solar Facility (Minnesota)
5.5 MW

Eastwood Solar Facility	
Estimated 2017 soybean production within 1km	532 acres (25,000 bushels)
Estimated 2017 soybean production within 2 km	1,425 acres (66,975 bushels)
Soybean production value	$9.15/bushel
Hypothetical 1% pollinator service increase benefit	$2,250 - $6,150

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Intersection of Solar Facilities with Pollinator-Dependent Croplands, Argonne National Laboratory, 2018, publication pending

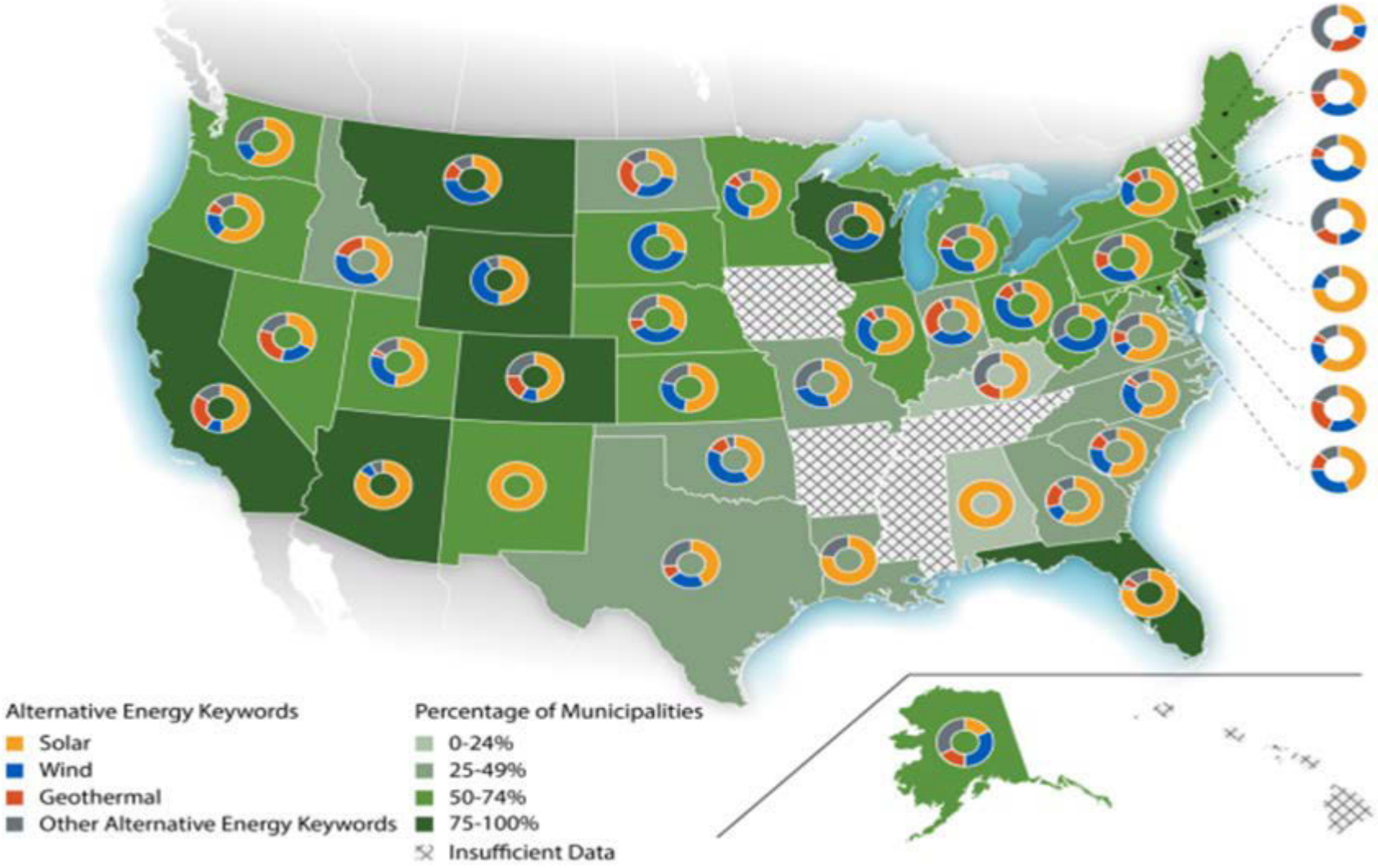
Solar Farms and Agriculture

Sunflowers for oil production grown under panels in Wisconsin

Solar Farms and Agriculture

Sheep grazing is a common vegetation management practice in North Carolina

Proportion of Municipalities Referencing Clean Energy in Codes in Each State



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Cook, et all. 2016. *Clean Energy in City Codes: A Baseline Analysis of Municipal Codification across the U.S.* NREL-66120. National Renewable Energy Laboratory (NREL), Golden, CO (US). http://www.nrel.gov/docs/fy17osti/66120.pdf

Photo: Prairie Restorations, Inc.

Thank you!

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  - Permitting
  - Inspection
  - **Planning and Zoning**