CENTER *for* RURAL AFFAIRS

Native Vegetation and Solar Energy

Cody Smith, Policy Associate, CFRA

Photos: Courtesy of Center for Pollinators in Energy

What is this practice?

Solar is expanding in the region

3 types of solar projects:

1.) Residential 2.) Community-scale 3.) Utility-scale

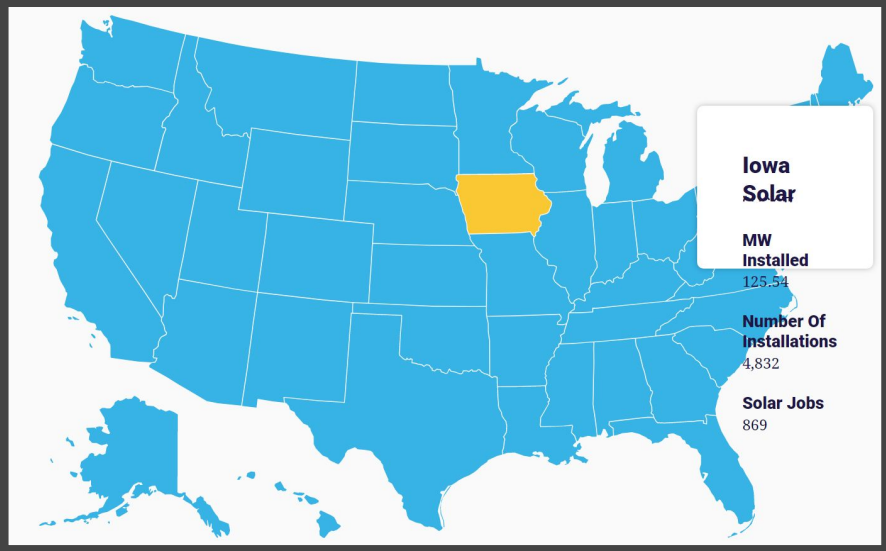
Solar Industry Growth between Oct. 2018 and Oct. 2019:

Iowa: 27.3 percent

Nebraska: 21.1 percent

South Dakota: 14.3 percent

Minnesota: 23.9 percent (‘19 to ‘20)



An opportunity for conservation

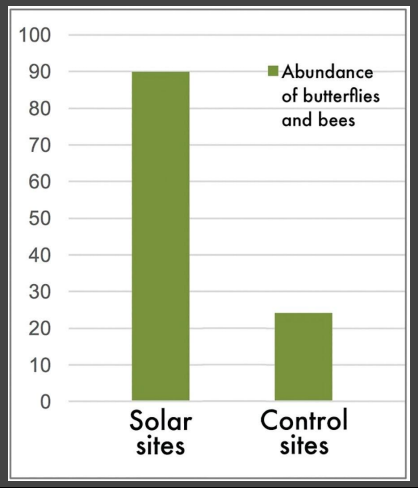
- 7 to 8 acres per megawatt of energy production according to NREL.
- To produce 10% of Iowa's energy from solar, 13,440 acres would be occupied. Small in comparison of total farmland (.05%).
- Habitat for pollinators, like honey bees and monarch butterflies.
- Wildlife habitat for game birds, like pheasants and quail.
- Water quality and soil health improvements.


© American Public Power Association

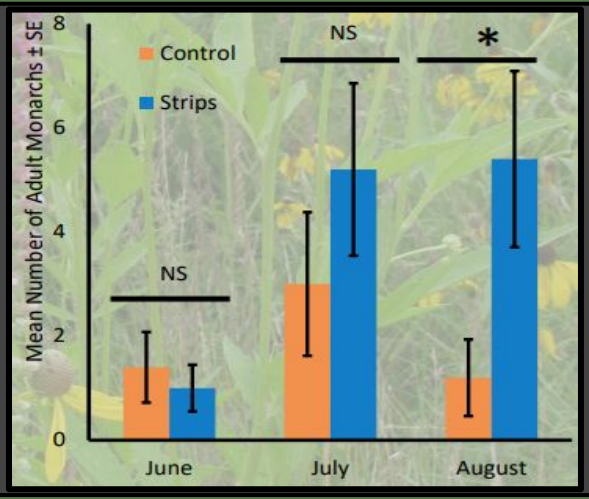

Raccoon Valley Electric Cooperative

Beneficial environmental enhancements

Native Bees



Monarch Butterflies



Pheasants and Quail

<u>2019 Iowa Upland Wildlife Populations Report:</u>

- **Acres of habitat lost between 1990 and 2018: -1,847,000 acres**
- **Square miles of habitat lost: -2,886 square miles.**

Soil and Water Quality

Perennial vegetation offers:

- **Nutrient load reductions**
- **Up to 40% peak flow reduction**
- **Increases in soil organic matter**

Adding project value

A practical, mutually-beneficial investment in renewables.

In addition to the positive environmental outcomes, investing in this practice on solar project sites offer a way for project developers to meet practical goals such as stormwater permitting, erosion control, and building public support.

Other opportunities include:

- Opening up the site for honey beekeepers and honey production.
- Potential for livestock grazing allows for rural development opportunities.
- Cost reductions by reducing mowing needs and building local supply chains.

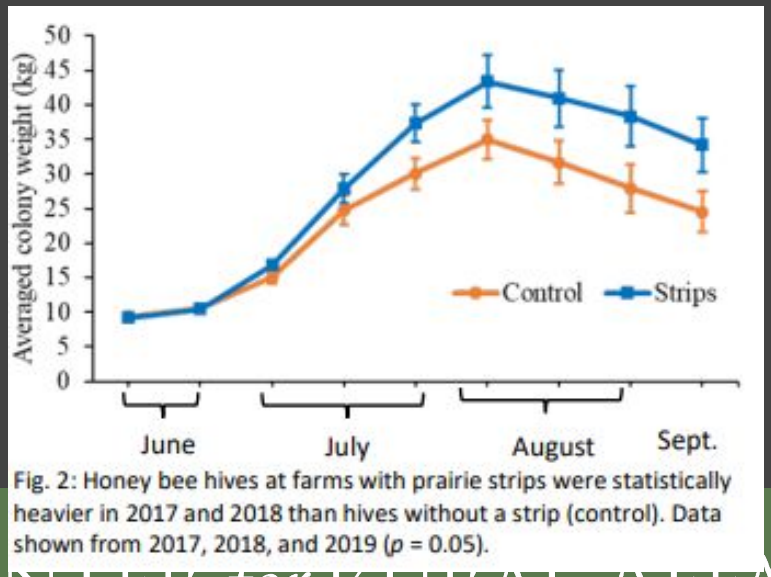


Fig. 2: Honey bee hives at farms with prairie strips were statistically heavier in 2017 and 2018 than hives without a strip (control). Data shown from 2017, 2018, and 2019 ($p = 0.05$).

With this practice, developers & communities add value to their projects for the entire community.


CLIF FAMILY
NAPA VALLEY
SOLAR GROWN™
RAW HONEY
NET WT 12 OZ (340g)

Planning for success

Incorporate native vegetation into initial planning to allow for a holistic consideration of all factors:

Planning at least one year before the seed goes into the ground is recommended; this provides adequate time to:

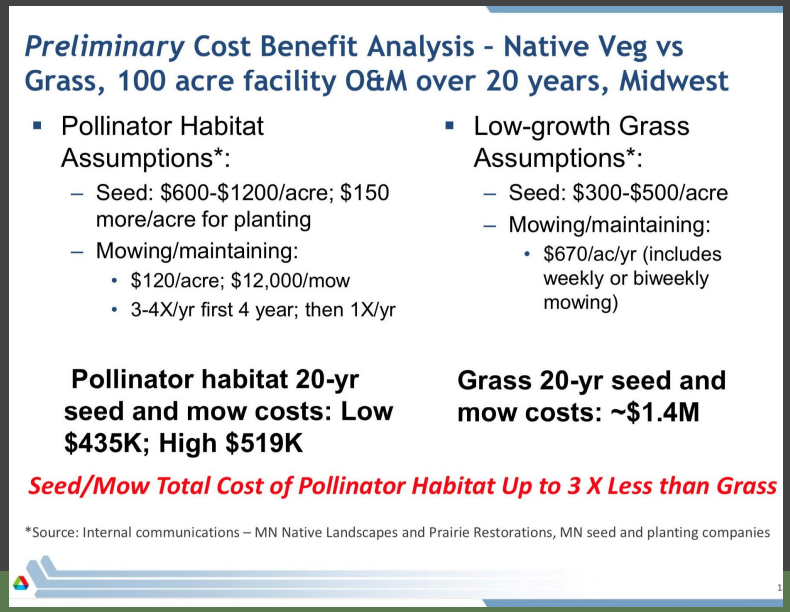
- Reach out for technical assistance,
- Review and select a site,
- Determine the existing dominant vegetation (if any),
- Conduct two or more herbicide applications to suppress existing vegetation (if needed),
- Gather quotes for a native seed mix.
- List of retailers in the region from Tallgrass Prairie Center at UNI:
    - 2020 IOWA SEED AND SERVICE PROVIDER LIST

Planning for this practice at least one year in advance allows for holistic consideration of all factors.

Evaluating costs and benefits

When considering total project cost, there are some key variables.

- Key variable: Project size and acreage.
- Management options may change with project size.
- Important consideration: Though up-front costs may be steeper, reduction in overall costs can be realized.



Per acre in Iowa, $500 to $1,000 for a seed mix is a reasonable range for most projects.

Considering project design & construction

Being flexible when it comes to the height of your project is important for ensuring success.

- 3 to 4 feet of clearance between the lower, tilted edge and the ground is widely viewed as the maximum solar panel height without substantially increasing material costs and creating the need for elevation of workers for operation and maintenance.
- A seed mix should include plants that don't reach a peak height that could shade the low, tilted edge of ground-mounted solar energy systems unless developers implement "strategic mowing" techniques.
- Accounting for management methods can help determine project site design.
- "Deer fencing" is less obtrusive to wildlife movement and fits project character.

Striking a balance between vegetative quality and project height can equalize costs.

Selecting a seed mix

The height of the solar panels is a primary consideration when selecting a seed mix.

Other factors to consider include:

- Project location,
- Soil type and moisture,
- The species of vegetation native to the area,
- Planned management methods for the site.

Setting goals for your project can guide outcomes.

- Wildlife habitat: Evaluate the ratio of grasses to forbs; a seed mix closer to 30 percent grasses and 70 percent forbs.
- Pollinators: A diversity of flowering plants that bloom during the entire growing season.
- Monarch butterflies: only lay eggs on milkweed plants.

FIGURE 1: RECOMMENDED NATIVE SEED MIX FOR A SOLAR PROJECT SITE IN CENTRAL IOWA[15]

Short species prairie seed mix for medium-dry soils in central Iowa			
Botanical name	Common name	Botanical name	Common name
Wildflowers (forbs)		Trees, shrubs, vines	
Asclepias tuberosa	Butterfly Weed	Ceanthus americanus	New Jersey Tea
Baptisia alba	White Wild Indigo	Rosa arkansana	Wild Rose
Chamaecrista fasciculata	Partridge Pea	Amorpha canescens	Lead Plant
Coreopsis lanceolata	Lance-leaf Coreopsis	Grasses, sedges, rushes	
Coreopsis palmata	Prairie Coreopsis	Bouteloua curtipendula	Side-oats Grama
Dalea candida	White Prairie Clover	Carex brevior	Plains Oval Sedge
Dalea purpurea	Purple Prairie Clover	Koeleria marcantha	June Grass
Drymocallis arguta	Prairie Cinquefoil	Schyzachyrium scoparium	Little Bluestem
Eryngium yuccifolium	Rattlesnake Master	Sun exposure: full	
Euphorbia corollata	Flowering Spurge	Soil moisture: medium-dry	
Liatris aspera	Button Blazing Star		
Pedicularis canadensis	Wood Betony		
Penstemon digitalis	Foxglove Beardtongue		
Pseudognaphalium obtusifolium	Sweet Everlasting		
Rudbeckia hirta	Black-eyed Susan		
Ruellia humilis	Wild Petunia		
Solidago speciosa	Showy Goldenrod		
Symphyotrichum oolentangiense	Sky Blue Aster		
Tradescantia ohiensis	Ohio Spiderwort		
Verbena stricta	Hoary Vervain		
Zizia aurea	Golden Alexanders		
Asclepias syriaca	Common Milkweed		
Symphyotrichum ericoides	Heath Aster		
Symphyotrichum pilosum	Frost Aster		
Gentiana alba	Cream Gentian		
Heliopsis helanthoides	Early Sunflower		
Desmodium canadense	Showy Tick Trefoil		

Recommendation for medium-dry soils in Central Iowa.

Prepared by Story Co. Conservation.

Seeding project vegetation

Timing of seed placement is key to success.

A site may take time to establish aesthetic native vegetation. To establish the needed firm seedbed, conventional methods include discing at least twice, and cultipacking, although this is dependent upon the conditions of each site.

Seeding methods can include:

- Broadcast
- Drill
- Hand-broadcast


Image via Tallgrass Prairie Center

Native grass seeds need good seed-to-soil contact.

Best practices:

- Signage that says, “Pollinator habitat in progress” can mitigate public concern.
- Each seedbed is different and may not need discing—these decisions should be made with a professional to review site-specific information such as existing vegetation, moisture levels, and soil type.
- Using a cover crop at the construction site could help you stabilize the soil prior to the seeding of your native mix if there are concerns about delays.

Frost-seeding between Nov. 1 and June 1 is ideal for maximum germination.

Managing project sites

Every site is unique and all timelines should be adjusted to the needs of a project.

Pollinator-friendly solar will require more management on years 1 through 3, but will eventually require minimal disturbance.

- **Year one**: Regular mowing (three to four times). The first mowing should be at a height of 4 to 6 inches soon after seeding, the next two mowings should be at a height no less than 8 inches.
- **Year two**: With a successful planting, years subsequent to establishment provide the opportunity for less maintenance, needing only an occasional disturbance to encourage desirable species.
- **Years three and four**: Mowing and baling approximately every three years is the preferred management option for solar project sites.

Timing impacts wildlife and pollinators

- After year two, avoid or minimize mowing between April 1 and Aug. 1 to reduce impacts during the nesting season of upland birds.
- Delaying mowing to late September facilitates a more welcoming habitat for migrating pollinators such as monarch butterflies.
- Spot mowing and/or herbicide application could be used if necessary.

Design and plan for a project that requires minimal mowing after establishment.

Promoting this practice in your community

Cities, counties, and states can work together to promote this investment in conservation.

Community solar projects are prime for this practice:

- Many communities are adopting community solar projects which provide a practical way for cities to invest in conservation while meeting clean energy goals.
- Schools with solar projects can use this as learning opportunity to educate students on the importance of pollinators and wildlife.

Counties may have unique authority to promote investments in native plantings on solar project sites:

- Requiring a vegetation management plan can give the county input on species planted, site management, and other related criteria.
- Example: Linn County, Iowa
  "…Seeds should include a mix of grasses and wildflowers, ideally native to the region of the project site that will result in a short stature prairie with a diversity of forbs or flowering plants that bloom throughout the growing season…"

Minnesota Habitat Friendly Solar Program:

State code says:

- **"an owner of a solar site implementing solar site management practices may claim that the site provides benefits to gamebirds, songbirds and pollinators only if the site adheres to guidance set forth by the pollinator plan provided by the Board of Water and Soil Resources."**
- **Counties reference the standards set forth by this state board in their ordinances, requiring developers to adhere to those standards.**

Draft Ordinance Language for Counties

By writing the following requirements into local zoning ordinances, counties add value for all in the community.

In order to satisfy the requirements for approval of a conditional use permit for a Solar Energy System (SES), in _____ County, the applicant must fulfill the following requirements:

- The applicant shall **submit a vegetation management plan** for the SES site that contains a mix of vegetation (grasses and forbs) which are native to Iowa. However, the vegetation management plan may also include other naturalized and non-invasive species of vegetation which provide habitat for pollinators and wildlife and/or other ecosystem services (i.e. clovers).

- The applicant shall **clearly identify the intended purpose and desired outcomes of their vegetation management plan**, which may include: providing habitat for pollinators such as bees and monarch butterflies, providing habitat for wildlife such as upland nesting birds and other wildlife, establishing vegetation for livestock grazing, reducing on-site soil erosion, and improving water quality.

- The applicant **shall consult with qualified and appropriate natural resources professionals**, which may include_____to formulate an informed, site-specific seed mix recommendation to be implemented at the SES site. This seed mix recommendation must be presented as part of the vegetation management plan within the application for a conditional use permit for the applicable SES site and must include contact information and organizational information of natural resources professionals consulted.

- The applicant shall outline within their vegetation management plan **how the vegetation will be managed** on an annual basis, with particular attention given to the establishment period of approximately 3 years.

Additional Resources

There are a variety of resources available to help you establish this practice.

Iowa Monarch Conservation Consortium

Prairie STRIPS project at Iowa State University

Tallgrass Prairie Center at the University of Northern Iowa

Local partners including:

- County conservation boards, natural resource districts, etc.
- Soil and water conservation districts
- State agriculture and natural resources agencies (IDALS, IDNR, etc.)
- Natural Resources Conservation Service (NRCS)
- University extension and outreach professionals

Pheasants Forever

Leveraging local partners can help demonstrate collaboration and ensure project success.

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A CLOSER LOOK: BEST PRACTICES FOR COMMUNITY SOLAR

Land selection is key for ground-mounted solar

Land already owned by the project developer, utility, or off-take customer is preferable.

- Several factors contribute to cost efficiency when considering a community solar project:
  - Proximity to high intensity energy users.
  - Strong local demand for electricity, especially produced from renewable resources.
  - Access to the electric grid, allowing for interconnection without building substantial new infrastructure.

- The type of site also contributes to cost efficiency over the long-term—a square or rectangular parcel of land and in-line set-up helps streamline ongoing management like mowing and system maintenance.

- Sites should also have easy access, with limited surrounding development or vegetation that may shade a solar energy system.

- Sites should also ideally allow for expansion of a project if demand from consumers increases over time.

- **Examples:**
  - The City of Ames will site their project on a parcel of land already owned by the City that was being leased for farmland.
  - The City of Cedar Falls community solar project currently occupies eight acres of previously undeveloped city property.

Community involvement in site selection is crucial

Public participation is critical to ensure project success and local buy-in.

- A robust cost-benefit analysis is recommended prior to proposing a community solar project.
- Officials should be sure to engage with a wide range of stakeholders to determine if there are other plans for a selected site or the surrounding area that may impact a future solar energy system.
- Once a project has been proposed, there should be opportunities provided for community members to attend meetings or open houses that allow them to learn more about the project and ask questions.
- Soliciting feedback from stakeholders about the proposed rate structure will assist in developing more local buy-in.

Alternatives to ground-mounted solar

Community leaders can work with private parties to explore alternatives to ground-mounted systems.

- Large rooftops such as those on manufacturing facilities or big box retailers may be potential sites for community solar projects.
- These sites reduce land acquisition concerns associated with selecting a site for a ground-mounted solar system while providing the host with some publicity for participating.
- Siting projects in parking lots in the form of a system mounted on canopies that also offers shade is possible, but precautions to reduce liability concerns around falling ice damaging vehicles during the winter months should be considered.
- Example:
    - Partnering with local commercial building operators and owners, like Walmart and Target could be an opportunity.

Development and project ownership

Innovative approaches to project ownership and management can amplify cost-savings.

- Leasing city land to a private developer and entering into a Power Purchase Agreement can reduce project costs by allowing the developer to take advantage of federal and state tax credits.

- If a municipal utility is seeking a private developer for a community solar project, there should be a transparent bidding process. Information that may be required in a bid includes:
    - Price and term for a power purchase agreement between the developer and the municipal utility.
    - Estimate of annual electricity production.
    - Performance history for the equipment that will be used in a similar environment.
    - Project timeline that lays out anticipated start and completion dates for construction as well as an in-service date for the system.
    - Previous experience developing similar projects.

- Example: Both Cedar Falls and Ames leased their land to a private developer at little to no cost and allowed them to construct the solar farm so the developer could take advantage of the 30% federal investment tax credit (now down to 26%).

Additional considerations for developer selection

Rigorous analysis of a project developer's proposal will ensure public trust and project success.

Full evaluation of a developer's proposal should account for:

- Strength and experience of the developer's project team and proven expertise of the project team.
- System and component product warranties.
- Developer's proposed project financing capability and structure.
- Project schedule.
- Experience with building at or near an airport or other specialized location.
- Notably, the federal investment tax credit began a gradual phase-out in 2020, dropping to 26 percent.

Adding consumer value

Projects may be designed to allow consumers to invest in a community project in various ways:

- Many community projects offer "shares" that residents can purchase. These typically act as a subscription in the project, paid through an additional charge on a monthly electric bill.
- In some cases, subscribers are credited an amount determined by the utility for energy produced by the project during the given period.
- In other models, consumers are allowed to purchase and own panels that are part of the community solar systems.
- This option may allow for consumers to access available tax credits while investing in a community project, often paying a monthly maintenance fee for upkeep of the panel(s).
- In some cases, consumers that choose this option may be credited for the full production of their panel(s) as though they were located behind their electric metering, as is the case with net metered residential solar.
- Community projects often feature a means of unsubscribing or selling back shares/panel(s). This often reduces anxiety associated with subscribing to a project, as residents are not tied to a subscription if they choose to move to a different area.
- Example: The city of Ames charges a $300 cost for a consumer subscription, or “power pack,” which is a subscription to one-half of one panel for 20 years. The power packs are expected to return average monthly credits of $1 to $2 for the duration of the 20-year contract. Payback is predicted to take anywhere between 16 and 18 years.

Questions?

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