RESOURCE GUIDE:

NATIVE SEED SUPPLY AND SEED MIXES FOR POLLINATOR-FRIENDLY SOLAR

When planning for a solar project site with native vegetation (including naturalized, non-invasive species), there are several variables site managers should consider. While the clearance between the lowest edge of a solar panel and the ground is a primary consideration when crafting a mix of native seeds for the site, managers should also look at these steps when designing, constructing, and planning their pollinator-friendly solar sites. Some vegetation species in this guide are not native to the Midwest Region, but are still listed because of their value to pollinators, like honeybees.

STEP ONE

Consult with natural resources professionals to evaluate the following site-specific information:

- Project location (i.e. floodplain, steep slopes),
- Soil type and moisture (i.e. wet, wet-dry, dry, etc.),
- Site history (past vegetation, previous uses),
- The species of vegetation native to the area (local ecotype varies by region), and
- Planned management methods for the site (mowing, grazing, equipment).

Photo provided by Center for Pollinators in Energy.

Set goals to help guide decision making

Managing a site to provide value for certain insect and wildlife species may require special considerations. Setting goals for the vegetation placed on a solar project site can help guide management decisions. Site managers should work with local stakeholders to help identify goals that will add the most value to a solar project site. Some special variables may include:

Wildlife generally responds more to the structure of vegetation instead of specific plant species. Seed mixes containing too many grasses could restrict the navigability of the site for upland nesting birds, such as pheasants, negating the value of the site to these birds. When formulating a seed mix, site managers should evaluate the ratio of grasses to forbs to inform their seed selection process. A desired seed mix for upland nesting birds would be closer to 30 percent grasses and 70 percent forbs.

Pollinators, including native bees, honey bees, and monarch butterflies, require a diversity of flowering plants that bloom during the entire growing season to provide pollen and nectar resources. This can help improve overall honey production in beehives placed on a project site, as well as provide crucial resources for migrating monarch butterflies.

Monarch butterflies only lay eggs on milkweed plants, making this species a crucial component of a seed mix intended to maximize project value for this flagship insect.

Photo provided by Center for Pollinators in Energy.

Wild bees benefit from vegetation native to the location. However, naturalized, non-invasive species (i.e. clover) could offer similar or enhanced value. Honey bees have been proven to benefit from both native and naturalized, non-invasive species. Figure 2 on page 5 displays some species which offer valuable nectar and pollen resources for these insects.

Livestock grazing should be withheld until after the establishment period of one to three years. Given the significant cost of the equipment installed at a solar farm, sheep offer the lowest amount of risk for grazing. Other livestock, such as goats, may jump up on the panels and/or chew crucial wiring. Meanwhile, cattle would be likely to utilize the solar array as a scratching post, posing potential risks of equipment damage. Sheep are flexible grazers and Figure 2 on page 5 highlights species of vegetation which could help enable grazing value at the site. Once sheep grazing is introduced, site managers should follow a robust rotational grazing plan.

Other pollinator considerations:

- Grasses, such as Little Bluestem, have limited value for pollinators.
- Clovers are valuable for honey bees. They are recognized as a source of nectar for honey production and have been identified as the most common source of pollen for honey bees in central Iowa, for example.
- Goldenrods (Solidigos) and Birdsfoot Trefoil (Lotus corniculatus) have been proven to be used as a source of pollen for honey bees.

STEP THREE

Determine site placement and workability

Once the plants have been identified to meet the goals of the project, their practicality for solar operations is a key consideration. Placement of certain species may be better suited for specific areas of the project, including around the border of the solar farm, between the solar arrays, underneath the panels, and in screening/buffer areas surrounding the solar project. See Figure 1. Some of the plants listed in Figure 2 on page 5 may be too tall to seed between the panels and should be limited to the border of the farm to avoid shading concerns—this should be determined in conjunction with site managers and natural resources professionals using site-specific information.

FIGURE 1: PROJECT SITE PLACEMENT OPPORTUNITIES FOR NATIVE AND NATURALIZED, NON-INVASIVE VEGETATION

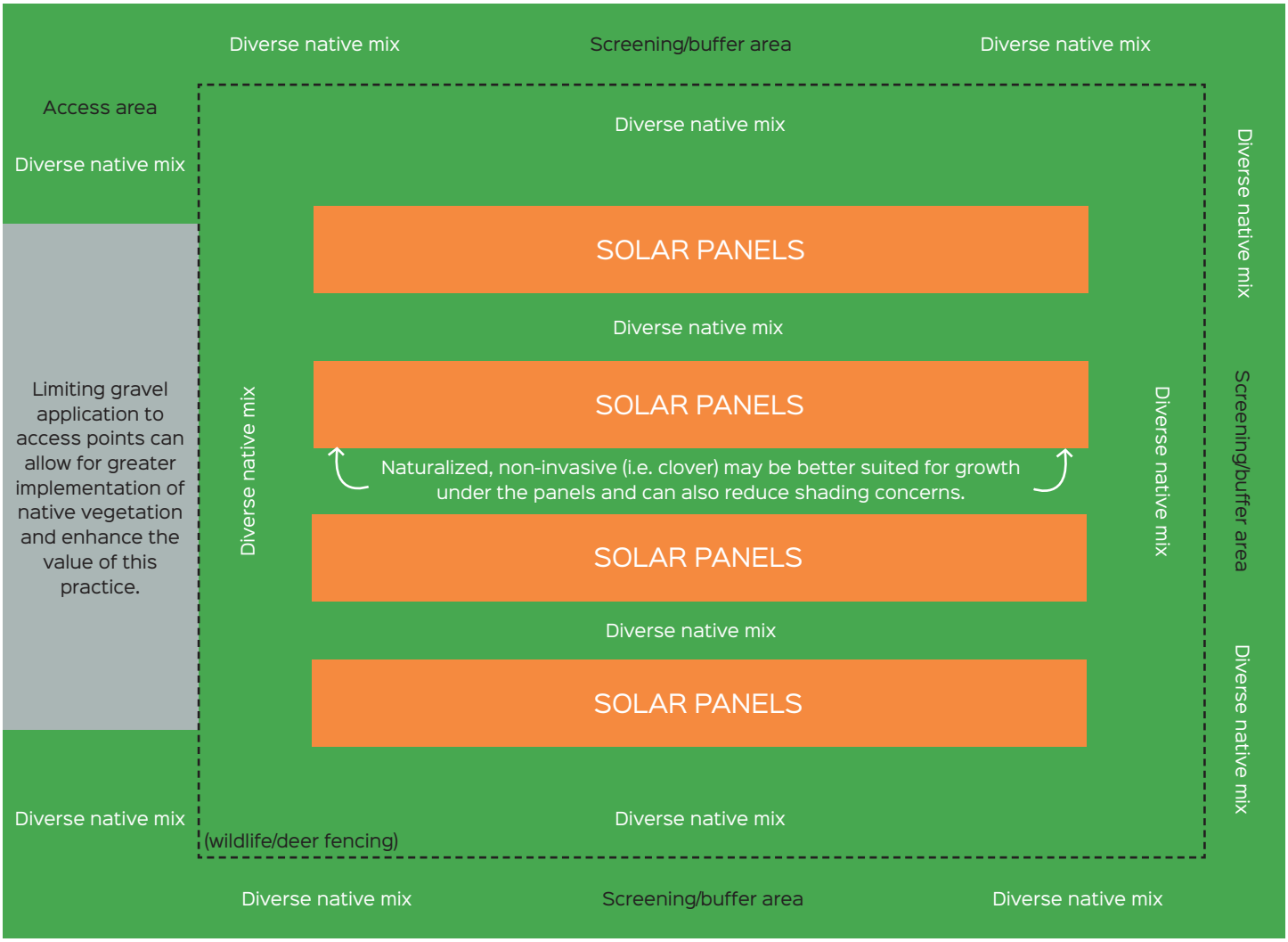

Photo provided by Center for Pollinators in Energy.

STEP FOUR

Determine seed source and suitability

Once the plant species have been identified, selecting a retailer who can source the seeds is a key project need. Retailers who offer local ecotype seeds—meaning they're best suited for establishment within the site's conditions and native to the region—are recommended to ensure maximum project value. For projects in Iowa, the Tallgrass Prairie Center at the University of Northern Iowa has provided a list that can help identify a seed retailer.[1] When consulting with retailers, the following factors should be considered:

- Is the seed locally sourced?
- Given my site history, what suggestions do you have for how I can ensure desirable species?
- What is your recommended seeding rate?
- What is the total cost per acre for this seed mix?

Figure 2 on page 5 contains information about native species which provide value to pollinators (indicated by a bee), monarchs (indicated by a butterfly), and grazing (indicated by a sheep) while also detailing considerations, such as projected height for solar site operators. Bloom times are listed so site managers can take actions to identify a replacement if they must remove a species due to height or other factors on-site—this ensures ample pollen and nectar resources for pollinators.

For site managers working to identify sources of natural resource expertise, the following list may prove useful:

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

To assist with planning purposes, a site manager should budget $700 per acre for the seed mix and $100 per acre for seedbed preparations. These numbers are expected to fluctuate based on the needs of different project sites.

Sources

1 "2020 Iowa Seed and Service Provider List." Tallgrass Prairie Center, University of Northern Iowa, March 2020, tallgrassprairiecenter.org/sites/default/files/ia_prairie_seed_service_providers_03-20.pdf. Accessed May 2020.

FIGURE 2: SPECIES CONSIDERATIONS FOR SEED MIX SELECTIONS

			Bloom time and color							
Latin name	**Common name**	**Height**	**April**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Insect attractiveness rating**
Zizia aurea	Golden Alexanders[2]	3'								HA, PP
Tradescantia ohiensis	Ohio Spiderwort (common spiderwort)[3]	3'								PP
Baptisia alba	Wild White Indigo[4]	4'								
Penstemon digitalis (Penstemon hirsutus)	Foxglove beardtongue[5]	3'								MA, PP
Asclepias tuberosa	Butterfly Milkweed[6]	2'								MA, LH, N
Coreopsis palmata (Coreopsis lanceolata)	Prairie Coreopsis[7]	2'								HA, PP
Euphorbia corollata	Flowering Spurge	3'								
Ruellia humilis	Wild Petunia	1'								
Ceanthus americanus	New Jersey Tea[8]	3'								L/NA, PP
Rosa arkansana (Rosa setigera)	Wild Rose[9]	2'								MA, PP
Amorpha canescens	Lead Plant[10]	3'								L/NA, PP
Asclepias syriaca	Common Milkweed	3'								
Dalea candida	White Prairie Clover	2'								
Drymocallis arguta	Prairie Cinquefoil[11]	2'								
Liatris aspera	Rough Blazing Star[12]	3'								MA, N
Pseudognaphalium obtusifolium	Sweet Everlasting[13]	2'								
Verbena stricta	Hoary Vervain[14]	2'								MA, PP
Heliopsis helianthoides	Early Sunflower[15]	5'								PP
Rudbeckia hirta	Black-eyed Susan[16]	2'								LN, H
Desmodium canadense	Showy Tick Trefoil[17]	5'								L, NA
Chamaecrista fasciculata	Partridge Pea[18]	2'								PP
Dalea purpurea	Purple Prairie Clover[19]	2'								PP
Eryngium yuccifolium	Rattlesnake Master[20]	4'								PP
Gentiana alba	Cream Gentian	3'								
Pedicularis lanceolata	Marsh Betony	3'								
Solidago speciosa	Showy Goldenrod[21]	5'								MA, N, PP
Symphyotrichum oolentangiense	Sky Blue Aster	3'								
Symphyotrichum ericoides	Heath Aster[22]	2'								PP
Symphyotrichum pilosum	Frost Aster	3'								
Bouteloua curtipendula	Side-oats Grama	2'								
Carex brevior	Plains Oval Sedge	1'								
Koeleria marcantha	June Grass	2'								
Schyzachyrium scoparium	Little Bluestem	3'								
Alternatives										
Symphyotrichumnovae-angliae (formerly Aster novae-angliae)	New England Aster[23]									HA
Asclepias tuberosa	Butterfly Weed									MA

KEY:

HA = Highly Attractive

MA = Moderately Attractive

L/NA = Low/No Attractiveness

PP = Attracts Pollinators and Predatory Insects

LH = Larval Host

N = Provides Nectar for Butterflies

= Value added to pollinators

= Value added to monarchs

= Value added to grazing livestock

Sources for Figure 2

2 Landis Doug, et al. “Native Plant Facts: Golden Alexanders.” Project GREEN, AgBioResearch, Department of Entomology, Michigan State University, canr.msu.edu/nativeplants/uploads/files/Golden_alexanders.pdf. Accessed June 2020.

3 Personal communication: Matthew O’Neal, Department of Entomology, Iowa State University, May 2020.

4 Landis, Doug, et al. “Native Plant Facts: Penstemon, Hairy beardtongue.” Project GREEN, AgBioResearch, Department of Entomology, Michigan State University, canr.msu.edu/nativeplants/uploads/files/Penstemon_and_Hairy_beardtongue.pdf. Accessed June 2020.

5 Ibid.

6 Landis, Doug, et al. “Native Plant Facts: Butterfly weed.” Project GREEN, AgBioResearch, Department of Entomology, Michigan State University, canr.msu.edu/nativeplants/uploads/files/Butterfly_weed.pdf. Accessed June 2020.

7 Landis, Doug, et al. “Native Plant Facts: Sand coreopsis.” Project GREEN, AgBioResearch, Department of Entomology, Michigan State University, canr.msu.edu/nativeplants/uploads/files/Sand_coreopsis_and_Ticksweed.pdf. Accessed June 2020.

8 Landis, Doug, et al. “Native Plant Facts: New Jersey tea.” Project GREEN, AgBioResearch, Department of Entomology, Michigan State University, canr.msu.edu/nativeplants/uploads/files/New_Jersey_Tea.pdf. Accessed June 2020.

9 Landis, Doug, et al. “Native Plant Facts: Michigan rose (Climbing rose).” Project GREEN, AgBioResearch, Department of Entomology, Michigan State University, canr.msu.edu/nativeplants/uploads/files/Michigan_rose_and_climbing_rose.pdf. Accessed June 2020.

10 Landis, Doug, et al. “Native Plant Facts: Leadplant.” Project GREEN, AgBioResearch, Department of Entomology, Michigan State University, canr.msu.edu/nativeplants/uploads/files/Leadplant.pdf. Accessed June 2020.

11 Landis, Doug, et al. “Native Plant Facts: Rough blazing star.” Project GREEN, AgBioResearch, Department of Entomology, Michigan State University, canr.msu.edu/nativeplants/uploads/files/Rough_blazing_star.pdf. Accessed June 2020.

12 Personal communication: Matthew O’Neal, Department of Entomology, Iowa State University, May 2020.

13 Landis, Doug, et al. “Native Plant Facts: Hoary vervain, Hoary verbena.” Project GREEN, AgBioResearch, Department of Entomology, Michigan State University, canr.msu.edu/nativeplants/uploads/files/Hoary_vervain_and_Hoary_verbena.pdf. Accessed June 2020.

14 Personal communication: Matthew O’Neal, Department of Entomology, Iowa State University, May 2020.

15 Ibid.

16 Landis, Doug, et al. “Native Plant Facts: Showy tick trefoil.” Project GREEN, AgBioResearch, Department of Entomology, Michigan State University, canr.msu.edu/nativeplants/uploads/files/Showy_tick_trefoil.pdf. Accessed June 2020.

17 Personal communication: Matthew O’Neal, Department of Entomology, Iowa State University, May 2020.

18 Ibid.

19 Ibid.

20 Ibid.

21 Landis, Doug, et al. “Native Plant Facts: Showy goldenrod.” Project GREEN, AgBioResearch, Department of Entomology, Michigan State University, canr.msu.edu/nativeplants/uploads/files/showy_goldenrod.pdf. Accessed June 2020.

22 Personal communication: Matthew O’Neal, Department of Entomology, Iowa State University, May 2020.

23 Landis, Doug, et al. “Native Plant Facts: New England aster.” Project GREEN, AgBioResearch, Department of Entomology, Michigan State University, canr.msu.edu/nativeplants/uploads/files/New_England_aster.pdf. Accessed June 2020.