Greening the Clean Energy Transition

Smart Siting and Pollinator-Friendly Solar Energy in Illinois

The Nature Conservancy

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POLLINATOR PARTNERSHIP

INTRODUCTION

Solar power is a key source of renewable energy that is expanding rapidly in Illinois. As the solar footprint grows to achieve a 100% clean energy economy in the state by 2050[1], Illinois will have to use smart planning and management strategies to sustainably meet energy production needs. Solar energy developers, operators, and buyers have a unique opportunity to serve as community and industry leaders by incorporating responsible environmental practices into renewable energy systems.

Without proper planning, solar development may have adverse consequences on the natural environment and surrounding communities. Impacts—including soil erosion, stormwater runoff, reduced water quality, and habitat fragmentation and loss—can ultimately reduce biodiversity and ecosystem function. Conventional approaches to managing solar sites, which often favor turfgrass installation under solar arrays, can negatively affect the environment and require higher inputs (e.g., labor for mowing, herbicide treatments) than habitat-friendly practices over the long term. As project lifetimes are expected to average between 20 to 30 years, decisions made today regarding solar project siting and site management will have lasting effects.

Fortunately, best management practices can be integrated into each phase of solar development and operation to minimize loss and promote beneficial outcomes. Smart siting—the selection of low-impact sites for renewable energy development to minimize environmental disturbance—and ecologically sensitive site design and management can maximize the benefits to nature and ecosystem services. In Illinois, where significant expanses of the natural landscape have been lost to development—including over 99.9% of the state's original prairie habitat[2]—planting beneficial vegetation under and around solar arrays can provide critical habitat for pollinator species like the iconic monarch butterfly. In addition to supporting biodiversity on the landscape, co-locating pollinator-friendly habitat in solar installations can yield multiple benefits for solar energy operations and management.

In this document, The Nature Conservancy (TNC) and Pollinator Partnership offer guidance on smart siting principles and solar habitat co-location to ensure win–win results for Illinois' transition to clean energy. The guide is intended to improve multiple outcomes, benefiting long-term environmental and community health as well as solar operations and management.

Given the highly dynamic nature of the renewable energy field, we anticipate that this guidance will evolve as the technology and evidence base for smart siting and pollinator-friendly solar advance. This guidance is not intended to provide a one-size-fits-all approach, but rather to create a common understanding of current best practices. Since each project has unique site conditions, we recommend consulting with experts and the community to implement this guidance, develop site-specific plans, and improve overall success.

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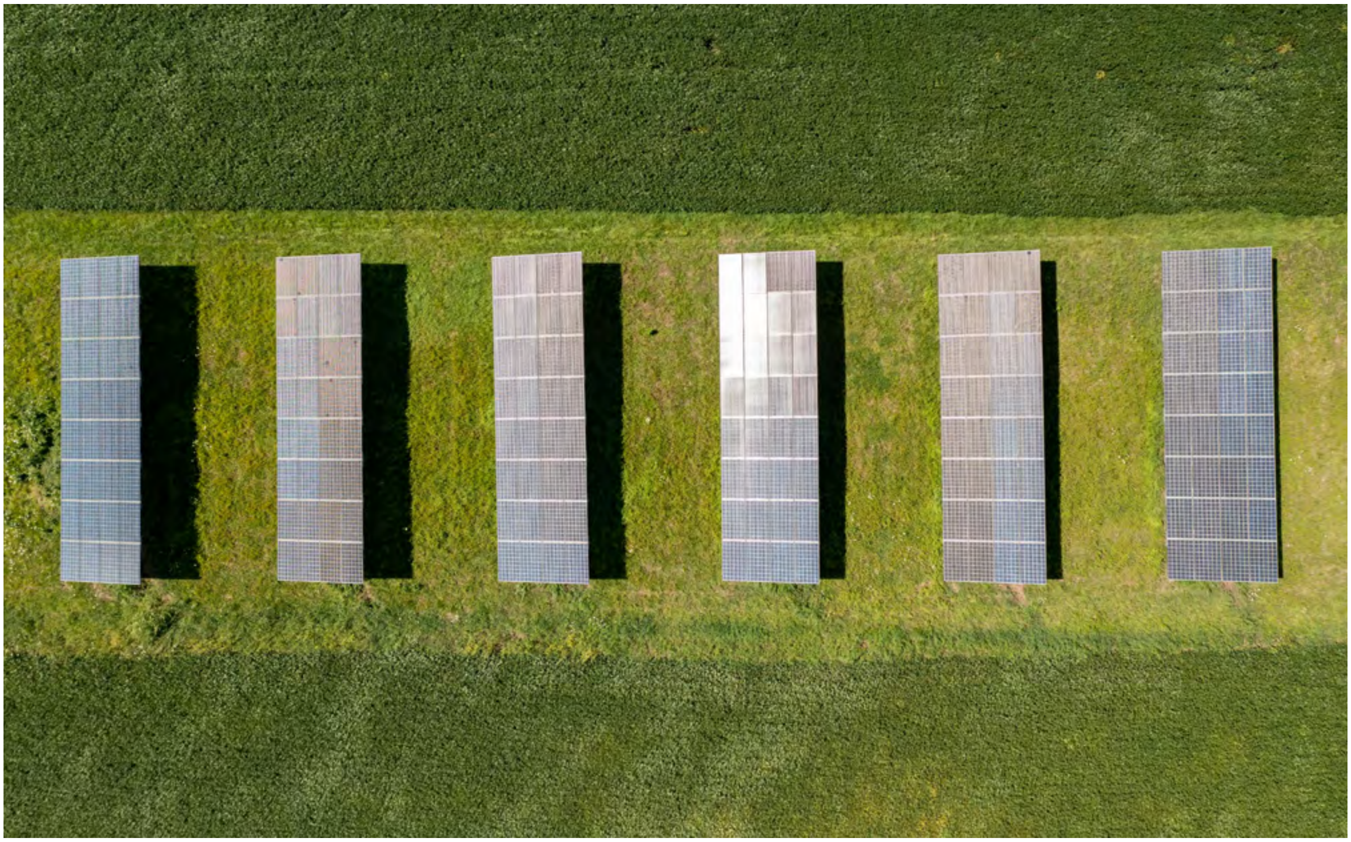

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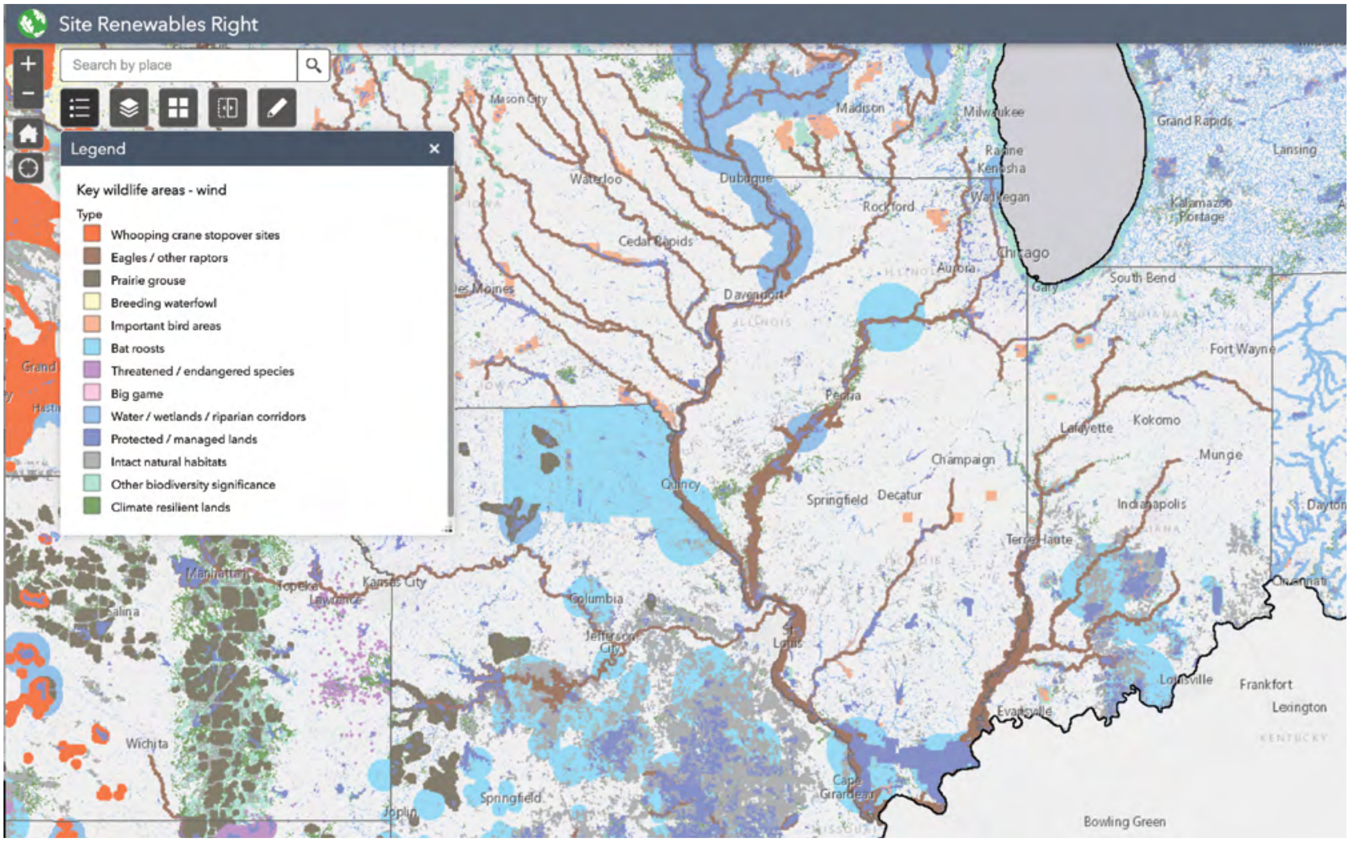
SMART SITING OF SOLAR PROJECTS

In the next five years, the solar industry projects that approximately 5,085 megawatts of new solar will be built in Illinois, impacting more than 38,100 acres across the state, assuming new development is ground-mounted.[3] Utility-scale solar energy systems occupy approximately 7.5 acres of land per megawatt of energy produced.[4] As Illinois makes the pivotal transition to 100% clean energy, models suggest that the overall solar footprint could affect as many as 320,000 acres by 2050.4 It is increasingly important to site new solar development in areas with the least potential to negatively impact habitat, biodiversity, and ecological function to ensure the overall sustainability of the sector. Research shows that considering ecological criteria in siting decisions can also benefit developers through project cost savings and shorter permitting timelines.[5]

To facilitate optimal climate and conservation outcomes, we recommend thinking of solar siting in terms of the mitigation hierarchy—a tiered, three-step process for minimizing environmental impacts from development. The first and best option is to avoid impacts to habitat and natural resources, to the extent possible. When impacts cannot be avoided, they should be minimized. Finally, as a last resort, the project should compensate for any unavoidable impacts by restoring ecological function elsewhere.

Mitigation Hierarchy



Avoiding impacts is the best way to reduce harmful effects of solar development on nature. It is a best practice to avoid new development that requires converting natural habitat, including forests, grasslands, wetlands, and floodplains. These areas can be important for habitat connectivity, climate resilience, and natural carbon storage. It is particularly important to avoid development in locations that provide high-quality, intact native habitat or where there is a moderate to high probability of adverse impacts to species of concern and/or their habitats.

To be fully aware of areas deemed most sensitive by the Illinois Department of Natural Resources, developers can consult the state's Conservation Opportunity Areas (COAs), which the state has identified for conserving Illinois' species in greatest need of conservation.[6] TNC's Site Renewables Right map can also serve as a helpful resource for evaluating conservation considerations during site selection. This interactive, online map synthesizes over 100 data layers to identify where renewable energy can be developed in the central United States without major impacts to wildlife habitat.[7] To identify the most climate-resilient lands and significant climate corridors that species are likely to use for migration in response to climate change, developers may consult TNC's Resilient and Connected Landscapes mapping tool.[8]

The decision of where to site solar development provides the first and best opportunity to minimize impacts to ecosystem services and natural habitat. The best way to prevent the degradation of natural systems is to deploy solar on previously developed or disturbed lands, where human activity has already altered natural ecological function and species composition.

To minimize impacts to nature, we recommend prioritizing solar development in the following low-impact areas.

1. The built environment

Renewable generation located in the built environment (e.g., on rooftops, in parking lots) is a great option for avoiding negative impacts to habitat, biodiversity, and ecological function. Existing rooftops are ideal low-impact locations for solar installation, and they usually have the added benefit of being close to the location of energy demand, which reduces loss due to transmission and distribution.

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2. Contaminated and degraded lands

Contaminated and degraded lands also serve as good locations for siting renewable energy projects. The options for safely reusing these sites productively are often limited, so solar installations can provide a beneficial way to repurpose the land. Potential sites include:

- Brownfields or previously contaminated lands, such as closed landfills
- Sites with prior development, little or no vegetation, and/or poor soil quality
- Mechanically altered lands, such as former mine lands
- Idle or underutilized industrial areas

The potential for solar development on contaminated and degraded lands across the state is high. According to an analysis by RMI, over 5,000 acres of land in Illinois could be developed for solar on closed landfills alone, with an estimated capacity of 1,570 MW.[9] Expanding the options to include other contaminated lands and mine lands increases the opportunity considerably. Illinois contains significant areas of mine lands and brownfields that are suitable for solar development. Information on relevant sites in Illinois is available through the U.S. Environmental Protection Agency, which has collected data on the renewable energy potential of contaminated lands, landfills, and mine lands through the RE-Powering America's Lands Program.[10]

In 2021, Illinois passed legislation that requires the state to procure at least 3% of solar energy from brownfield sites.[1] This carve-out within the Renewable Portfolio Standard is intended to incentivize solar development on brownfields in Illinois.

3. Marginal and non-productive farmland

Solar can be located on agricultural land that is less suited to growing crops or has low productivity, such as drought- or flood-prone farmland or highly erodible farmland. Such lands should be identified in collaboration with relevant stakeholders, including federal and state agriculture agencies. Renewable energy deployment on marginal and non-productive farmland can provide an alternative revenue stream and may yield improved water quality and land management benefits. Incorporating quality, pollinator-friendly habitat within solar sites on agricultural lands can also support the provision of multiple co-benefits for agricultural producers, such as improved soil health and increased crop productivity.

Solar Energy and Agriculture

Illinois is home to some of the most fertile soil in the world. Of the state's 27 million acres of farmland, approximately 89% is categorized as prime farmland.[11] Between 2001 and 2016, Illinois lost over 176,000 acres of prime farmland to urban, suburban, and low-density residential development, suggesting that better land-use planning and stronger policies are needed to slow the rate of conversion.[12] Efforts to incentivize solar in the built environment and on degraded lands can minimize the amount of prime farmland impacted in the state to meet energy needs. Each solar project developed on a roof, parking lot, or landfill avoids taking agricultural land out of production.

Alternatively, solar built on farmland (preferably marginal and non-productive farmland) can be designed and managed to provide benefits for surrounding agricultural activities. Co-locating pollinator-friendly vegetation with solar installations can improve soil quality and increase the abundance of pollinators and beneficial predatory insects, aiding nearby farms with crop pollination and pest control.[13,14] The benefits of habitat co-location also extend to farms with crops that are traditionally thought not to need pollination. For example, while soybeans are not pollinator dependent, pollinators have been shown to increase soybean yields by more than 20%.[15]

Farmers may also be able to diversify profits by combining energy and food production in agrivoltaic systems—by planting forage and specialty crops under solar panels. Research is ongoing to evaluate the production potential and economic viability of these systems, given that agrivoltaic practices are still in an early experimental phase. Importantly, solar lease payments could provide supplemental income for some small and mid-sized landowners, who may be struggling to compete in the face of increasing farm consolidation.[16]

Transmission Infrastructure

Solar energy is transported from producers to consumers through the electrical grid, using high-voltage transmission lines to send electricity long distances before converting it to a lower voltage and distributing it for use via distribution lines. Current transmission capacity on the U.S. electrical grid is inadequate to accommodate all of the new renewable energy required to meet the country's climate goals, and additional transmission infrastructure will need to be built.

As with renewable energy systems, new transmission and transmission interconnection facilities can impact natural systems, and smart siting principles should be applied to minimize their impact. Electric transmission projects have long, linear features that can cause problems such as increasing habitat fragmentation, interrupting landscape connectivity, and helping spread invasive species.

Where possible, solar facilities should be sited to optimize existing transmission infrastructure. However, where new transmission lines are required to connect solar projects to the grid, we recommend planning development for low-impact areas. Ideally, new transmission lines will be co-located with other utility and transportation rights-of-way. Where that is not possible, routes that have the least overlap with natural habitats should be favored. The Right-of-Way Stewardship Council has developed standards to ameliorate the impacts of transmission corridors after they have been constructed.[17] The Rights-of-Way as Habitat Working Group provides tools, resources, and networking opportunities to support the energy and transportation sectors to promote habitat conservation on rights of way.[18]

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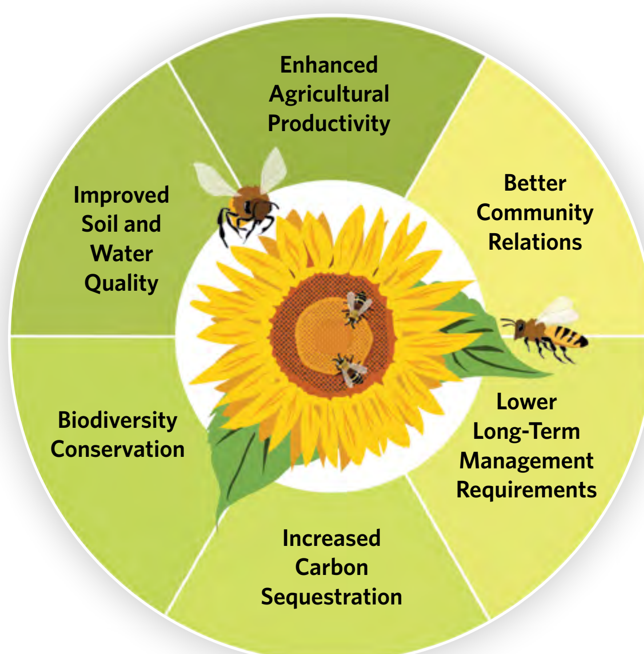
DESIGNING AND MANAGING POLLINATOR-FRIENDLY HABITAT ON SOLAR SITES

Ecologically sensitive site design and the use of pollinator-friendly plantings can maximize the environmental benefits of a solar site. They provide valuable habitat and increase the ecosystem services delivered by solar sites. This section offers detailed recommendations on how to incorporate environmental and habitat considerations into site design and how to install and manage pollinator-friendly vegetation appropriate for Illinois.



Habitat-friendly site design options should be built into early planning stages, as certain decisions can limit the overall success of a project, including the level of co-benefits that can be achieved for both the developer and surrounding community. It is also important to engage a specialist with knowledge of native plants and local environmental considerations in the development of site-specific project designs, as well as plans for site preparation, planting, and management.

Benefits of Pollinator-Friendly Habitat in Solar Sites

Co-locating pollinator-friendly vegetation within solar installations provides a wide array of benefits, especially in comparison with conventional management schemes. Well-designed pollinator-friendly habitat includes diverse, regionally appropriate native grasses and wildflowers and non-invasive cover crops.

Benefits for Pollinators and Biodiversity

Pollinators are a highly diverse group of species that are vital to maintaining biodiversity and food security. Nearly 90% of flowering plants worldwide either depend on or are enhanced by animal pollination for successful reproduction and genetic diversity.[22,23] However, habitat loss and fragmentation and increasing pressures from pathogens, invasive species, pesticides, and climate change have resulted in the unprecedented loss of pollinator species in Illinois and worldwide. Co-locating native plantings within solar installations has been shown to increase pollinator abundance by three times compared with conventional agricultural fields and 30% more than solar installations with turfgrass.[14] Pollinator plantings in and around solar arrays can help support the long-term survival of multiple pollinator species present in Illinois, including the endangered rusty patched bumble bee and the monarch butterfly (listed as endangered by IUCN).

Benefits for Soil and Water Quality

Revegetation plans that incorporate pollinator-friendly species, such as native grasses, wildflowers, and non-invasive cover-crops, under and around solar arrays will benefit water quality and soil health. The deep root systems associated with Illinois' native grassland prairie species help to increase stormwater infiltration, reduce soil erosion, retain more water during periods of drought, and improve soil health. In comparison with solar sites with turfgrass, pollinator-friendly solar sites can retain nearly 10% more water and reduce erosion by 77%.[14]

Benefits for Carbon Sequestration

Revegetating ground-mounted solar sites with pollinator-friendly habitat that includes deep-rooted native perennial grass and flowering species has been shown to sequester carbon, adding to the climate benefit provided by solar energy generation. In the Midwest, solar sites paired with native grassland species have the potential to store 35% more carbon on average than solar developments with turfgrass.[14] Notably, solar sites with native grassland species also have the potential to store 65% more carbon on average than if the same acreage were used solely for crop production.[14]

Benefits for Solar Developers

Co-locating pollinator-friendly habitat with solar can provide multiple benefits for solar operations and management. While upfront costs for native seed mixes are higher than those for turfgrass and clover, installing native species can reduce long-term management requirements and operational costs. The reduced need for frequent maintenance not only reduces the direct costs from labor, equipment, fuel, etc., but can also decrease risks of incidental damage to solar panels owing to high mowing frequency. Notably, the deep root systems provided by native vegetation also reduce risks from frost heaving, erosion, and flooding.[22] The inclusion of native plantings in solar sites also improves visual aesthetics and can lead to increased stakeholder buy-in and local community support.

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SITE ASSESSMENT

Prior to permitting, developers complete a number of assessments to evaluate potential impacts at the site, including impacts to endangered and sensitive species, aquatic features including surface waters and wetlands, and historical places. These assessments are completed to ensure that development plans comply with laws such as the Endangered Species Act, the Clean Water Act, and the National Environmental Policy Act.

Importantly, analyses completed during this phase provide valuable information for designing site-specific habitat plans. For instance, biological surveys document wildlife occurrences, including the presence or potential presence of sensitive and/or endangered species, and inventory existing vegetation, including the presence of native, non-native, and invasive species. Soil, topographic, and hydrologic analyses identify soil type, slope, and the presence of any important hydrologic features and wetlands.

The site assessment process is a necessary precursor to designing site-specific revegetation plans that aim to optimize outcomes for wildlife, habitat, and ecosystem services. This process provides critical information for making informed decisions when developing the site design and prescribing site preparation activities, implementation timelines, plant species mixes, planting options, and long-term management requirements.

Since the solar energy project development process is a complex, multi-step process, valuable information from the site assessment phase may not always be readily available to site managers. To improve project outcomes, ensure that information from the site assessment is not just used during permit acquisition but is also shared with site managers, who can use it to inform site management decisions.

SITE DESIGN

Site design should minimize impacts on the local environment and enhance overall habitat value. It can include protection and restoration of on-site natural features, the planting of pollinator-friendly vegetation, the creation of additional habitat around the perimeter of the project, reduced barriers to wildlife movement, the addition of supplemental wildlife features, and maximized water quality benefits. Habitat design for solar sites will vary based on where a facility is located within the landscape, taking into account local land-use patterns, placement within the watershed, and natural habitat in the surrounding area.

Protect and Restore On-Site Natural Features

If there are special natural features (e.g., wetlands or vegetated buffers) in or near the solar facility that cannot be avoided via the siting process, the developer can incorporate them into site design to provide wildlife habitat. Vegetated buffers, intact or restored wetlands, and patches of forest can provide additional habitat that enhances the site's value for native wildlife.

Plant Pollinator-Friendly Vegetation

Throughout their lifecycles, pollinators depend on resources provided by different habitat features, including pollen and nectar for nourishment, nesting sites for reproduction, and refuge for overwintering. Installing locally appropriate, diverse seed mixes under and around solar arrays can provide these vital habitat resources to support numerous pollinator species, as well as other beneficial insect and wildlife species. Guidance and recommendations on pollinator-friendly seed mix selection, site preparation, and vegetation management are provided in greater detail below.

Create Habitat Around the Perimeter

Planting vegetated buffers around the facility (both inside and outside the fence) consisting of native forb, grass, shrub, and tree species will provide additional habitat and increase biodiversity across the site. In addition, installing native vegetation around the perimeter will help prevent erosion and runoff and provide a visual screen around the facility, which can increase community support. If a buffer or hedgerow is included in the design scheme, include a selection of species that are appropriate for site conditions. Strive to include structural and species diversity, as opposed to installing a limited number of species, to best ensure the continued health and longevity of the installation, including resilience to year-to-year variability in climate and environmental conditions.

Reduce Barriers to Wildlife Movement

Traditional chain-link fencing at solar facilities generally creates a barrier to wildlife movement. Wildlife passageways—unfenced pathways with vegetative cover that allow animals to pass through a facility—can be integrated into the design of a site where the disruption of wildlife movement is likely. Riparian areas within a solar site can be used to facilitate wildlife movement, since riparian areas often function as natural wildlife corridors and are not suitable for solar panels. We encourage the use of wildlife-friendly fencing in lieu of the traditional chain-link fencing (e.g., 6'-high, 12.5-gauge, Fixed Knot Deer Busters, 17/75/6 deer mesh galvanized fence with three strands of 12.5-gauge, 4-point barbed wire). Wildlife-friendly fencing has larger holes at the bottom that allow small to mid-sized creatures (e.g., rabbits, foxes, raccoons) to pass through.[19] Because wildlife-friendly fencing allows wildlife species to inhabit the area, it can also benefit the long-term health of pollinator-friendly plantings within a site.

Add Supplemental Wildlife Features

Supplemental features can be added to mitigate habitat features lost to development. Examples of wildlife features include bird perches and nesting boxes, bat boxes, and bee houses. Although the benefits of these practices at solar sites are largely untested, they have proven to be successful in a variety of suburban and urban settings.[20]

Maximize Water Quality Benefits

Site location and management decisions can make the difference between projects that present risks to watersheds and surface waters and those that provide "green infrastructure" to improve water quality. Incorporating deep-rooted native plant species can maximize potential water quality benefits.[21]

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SITE PREPARATION

Thorough site preparation is one of the most important steps to ensure the successful establishment of pollinator-friendly habitat. The importance of this process cannot be overstated but is commonly underestimated. An adequate amount of time must be allocated to properly prepare the site, or revegetation efforts are set up for failure and loss of investment.

Proper site preparation provides a clean slate that supports native vegetation establishment, including the elimination of problematic species that can be detrimental to solar operations and management. Removing non-desirable vegetation—non-native and weedy species that quickly outcompete native and desirable species—is essential for successful revegetation outcomes. Weed removal commonly requires treatments across multiple growing seasons. Ideally, site preparation activities should begin 18 months in advance of seeding to provide adequate time to manage non-desirable vegetation.[i] Highly problematic invasive plant species may require an aggressive treatment plan over consecutive seasons and across a multi-year program to prevent re-establishment.

Efforts to reduce non-desirable vegetation must also include measures to manage dormant weed seeds in the seed bank, a naturally occurring repository of seeds in the soil. The seeds of many weedy species can remain viable for years as they wait for the right opportunity to germinate. Notably, activities during construction that disturb the ground are likely to bring dormant seeds to the

[i] Some jurisdictions may have permit requirements that call for immediate revegetation following panel installation, which can complicate the longer timelines required to adequately prepare sites for the establishment of pollinator-friendly vegetation. It is important to work with local authorities to get approval for a full site plan that will allow for adequate site preparation. In certain cases, it may also be possible to revegetate the site with a cover crop immediately after panel installation and then begin the site preparation process.

surface and increase weed populations. Site preparation will typically commence once solar panels and associated infrastructure have been installed, providing an opportunity to address newly surfaced seeds.

The current site conditions and land-use history significantly impact site preparation requirements, including the choice of treatments and timelines. Developers are advised to seek professional consultation to create a site-specific plan to meet the needs of each project site. In general, fallow fields and grazing pastures contain a high number of weedy species and large seed banks, necessitating a longer site preparation time. Areas recently farmed with GMO soy or corn require less site preparation due to GMO row crop management protocols that suppress weedy species.

Site Preparation for Fallow Fields and Pastures

The recommended approach to site preparation for fallow fields or pastures is to begin preparing the site a full year and half (18 months) prior to seeding. This timeline will most effectively address undesirable warm- and cool-season species, including plants that are viable in year one and plants that emerge from persistent perennial rootstock and the seed bank.

If the soils are compacted from construction activities and if the revegetation plan includes broadcast seed application, it may be beneficial to lightly disk the site (to a depth no deeper than 2 inches) as a first step. Disking should be completed before beginning the standard site preparation process, since disking the site will surface more weeds.

Most vegetation can be treated by combining mowing and thatch removal with broad-spectrum foliar herbicide treatments. Scheduling herbicide treatments multiple times over the course of 12 to 18 months in conjunction with re-occurring mowing and thatch removal is recommended to treat both warm- and cool-season species. Treatment may also involve the use of pre-emergent herbicides to address dormant seeds in the seed bank, since foliar herbicides are only effective on plants that have already germinated. However, it is imperative to use pre-emergents with a short half-life that will not persist into the time period when seeding is planned. Herbicide contractors must be fully aware of the revegetation timeline and must carefully select pre-emergent herbicides in accordance with scheduled seeding events.

In areas where persistent and/or aggressive woody species are present (e.g., buckthorn, honeysuckle, locust trees, multiflora rose), a combination of management actions may be required, including mechanical removal and

© Fresh Energy/Center for Pollinators in Energy herbicide application. Noxious weed species, such as sericea lespedeza (*Lespedeza cuneata*), may require advanced and ongoing management actions, including specialized herbicide treatments. It is important to consult with a licensed herbicide applicator to develop a plan to meet each site's unique conditions and requirements.

Site Preparation for Former Row Crop Areas

Site preparation activities in areas that were formerly utilized for row crops are much less intensive than those required for fallow fields and pastures. This reflects the management history associated with row-crop production and weed abatement activities. Areas recently managed for row crops, such as GMO corn and soybeans, can be planted the same year they are prepared, as long as they were not idle the previous growing season and weeds have not become established. If the site is not ready for revegetation, plant a cover crop, such as clover, oats, or winter wheat, to prevent widespread reestablishment of weeds in the interim.

Areas that have residual coarse vegetation, such as standing corn stocks, need to be mowed to break down the remaining vegetation. After the coarse vegetation has been treated, options for further site preparation depend on the seeding method (as described in more detail below in the planting section). Secure a contractor well in advance of seeding, since different types of seeding equipment (e.g., broadcasters vs. seed drills) require different surface conditions for seeding. As with fallow fields and pastures, when revegetation plans include broadcast seed application, it may be beneficial to lightly disk the site to a depth no deeper than 2 inches if the soil has been heavily compacted from construction activities.

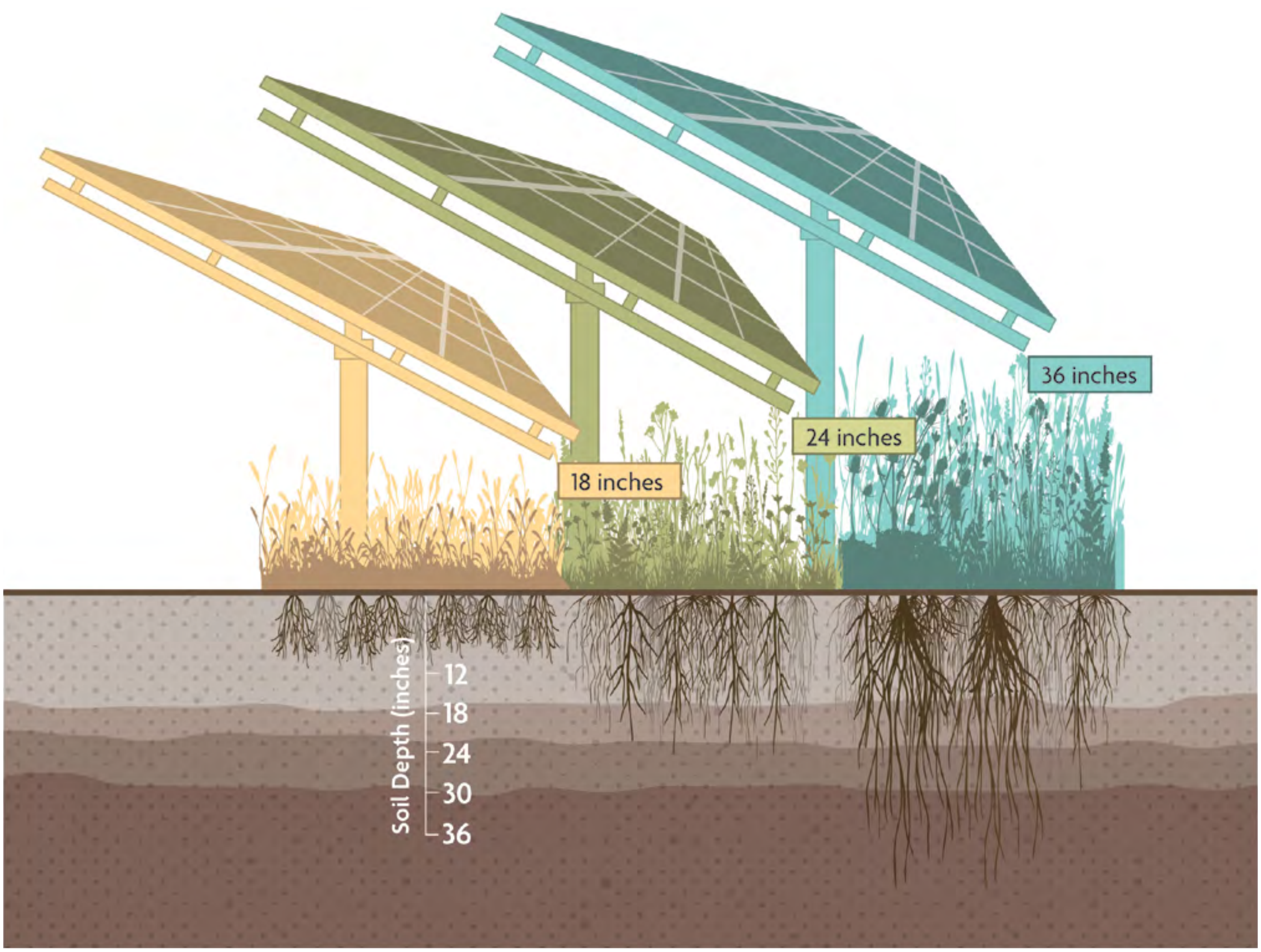
Be aware of each site's management history. Previously farmed lands may contain persistent pre-emergent herbicides that can interfere with new vegetation establishment. Because these herbicides vary in half-life and can have lasting effects that prevent plant germination, it is imperative to have full knowledge of what chemicals were used and when. To ensure the success of seed installation and establishment, confirm that any residual pre-emergent herbicides have adequately expired.

In former row crop areas, soil may also contain elevated nitrogen from repetitive fertilizer applications over multiple years or even decades to enhance crop growth. Vegetation installed on these sites may grow taller than expected in the first few years until the excess nitrogen is depleted. It may be necessary to adjust site management activities accordingly for the first few years after planting to keep plants at the desired height, and more frequent mowing may be necessary, taking care to never mow below 6 inches.

SEED MIX CONSIDERATIONS

Pollinator-friendly seed mixes for use in solar installations should be developed based on three primary considerations: 1) the height limitations dictated by solar array mounting heights, 2) the site's unique environmental conditions (e.g., geographic location, climate, soil type, moisture level), and 3) the project budget. Full consideration of these factors will increase the likelihood of successful vegetation establishment and support longevity across the expected project lifetime, which averages 20 to 30 years. Additional information and considerations for designing pollinator-friendly seed mixes are outlined below.

- **Solar panel mounting height.** Panel mounting height is one of the most important factors to consider and will greatly influence the benefits resulting from habitat co-location. Ideally, the lower edge of each panel should be at least 3 feet (36 inches) above grade. This will allow for a greater diversity of plant species, provide more flexibility when selecting species, and lower the cost of seed mixes. Solar panels with a lower edge of 2 feet (24 inches) above grade will allow for a moderately diverse planting but will restrict options for species selection and may result in higher cost seed mixes. In general, mounting panels higher will increase steel costs but should result in lower management costs over the lifetime of the project by reducing inputs, maintenance, and labor, assuming that proper site management protocols are followed.



Solar panels whose lower edge is only 18 inches above grade have severely limited options for revegetation. Very few species will not exceed 18 inches in height. Although they are still better than turfgrass, seed mixes designed for low mounting heights are limited to a few primarily non-native species, such as clovers and fescue grasses. Clovers and fescue grasses have shallow root systems and, therefore, will not provide the desirable co-benefits associated with deep-rooted native species, such as stormwater infiltration, reduced erosion and protection against frost heaving. Restricted revegetation mixes lack diversity and do not provide the higher-quality resources that pollinators and other wildlife depend upon. If lower-mounted panels are the only option or have already been installed, it is important to couple the lower-diversity seed mix that is used under panels with a high-quality seed mix along the perimeter.

- **Soil type.** Species should be selected that are compatible with the soil type and moisture level. Soils that are predominately sandy and/or rocky are often fast draining and dry and will support different species than those that are classified as wet-mesic to mesic and hold moisture, such as predominantly clay or loamy soils.

- **Native and locally appropriate species.** Native plant species are inherently adapted to local climate and soil conditions and provide the highest nutritional value and other necessary habitat resources for native wildlife, including pollinators. Whenever possible, acquire materials from vendors that can provide seed sourced from the same geographic region as the project site. Locally sourced seed is most likely to be genetically adapted to local environmental conditions. Illinois is a large state, and some species in the recommended seed lists will be more appropriate and provide the most wildlife and ecosystem benefits for southern, central, or northern regions of the state.

  While it is important to the success of any pollinator-friendly solar project to emphasize native plants, a limited number of non-invasive cover crop species, such as clover, may be included in solar seed mixes. In particular, the use of these species will be necessary at sites with lower mounted panels where native species are too tall. Using non-native species at these sites is preferable to using turfgrass, but they will not provide the same benefits for biodiversity or site operations and management as native vegetation will.

- **Species diversity.** A diverse seed mix will include both cool- and warm-season grasses, sedges, and multiple native wildflower species. Seed mixes that include multiple native plant species will provide diverse resources to attract and support multiple pollinator species, including native and managed bees, butterflies, and hummingbirds, as well as other grassland birds and beneficial insects. Notably, some species require specific host plants for reproduction, such as butterflies and pollinating moths. For example, monarch butterflies can only reproduce on a single plant genus—milkweed (*Asclepias*). Including milkweed species within array areas and/or along the perimeter will provide the reproductive resources that are critical to the survival of this iconic species, which was recently listed as endangered by IUCN and is also under consideration for listing by the U.S. Fish and Wildlife Service.[ii] Diverse plantings also increase the long-term health and longevity of the installation, by lowering management requirements and reducing long-term costs.[24,25]

- **Phenological and morphological diversity.** Vegetation installed within and around solar sites should include flowering species that bloom throughout the growing season, from early spring to late fall, and should include diverse flower sizes, forms, and colors. Providing diverse floral resources will help meet the requirements and preferences of diverse pollinator species, provide forage across all growing seasons, and provide benefits that support multiple pollinator species.

[ii] Entities that have concerns over providing habitat that will attract monarchs due to the potential listing by the U.S. Fish and Wildlife Service can opt into the Monarch Candidate Conservation Agreement with Assurances (CCAA) with the Fish and Wildlife Service. The CCAA provides assurances to property owners, lease holders, and easement holders who voluntarily support monarch habitat conservation activities that no additional regulatory requirements will be imposed beyond those in the CCAA agreement if the species is listed as endangered, thereby providing certainty to business operations. An applicant can define which conservation measures will apply and how they will implement them.[27]

Pollinator-Friendly Seed Mix Recommendations

This guide includes seed mix recommendations for Illinois, based on the types of soils that developers are most likely to encounter in the state and taking into account height restrictions. Seed mix recommendations are provided for sites with faster draining soils, characterized as dry-mesic to dry, and sites with soils that better retain moisture, characterized as wet-mesic to mesic. For both soil types, seed mix recommendations are provided for two height categories: species with a maximum height potential of up to 2 feet and up to 3 feet. In addition, for utility-scale solar sites with cost constraints, we provide an alternative, lower-cost seed mix option that consists of species appropriate for all soil types with a maximum height potential up to 3 feet.

As noted above, lower mounting heights for solar arrays greatly restrict the diversity, environmental, and site management co-benefits of habitat plantings. However, a seed mix composed of short-statured species is included for sites with height restrictions (18 inches). Very few options exist for plant species that are compatible with low-mounted panels. The low-height mix is limited in diversity and will not provide a rich pollinator-friendly habitat or other co-benefits associated with deep rooted species, but it is superior to installing non-native turfgrass. It is imperative to pair this mix with a diverse, pollinator-friendly perimeter planting to provide the floral resources and habitat characteristics required by pollinators.

For perimeter plantings, which have no height restrictions, we recommend a species mix that includes species appropriate for most soil types. While perimeter plantings are particularly important at sites with low-mounted panels, they can also be used to maximize pollinator-friendly habitat at all solar sites, regardless of mounting heights.

All of these seed mixes are intended to serve as a starting point for discussion with a local seed vendor, with the recognition that the final seed mix used for a project may vary based on seed availability and cost.

Recommended seed mixes for sites in Illinois are included in Appendix A, while a list of local seed vendors appears in Appendix B.

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PLANTING

Preparing for a successful planting includes properly preparing the seedbed, choosing a seeding method, selecting the right quantity of seed, and choosing the ideal time to plant.

Seedbed Preparation

The most important factors for seeding are good seed-to-soil contact and proper planting depth, and the seedbed must be prepared to facilitate both. Seedbed preparation varies depending on the seeding method that will be used. For no-till drill planting, the ideal seedbed is level, bare, relatively firm ground. When broadcasting seed, lightly disking the soil bed no deeper than 2 inches can be beneficial if soils are compacted from construction activities. If disking is recommended, conduct it during early site preparation prior to executing herbicide treatments (to treat weed seeds that will be brought to the surface by disking).

Seeding Method

Seed can be broadcast or installed with a no-till native seed drill. Native seed drills have the correct size boxes for small native seeds and can be calibrated to plant seeds at the appropriate depth. Traditional grass and agricultural seed drills are not well equipped to work with tiny native seeds. Native seeds need to be planted at a depth of ⅛ to ¼ inch, as planting seeds deeper will prevent them from germinating. If broadcasting seed, complete the installation by pressing or planting the seed into the soil using a cultipacker or by harrowing to ensure sufficient contact with the soil for successful germination and seedling survival. To help ensure even seed distribution across the site, carrier agents (such as rice hulls) or nurse crops (such as cereal oats, annual barley, or buckwheat) should be combined with the native seed mix prior to application. We do not recommend the use of winter wheat or rye as nurse crops, because they are allelopathic and produce chemicals that retard competing plant growth.

Seed Quantity

The recommended amount of seeds depends on the application method (broadcast or drill seeding), seed size, and relative ground slope. In general, installing too few seeds can result in poor establishment of desirable species and allow increased weedy species to re-establish. On level sites, the recommended minimum seeding rate is 40 seeds/ft^2 when drill seeding and 60 to 80 seeds/ft^2 when broadcasting. The 18-inch seed mix requires broadcasting seeds at a higher seeding rate of 100 seeds/ft^2, since the species in this mix generally have larger seeds. Seek consultation for sites with a slope of 3 to 5% since a higher seeding rate will likely be required to compensate for erosion. Note that the total pounds of seed needed per acre will vary based on the species included in a given mix, as seed weights vary considerably between species.

Planting Time

Winter Planting (Recommended): Planting native species between December and early February, also known as dormant seeding, is favorable for most perennial wildflower species because they require a period of cold-moist stratification. Seeding over snow on the ground is ideal as the natural freeze/thaw cycles will help achieve good seed-to-soil contact and planting depth. If snow is not present, ensure good seed-to-soil contact by using no-till native drill seeders or by cultipacking seed after broadcast application.

Spring Planting: Spring planting favors grass species and some annual forbs. When mixes contain a higher percentage of grass and cover crop species than native perennial species, as is the case for the 18-inch mix provided for lower panel heights, seed should be installed during the early spring months.

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SITE MAINTENANCE

Ongoing management is needed to prevent non-native and invasive species from re-establishing on the site throughout the lifetime of the project, especially the first three years after planting. Once the installed habitat reaches maturity, management actions will be greatly reduced, as the desired vegetation will limit the re-establishment of weeds and invasive species. Until that point, control non-native and invasive weeds with conservation mowing and spot treat resistant weeds. Although overall management requirements should decrease with time, annual spot treatment and periodic mowing will continue to be necessary to prevent the encroachment of woody species even after the habitat is well established.

Although consultation with a local expert is important to establish a site-specific management plan, the information below provides a general overview of the management steps that will be required in the first year after planting, during the early years of establishment, and over the long term.

Year 1 (after seeding): In the first year, plant growth is concentrated on root development. During this period, mowing is used to manage sites after plantings are established. This is imperative to control quick-growing weeds, preventing them from shading out young native seedlings and from maturing and producing more seed. Expect to mow 2 to 3 times across the first growing season after seeding, to prevent perennial weeds from establishing. Whenever vegetation growth reaches approximately 12 to 14 inches tall, mow the area to a height of 6 to 8 inches. Mowing vegetation down to 6 to 8 inches will not harm native species, since they allocate most of their energy to root system development the first few years of growth. However, it is imperative to never mow below 6 inches, as mowing below 6 inches will kill many native species. It is also important to refrain from mowing when soils are wet to avoid excessive soil compaction from equipment.

Years 2 and 3: During years two and three, the stand will begin to mature. Aboveground plant growth will increase and flowers will become more prevalent. The site will need to be monitored closely to watch for invasive and non-desirable plant re-establishment. During this management period, the full site should be surveyed at least 2 to 3 times per growing season to appropriately time mowing events and maintain control over weedy species while the desirable vegetation continues to become established. When non-desirable vegetation is observed, treat it immediately by mowing and/or spot herbicide treatment, using methods that are appropriate for the specific weed species. Plan to execute mowing events across the full site 1 to 2 times per year during years two and three, preferably mowing at a minimum height of 9–12 inches and never mowing below 6 inches. To prevent annual and biennial weeds from seeding and continuing to re-infest an area, it is important to time mowing when weeds are in full bloom but before they set seed. If herbicide applications are required to treat aggressive and/or persistent weedy species, instruct contractors to selectively target invasive species by using the appropriate equipment to avoid unintentionally spraying native species. Herbicide applications made in the early morning, before temperatures have warmed and pollinators are most active, can also help to prevent unintended pollinator mortality. Consultation during this phase is recommended to maintain control over invasive species re-establishment.

Year 4 and Beyond: By the fourth year, management requirements should be greatly reduced. Monitor the site twice a year to keep ahead of any problematic species and treat them as needed. Occasional mowing will continue to be necessary to inhibit tree and shrub encroachment and can be used in lieu of prescribed fire treatments to rejuvenate the site and encourage successional diversity. The frequency of mowing events will depend on the presence and proximity of woody species to the site. Mowing will be required once every 1 to 3 years to prevent woody encroachment. To effectively control most invasive plants while minimizing impacts on native species, mow to a height of 9 to 12 inches (but never below 6 inches). Spot treating noxious weeds must be done on an annual basis throughout the lifetime of the project.[iii]

[iii] Practices that eliminate herbicide use for both site preparation and site maintenance may be considered at smaller sites and/or sites where organic practices are preferred. For examples of relevant guidance, resources from the Xerces Society on organic site preparation and maintenance for wildflower plantings are listed in Appendix C.

When Is the Best Time to Mow Once the Planting Is Established?

The ideal time to mow an established planting depends on which wildlife species are the focus of conservation efforts. Wildlife species vary greatly in the timing of their life-cycle phases and rely on different habitat features during different times of the year for shelter, food, and reproduction. It is important to be aware of the various ecological tradeoffs and impacts to different species of wildlife when planning management events such as mowing.

For instance, to protect ground-nesting birds, it is best to hold off on mowing until at least August, since mowing in late spring and early summer can harm these species. However, mowing in late summer is harmful to pollinators, including monarchs, which continue to rely on floral resources for food and shelter into the late fall.

Mowing in late fall and winter, after at least one hard frost, is likely best for most species. Furthermore, implementing a management plan that calls for alternatively mowing vegetation in sections (⅓ to ½ of the site) during alternating years is highly recommended. This approach can avoid harm to overwintering insects and provide refuge for birds and small mammals, while also creating a more complex, multi-aged habitat.

Be sure to fully brief any site-maintenance contractors on mowing requirements to ensure that they follow the proper protocols. It is critical to prevent excessive mowing, which can severely limit project success.

Ground-Nesting Birds
To protect ground-nesting birds, such as eastern meadowlarks or bobolinks, during their peak breeding season, avoid mowing from late April to mid-August.[28]

Monarch Butterfly
To accommodate monarch breeding and migration, mow at sites containing milkweed between October 1 and May 1 in the northern half of Illinois, and between October 15 and April 1 in the southern half of the state.[30]

Rusty Patched Bumble Bee
The rusty patched bumble bee actively forages between mid-March to mid-October, so mow in late fall and winter. To protect overwintering queens, which nest just underground, mow at the highest height possible.[29]

For additional climate related information and resources visit nature.org/ilclimate

APPENDIX A: Seed Mix Recommendations

This appendix contains recommendations for seed mixes that are suitable for different sites, including seed mixes designed to accommodate varying height restrictions (3-foot, 2-foot, 18-inch mounting heights) and soil types (dry/dry-mesic and wet-mesic/mesic soils). Taking budget into account, an alternative, lower-cost seed mix option is also included for the 3-foot mounting height.

These seed mixes will provide floral resources from spring through late fall and include diverse flower colors, forms, and shapes to support multiple pollinator species. As noted, higher panel mounting heights allow for more plant diversity and are strongly encouraged. Few species can grow below low-mounted panels (below 2 feet), so the 18-inch seed mix will support significantly fewer pollinator species. For low-mounted panels, it is imperative to plant a more diverse seed mix around the perimeter to improve diversity at those sites. A perimeter seed mix is provided here, which does not have height restrictions and is appropriate for all soil types. This seed mix can also be used at sites with higher panels to maximize habitat benefits.

We encourage consultation with local revegetation, restoration, and/or conservation experts to determine the best seed mix to meet each site's unique requirements. Due to annual fluctuations in the availability and costs of native seed, adjustments to seed mixes should be expected.

Nurse Crops

Seed mixes can be installed with an annual nurse crop such as cereal oats, annual barley, or buckwheat to help prevent unwanted weeds from establishing on bare ground while the native species become established. Adding nurse crop seed to the native seed mix will also act as a carrier agent in place of inert options such as rice hulls, cracked corn, or clay cat litter. Mowing during the first year will prevent these annual crop species from reseeding throughout the site.

Seeding Rates

With the exception of the seed mix provided for low-mounted (18-inch) panels, the recommended seed application rate is 40 seeds/ft2 for drill seeding and 60 to 80 seeds/ft2 for broadcast seeding. For frost seeding the 2-foot and 3-foot seed mixes, warm-season grasses should be increased by 25%.26 For the 18-inch seed mix, which should be planted in the spring, the recommended seed application rate is 100 seeds/ft2 for broadcast seeding. Drill seeding at sites with low-mounted panels will be very difficult due to the low clearance.

Soil Moisture Levels

Wet	Saturated Soil
Wet-Mesic	Seasonally Saturated Soil
Mesic	Moderately Moist Soil
Dry-Mesic	Well-Drained Soil
Dry	Excessively Drained Soil

Wet soils are commonly saturated year-round and are considered wetlands. Development is not recommended in wetlands, as these areas are highly sensitive. If any aspect of a project is located near, has the potential to cross into, or will impact any wetland area, seek specialized expertise and consultation.

Wet-mesic soils have moisture levels between wet and mesic soils. They are moister than mesic soils.

Mesic soils are characterized by slightly moist to moist conditions. They tend to be well drained and balanced in composition. They do not remain saturated for extended periods, nor do they completely dry out beneath the upper soil layers.

Dry-mesic soils have moisture levels between dry and mesic soils. Sites where drainage tiles have been installed may present characteristics of dry-mesic soils. They usually include more organic matter and retain higher moisture than naturally dry soils.

Dry soils have very low moisture levels and drain quickly. They commonly contain greater amounts of sand and/or rock and little organic matter.

Sample Seed Mix				
For Sites with Dry to Dry-Mesic Soils / 3-foot Vegetation Height				
Botanical Name	**Common Name**	**Height**	**Bloom Time**	**Color**
Achillea millefolium	common yarrow	1.5′–3′	June–Aug.	White
Agastache foeniculum	anise hyssop	1′–3′	June–Sept.	Purple
Amorpha canescens	leadplant	3′	June–Aug.	Purple
Asclepias tuberosa	butterfly milkweed	1′–2.5′	June–Aug.	Orange
Astragalus canadensis	Canada milkvetch	3′	June–Aug.	Cream
Bouteloua curtipendula	sideoats grama	1′–3′	warm season	n/a
Bouteloua gracilis	blue grama	1′–1.8′	warm season	n/a
Bromus kalmii	prairie brome	3′	cool season	n/a
Carex bicknellii	Bicknell's sedge	3′	cool season	n/a
Carex brevior	plains oval sedge	1′	cool season	n/a
Carex gravida	heavy sedge	2′	cool season	n/a
Carex molesta	field oval sedge	3′	cool season	n/a
Chamaecrista fasciculata	partridge pea	2′	July–Sept.	Yellow
Coreopsis lanceolata	sand coreopsis	1′–2.5′	May–Aug.	Yellow
Coreopsis tinctoria	plains coreopsis (tickseed)	1′–3′	Apr.–June	Yellow
Dalea candida	white prairie clover	1′–2′	June–Sept.	White
Dalea purpurea	purple prairie clover	1′–3′	July–Sept.	Purple
Danthonia spicata	poverty oatgrass	1′–3′	cool season	n/a
Drymocallis arguta	prairie cinquefoil	1′–3′	June–Sept.	Yellow
Echinacea pallida	pale purple coneflower	2′–3′	June–July	Lavender
Elymus trachycaulus	slender wheatgrass	1′–3′	cool season	n/a
Eragrostis spectabilis	purple lovegrass	1′–2′	warm season	n/a
Euthamia graminifolia	grass-leaved goldenrod	2′–3′	July–Sept.	Yellow
Festuca subverticillata	nodding fescue	2′–3′	cool season	n/a
Koeleria macrantha	June grass	2′	cool season	n/a
Liatris cylindracea	dwarf blazingstar	1′–1.5′	July–Oct.	Purple
Monarda punctata	spotted bee balm	1′–3′	July–Sept.	Lavender
Penstemon hirsutus	hairy beardtongue	1.5′	June–Aug.	Purple
Pycnanthemum pilosum	hairy mountain mint	1′–3′	July–Aug.	White
Pycnanthemum tenuifolium	slender mountain mint	2′–3′	June–Sept.	White
Ratibida columnifera	long-headed coneflower	1′–3′	June–Aug.	Yellow
Rudbeckia hirta	black-eyed Susan	1′–2.5′	June–Oct.	Yellow
Schizachyrium scoparium	little bluestem	3′	warm season	n/a
Solidago nemoralis	gray goldenrod	1′–2.5′	Aug.–Oct.	Yellow
Solidago ptarmicoides	white flat-top goldenrod	1′	June–Sept.	White
Sporobolus cryptandrus	sand dropseed	2′–3′	warm season	n/a
Sporobolus heterolepis	prairie dropseed	2′–2.5′	warm season	n/a
Symphyotrichum ericoides	heath aster	2′	Aug.–Oct.	White
Symphyotrichum oolentangiense	sky blue aster	1.5′–3′	Aug.–Oct.	Blue
Symphyotrichum pilosum	frost aster	1′–3′	Sept.–Oct.	White
Verbena stricta	hoary vervain	2′	June–Sept.	Blue
Zizia aurea	golden alexanders	2.5′	Apr.–June	Yellow

* This mix contains 65% forb species and 35% graminoid species.

Sample Seed Mix				
For Sites with Dry to Dry-Mesic Soils / 2-foot Vegetation Height				
Botanical Name	**Common Name**	**Height**	**Bloom Time**	**Color**
Allium stellatum	prairie onion	1′–2′	July–Aug.	Lavender
Antennaria neglecta	field pussytoes	0.5′	Apr.–June	White
Asclepias verticillata	whorled milkweed	1′–2′	July–Sep.	White
Bouteloua dactyloides	buffalograss	0.25′–0.75′	warm season	n/a
Bouteloua gracilis	blue grama	1′–1.3′	warm season	n/a
Carex brevior	plains oval sedge	1′	cool season	n/a
Carex gravida	heavy sedge	2′	cool season	n/a
Carex sprengelii	long-beaked sedge	2′	cool season	n/a
Chamaecrista fasciculata	partridge pea	2′	July - Sept.	Yellow
Conoclinium coelestinum	mistflower	1′–2′	Sept.-Oct.	Blue
Dalea candida	white prairie clover	1′–2′	June - Sept.	White
Echinacea angustifolia	narrow-leaved coneflower	2′	June - July	Pink
Eragrostis spectabilis	purple lovegrass	1′–2′	warm season	n/a
Festuca subverticillata	nodding fescue	2′	warm season	n/a
Heuchera richardsonii	prairie alumroot	2′	May–July	White
Koeleria macrantha	June grass	2′	cool season	n/a
Liatris cylindracea	dwarf blazingstar	1′–1.5′	July–Oct.	Purple
Penstemon hirsutus	hairy beardtongue	1.5′	June–Aug.	Purple
Solidago ptarmicoides	white flat-top goldenrod	1′	June–Sept.	White
Symphyotrichum ericoides	heath aster	2′	Aug.-Oct.	White
Symphyotrichum lateriflorum	calico aster	2′	Aug.-Oct.	White
Trifolium hybridum	alsike clover	0.5′–2′	spring/summer	White/ Pink
Trifolium incarnatum	crimson clover	0.75′–2.5′	May–July	Red
Trifolium pratense	red clover	0.5′–2′	spring/summer	Pink
Trifolium repens	white clover (white Dutch clover)	0.5′–0.75′	spring	White
Verbena stricta	hoary vervain	2′	June–Sept.	Blue
Zizia aptera	heartleaf alexanders	2′	Apr.–May	Yellow

* This mix contains 65% forb species and 35% graminoid species.

Sample Seed Mix				
For Sites with Mesic to Wet-Mesic Soils / 3-foot Vegetation Height				
Botanical Name	**Common Name**	**Height**	**Bloom Time**	**Color**
Allium cernuum	nodding onion	1′–2′	July–Aug.	Lavender
Anemone canadensis	Canada anemone	1′	May–June	White
Bidens frondosa	beggar's tick	3′	Aug.–Oct.	Yellow
Bromus kalmii	prairie brome	3′	cool season	n/a
Carex annectens	small yellow fox sedge	2′	cool season	n/a
Carex frankii	bristly cattail sedge	2′	cool season	n/a
Carex molesta	field oval sedge	1′–2.5′	cool season	n/a
Carex scoparia	pointed broom sedge	2′	cool season	n/a
Carex tribuloides	awl-fruited oval sedge	3′	cool season	n/a
Carex vulpinoidea	brown fox sedge	1′–3′	cool season	n/a
Chamaecrista fasciculata	partridge pea	2′	July–Sept.	Yellow
Chasmanthium latifolium	river oats	3′	cool season	n/a
Coreopsis tinctoria	plains coreopsis (tickseed)	1′–3′	Apr.–June	Yellow
Deschampsia cespitosa	tufted hairgrass	1′–3′	cool season	n/a
Elymus villosus	silky wild rye	1.3′–3′	cool season	n/a
Eupatorium coelestinum	mistflower	1′–2′	July–Sept.	Blue
Euthamia graminifolia	grass-leaved goldenrod	2′–3′	July–Sept.	Yellow
Festuca subverticillata	nodding fescue	2′–3′	cool season	n/a
Heuchera richardsonii	prairie alumroot	2′	May–July	White
Iris virginica	southern blue flag iris	3′	May–July	Blue
Juncus tenuis	path rush	1′	cool season	n/a
Juncus torreyi	Torrey's rush	1′–3′	cool season	n/a
Lobelia siphilitica	great blue lobelia	3′	July–Oct.	Blue
Poa palustris	fowl bluegrass	1′–2′	cool season	n/a
Pycnanthemum tenuifolium	slender mountain mint	2′–3′	June–Sept.	White
Pycnanthemum virginianum	Virginia mountain mint	3′	June–Sept.	White
Rudbeckia fulgida	Sullivant's coneflower	1.5′–3′	July–Sept.	Orange
Rudbeckia hirta	black-eyed Susan	1′–2.5′	June–Oct.	Yellow
Solidago ohioensis	Ohio goldenrod	3′–4′	July–Sept.	Yellow
Solidago riddellii	Riddell's goldenrod	3′	Aug.–Oct.	Yellow
Sporobolus heterolepis	prairie dropseed	2′–2.5′	warm season	n/a
Symphyotrichum lateriflorum	calico aster	2′	Aug.–Oct.	White
Thalictrum dioicum	early meadow-rue	2′	Apr.–May	Green
Zizia aurea	golden alexanders	3′	Apr.–June	Yellow

* This mix contains 60% forb species and 40% graminoid species.

Sample Seed Mix				
For Sites with Mesic to Wet-Mesic Soils / 2-foot Vegetation Height				
Botanical Name	**Common Name**	**Height**	**Bloom Time**	**Color**
Allium cernuum	nodding onion	1′–2′	July–Aug.	Lavender
Anemone canadensis	Canada anemone	1′	May–June	White
Carex annectens	small yellow fox sedge	2′	cool season	n/a
Carex frankii	bristly cattail sedge	2′	cool season	n/a
Carex scoparia	pointed broom sedge	2′	cool season	n/a
Chamaecrista fasciculata	partridge pea	2′	July–Sept.	Yellow
Eupatorium coelestinum	mistflower	1′–2′	July–Sept.	Blue
Heuchera richardsonii	prairie alumroot	2′	May–July	White
Juncus tenuis	path rush	1′	cool season	n/a
Poa palustris	fowl bluegrass	1′–2′	cool season	n/a
Symphyotrichum lateriflorum	calico aster	2′	Aug.–Oct.	White
Thalictrum dioicum	early meadow-rue	2′	Apr.–May	Green

* This mix contains 50% forb species and 50% graminoid species.

Sample Low-Cost Seed Mix				
For Sites with All Soil Types / 3-foot Vegetation Height				
Botanical Name	**Common Name**	**Height**	**Bloom Time**	**Color**
Achillea millefolium	common yarrow	1.5′–3′	June–Aug.	White
Agastache foeniculum	anise hyssop	1′–3′	June–Sept.	Purple
Allium cernuum	nodding onion	1′–2′	July–Aug.	Lavender
Amorpha canescens	leadplant	3′	June–Aug.	Purple
Astragalus canadensis	Canada milkvetch	3′	June–Aug.	Cream
Bidens frondosa	beggar's tick	3′	Aug.–Oct.	Yellow
Bouteloua curtipendula	sideoats grama	1′–3′	warm season	n/a
Chamaecrista fasciculata	partridge pea	2′	July–Sept.	Yellow
Coreopsis lanceolata	sand coreopsis	1′–2.5′	May–Aug.	Yellow
Coreopsis tinctoria	plains coreopsis (tickseed)	1′–3′	Apr.–June	Yellow
Dalea candida	white prairie clover	1′–2′	June–Sept.	White
Dalea purpurea	purple prairie clover	1′–3′	July–Sept.	Purple
Deschampsia cespitosa	tufted hairgrass	1′–3′	cool season	n/a
Echinacea pallida	pale purple coneflower	2′–3′	June–July	Lavender
Poa palustris	fowl bluegrass	1′–2′	cool season	n/a
Pycnanthemum tenuifolium	slender mountain mint	2′–3′	June–Sept.	White
Ratibida columnifera	long-headed coneflower	1′–3′	June–Aug.	Yellow
Rudbeckia hirta	black-eyed Susan	1′–2.5′	June–Oct.	Yellow
Schizachyrium scoparium	little bluestem	3′	warm season	n/a
Solidago riddellii	Riddell's goldenrod	3′	Aug.–Oct.	Yellow
Sporobolus cryptandrus	sand dropseed	2′–3′	warm season	n/a
Verbena stricta	hoary vervain	2′	June–Sept.	Blue
Zizia aurea	golden alexanders	2.5′	Apr.–June	Yellow

Sample Seed Mix				
For Sites with All Soil Types / Low-Mounted Panels (18″)				
Botanical Name	**Common Name**	**Height**	**Bloom Time**	**Color**
Bouteloua dactyloides	buffalograss	0.25′–0.75′	warm season	n/a
Bouteloua gracilis	blue grama	1′–1.3′	warm season	n/a
Carex brevior	plains oval sedge	1′	cool season	n/a
Festuca trachyphylla	hard fescue	0.5′–1.2′	cool season	n/a
Trifolium incarnatum	crimson clover	0.75′–2.5′	May-July	Red
Trifolium repens	white clover	0.5′–0.75′	spring	White

* This mix contains 65% forb species and 35% graminoid species.
* This mix needs to be installed in the spring and should be accompanied by a quality, pollinator-friendly perimeter planting to compensate for the low diversity.

Sample Seed Mix				
For Perimeter Plantings / All Soil Types				
Botanical Name	**Common Name**	**Height**	**Bloom Time**	**Color**
Achillea millefolium	common yarrow	1.5′–3′	June–Aug.	White
Andropogon gerardii	big bluestem	7′	warm season	n/a
Asclepias incarnata	swamp milkweed	4′	June–Aug.	Red
Asclepias syriaca	common milkweed	3′–5′	June–Aug.	Pink
Astragalus canadensis	Canada milkvetch	3′	June–Aug.	Cream
Bouteloua curtipendula	sideoats grama	2′	warm season	n/a
Carex annectens	small yellow fox sedge	2′	cool season	n/a
Carex molesta	field oval sedge	3′	cool season	n/a
Chamaecrista fasciculata	partridge pea	2′	July–Sept.	Yellow
Conoclinium coelestinum	mistflower	1′–2′	Aug.–Sept.	Blue
Coreopsis tinctoria	plains coreopsis (tickseed)	1′–3′	Apr.–June	Yellow
Dalea purpurea	purple prairie clover	1′–3′	July–Sept.	Purple
Desmodium canadense	showy tick-trefoil	5′	July–Aug.	Purple
Echinacea purpurea	purple coneflower	4′	July–Sept.	Purple
Elymus canadensis	Canada wild rye	4′	cool season	n/a
Elymus virginicus	Virginia wild rye	4′	cool season	n/a
Eryngium yuccifolium	rattlesnake master	4′	July–Sept.	White
Eupatorium altissimum	tall boneset	4′	Aug.–Oct.	White
Glyceria striata	fowl manna grass	3′	cool season	n/a
Helenium autumnale	sneezeweed	4′	Aug.–Oct.	White
Heliopsis helianthoides	ox-eye sunflower	5′	June–Sept.	Yellow
Koeleria macrantha	June grass	2′	cool season	n/a
Lespedeza capitata	round-headed bush clover	4′	Aug.–Sept.	White
Liatris aspera	button blazingstar	3′	July–Oct.	Yellow
Liatris spicata	marsh blazingstar	5′	July–Sept.	Yellow
Monarda fistulosa	wild bergamot	4′	July–Sept.	Purple
Oenothera biennis	common evening primrose	6′	June–Sept.	Yellow
Penstemon digitalis	foxglove beardtongue	4′	June–July	Lavender
Penstemon hirsutus	hairy beardtongue	1.5′	June–Aug.	Yellow
Pycnanthemum tenuifolium	slender mountain mint	2′–3′	June–Sept.	White
Ratibida pinnata	yellow coneflower	3′–5′	July–Sept.	Purple
Rudbeckia hirta	black-eyed Susan	2′	June–Oct.	Yellow
Schizachyrium scoparium	little bluestem	3′	warm season	n/a
Silphium laciniatum	compass plant	8′	June–Sept.	White
Silphium perfoliatum	cup plant	8′	July–Sept.	Yellow
Solidago rigida	stiff goldenrod	4′	Aug.–Oct.	Pink

Sample Seed Mix				
For Perimeter Plantings / All Soil Types				
Botanical Name	**Common Name**	**Height**	**Bloom Time**	**Color**
Sporobolus heterolepis	prairie dropseed	3′	warm season	n/a
Symphyotrichum lateriflorum	calico aster	2′	Aug.–Oct.	Yellow
Symphyotrichum novae-angliae	New England aster	4′	Aug.–Oct.	Yellow
Symphyotrichum pilosum	frost aster	1′-3′	Sept.–Oct.	White
Vernonia fasciculata	common ironweed	6′	July–Sept.	Purple
Veronicastrum virginicum	Culver’s root	5′	June–Aug.	White
Zizia aurea	golden alexanders	3′	Apr.–June	Yellow

* This mix contains 60% forb species and 40% graminoid species.

APPENDIX B: Regional Vendors of Native Seed

Genesis Nursery, Inc.
Website: http://www.genesisnurseryinc.com/index.html
Location: Tampico, IL
Email: info@genesisnurseryinc.com
Phone: 877-817-5325

Gordon Farms Seed Co.
Website: http://www.gfseedco.com/index.html
Location: Penfield, IL
Phone: 217-841-0131

Mason State Nursery
Website: www2.illinois.gov/dnr/conservation/forestry/pages/tree-nurseries.aspx
Location: Topeka, IL
Email: dnr.masonstatenursery@illinois.gov
Phone: 309-535-2185

Natural Communities, LLC
Website: https://naturalcommunities.net/
Location: Lisle, IL
Email: natives@naturalcommunities.net
Phone: 331-248-1016

Prairie State Nursery, LLC
Website: https://www.prairiestatenursery.com/
Location: LaSalle County, IL
Email: info@prairiestatenursery.com
Phone: 815-324-2061

Pure Air Natives [St. Louis]
Website: https://pureairnatives.com/
Location: St. Louis, MO
Phone: 636-357-6433

Roundstone Native Seed, LLC
Website: https://roundstoneseed.com/
Location: Upton, KY
Email: sales@roundstoneseed.com
Phone: 888-531-2353 / 270-531-3034

Seeds of the Prairie
Website: https://seedsoftheprairie.com/
Location: Downers Grove, IL
Email: service@seedsoftheprairie.com
Phone: 708-415-8108

APPENDIX C: Additional Resources

Resources for Smart Siting

Illinois Department of Natural Resources (IDNR)
Conservation Opportunity Areas:
https://www2.illinois.gov/dnr/conservation/IWAP/Pages/ConservationOpportunityAreas.aspx

TNC
Site Renewables Right map:
https://www.arcgis.com/apps/webappviewer/index.html?id=93588641abed4a6eba5e38dbb5ce006a&extent=-14590304.7423%2C2371251.1944%2C-7154510.6308%2C6999054.6349%2C102100

Resilient and Connected Landscapes map:
https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/reportsdata/terrestrial/resilience/Pages/default.aspx

U.S. EPA
RE-powering America's Lands:
https://www.epa.gov/re-powering#:~:text=RE%2DPowering%20America's%20Land%20is,community's%20vision%20for%20the%20site

Rights-of-Way as Habitat Working Group, University of Illinois, Chicago
https://rightofway.erc.uic.edu/

Right-of-Way Stewardship Council
https://www.rowstewardship.org/

Resources for Pollinator-Friendly Solar

Fund
Pollinator Habitat Establishment and Management Guide:
https://www.beeandbutterflyfund.org/uploads/1/3/3/3/133320811/habitatguideinteractive7_22_21.pdf

EPRI
Overview of Pollinator-Friendly Solar:
https://www.epri.com/research/products/3002014869

Fresh Energy
State Neutral Pollinator-Friendly Solar Scorecard:
https://fresh-energy.org/wp-content/uploads/2020/01/Pollinator_FriendlySolar_Scorecard.pdf

Midwest Invasive Plant Control Database
https://www.mipn.org/control/

Pollinator Partnership
Solar Pollinator Habitat Resources:
https://www.pollinator.org/consulting/solar-pollinator-habitat

Xerces Society
Native Wildflower Meadows Habitat Installation Guide:
https://xerces.org/sites/default/files/publications/15-042.pdf

Organic Site Preparation for Wildflower Establishment
https://xerces.org/sites/default/files/2018-05/16-027_02_XercesSoc_Organic-Site-Preparation-for-Wildflower-Establishment_web.pdf

Maintaining Diverse Stands of Wildflowers Planted for Pollinators
https://xerces.org/sites/default/files/publications/16-028_02_MaintainingDiverseWildflowers_web_final.pdf

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