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Vegetation Management Strategy

High Noon Solar Energy Center
Columbia County, Wisconsin

Invenergy

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1.0 Executive Summary

High Noon Solar Energy LLC prepared this Vegetation Management Strategy ("VMS", the "Strategy") for the proposed High Noon Solar Energy Center ("High Noon Solar" or the "Project"), a 300 ("MW_{AC}") (megawatt alternate current) solar generation facility with a 165 MWac/660 MWh (megawatt hour) Battery Energy Storage System (BESS) planned for approximately 2,777 acres in Columbia County, Wisconsin. High Noon Solar is within a 4,355-acre Project Area and in the Townships of Leeds, Hampden, Arlington, and Lowville. This strategy will be used for permitting and to develop a final Vegetation and Soil Management Plan ("VSMP"). The VSMP will be an evolving plan as the site layout, schedule, costs, weather, and other factors are finalized.

Prior to the development of this Strategy, the biophysical site conditions, including current land cover types, soil classifications, slopes and other environmental factors were evaluated. The biophysical site conditions were used to inform where certain native and naturalized species and species mix compositions would perform best. Local genetic native seed varieties as a seed source, if available, should be used, as they are more likely to germinate and persist compared to genetically similar specimens sourced from further away.

The Strategy has been developed to achieve the following objectives:

- Minimize interference with solar panels
- Maintain a high degree of weed and invasive species management
- Benefit soil health, water, plants, and wildlife
- Minimize soil stabilization and maintenance costs
- Use native and naturalized species adapted to a range of soil moisture conditions now or in the future

The Strategy envisions a three-phase vegetation establishment process with the first phase being site preparation for weed management over varying timeframes and methodologies depending on soil types, soil moisture regimes, weather, and construction schedule. In the second phase, a matrix of native grasses and sedges will be installed to help control broadleaf weeds and aid in soil stabilization. Some areas will receive an additional seed mix comprised of pollinator species. The third phase begins the management requirements to establish and maintain the seeding zones.

Seed mixes of grasses, sedges, wildflowers, and pollinators may be seeded concurrently or as separate seedings. A pollinator-friendly mix with a variety of differing bloom times will benefit bees, butterflies, and other pollinators. The Strategy will increase plant community diversity and ecosystem functionality within the Project site.

There are numerous benefits of the Strategy, including but not limited to:

- Improved water quality from reduced sediment and nutrient runoff, cessation of fertilizer application and insecticide use and reduced herbicide use;
- Improved erosion control, stormwater storage and infiltration from a diverse and dense ground cover with their deep rooted and dense fibrous root systems;
- Improved nearby agricultural productivity due to progression and accumulation of native bacteria, microbes, moisture content, and root network;
- Improved habitat for wildlife including birds, reptiles, and pollinators such as butterflies and bees; and
- Reduction of noxious and undesirable weeds and establishment of desired vegetation.

Seed mixes used will consider soil conditions, plant height, and an ability to tolerate mowing. For example, beneath and near PV panels vegetation heights must remain below 18 inches. Consequently, the species chosen for planting beneath and near the PV panels are low in stature and will be able to withstand periodic mowing.

The vegetation zones that may be planted include:

- Permanent Short Stature Grass Sedge (GS) Zone – A naturalized grass and sedge species cover mix which will include some low growing clovers. This zone will be the most extensive on the solar facility.

- Pollinator Habitat (PH) Zone – A seed mix containing a range of short, mid, and taller statured pollinator species in addition to the GS mix will create pollinator habitats within the fenced solar array and are not intended for use in between panels. The PH zone will provide early, mid, and late summer to early fall growing season pollinator blooming plant species.
- Buffer Zone – A seed mix comprised of components from the permanent short stature Grass Sedge seed mix along with low growing clovers. This zone will be between the array fence and arrays and will be mowed as necessary to maintain a low fuel matrix.
- View Screening Areas – Areas within the site to obscure or soften solar facility views, as requested by neighbors or regulators.

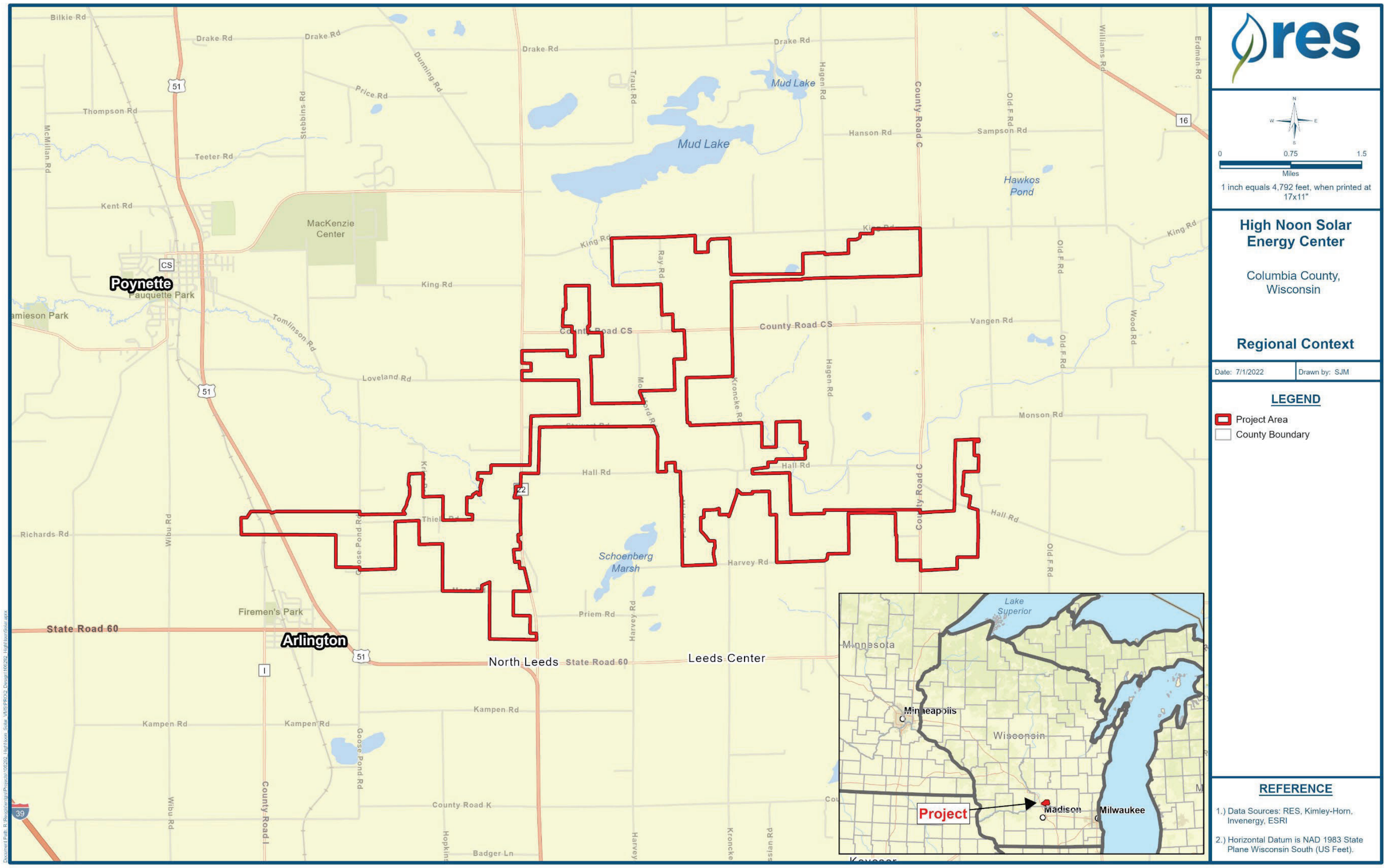
2.0 Introduction

This Strategy provides for the establishment and management of vegetation at the proposed 300 MWac High Noon Solar Energy Center planned for parts of four Columbia County Townships: Leeds (T10N R10E), Hampden (T10N R11E), Arlington (T10N R9E) and Lowville (T11N R10E) (See Figure 1). High Noon Solar will also have a 165 MWac/660 MWh Battery Energy Storage System ("BESS"). The Project Area is located primarily east of Highway 51, north of County Road 60, and intersected by County Road 22 (See Figure 1). The Project Area encompasses 4,355 acres (6.8 square miles) and the potential solar array area consists of approximately 2,777 acres (4.3 square miles).

The VMS first describes the biophysical attributes of the Project Area. Next, it describes site preparation methods followed by seeding methods, and lastly describes the expected vegetation maintenance and monitoring requirements for both the short and long-term persistence of the vegetation. The Strategy includes using naturalized plants for a biodiverse vegetative cover, soil stabilization, and as the primary pollinator plants.

The Strategy will be converted into a VSMP prior to construction. The VSMP will materially resemble the Strategy and will incorporate onsite conditions within the final limits of disturbance, soil sample analysis, seed mix availability, weather, and timing of construction.

Figure 1. Regional Context



3.0 Biophysical Attributes of the High Noon Solar Energy Center

The VMS incorporates the existing land cover types, soils, topography, water, wetlands, plant life, climate, geology, and other factors. The biophysical attributes of the Project Area were used to inform and make recommendations on site preparation, seeding methods, and planting zones, and for the development of seed mixes. An overview of the land cover was previously described and mapped by the Wisconsin Department of Natural Resources ("WDNR") Wiscland 2 Land Cover Database and the USDA National Agricultural Statistics Service Cropland Data Layer ("NASS CDL"), which was field checked on March 3, 2022, and refined by Resource Environmental Solutions ("RES"). Along with the Kimley-Horn delineated wetlands and waterways (Kimley-Horn 2022), a land cover map was prepared (See Figure 2). The land cover classification scheme is to be used to identify seeding zones within the solar array areas.

3.1 Land Cover Classification

Historical (e.g., pre-settlement) vegetation described by the early land surveyors, identified much of the Project Area as native prairie with scattered bur oak, black oak, and white oak (*Quercus macrocarpa, Q. velutina, Q. alba*) in openings and oak woodlands. Marshlands were scattered throughout on hydric soils, along water courses and in-between drumlins.

The historic Prairie in the region was known as the Empire Prairie, an expansive area with few trees as evidenced by the lack of nearby marker trees in the Public Land surveyor's (PLSS) records. The Project Area and surrounding lands contain two prairie remnants remaining from the historic Empire Prairie. Portions of the High Noon Solar Energy Center are found in areas once part of the Empire Prairie that stretched across southern Columbia County (Sections 24 & 28 in T11N R10E). The Hagen Prairie Unit remnant, located in the Mud Lake Wildlife Area, supports a diversity of plants including an outstanding display of shooting stars (*Dodecatheon meadia*). Most plants in this remnant are typical dry-mesic species, but a few are wet-mesic species, including swamp milkweed (*Asclepias incarnata*) and prairie blazing star (*Liatris* sp.). The Ashton Unit remnant is located nearby on an isolated hill surrounded by cropland. The hill is dolomite bedrock with glacial till near its base. This dry-mesic remnant contains more than 60 native species and is dominated by prairie drop-seed *(Sporobolus heterolepis*).

Dominant land cover types within the Project Area were classified, mapped, and refined from field observations, aerial images, and other available data (See Figure 2). The classified land cover types previously mapped were generally consistent with the March 2022 field observations. The major land cover type category observed was agriculture and comprised 95% of the Project Area (See Table 1). The second-most extensive land cover type is Urban/Developed at 2.5% followed by Forested at 1.4%. Kimley-Horn (2022) delineated approximately 44 acres of wetlands in their delineation field study area. The Kimley-Horn field delineated wetlands and waterways are included in Figure 2.

Figure 2. Land Cover

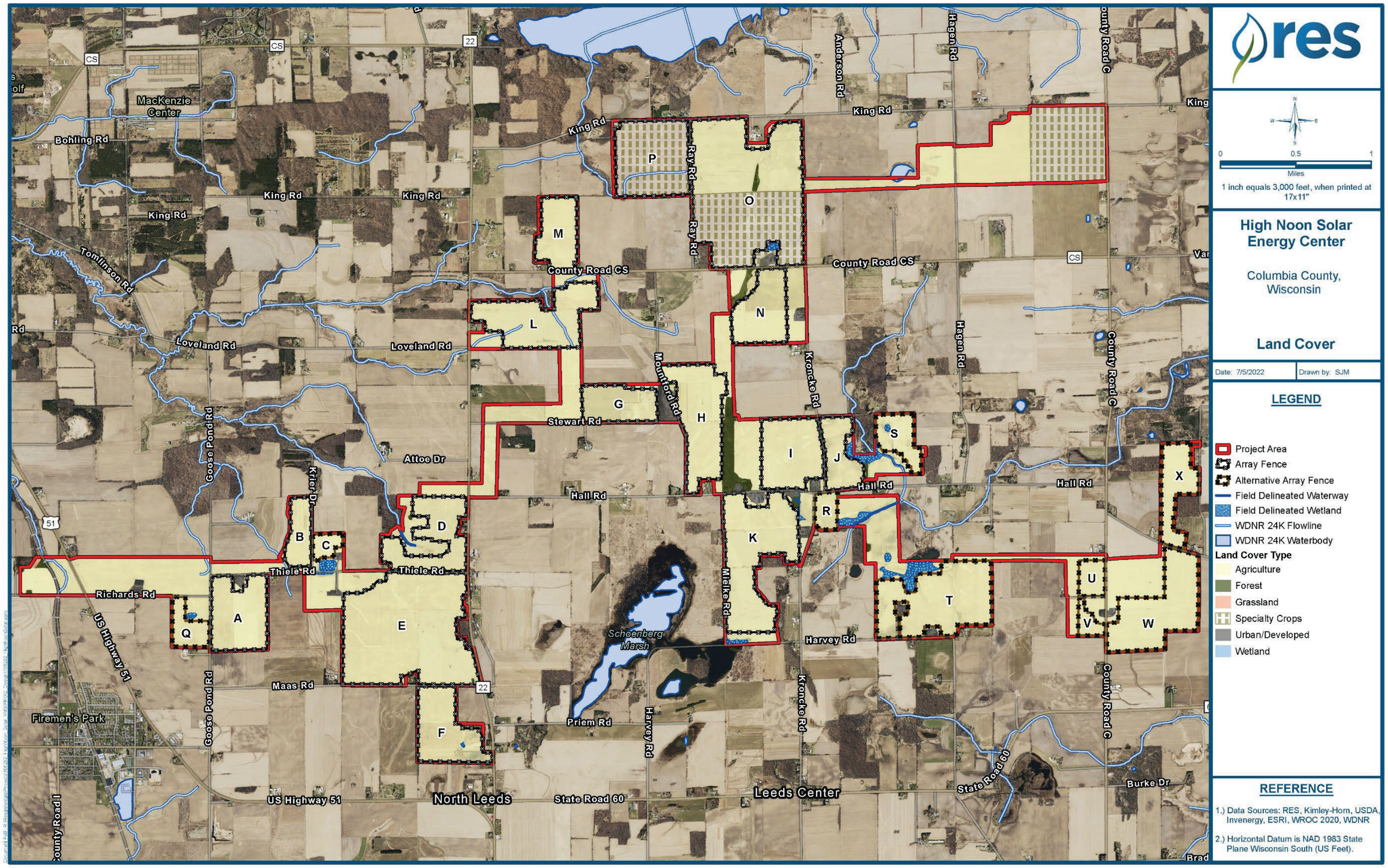


Table 1. Existing Land Cover Types in the High Noon Solar Energy Project Area.

Land Cover Type	Acres	Percent (%)
Agriculture	4,135	95
Urban/Developed	110	2.5
Forest	63	1.4
Wetland	44	1.0
Grassland	3	0.1
Total	**4,355**	**100**

3.2 Existing Field Conditions and Potential Herbicide and Insecticide Carryover

Herbicide carryover, or retention in the soil, is an important factor to consider prior to seeding. Depending on the herbicide and soil type, carryover can last many months after the cessation of herbicide use. Seed installation before herbicide carryover has been alleviated can result in the unsuccessful establishment of newly seeded areas. Available data regarding 2021 crop history, herbicide and pesticide use, and the anticipated field conditions after harvest were collected by a mail survey sent to landowners in March 2022.

Pesticide half-life can help estimate whether there is a tendency to build up in the environment (Hanson et al. 2015). Pesticide half-lives are lumped into three groups to estimate persistence. These are low (less than 16-day half-life), moderate (16 to 59 days), and high (over 60 days). Pesticides with shorter half-lives tend to build up less because they are much less likely to persist in the environment. In contrast, pesticides with longer half-lives are more likely to build up after repeated applications which can increase the risk of contaminating nearby surface water, ground water, plants, and animals.

Tobacco used to be a major cash crop in Wisconsin, but today only a few tobacco farms remain with approximately 1,000 acres of tobacco being planted annually in southeast Dane, Jefferson, Columbia, and Rock Counties. Individual tobacco fields are generally small, less than 10 acres, and comprise a small footprint in the region. Tobacco growers apply large amounts of fertilizer, herbicides, and pesticides to their crops during a three-month growing period. Among the pesticides commonly used on tobacco are aldicarb and chlorpyrifos. Methyl bromide is sometimes used to fumigate the soil prior to planting tobacco seedlings. Tobacco fields were not observed within the Project Area.

Insecticide carryover is an important factor when considering impacts on beneficial pollinator insects, especially [redacted] and the federally endangered [redacted] At least one insecticide (Bifenthrin), has been documented as having been used within the Project Area. This insecticide is toxic to bees and can persist for extended periods in the soil. Commonly used herbicides and insecticides used in south central Wisconsin agricultural fields are provided in Table 2.

Table 2. Commonly Used Pesticides. Based on Prior Research and Local Landowner Interviews with Recommended Waiting Times for Native Grass and Forb Plantings.

Product Name	Agricultural Chemical	Months Before Select Native Grasses Can Be Planted	Months Before Select Native Forbs Can Be Planted
2,4-D	2,4-Dichlorophenoxyacetic Acid	1	3
Acuron	Atrazine, Bicyclopyrone, Mesotrione, S-Metolachlor	2	12
Affinity	thifensulfuron, tribenuron	1.5	1.5
Aim	Carfentrazone-ethyl 22.3%	12	12
Authority First	Sulfentrazone, Chlorimuron Ethyl	4-12	10-36
Basis	rimsulfuron, thifensulfuron	10	18
Calvary II Insecticide	Lambda-cyhalothrin	NA	NA
Capture Insecticide	Bifenthrin	NA	NA
Command/Commence	Clomazone	4	4
Command 3me Tobacco	Clomazone	16	16
Dual II Mag Tobacco	S-Metolachlor	4	12-18
Durango DMA	Glyphosate	1	1
Enlight	Chlorirnuron ethyl, Flumioxazin, Thifensulfuron methyl	12	18
Firstrate	Cloransulam	18	18
Goaltender	Oxyfluorfen	10	10
Laudis	Tembotrione		
Miravis Neo Fungicide	Propiconazole, Dydifumeton, Az0xystrobin	NA	NA
Nortron	Ethofumesate	12	12
Poast	Sethoxydim	1	1
Prefix	S-metolachlor + Sodium Salt of Fomesafen	4	18
Prowl h20	Pendimethalin	12	12
Quadris SBX fungicide	Azoxystrobin, Difenoconazole	NA	NA
Resicore	Acetochlor, Mesotrione, Clopyralid MEA salt	12	18

Product Name	Agricultural Chemical	Months Before Select Native Grasses Can Be Planted	Months Before Select Native Forbs Can Be Planted
Roundup PowerMax	Glyphosate	0-1	0-11
Satellite	Pendimethalin	12	12
Simazone	Simazine	18	18
Sonic	Sulfentrazone, Cloransulam-methl	12	12
Status/Banvel	Dicamba, Diflufenzopyr	4	4
Staunch	Acetochlor, Mesotrione, Clopyralid MEA salt	12	18
Surestart II	Acetochlor, Mesotrione, Clopyralid MEA salt	12	18
Valor	Flumiozazin	4	8
Verdict	Dimethenamid-P (25), Saflufenacil (8)	4	12
Warrant	Acetochlor	6	18

Many native grasses and sedges can be planted within 1-12 months of the last application for most herbicides. Herbicides like 2,4-D and Glyphosate (Roundup®) have a low residence time and most native grasses can be safely planted after 1 month from the date of last application. Herbicides, like Poast (Sethoxydim) are grass specific with a low residence time (half-life in soil is 5 days). If Atrazine (and its derivatives) is used on farm fields planted to corn within the Project Area, a 12-18-month wait period after last application prior to native seeding is recommended, unless it can be documented that the residual activity is no longer present.

Native wildflowers are less tolerant than native grasses to most herbicides, with some requiring up to two years since the last herbicide application before they can be planted. Most native prairie wildflowers can be safely installed less than 1 month from the date of last application in most fields where common herbicides have been used. Seed mixes will be planted after the risk of herbicide carryover has passed.

3.3 Characterization of Existing Crop and Vegetative Land Cover

Two RES Ecologists conducted a site reconnaissance on March 3, 2022, to map and document existing land cover conditions. Field observations were completed from windshield surveys via public roads and other public access locations. Observable land cover units were mapped on hard copy aerial maps. The major land cover units were classified using the following categories: corn, soybeans, rye (small grains), alfalfa, forest, grassland, and pasture. Invasive or weedy plant species were noted in the windshield surveys (See Appendix A, Table 1). Invasive weed identification and control are important components of short-term and long-term vegetation management. The results of the windshield survey are summarized below.

Not all invasive species were observable at the time of the survey due to limited site access, plant senescence and the post-harvest/recently mowed condition in most of the Project Area. Non-agricultural areas mapped as "wetlands" by Kimley-Horn (2022) tended to be dominated by invasive non-native species such as reed canary grass (*Phalaris arundinacea*) or aggressive native species such as sandbar willow (*Salix interior*).

RES Ecologists also visited three nearby natural areas to assess potential reference plant communities: Schoenberg Marsh South, Schoenberg Marsh North, and Mud Lake Southwest. Schoenberg Marsh South has a restored native prairie in the upland areas and scrub-shrub and emergent marsh wetlands in the lowland portions of the site. Common species are wild bergamot (*Monarda fistulosa*), Indian grass (*Sorghastrum nutans*), horseweed (*Conyza canadensis*), round headed bush clover (*Lespedeza capitata*), compass plant (*Silphium laciniatum*), prairie dock (*Silphium terebinthinaceum)*, common milkweed (*Asclepias syriaca*), little blue-stem (*Schizachyrium scoparium*), blue vervain (*Verbena hastata*), Canada wildrye (*Elymus canadensis*), rattlesnake master (*Eryngium yuccifolium*), sun flower (*Helianthus* sp.), switchgrass (*Panicum virgatum*), Canada goldenrod (*Solidago canadensis*), stiff goldenrod (*Oligoneuron rigidum*), cinquefoil (*Potentilla* sp.), and gray dogwood (*Cornus racemosa*). Sandbar willow, red osier dogwood (*Cornus sericea*) with reed canary grass dominance increasing towards the marsh.

Schoenberg Marsh North consists primarily of old field with some patches of oak savanna/oak woodland plant communities. Common old field species include smooth brome (*Bromus inermis*), Canada goldenrod, gray dogwood, and silky dogwood/red osier dogwood (*C. amomum/C. sericea*). Switchgrass and Indian grass are present in lower abundance. White oak, red oak (*Q. rubra*), shagbark hickory (*Carya ovata*), and black cherry (*Prunus serotina*) dominate in the overstory of oak savanna/oak woodland areas.

Mud Lake Southwest consists primarily of restored native prairie in the upland areas and scrub-shrub/sedge meadow/emergent marsh wetlands in the lowland portion of the site. Species present in the restored prairie include Canada wild rye, switchgrass, rattlesnake master, blazing star (*Liatris* sp.), Indian grass, Canada goldenrod, and white avens (*Geum canadensis*). Abundant species in the scrub-shrub/sedge meadow/emergent marsh wetland area include gray dogwood, silky dogwood/red osier dogwood, sedges (*Carex* spp.), prairie cordgrass (*Spartina pectinata*), narrow-leaved cattail (*Typha angustifolia*), and reed canary grass.

3.3.1 Agricultural and Non-agricultural Land Cover

Agricultural fields and areas adjacent to or surrounding agricultural fields and residential yards included the following habitats:

- Agricultural fields are dominated by corn and soybeans, with woodlands on drumlins and in woodlots (See Figure 2). Although it appeared cover crops have not been used on the agricultural fields, significant soil erosion issues were not observed, due to the level of gently sloping topography.
- Road easements are dominated by cool season grasses; Kentucky blue grass (*Poa pratensis*), European brome grass, orchard grass (*Dactylis glomerata*) and foxtail grass (*Setaria* spp.).
- Small to moderately sized seasonally flooded wetland complexes are present on private properties and in agricultural fields. These habitats are typically dominated by reed canary grass with occasional patches of other wetland species, such as narrow leaf cattail. Open wetlands often transitioned to dense shrubs and young trees, with species such as willows (*Salix. interior, S. nigra*), and cottonwood (*Populus deltoides*).
- Vegetated waterways that are shallow mowed grass swales are quite common throughout the Project Area, most of which are not wetlands.

3.3.2 Invasive Species of Concern

Invasive species of concern include reed canary grass, sandbar willow and cattail in wet soil conditions, and poison parsnip *(Pastinaca sativa*), burdock (*Arctium minus*), common teasels (*Dipsacus* spp.), sweet clovers (*Melilotus* spp.), common buckthorn (*Rhamnus cathartica*), and bush honeysuckles (*Lonicera* spp.) in well-drained soils. The seed bank will likely contain additional invasive and weedy species that may be encountered during installation and maintenance phases.

Other weedy species include Eurasian cool-season grasses such as smooth brome and Kentucky bluegrass and broadleaf short statured agricultural weeds such as dandelion (*Taraxacum officinale*). While problematic in native prairie restorations, these should not be as problematic in the Grass Sedge only areas and Pollinator areas. These weedy and other low growing non-native species will be discussed in a VSMP as to their impact on the native plantings and for their potential management.

3.4 Regional Soils

Two factors of the glacial and early post-glacial history are important for the soil formation in the region. First, is the distribution of glacial materials, particularly tills. Tills in the region are predominantly sandy loam in texture and often contain large volumes of coarse fragments greater than 2 millimeters in size. The second is the westerly winds following the final retreat of the ice, which picked up silt-sized materials transported over great distances and deposited them in broad flood plains and lake basins. The silt-sized materials, called loess, together with the various glacial materials make up most of the soil parent materials in Southern Wisconsin. Other conditions such as relief, climate, natural vegetation, and the time that the soil has had to form, have also influenced the type of soil that develops.

The soils in the vicinity of the Project Area are generally deep, well drained Loess deposits on outwash plains, stream terraces, and till plains. The loess surface is silty with an underlying loamy stratified outwash or sandy loam till. Permeability of these soils is considered moderately high.

The Project Area is dominated by Mollisols with minor presence of some Alfisols. Mollisols formed under grassland vegetation and have been heavily influenced by dense sod and matted roots of thick-growing grasses. The roots eventually decay, turning into humus and giving Mollisols a thick dark brown or black color surface layer.

Alfisols formed under a hardwood forest cover. They have a clay-enriched subsoil and relatively high native fertility. “Alf” refers to aluminum (Al) and iron (Fe). Alfisols are commonly found in glaciated areas. Alfisols are widely used both in agriculture and forestry and are easier to keep fertile than other humid-climate soils. Alfisols have undergone moderate leaching with calcium, magnesium, and potassium remaining relatively abundant.

3.4.1 Project Area Upland Soils

Soils with less than 10% hydric inclusions can be generally described as being upland soils (See Figure 3). Upland soil series are comprised of silt loams and fine sandy loams with most of these soils on a 0-2% slope. A few steeper slopes (e.g., 12%) exist in the Project Area. Sandy drift, loamy outwash, and sandy to loamy till are often capped with a silty loess.

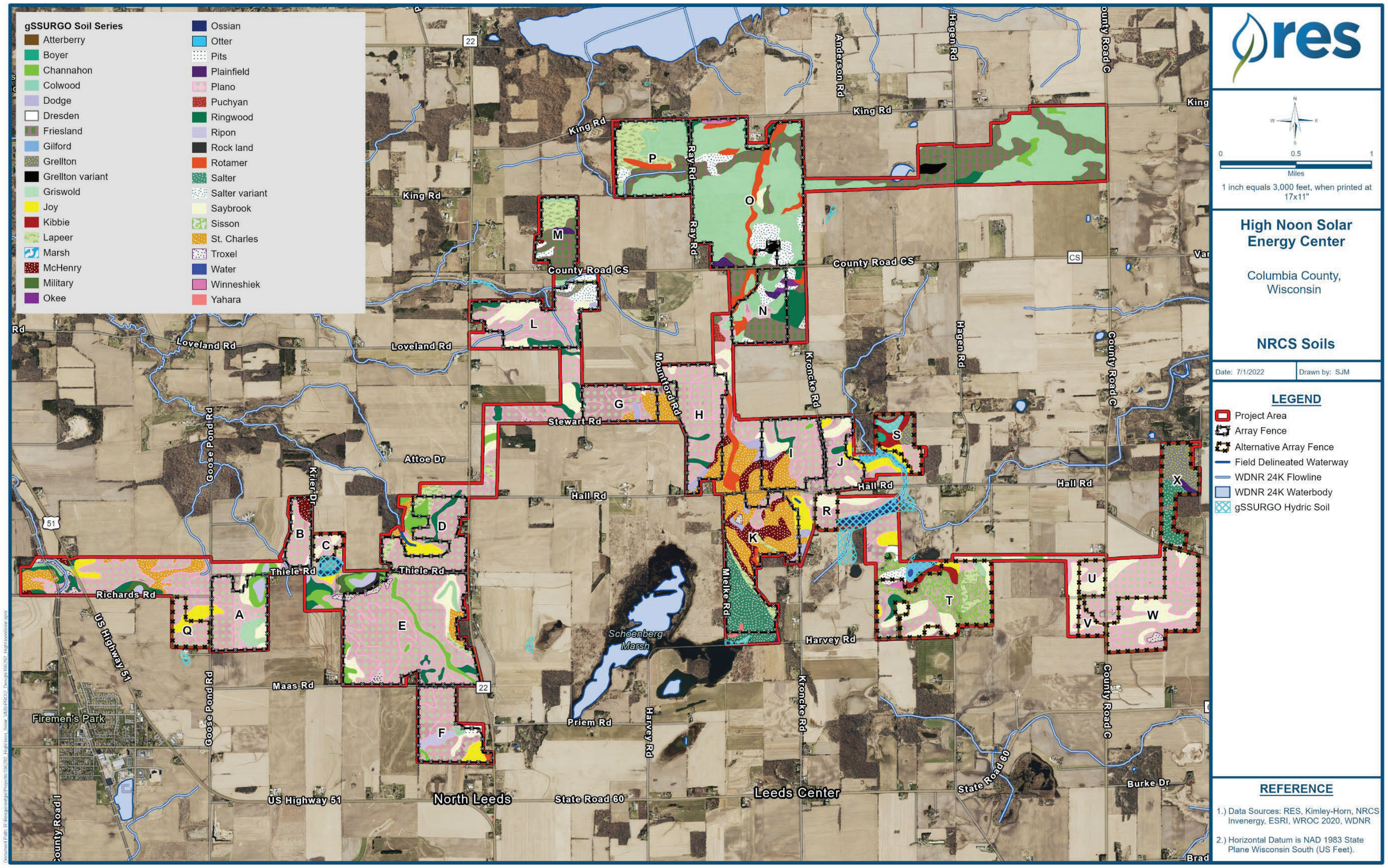
Upland soils account for approximately 98% of the Project Area’s soil types. Typical upland silt loams within the Project Area are Plano (0-6% slopes), Griswold (2-12% slopes), Saybrook (2-12% slopes), and St. Charles (2-12% slope). Roughly one-third of the upland soils were on the Plano series. The Friesland Fine Sandy Loam (1-6% slope) was the dominate course textured soil in the upland. The upland soil series historically supported upland prairies.

3.4.2 Project Area Moist Soils

Hydric soils are defined as soils that form under conditions of saturation, flooding, or ponding for long enough time during the growing season to develop low or no oxygen conditions. These soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

Hydric soils include silt loams, silty clay loams and all the muck soil types. Hydric soils under agricultural production are likely drain tiled or surface drained and will be less problematic than undrained hydric soils. Ossian Silt Loam and Otter Silt Loam composed most of the hydric soils on the site. Gilford Fine Sandy Loam and Colwood fine sandy loam are marginal soils that have hydric indicators. Hydric soils make up less than 2% of the acreage found in the Project Area (See Figure 3). Hydric soils (either drained or undrained), due to their scarcity within the Project Area will likely not require different site preparation, seeding and management approaches compared to upland soils. Hydric soils within delineated wetlands will be avoided. Except for the histosols (mucks), most of the hydric and moist soil series are classified as Mollisols and historically supported wet prairie and sedge meadow.

Figure 3. Soils at the High Noon Solar Energy Center



3.4.3 Soil Health

Within the agricultural settings of the Project Area, there is a paucity of native plant species in the overall landscape. Adjacent to the Project Area there are federal, and state owned and managed areas, such as Goose Pond State Natural Area (GPS), the Schoenberg Marsh, and Mud Lake that have incorporated native plant species into their lands. The use of native plants to increase biodiversity and productivity can improve soil health. Native deep-rooted and densely fibrous rooted cool and warm season grasses and native nitrogen fixing legumes accelerate soil benefits and benefit the larger ecosystem.

Soil microbial activity is enhanced and restored through prairie plantings and significant soil health improvements can be achieved. The native vegetation species contained in the High Noon Solar naturalized array seed mix can serve as "landscape islands" which can begin the process of rebuilding soil microbial and fungal systems. Reducing soil runoff, controlling erosion, and improving soil fertility through microbial and fungal pathways can accelerate soil health. Native species-dominated prairie vegetation provides suitable conditions for many native fungal species to dominate the microbial communities. Because soil fungi are dispersed by spores, the native vegetation on the solar facility can be useful as a "center of origin" to replenish depleted soil micro-biomes within the surrounding farmlands.

Soil health improvements can be achieved by increasing grass productivity and increasing drought resilience by installing native vegetation. Native grass plantings having a variety of native wildflowers can put soils on a trajectory to increase soil carbon levels and improve water infiltration rates. Carbon credit and nutrient credit opportunities may be present in some locations through conversion of farmland to native species because of the degraded nature of the agricultural soils. The soil health improving strategies can be an added ecosystem benefit on solar facilities planted to large-scale prairie type vegetation.

3.5 Regional Geology

The Project Area is in the Southeastern Wisconsin Savannah and Till Plain ecoregion. Columbia County is underlain with Precambrian igneous or metamorphic bedrock (Columbia County Land and Water Conservation Department 2016). Preglacial, glacial, and postglacial erosion formed the bedrock topographic surface. Bedrock valleys underlay and control present surface drainage and are filled with drift that created important aquifers. The drift is largely glacial sediment laid down by the Green Bay lobe during Wisconsin Glaciation, but they also include some alluvium and marsh deposits. Distinctive landforms (end moraine, ground moraine, outwash, and lake plains) resulting from glaciation are composed of sediment types determined by their mode of deposition. The topography of Columbia County generally consists of a ground moraine with gentle slopes. At some distance behind the belts of moraines, elongated hills called drumlins were sculpted beneath the ice. Drumlins are oval shaped hills composed of glacial drift resembling an inverted spoon or half - buried egg and are aligned in the direction of the ice flow. They tend to exist as "fields" or "swarms" of drumlins, at times found in the thousands and are typically not found as an isolated feature.

This ecoregion supports a mix of agriculture (mostly cropland and dairy operations) and woodland. Most of the original native prairie vegetation has been cleared with forested areas remaining on steeper drumlins, end moraines and poorly drained depressions. Wetlands are found throughout the region, especially along end morainal ridges and between drumlins.

3.6 Regional Climate

South Central Wisconsin has a cold winter/hot summer, humid continental climate. Precipitation consists of rain, snow, sleet, or hail. The area receives regular snowfall averaging around 40 inches per year with Columbia County averaging 41 inches. Columbia County averages 35.2 inches of rain per year, while the U.S. averages 38.1 inches of rain per year. Columbia County receives precipitation 112 days per year. There are typically 185 sunny days per year in Columbia County with the U.S. average being 205 sunny days.

South Central Wisconsin's climate is changing (August 2016 EPA 430-F-16-051). In the past century, most of the state has warmed about two degrees (F). Heavy rainstorms are becoming more frequent. In the coming decades, the state will have more extremely hot days, which may harm public health in urban areas and crop harvests in rural areas.

Heavy precipitation is likely to increase the frequency of future floods in Wisconsin. Over the last half century, average annual precipitation in most of the Midwest has increased by 5 to 10 percent. But rainfall during the four wettest days of the year has increased about 35 percent. During the next century, spring rainfall and annual precipitation are likely to increase, and severe rainstorms are likely to intensify (August 2016 EPA 430-F-16-051).

Along with range shifts, changes in timing can disrupt the intricate web of relationships between animals and their food sources and between plants and pollinators. Migratory birds are arriving in the Midwest earlier in spring today than 40 years ago. Because not all species adjust to climate change in the same way, the food that one species eats may no longer be available when that species needs it (for example, when migrating birds arrive). Scientists have demonstrated that maintaining grasslands is among the most cost-effective and scalable solutions to mitigating climate change. Grassland is categorized as any managed or natural area dominated by herbaceous or non-woody vegetation, like tall grasses and prairie plants. These landscapes are well-known for their ability to absorb and store carbon in roots and soil. Maintaining grasslands near agricultural fields can also boost crop production, because grasslands promote biodiversity, support pollinators, support ground nesting birds and host predators that can help to suppress potential pests. They also help improve biodiversity, soil health and water quality[1].

3.7 Wetlands

Kimley-Horn and Associates, Inc. (2022) delineated wetlands and waterways in the Project Area. The methods and results of the wetland investigation and delineation are documented in the Wetland Delineation Report dated June 22, 2022. A routine Level 2 (onsite) wetland delineation, as outlined in the 1987 Corps of Engineers Wetlands Delineation Manual (January 1987) along with the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northeast/Northcentral Region (Version 2.0) (January 2012) was performed in October 2021 and May 2022.

In total, 16 wetlands (approximately 44 delineated acres) and 3 waterways were field delineated within the Project Area. An additional two (2) wetlands were desktop delineated within the Project Area, for a total of 18 wetlands (approximately 44.4 acres). Wetlands fall under the following wetland types: seasonally flooded basins, shallow marsh, and deep marsh. Many wetlands are in an agricultural setting and had little apparent vegetation at the time of the delineation. These agriculturally situated wetlands were generally of low diversity and low quality.

3.8 USFWS and WDNR T&E Species

The Endangered Resources Review (ERR) identified 17 State of Wisconsin endangered resources that have the potential to be located within and surrounding the Project Area (ERR Log 21-0616 updated June 10, 2022). Nine state listed species have no follow-up actions, four have recommended actions, and four have required actions. The four state listed species with required actions, are described below.

1 https://uwmadscience.news.wisc.edu/ecology/grasslands-among-the-best-landscapes-to-curb-climate-change/

3.8.1 [redacted]

Suitable [redacted] habitat [redacted] may be present in [redacted] as well as [redacted] For any work within suitable mapped habitat, one of the following actions will be followed:

(i) Assume the birds are present and avoid clearing and initial ground disturbance in these areas from April 20 - August 1; or

(ii) Have a qualified biologist conduct surveys to determine if the birds are present in the Project Area (the biologist and survey protocols must be sent to the ER Utility Liaison for approval prior to the initiation of surveys unless already pre-approved).

If the [redacted] is not identified on the site through the surveys, there will be no Project restrictions related to this species. If surveys are conducted and the species is recorded, option (i) must be followed above. Survey results will be submitted to the Endangered Resources Utility Liaison.

3.8.2 [redacted] and [redacted]

Suitable [redacted] habitat for the [redacted] and [redacted] is present adjacent to the Project Area in [redacted] For any work within 300 ft of suitable mapped habitat, one of the following actions will be followed:

(i) Assume the birds are present and start Project activities and ground disturbances outside of the [redacted] nesting season (May 15 - July 31) and/or the [redacted] nesting season (May 1- June 15). If ground disturbance can begin outside of those dates, then work may continue through the nesting season, if needed.

(ii) Have a qualified biologist conduct surveys to determine if the birds are present in the Project Area (the biologist and survey protocols must be sent to the ER Utility Liaison for approval prior to the initiation of surveys unless already preapproved).

If the [redacted] and/or the [redacted] are not found on the site because of the surveys, there will be no Project restrictions related to these species. If surveys are conducted and the species is recorded on the site, option (i) must be followed above. Survey results will be submitted to the Endangered Resources Utility Liaison.

3.8.3 [redacted]

Since suitable habitat exists immediately adjacent to the Project Area [redacted] it is possible for a [redacted] to incidentally be found. If found, the ER Utility liaison will be contacted immediately for further guidance.

4.0 Vegetation Installation Strategy

The biophysical conditions described in Section 3 were used, in part, to develop this VMS. A key aspect of the VMS is to use naturalized perennial plant species from upland prairie ecosystems of the region (See Tables in Appendix B). Shallow-rooted, non-native turf grasses, corn, and soybeans cannot stabilize soils to the extent that the deep roots of native, perennial prairie plants can (See Figures 4 & 5).

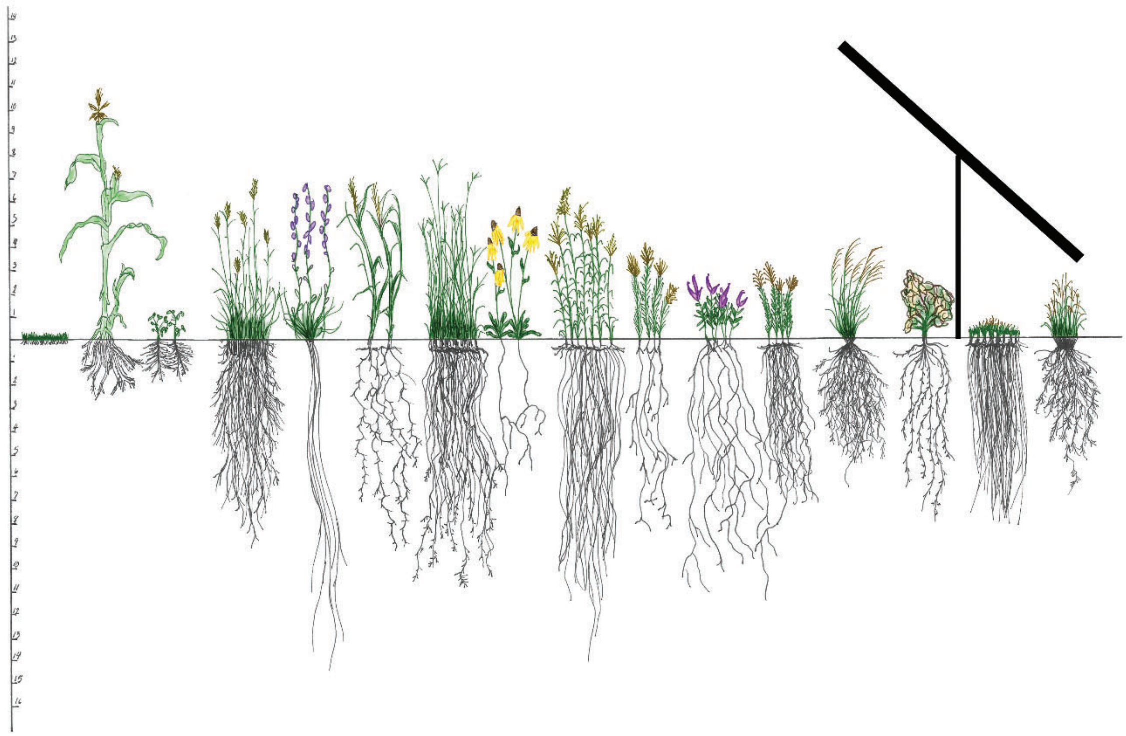


Figure 4. Selected Upland Natualized Prairie Plant Rooting Depths and Growth Heights

From left to right, the plants depicted are turf grass, corn, soybeans, native prairie grasses and forbs, and a solar racking system depicted in a 2x1 portrait configuration. Scale is in feet.

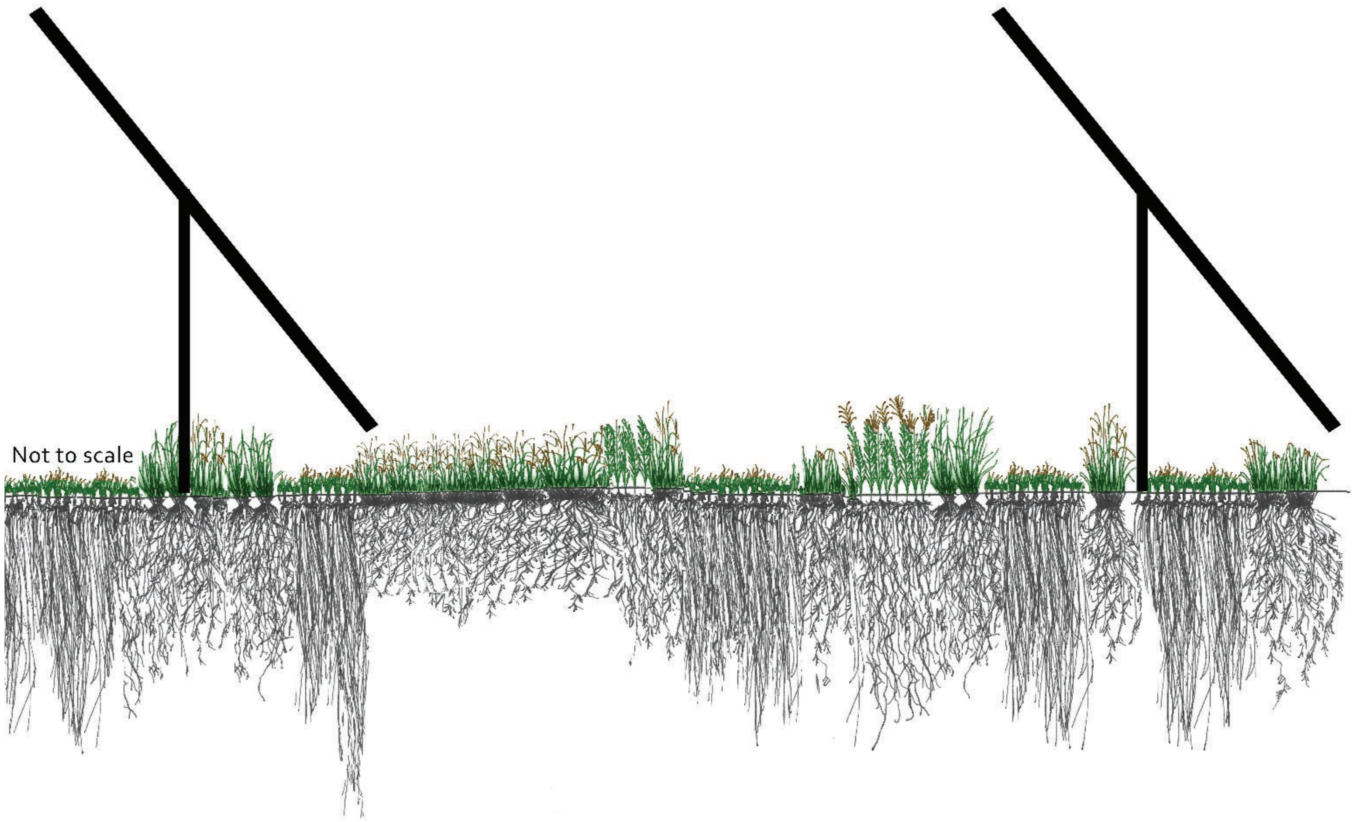


Figure 5. Schematic of a Grass Sedge Cover in Upland Soils in Relation to Solar Panels

4.1 Vegetation Establishment

Native perennials require two to three years to establish with the first years' growth concentrated in the development of a deep and fibrous root system. Another 1-2 years follow before root and above ground growth is sufficient to promote flowering and seed set.

Aggressive native and non-native weeds concentrate on above ground growth in the first year or two and expend less energy on root development. The soil must be properly prepared to manage these undesirable weeds before and after planting. A phased approach, beginning with soil preparation (Phase 1), followed by the Zone Establishment of a native grass and sedge ground cover and pollinator mixes (Phase 2) reduces the risk of native plantings being overtaken by weedy plants and results in reduced long-term maintenance. Site vegetation management (Phase 3) begins after substantial completion of the solar facilities and the seed has been installed.

Implementing Phase 1 and Phase 2 can occur before or after solar panel installation and other facility construction but will ideally occur prior to panel installation. Soil preparation scheduling depends on construction schedules, weather, seasonality, soil preparation requirements and initial cover crop and/or naturalized grass and sedge seeding. Maintaining plan flexibility will be key to the successful implementation of the VSMP.

4.1.1 Phase 1 & 2 Site Preparation and Seeding

The three-phased approach results in a vegetation matrix containing a diversity of species while minimizing disturbance and maximizing weed control. The location of the ecological communities proposed in the Zone Establishment section will be finalized based on weather conditions, seasonality, site construction schedules, final panel layout, and seed availability.

4.1.1.1 Phase 1a – Site Preparation

The most critical aspect of preparing the site for native plants is to have adequate soil preparation. Specific steps during the site preparation phase are tied directly to the existing land cover types and soil conditions related to the PV panels and other features within High Noon Solar.

Weed seeds persist for years and can dominate agricultural land seed banks. Weed seeds typically germinate earlier and weeds grow faster than perennial native grasses and wildflowers. Weed species arising from a moist soil seed bank or through wind dispersal can be a problem. Therefore, soil preparation is generally more important in moist soil conditions as compared to drier soils. Tall-growing invasive species can dominate wet and moist soils (e.g., hydric soils) upon cessation of agricultural practices and if detected will need to be controlled. Hydric/moist soils comprise a small percentage of the soil types in High Noon Solar and there should be fewer wet soil adapted seed bank weeds.

Prior to seeding, some emerging weeds will need to be controlled by a variety of site preparation strategies. One or two herbicide applications to newly emerging weeds may be necessary as part of the seed bed preparation, either before or after grading, cover crop installation, as well as prior to permanent and buffer seed installations. Herbicides selected will be those documented as not being harmful to pollinators.

As agricultural fields make up the majority of the current land use at High Noon Solar Project Area, all crops will need to be harvested or removed before the conversion of the site to permanent vegetation can begin. If large areas of heavy crop residue, such as corn stubble, remain after harvest is completed, seedbed preparation via a light disking or similar means may be necessary to break up the vegetation residue. Other vegetation removal strategies, such as cover crops, mowing, disking, raking, dragging and soil ripping/chisel plowing are additional soil preparation methods that may be needed prior to seed installation. Crop history, soil moisture regime, emerging weeds from the seed bank, wind-blown seeds, weather, compaction, and construction schedule are some of the conditions that will determine the most appropriate site preparation methods.

If excessive soil compaction occurs it can inhibit, delay, or result in poor vegetation establishment. Methods such as disking, ripping or chisel plowing as part of the soil preparation are potential solutions to reducing compacted soil conditions.

4.1.1.2 Temporary Stabilization

An Erosion Control and Stormwater Management Plan (ECSWMP) detailing the required sediment and erosion controls will be in place prior to the start of any grading work. The maintenance and removal of sediment and erosion control materials may be a requirement once a Notice of Termination of the ECSWMP permit has been received.

4.1.1.3 Phase 1b – Temporary Cover Crop Seeding

Crop history and herbicide residence times are useful in determining where and what species to use as a cover crop (See Appendix B, Table 1). When cover crop seeding is performed, several seeding methods can be considered that include broadcast and cultipacking, air seeding, or no-till drill methods to meet the objective of limiting soil disturbance and minimizing re-introduction of broadleaf weed species from the seed bank and surrounding areas. Once a cover crop seeding method is selected and seeding has occurred, growing season mowing may be enough to maintain a low vegetation profile before installing the native species. Installation and establishment of a cover crop will help stabilize soils, outcompete noxious and invasive species, and reduce erosion potential during construction. Depending on construction scheduling, cover crop may be included with and occur simultaneously with the other types of seeding zone installations. Areas of bare soil created by grading or construction disturbance, steeper slopes, and erosion potential may require a cover crop followed by mulching or installation of straw bales, unreinforced silt fences – and netless erosion control blankets. When straw mulching is needed it will be clean, weed-free straw mulch and applied at 1 ½ to two tons per acre after temporary seed materials have been installed. Straw mulch must be crimped or pressed into the soil to ensure adherence to the soil surface.

Air seeding is a relatively recent method for installing cover crop using a variety of vertical air seeder systems (e.g., Turbo-Seeder™ attachment from Great Plains®). Air seeding is a cost-effective, highly productive method for seeding cover crops. Air seeders use high cover crop rates of small grains, such as oats, wheat, rice, and ryegrass. Air seeders can be attached to a combine head that blows the seed forward and is ahead of the mulch coming through the head. This helps the seeds germinate and establish a good cover crop stand.

If the cover crop is to be replaced prior to permanent seeding, the cover crop can be terminated by mechanical rolling-crimping if herbicide use to kill off the cover crop is not desired. Traditional rolling-crimping machines are designed so that a weighted roller flattens the crop to create a protective layer of residue on the soil surface. The native seed can then be seeded directly into the residue cover. The mat of residue protects the soil from water erosion and acts like a mulch, preventing moisture loss through evaporation. The residue also adds carbon to the soil. However, simply rolling the cover crop flat will not terminate the cover plants. Hence, the crimping process is needed to damage the stems, so the plants die. Crimping must be accomplished at the late flowering stage of the cover crop to kill it and to provide enough mulch biomass to suppress weeds. An effective no-till drill with a relatively high planting rate is essential to make this system work.

4.1.1.4 Phase 2 – Permanent Zone Seeding

Once the soil/seed bed has been prepared, the remainder of the site preparation approach will be to perform seeding of the permanent short stature Grass Sedge matrix over the panel array and perimeter areas using a variety of methods, such as no-till drilling, drilling, broadcast, and air seeding methods using low impact equipment to minimize soil disturbance.

Seed mixes are designed to provide a naturalized vegetative cover while ensuring performance goals. The seed mixes are to be installed at various stages of construction, utilizing the appropriate methodology for installation. The initial permanent short stature seed mixes will consist of a mix of native and naturalized grasses and grass-like plants, such as native sedges, rushes, and a few non-native short-lived and short statured grasses (See Appendix B, Table 2).

Seed mixes were developed by using the resources of Taylor Creek Nurseries to ensure appropriate species have been selected for the site conditions along with determining the adequacy of supply within the market. Seed should be provided on a Pure Live Seed (PLS) basis. PLS is a measure used by the seed industry to describe the percentage of a quantity of seed that will germinate, which is determined by multiplying the percentage of total viable seed by the purity percentage and then dividing by 100. PLS is determined by a qualified seed laboratory.

Local genetic native seed varieties as a seed source, if available, should be used, as they are more likely to germinate and persist compared to genetically similar specimens sourced from farther away. Seed should be shipped and stored in the supplier's original, labeled packaging until installed and stored in a manner to protect from moisture, heat, or other conditions that would jeopardize viability. Seed for individual mixes will be categorized, blended, and packaged by small, large, and fluffy seed to accommodate for installation implements. Legume seed should be inoculated by the supplier, prior to shipment.

Appropriate seeding strategies, such as broadcasting and cultipacking, no-till drilling and air seeding will be important in most soil types. The use of low impact seeding equipment will be effective in moist soils and in previous row crop (soybean and corn) fields. These methods do not expose buried weed seeds to sunlight keeping them as a seed bank component which will not hamper germination of the installed native seed. In some fields, no-till seed drilling may be the best seeding option. For instance, in upland soils with low soil moisture, no-till drill seeding with standard farm equipment can be an effective seeding method. While no-till drill seeding creates some soil disturbance, it is less disruptive than standard disking followed by drilling, thereby reducing the germination of weeds present in the seed bank.

The permanent short stature Grass Sedge mix will stabilize soils against erosion, control weeds, and act as a nurse crop for the Pollinator Habitat zone seedings. Certain broadleaf weeds of concern, due to their height and aggressiveness, arising after broadcasting or no-till drilling will need to be treated with a broadleaved herbicide or spot mowed. Local farm equipment and/or modified lightweight and low impact farm equipment for use in upland soils (and some moist soils) will be used for some of these activities. Ground cover establishment of either a cover crop in Phase 1 and/or mix native grasses and sedges in Phase 2 could be installed prior to, or concurrent with site construction.

After soil preparation, temporary ground cover seeding, and the permanent short stature Grass Sedge seeding is completed, a mixture of annual, biennial, and perennial naturalized plants will be established in various Pollinator Habitat locations. Depending on weather and site conditions, the Pollinator Habitat species could be installed either prior to the solar panel installation and before most facilities are constructed or after most site disturbance has been completed.

4.2 Zone Descriptions

4.2.1 Permanent Short Stature Grass Sedge (GS) Cover Zone

The Grass Sedge Zone (GS) will be the one vegetation zone seeded across most of the solar array area (See Appendix B, Table 2). The GS Zone will require the lowest level of maintenance because it will contain grass and grass-like plants which can be selectively treated with broadleaf herbicides to remove weedy colonizers such as: Canada thistle (*Cirsium arvense*), giant ragweed, sweet clovers (*Melilotus* spp.), goldenrod, burdock, and cottonwood seedlings. The rapid growth and a heavy seeding of the Grass Sedge cover will effectively outcompete weedy colonizers. In swale areas, a higher application rate of the Grass Sedge seed mix rate can be used to encourage rapid stabilization.

Because of the site scale, panel construction timing, and seed availability, several different grass and sedge seed mixes may need to be selected from Appendix B, Table 2 to ensure success of planting and achieve site-specific vegetation goals over the entire area. This will provide for more diversity of naturalized grasses, sedges, grass-like plants and will provide additional ecological benefits. The grass and sedge root matrices are expected to contribute agricultural benefits, such as carbon accrual, and assist with water infiltration and reduced runoff. Most of the grass species proposed are native to the prairie and moist soil areas of Wisconsin and were selected for short stature and bunch growth habit. A few naturalized and/or low stature non-native grasses may also be used to help maintain a low stature.

The Grass Sedge cover will develop a dense network of fibrous roots and have some deep-rooted species (See Figure 5), which are home to numerous beneficial organisms that play a key, yet often overlooked, role in soil-building, soil fertility, and plant health. Significant improvements are expected to the biodiversity of habitats and organisms in both the below ground and above ground biomass within these areas.

4.2.2 Pollinator Habitat (PH) Zone

The Pollinator Habitat (PH) zone will be seeded into non-array areas having the permanent short stature Grass Sedge cover already established or will be seeded along with the Grass Sedge seeding depending on site conditions, weather, and schedules. The Pollinator Habitat Zone will provide benefits for wildlife by providing host plants and habitat for a variety of pollinators and other beneficial native species, including bees. These seed mixes will feature a range of short, moderate, and taller statured plant species and display a variety of plant life and color and provide a diversity of pollinator plants that bloom at various times. Depending on soil conditions, site constraints and seed availability, a subset of the species listed in Appendix B, Table 3 will be selected for seeding in select areas. The Pollinator Habitat Zone will provide refugia for pollinator faunal species, such as monarch butterflies and bees. Pollinator Habitat Zones will be strategically placed in non-array areas that are easily identifiable to construction and operation teams. Signage will be established in the Pollinator Habitat Zones where mowing restrictions are required and will outline these restrictions.

Pollinator Habitat seedings are best used in the following locations:

- Areas with low risk of herbicide/insecticide drift from neighboring properties.
- Areas with less frequent mowing requirements.
- Unused areas next to fallow fields, pastures lacking noxious or invasive weeds, shelterbelts or windrows, increased habitat such as rock piles, dead trees, flowering shrubs, untilled ground, and drainageways.
- Temporary or permanent stormwater management areas.

4.2.3 Buffer Zone

Some areas between the solar array fences and the array panels will serve as a vegetative buffer that will be seeded with a Buffer seed mix (See Appendix B, Table 4). This mix will be comprised of components from the permanent short stature Grass Sedge seed mix (See Appendix B, Table 2) along with low growing clovers, such as white, red and alsike (*Trifolium repens, T. pratense, T. hybridum*). Buffers will be mowed as necessary to maintain a low fuel matrix.

4.2.4 View Screening (VS) Zone

If desired, View Screening Zones can be planted into the permanent short stature Grass Sedge cover with a few native wildflowers beneath a series of horticultural native woody shrubs and taller trees (deciduous and evergreen) to serve as a visual screening to be determined for discrete locations. This zone will screen or soften views of solar facilities with colorful, native vegetation (See Appendix B, Tables 5 and 6). While completely blocking views of solar arrays may not be possible, landscaping plants can soften or obscure the view of the solar facility and provide cover and food sources for wildlife. If this zone is desired, screens will be designed, and locations identified prior to or during construction activities, but no such areas are currently sited in Figures 6-9.

4.3 Example Zone Planting Plan

Figures 6-9 offer an illustrative representation of how the three different seed mix zones may be located at High Noon Solar, using areas inside array fences A, E, G, K, O, P, and Q as examples. These areas were chosen as they will provide a visual and colorful display of pollinator wildflowers.

This concept (See Figures 6-9) of the VMS could be applied in varying degrees across other areas of the Project Area, as determined by an ecological consulting firm/landscape professional, High Noon Solar staff, and construction contractors. The VSMP will be implemented by a similar group of experienced professionals with oversight by the ecological consulting firm/landscape professionals, High Noon Solar staff, and the construction contractor.

Figure 6. Conceptual Seeding Plan

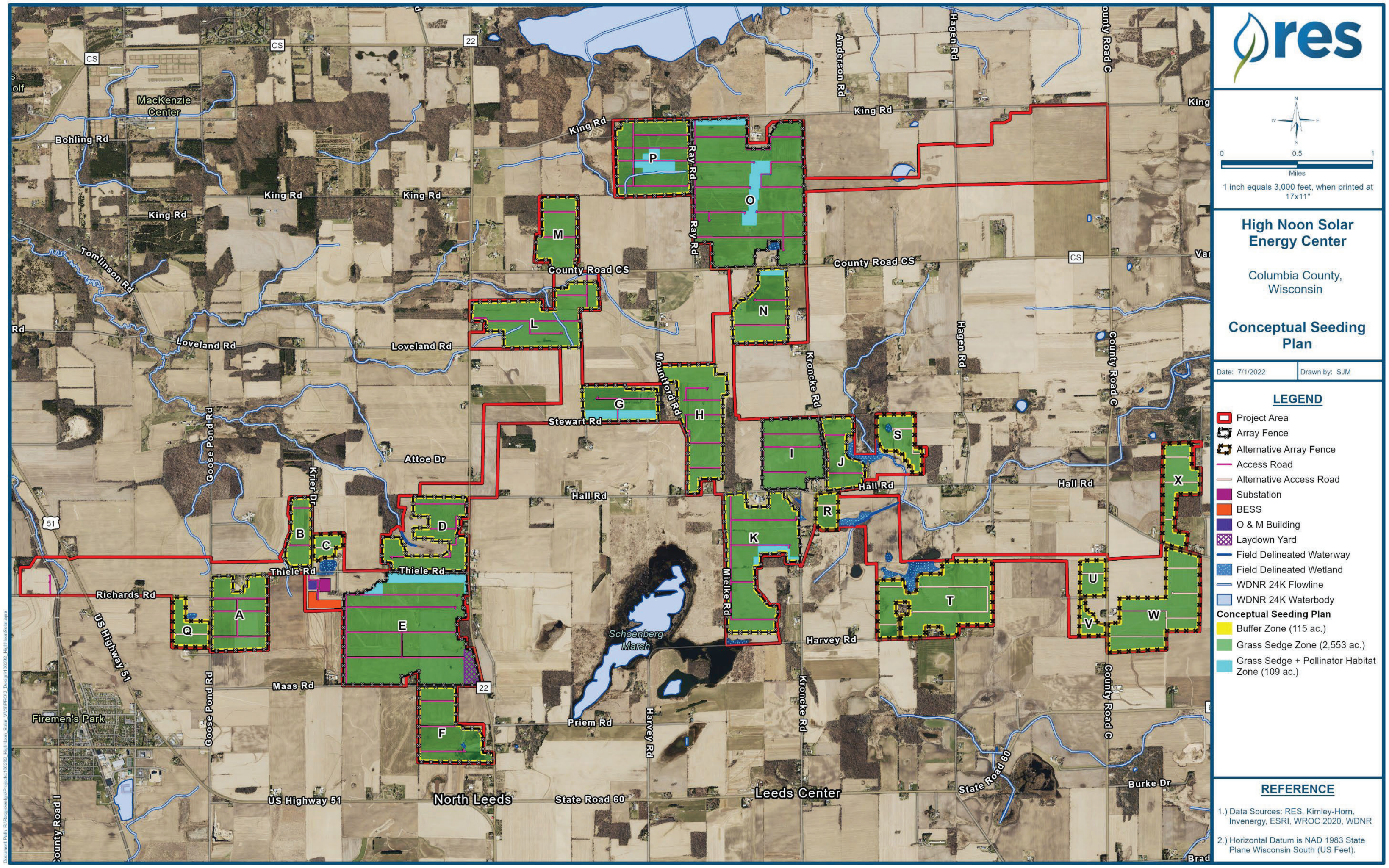


Figure 7. Conceptual Seeding Plan for Array Fence E

Figure 8. Conceptual Seeding Plan for Array Fences G & K

Figure 9. Conceptual Seeding Plan for Array Fences N, O & P

5.0 Vegetation Maintenance

Weeds allocate most of their resources into stems, leaves, flowers, and seed production in their initial year(s) of growth. In contrast, native perennials allocate most of their resources to root development in their initial establishment years. The management techniques and schedules to be employed recognize these different growth strategies. The vegetation establishment period for this Strategy focuses on ensuring the permanent short stature Grass Sedge (GS) cover seed mix develops relatively quickly and stabilizes the soil.

The third phase of the Vegetation Management Strategy includes a plan for short and long-term vegetation management. Vegetation maintenance begins in the first year of naturalized plant installation and will last for the life of High Noon Solar. The most intense maintenance period will occur in the first 1-3 years as naturalized seed zones establish. Maintenance will focus on invasive plant control, especially tall invasive native and tall non-native herbaceous and woody species. Prevention of tree and shrub invasion and establishment of weeds from surrounding outside sources will be a management priority. Proper timing of maintenance activities is essential to minimize the development and spread of weed and woody species seeds. Maintenance practices include the following:

5.1 Mowing

The overall site mowing schedule, where to mow and how frequently it will occur will need to be quite flexible and likely will need to be adjusted across the High Noon Solar Energy Center in any year. In years 1-3, weed control by mowing will be required at various times during the growing season to favor the permanent short stature Grass Sedge and Pollinator Habitat zone establishment. During Years 4 and beyond, mowing of the Pollinator Habitat zone will occur between October 15 and March 15 to minimize disturbance to ground nesting birds and their young that may be using these areas as well as to minimize disturbance to peak pollinator movements. Additional mowing(s) in fall or winter, if necessary, to decrease plant heights over winter and prevent snow accumulation on vegetation will need to be scheduled. An early spring or fall mowing may be necessary in areas such as buffers areas outside of the fences to reduce dead standing crop and associated fuel loads. Annual mowing inside the fences will manage plant heights and help to prevent woody species establishment. In areas of high soil moisture, mowing may need to be scheduled when ground is dry enough to prevent tire rutting or when the moist soil areas are frozen.

Mowing may take place in mid to late-summer in some areas to establish and maintain vegetation under 18 inches in areas with a risk of shading the PV panels. An important purpose of treating annual invasive plants through mowing is to prevent their seed production. The mowing may need, at times, to be modified if avian and pollinator timing conflicts with weed height and seed production. Repeated mowing (e.g., more than twice per year) may produce a buildup of organic thatch, which discourages the development and persistence of diverse naturalized vegetation.

Specialized mowing equipment, such as a tractor with low impact tires, and specialized tractor mounted mowing equipment may need to be implemented at times. To help prevent thatch buildup onsite, mowing will be conducted with a flail-type mower to mulch the cut vegetation. A swing arm specifically designed for mowing under solar panels is recommended for cutting beneath panels[2] but spot-mowing with brush saws, weed whips, and similar equipment is also recommended. Mowing equipment will be cleaned prior to use on site to prevent the introduction and spread of invasive and non-native species. The mowing regime will prevent annual and perennial weeds from flowering and setting seed, prevent weeds from shading out the solar panels, help control woody plant growth onsite and reduce fire susceptibility.

5.2 Spot-Herbicide Treatment

Herbicide applications to individual plants and groups of targeted plants will be performed as needed. Herbicide application will be by State of Wisconsin certified applicators using State of Wisconsin approved herbicides. Herbicide application will follow instructions provided by the manufacturer. Apply herbicides as locally and directly as feasible, following the preparation and application requirements. Wisconsin listed noxious weeds found on site will be treated by spot herbicide treatment or mowing, or a combination of both methods, with the intention of materially preventing the weeds from setting seed or spreading by rhizomes, stolons, or other vegetative means.

Many weeds will diminish with proper maintenance during the establishment phase, but several will require special attention due to their highly competitive behavior. These include grasses like reed canary grass, common reed, and several species of brome grass. Broadleaf weeds in this category include sweet clovers and Canada thistle. Herbicide application is generally required to prevent the spread of perennial invasive plants.

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2 https://www.superbmowingcompany.com/md-series-solar-mowers

Non-native perennial tall grasses will be treated by spot-spraying or boom spraying as warranted, with glyphosate or comparably effective herbicides, or the aquatic formulation of the same if near open water. Perennial broadleaf invasive plants will be treated by spot-spraying or boom spraying, as warranted, with glyphosate or comparably effective herbicides. The contractor/applicator will consult the manufacturer's guidelines regarding the effective residence time of herbicides being used and will apply herbicides sufficiently in advance of planting and seeding to avoid inhibiting the germination and growth of planted species.

Several native species have the potential to interfere with the functioning of the solar panels. Native vines have the potential to overgrow installations, including wild grape (*Vitis* spp.), wild cucumber (*Echinocystis lobata*), bur cucumber (*Sicyos angulatus*), and woodbine/Virginia creeper (*Parthenocissus quinquefolia*). Giant ragweed and other native species shading the arrays should be controlled by mowing (see above). When found growing beneath or near solar panels, wild cucumber and bur cucumber may be pulled and removed manually, but woody vines such as wild grape and woodbine/Virginia creeper will be cut to within 1 inch of the ground and stump treated with glyphosate, triclopyr, or a comparable herbicide by a licensed applicator, following instructions provided by the manufacturer.

Trees and shrubs can shade and interfere with the operation of solar panels. Seeds blown in from nearby areas, after solar panel construction, from native woody shrub species of willows and female cottonwood trees will need to be monitored. Seed establishment of trees and shrubs transported by birds, such as wild black cherry and shrubs, such as, European buckthorn will also require monitoring. Removal of woody plants within the solar array areas will be necessary and consideration of removal of non-native European buckthorn in outside but leased lands will be considered. This can be done by herbicide applications, mowing, or a combination of both methods. Woody plants that are too large to mow will be cut to within 1 inch of the ground and the stump treated with triclopyr or a comparable herbicide by a licensed applicator. Cut brush will need to be removed from the site.

Avoidance of insecticide use will be employed except if there is risk to human safety or solar equipment function. If pest species (plant or animal) are identified during operational activities within the fenced areas, the Project will work with a qualified party to address the occurrence in a manner consistent with the principles of Integrated Pest Management.

5.3 Upland Drainage Management

Vegetation in grassed upland drainages where tall and invasive species are not problematic will remain largely undisturbed, except for mowing to prevent erosion. However, if these upland drainages located within the fenced array area are found to harbor tall, invasive, non-native species, such as giant ragweed, reed canary grass, common reed grass (*Phragmites australis*) and purple loosestrife (*Lythrum salicaria*), some management control (e.g., herbicide treatment, mowing and re-vegetation) will be necessary.

5.4 ROW and Tree Line Management

Weedy herbaceous and woody plant species will have an opportunity to enter High Noon Solar from road Rights-of-Way (ROW) and tree lines crossing through non-panel areas and thus remaining tree lines will be a priority for monitoring the likelihood of species invading through seed dispersal. Within lands under lease/control by High Noon Solar, it may be necessary for spot-herbicide treatments to control the invaders. Seed production and seed dispersal by native and non-native trees, shrubs and herbaceous species from nearby and adjacent ditches, woodlots and treelines will need to be monitored prior to and after the solar arrays have been installed.

5.5 Vegetation Performance Standards

To assess the success of the native and non-native species and habitats installed at High Noon Solar, a monitoring program will be established to address Performance Standards and vegetation milestones. Performance Standards and yearly milestones will be related to the early years of vegetation establishment and include plant characteristics such as plant cover and plant species richness/floristic quality. Data on both these Performance Standards can be collected using one field method. The Standards will provide guidance to and provide milestones for the native seeding contractor to determine if plantings are currently on a trajectory to establish sufficient cover, are providing erosion control, and are providing diverse and successful pollinator habitat. The standards will provide yearly guidance on vegetation milestones until substantial completion is achieved and the vegetation has met the Performance Standards.

5.6 Vegetation Monitoring

Periodic visual inspections of the vegetation by a qualified contractor will be made to address achievement of milestones and Performance Standards. Ancillary data collection to detect both native and non-native invasive species and their expansion, ensure plant growth is not shading panels, and to identify erosion and soil stabilization issues should be a part of the monitoring protocol. The results of the inspections will provide information on the achievement of preliminary Performance Standards through substantial completion and beyond and will provide recommendations on management methods, erosion and soil stabilization issues and recommendations on additional seeding. The timing and frequency of these inspections will be adapted in response to needs identified during and immediately following construction. The outcome of these inspections will be contractor-developed recommendations based on the species and circumstances observed. These recommendations will be reviewed appropriately by High Noon Solar and implemented by the Project or a designated representative.

5.7 Remedial Seeding

Areas damaged by construction activities or failing to meet the established vegetation Performance Standards and/or milestones will be addressed in a remedial action plan and will likely require some site preparation followed by supplemental seeding of appropriate species or seed mixes.

6.0 References

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Appendix A. Plant Species in the High Noon Solar Project Area

Table 1. Representative Native and Non-native Vascular Plant Species in the High Noon Solar Project Area and Reference Areas.

Scientific Name	Common Name	Woodlands	Wetlands	Other
Native Species				
Asclepias syriaca	Common milkweed			x
Carex spp.	Sedges	x	x	
Conyza canadensis	horsetail			x
Cornus racemosa	Gray dogwood	x	x	
Cornus sericea	Red-osier dogwood		x	
Elymus canadensis	Canada wildrye			x
Eryngium yuccifolium	Rattle snake master			x
Geum canadense	White avens	x		x
Helianthus sp.	Sunflower	x		x
Lespedeza capitata	Prairie bush clover			x
Liatris spp.	Blazing star			x
Monarda fistulosa	Bergamot			x
Oenothera biennis	Evening primrose			x
Oligoneuron rigidum	Stiff goldenrod			x
Panicum virgatum	Switch grass		x	x
Populus deltoides	Eastern cottonwood	x	x	x
Potentilla sp.	cinquefoil			x
Prunus serotina	Black cherry	x		
Quercus alba	White oak	x		
Quercus macrocarpa	Bur oak	x		
Quercus rubra	Red oak	x		
Ratibida pinnata	Yellow coneflower			x
Schizachyrium scoparium	Little bluestem			x
Silphium laciniatum	Compass plant			x
Silphium terebinthinaceum	Prairie dock			x
Solidago canadensis	Canada goldenrod			x
Sorghastrum nutans	Indian grass			x
Spartina pectinata	Prairie cordgrass		x	
Urticia dioica	Nettle	x	x	x
Verbena hastata	Blue vervain		x	
Vitis riparia	Riverbank grape	x	x	

Scientific Name	Common Name	Woodlands	Wetlands	Other
Invasive natives and non-natives				
Abutilon theophrasti	Velvet leaf			x
Acer negundo	Boxelder	x	x	
Alliaria petiolata	Garlic mustard	x		
Arctium minus	Common burdock	x		x
Ambrosia artemisiifolia	Common ragweed			
Ambrosia trifida	Giant ragweed		x	x
Bromus inermis	Smooth brome	x	x	x
Centaurea spp.	knapweeds			
Cichorium intybus	Chicory			x
Cirsium arvense	Canada thistle			
Cirsium vulgare	Bull thistle			x
Dactylis glomerata	Orchard grass	x		x
Daucus carota	Queen Anne’s lace		x	x
Dipsacus spp.	teasels			
Hesperis matronalis	Dame’s rocket	x	x	x
Lonicera spp.	Bush honeysuckles	x	x	x
Melilotus spp.	Sweet clovers			x
Phalaris arundinacea	Reed canary grass		x	x
Poa pratensis	Kentucky bluegrass	x	x	x
Rhamnus cathartica	Common buckthorn	x	x	
Salix interior	Sandbar willow		x	
Setaria faberi	Giant foxtail			x
Setaria pumila	Yellow foxtail			x
Taraxacum officinale	Dandelion	x	x	x
Trifolium pratense	Red clover			x
Typha spp.	Cattail		x	

Appendix B. Proposed Seed for Mixes

Table 1. Temporary Cover Crop for Use in the High Noon Solar Energy Center. Apply at a variable rate depending on species selected (40-100 lbs./acre as a single species or mix of species, depending on site conditions).

Botanical Name	Common Name	Soil Condition (mesic, moist, wet)
Alopercurus aequalis	Short awn foxtail	Wet
*Avena sativa**	Oats	Mesic
Chamaecrista fasciculata	Partridge pea	Mesic
*Dactylis glomerata**	Orchard grass	Mesic
Echinochloa crusgallii	Barnyard grass	Moist, Wet
Elymus virginicus	Virginia wild rye	Moist, Wet
*Fagopyron esculentum**	Buckwheat	Mesic well drained
*Festuca spp.**	Fescue species	Mesic
*Hordeum jubatum**	Squirrel tail barley	Mesic, Moist
Lolium multiflorum *	Annual rye	Mesic, Moist
Panicum capillare	Common witch grass	Moist, Wet
Panicum dichotomiflorum	Knee grass	Moist, Wet
*Phleum pratense**	Timothy	Mesic
*Secale cereale**	Winter rye	Mesic, Moist
Trifolium hybridum	Alsike clover	Mesic
Trifolium pratense	Red Clover	Mesic
Trifolium repens	White clover	Mesic
*Triticum aestivum**	Winter wheat	Mesic

*Non-native species

Table 2. Permanent Short Stature Grass Sedge (GS) Species for Use in the High Noon Solar Energy Center.

Botanical Name	Common Name	Wetland Category	Functional Group	Form
Bouteloua curtipendula	Side oats grama	UPL 8	Perennial warm season grass	Rhizomatous
Bromus ciliatus	Fringed brome	FACW 7	Perennial cool season grass	Rhizomatous
Bromus kalmia	Kalm's brome	FACU 8	Perennial cool season grass	Rhizomatous
Carex bicknellii	Bicknell's sedge	UPL 6	Perennial sedge	Bunch
Carex blanda	Wood sedge	FAC 1	Perennial sedge	Bunch
Carex brevior	Short beak sedge	FACU 4	Perennial sedge	Bunch
Carex cristatella	Crested oval sedge	FACW 4	Perennial sedge	Bunch
Carex gravida	Heavy sedge	FACU 3	Perennial sedge	Bunch
Carex normalis	Spreading oval sedge	FAC5	Perennial sedge	Bunch
Carex scoparia	Broom sedge	OBL 4	Perennial sedge	Bunch
Carex vulpinoidea	Brown fox sedge	OBL 2	Perennial sedge	Bunch

Botanical Name	Common Name	Wetland Category	Functional Group	Form
Danthonia spicata	Poverty wild oats	UPL 4	Perennial grass	Bunch
Dichanthelium spp.	Prairie panic grass	various	Perennial cool season grass	Bunch
Elymus virginicus	Virginia wild rye	FACW 4	Perennial cool season grass	Bunch
Eragrostis spectabilis	Purple love grass	UPL 3	Perennial grass	Bunch
Festuca rubra	Red Fescue	FACU	Perennial non-native cool season grass	Bunch
Hordeum jubatum	Foxtail-barley	FAC	Perennial grass non-native cool season grass	Bunch
Juncus dudleyi	Dudley's rush	FACW 4	Perennial rush	Bunch
Juncus tenuis	Path rush	FACU 1	Perennial rush	Bunch
Koeleria macrantha	June grass	UPL 7	Perennial cool season grass	Bunch
Phleum pratense	Timothy	UPL	Perennial non-native cool season grass	Bunch
Schizachyrium scoparium	Little bluestem grass	FACU 4	Perennial warm season grass	Bunch
Trifolium hybridum	Alsike clover	FACU	Perennial non-native forb	Forb
Trifolium pratense	Red clover	FACU	Perennial non-native forb	Forb
Trifolium repens	White clover	FACU	Perennial non-native forb	Forb

*Number represents Native Coefficient of Conservativism

Table 3. Pollinator Habitat Species (PH) for Use in the High Noon Solar Energy Center. Select species that bloom early, mid, and late season and from these key groups: legumes, sedges, grasses, umbels, mints, asters, and sunflowers

Botanical Name	Common Name	Wetland Category	Functional Group	Bloom Time Season	Flower Color	Notes
Achillea millefolium	Yarrow	FACU	Non-native perennial forb	Summer	White	Non-native
Allium cernuum	Nodding wild onion	FAC 7*	Perennial forb	Summer	Pink	
Andropogon gerardii	Big bluestem grass	FAC 4	Perennial grass	Summer	NA	Bunch grass, tall
Amorpha canescens	leadplant	UPL 7	Perennial forb	Summer	Purple	
Anemone canadensis	Meadow anemone	FACW 4	Perennial forb	Spring, Summer	White	
Asclepias tuberosa	Butterfly milkweed	UPL 6	Perennial forb	Summer	Orange	
Asclepias syriaca	Common milkweed	UPL 1	Perennial forb	summer	Lavender	
Asclepias verticillata	Whorled milkweed	UPL 1	Perennial forb	Summer	White	
Baptisia alba	White wild indigo	FACU 8	Perennial forb	Summer	White	Legume
Baptisia bracteata	Cream wild indigo	UPL 7	Perennial forb	Spring	Yellow	
Bouteloua curtipendula	Side oats grama	UPL 8	Perennial warm season grass	N/A	N/A	Bunch
Chamaecrista fasciculata	Partridge pea	FACU 5	Annual forb	Summer, Fall	Yellow	Legume

Botanical Name	Common Name	Wetland Category	Functional Group	Bloom Time Season	Flower Color	Notes
Coreopsis lanceolata	Sand coreopsis	FACU 5	Perennial forb	Spring, Summer	Yellow	
Coreopsis palmata	Prairie coreopsis	UPL 8	Perennial forb	Summer	Yellow	
Dalea candida	White prairie clover	UPL 8	Perennial forb	Summer	White	Legume
Dalea purpurea	Purple prairie clover	UPL 9	Perennial forb	Summer, Fall	Purple	Legume
Dodecatheon meadia	Shooting star	FACU 7	Perennial forb	Summer	Pink	
Echinacea purpurea	Purple coneflower	UPL 3	Perennial forb	Summer	Purple	Introduced
Elymus canadensis	Canada wild rye	FACU 4	Perennial grass	Summer	N/A	
Elymus virginicus	Virginia wild rye	FACW 6	Perennial grass	Spring	N/A	
Eupatorium perfoliatum	Common boneset	FACW 6	Perennial forb	Summer	White	
Euthamia graminifolia	Grass leaf goldenrod	FACW 4	Perennial forb	Summer	Yellow	
Gentiana alba	Yellowish gentian	FACU 9	Perennial forb	Summer, Fall	White/Yellow	
Gentiana andrewsii	Bottle gentian	FACW 6	Perennial forb	Summer	Blue	
Gentiana puberulenta	Downy gentian	UPL 9	Perennial forb	Summer, Fall	Blue	
Geranium maculatum	Wild geranium	FACU 4	Perennial forb	Spring	Lavender	
Heliopsis helianthoides	False sunflower	FACU 5	Perennial forb	Summer	Yellow	
Heuchera richardsonii	Alumroot	FACU 7	Perennial forb	Spring	Yellow/ Green	
Liatris aspera	Rough blazing star	UPL 5	Perennial forb	Summer, Fall	Blue	
Liatris cylindracea	Dwarf blazing star	UPL 9	Perennial forb	Summer/Fall	Purple	
Liatris pycnostachya	Prairie blazing star	FAC 8	Perennial forb	Summer	Purple	
Lobelia cardinalis	Cardinal flower	OBL 7	Perennial forb	Summer	Red	
Lobelia siphilitica	Great blue lobelia	FACW 5	Perennial forb	Summer	Blue	
Lobelia spicata	Pale spiked lobelia	FAC 6	Perennial forb	Summer	Pink	
Monarda fistulosa	Wild bergamot	FACU 4	Perennial forb	Summer, Fall	Lavender	
Monarda punctata	Horse mint	UPL 3	Perennial forb	Summer	White	
Oligoneuron album	Stiff aster (goldenrod)	FACU 8	Perennial forb	Fall	Yellow	
Oligoneuron riddellii	Riddell’s goldenrod	OBL 7	Perennial forb	Summer	White	
Oligoneuron rigidum	Stiff goldenrod	FACU 5	Perennial forb	Summer	Yellow	
Panicum capillare	Old witch grass	FAC 1	Annual grass	N/A	N/A	
Panicum virgatum	Switch grass	FAC 4	Perennial grass	Summer	N/A	
Parthenium integrifolium	Wild quinine	UPL 8	Perennial forb	Summer, Fall	White	
Penstemon calycosus	Small beardtongue	FACU 7	Perennial forb	Spring, Summer	White	

Botanical Name	Common Name	Wetland Category	Functional Group	Bloom Time Season	Flower Color	Notes
Penstemon digitalis	Smooth penstemon	FAC	Perennial forb	Early Summer	White	Introduced
Potentilla arguta	Prairie cinquefoil	FACU 7	Perennial forb	Summer	Yellow	
Ratibida pinnata	Yellow coneflower	UPL 4	Perennial forb	Summer	Yellow	
Rudbeckia hirta	Black-eyed Susan	FACU 1	Biennial forb	Summer, Fall	Yellow	
Rudbeckia triloba	Brown-eyed Susan	FACU 3	Perennial forb	Summer, Fall	Yellow	
Schizachyrium scoparium	Little bluestem	FACU 5	Perennial warm season grass	N/A	N/A	
Senna hebecarpa	Wild senna	FACW 9	Perennial forb	Summer, Fall	Yellow	Legume
Solidago nemoralis	Old-field goldenrod	UPL 4	Perennial forb	Summer, Fall	Yellow	
Solidago speciosa	Showy goldenrod	FACU 5	Perennial forb	Summer, Fall	Yellow	
Sporobolus cryptandrus	Sand dropseed	FACU 3	Perennial grass	Summer	N/A	Bunch grass
Symphyotrichum ericoides	Heath aster	FACU 4	Perennial forb	Fall	White	
Symphyotrichum laeve	Smooth blue aster	FACU 6	Perennial forb	Summer, Fall	Blue	
Symphyotrichum novae angliae	New England aster	FACW 3	Perennial forb	Fall	Blue	
Symphyotrichum oolentangiense	Sky blue aster	UPL 8	Perennial forb	Summer	Blue	
Symphyotrichum sericeum	Silky aster	UPL 5	Perennial forb	Fall	Blue	
Tradescantia ohiensis	Spiderwort	FACU 5	Perennial forb	Early Summer	Blue	
Zizia aurea	Golden Alexanders	FAC 7	Perennial forb	Spring	Yellow	

*Number represents Coefficient of Conservativism.

Table 4. Buffer Zone Permanent Short Stature Grass Sedge (GS) Species for Use in the High Noon Solar Energy Center.

Botanical Name	Common Name	Wetland Category	Functional Group	Form
Bouteloua curtipendula	Side oats grama	UPL 8	Perennial warm season grass	Bunch
Carex brevior	Short beak sedge	FACU 4	Perennial sedge	Bunch
Carex normalis	Spreading oval sedge	FAC 5	Perennial sedge	Bunch
Dichanthelium spp.	Prairie panic grass	various	Perennial cool season grass	Bunch
Festuca rubra	Red Fescue	FACU	Perennial non-native cool season grass	Bunch
Juncus dudleyi	Dudley’s rush	FACW 4	Perennial rush	Bunch
Juncus tenuis	Path rush	FACU 1	Perennial rush	Bunch
Koeleria macrantha	June grass	UPL 7	Perennial cool season grass	Bunch
Schizachyrium scoparium	Little bluestem grass	FACU 4	Perennial warm season grass	Bunch
Trifolium hybridum	Alsike clover	FACU	Perennial non-native legume	Forb

Trifolium pratense	Red clover	FACU	Perennial non-native legume	Forb
Trifolium repens	White clover	FACU	Perennial non-native legume	Forb

*Number represents Native Coefficient of Conservativism

Table 5. Potential View Screen Perennial Plant Species for Use in the High Noon Solar Energy Center. Species selected for optimal screening and selective herbicide control.

Botanical Name	Common Name	Wetland Category	Herbicide Tolerance	Stature
Asclepias tuberosa	Butterfly milkweed	UPL 6*	Moderate tolerance	Medium
Bouteloua curtipendula	Side oats grama	UPL 8	Moderate tolerance	Short
Chamaecrista fasciculata	Partridge pea	FACU 5	High tolerance	Short
Coreopsis lanceolata	Sand coreopsis	FACU 5	High tolerance	Short
Dalea purpurea	Purple prairie clover	UPL 9	High tolerance	Short
Echinacea purpurea	Purple coneflower	UPL 3	Moderate tolerance	Medium
Elymus canadensis	Canada wild rye	FAC 4	Low tolerance	Medium
Liatris aspera	Rough blazing star	UPL 6	Moderate tolerance	Medium
Lupinus perennis	Wild lupine	UPL 6	Low tolerance	Short
Monarda fistulosa	Wild bergamot	FACU 4	Low tolerance	Medium
Penstemon digitalis	Beardtongue	FAC 4	Low tolerance	Medium
Ratibida pinnata	Yellow coneflower	UPL 4	Low tolerance	Medium
Rudbeckia hirta	Black-eyed Susan	FACU 1	Moderate tolerance	Short
Schizachyrium scoparium	Little bluestem	FACU 5	High tolerance	Short
Solidago nemoralis	Old-field goldenrod	UPL 4	Moderate tolerance	Short
Verbena hastata	Blue vervain	FACW 4	Low tolerance	Medium

*Number represents native Coefficient of Conservativism.

Table 6. Potential View Screen Trees and Shrubs for use in the High Noon Solar Energy Center. Species selected for low risk of invasion and a moderate maximum height and width

.Botanical Name	Common Name	Wetland Category	Height (feet)	Width (feet)
Amelanchier laevis	Serviceberry	UPL 8*	20	10
Aronia prunifolia	Chokeberry	FACW 7	4	2
Carpinus caroliniana	Hornbeam	FAC 6	15	10
Ceanothus americanus	New Jersey tea	UPL 6	2	2
Cornus spp.	Various dogwoods		15	6
Corylus americana	American hazelnut	FACU 5	10	8
Crataegus spp.	Various hawthorns		20	8
Hamamelis virginiana	Witch hazel	FACU 8	10	10
Ilex verticillata	Winterberry	FACW 10	7	3
Malus ioensis	Prairie crabapple	UPL 3	15	10
Rosa blanda	Early wild rose	FACU 5	4	4
Rosa carolina	Carolina rose	FACU 5	2	2
Rosa setigera	Savanna rose	FACU 7	5	6
Salix humilis	Prairie willow	FACU 6	4	2

.Botanical Name	Common Name	Wetland Category	Height (feet)	Width (feet)
Spiraea alba	Meadowsweet	FACW 4	3	2
Spiraea tomentosa	Steeple bush	FACW 6	3	2
Thuja occidentalis	Arbor vitae	FACW 9	30	4
Vaccinium spp.	Various blueberry	FACW 6-10	2-4	2
Viburnum prunifolium	Black haw viburnum	FACU 5	12	10
Viburnum acerifolium	Maple leaf viburnum	UPL 7	6	6
Viburnum trilobum	Highbush cranberry	FACW 6	8	4

*Number represents native Coefficient of Conservativism.

*The Coefficient of Conservatism is a number from 0-10 given to each native species occurring in a regional flora. It represents an estimated probability that a species is likely to occur in a landscape relatively unaltered from what is believed to be a pre-settlement condition. The most conservative species (number 9-10) require a narrow range of ecological conditions, are intolerant of disturbance and are unlikely to be found outside undegraded remnant natural areas. The least conservative species (numbers 0-3) can be found in a wide variety of settings and thrive on disturbance.

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