

IARC Prairie Planting

Summary & Recommendations

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Introduction

The recent addition of the Office Technical and Education Building (OTE) to the Illinois Accelerator Research Center (IARC) at the Fermilab National Accelerator Laboratory showcases advances in sustainable building and environmental responsibility. A candidate for LEED certification, all design and construction decisions were shaped by the goals of energy conservation, reducing water consumption, making more sustainable materials choices, and improving indoor air quality. Adhering to parameters defined by the U.S. Green Building Council, the OTE team utilized sustainable practices including using recycled and regionally-sourced materials, geothermal heating, and construction of a green roof. In order to satisfy the requirement of Water Efficient Landscaping, a prairie planting replaces traditional landscaping surrounding the bike path along D Rd.

By creating a native prairie, the OTE building's landscaping will not only be beautiful, but also ecologically beneficial. This planting will increase connectivity between large prairies on site, naturally conserve water, and decrease runoff and erosion. While native plantings from seed can take a few years to become established, the prairie will become both low maintenance and self-sustaining. This is due, in part, to the extensive root systems characteristic of prairie plants; though modest in appearance this growing season, many species are beginning to establish themselves below the surface. Knowing this, we can look forward to seeing a sustainable and beautiful planting.

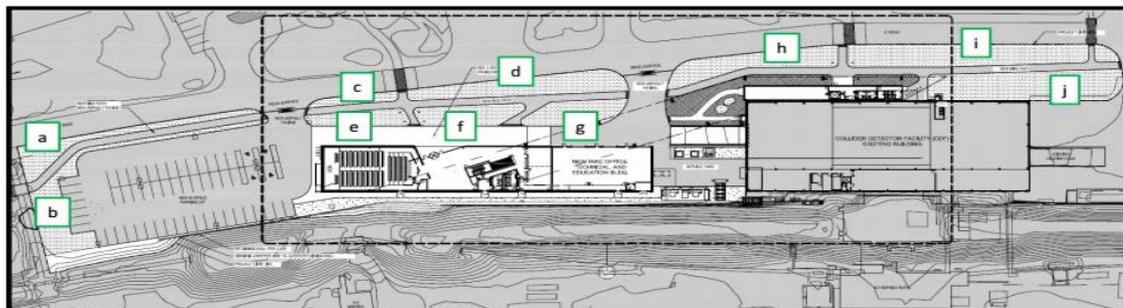
Background

A custom seed mix was designed by Fermilab's Restoration Ecologist to meet site conditions and to create a high diversity native plant community. The species that were selected are well-suited for dry soil, partial shade, and are short enough to allow visibility of bikers, pedestrians, and vehicles. The mix is made up of a wide variety of forbs, or wildflowers, ranging from hearty annual species to more conservative perennials, which will flower at different times throughout the season. In order to combat grass dominance, short grasses were selected and wood betony, a hemi-parasite of grasses, was included in the seed mix. All species included in the planting seed mix are listed below.

Seed Mix Composition	
<i>Forbs</i>	
Nodding Onion	<i>Allium cernuum</i>
Thimbleweed	<i>Anemone cylindrica</i>
Butterfly Weed	<i>Asclepias tuberosa</i>
Heath Aster	<i>Aster ericoides</i>
Smooth Blue Aster	<i>Aster laevis</i>
Sky Blue Aster	<i>Aster oolentangiense</i>
White Wild Indigo	<i>Baptisia alba</i>
White Prairie Clover	<i>Dalea candida</i>
Purple Prairie Clover	<i>Dalea purpurea</i>
Midland Shooting Star	<i>Dodecatheon meadia</i>
Pale Purple Coneflower	<i>Echinacea pallida</i>

Rattlesnake Master	<i>Eryngium yuccifolium</i>
Flowering Spurge	<i>Euphorbia corollata</i>
Cream Gentian	<i>Gentiana flavida</i>
Downy Sunflower	<i>Helianthus mollis</i>
Button Blazing Star	<i>Liatris aspera</i>
Wood Betony	<i>Pedicularis canadensis</i>
Foxglove Beardtongue	<i>Penstemon digitalis</i>
Prairie Phlox	<i>Phlox pillosa</i>
Prairie Cinquefoil	<i>Potentilla arguta</i>
Black-eyed Susan	<i>Rudbeckia hirta</i>
Ohio Spiderwort	<i>Tradescantia ohioensis</i>
Culver's Root	<i>Veronicastrum virginicum</i>
Golden Alexanders	<i>Zizia aurea</i>
<i>Shrubs & Vines</i>	
Lead Plant	<i>Amorpha canescens</i>
New Jersey Tea	<i>Ceanothus americanus</i>
Early Wild Rose	<i>Rosa blanda</i>
<i>Grasses & Sedges</i>	
Side-Oats Grama	<i>Bouteloua curtipendula</i>
Prairie Brome	<i>Bromus kalmii</i>
Copper-shouldered Oval Sedge	<i>Carex bicknellii</i>
Little Bluestem	<i>Schyzachyrium scoparium</i>
Porcupine Grass	<i>Stipa spartea</i>

This seed mix was spread throughout the planting late November 2013 at a rate of 40 pounds per acre, or about 663 seeds per square foot. This seeding rate (40lb/acre) is common in high quality restorations as it helps establish native species quickly while naturally excluding weeds. Prairie matrix seed collected from Fermilab's established plantings was seeded in plots A and B and the custom seed mix was evenly distributed throughout the remaining plots, C through J (see below).



Methods

In the planting's first growing season, a survey was conducted to develop a baseline species list for the site and assess its progress for years to come. As most prairie species require a few growing seasons to become established, it was exciting to see an abundance of seedlings of the species that had been seeded the previous fall. The species list was compiled throughout several surveys conducted throughout the summer. Determining the species composition of the planting required careful examination of the site and discerning eye. Seedling identification guides were utilized as well as comparisons to online resources.

Results

Surveying the planting yielded evidence of a high rate of germination and seedling success. Of the seeded species, three flowered in their first growing season: black-eyed Susan, purple prairie clover and white prairie clover. Many of the others were present as seedlings including lead plant, a particularly conservative and high quality species, of which a high abundance of seedlings was discovered. The 54 total species observed will be used as a baseline for comparison as the planting matures and species are added over the next few years.

Plains coreopsis, one species we did not expect to find in this planting, is a wildflower native to the Great Plains and not typically associated with Midwest Prairies, but is common in wildflower mixes and visually pleasing. While it's origin in this planting is unknown, its short stature and color make it an acceptable species for the purposes of this planting.

Of the 31 species included in the custom seed mix, 20 were identified in the planting in the first year. These species are indicated in bold in the total species list below. It is likely that some of the introduced grasses and sedges are present as seedlings, but differentiating them from other species is nearly impossible at such an early stage. The success of the seeded plants in the first year promises a successful and high diversity planting in the years to come.

Total Species List	
Velvet Leaf	<i>Abutilon theophrasti</i>
Box Elder	<i>Acer negundo</i>
Common Ragweed	<i>Ambrosia artimissifolia</i>
Giant Ragweed	<i>Ambrosia trifida</i>
Lead Plant	<i>Amorpha canescens</i>
Thimbleweed	<i>Anemone cylindrica</i>
Indian Hemp	<i>Apocynum cannabinum</i>
Butterfly Milkweed	<i>Asclepias tuberosa</i>
Heath Aster	<i>Aster ericoides</i>
Smooth Blue Aster	<i>Aster laevis</i>
White Wild Indigo	<i>Baptisia alba</i>
Black Mustard	<i>Brassica nigra</i>
Japanese Chess Grass	<i>Bromus japonicus</i>

Chicory	<i>Cichorium intybus</i>
Canada Thistle	<i>Cirsium arvense</i>
Field Bindweed	<i>Convolvulus arvensis</i>
Hedge Bindweed	<i>Convolvulus sepium</i>
Plains Coreopsis	<i>Coreopsis tinctoria</i>
Crown Vetch	<i>Coronilla varia</i>
Yellow Nutsedge	<i>Cyperus erythrorhizos</i>
White Prairie Clover	<i>Dalea candida</i>
Purple Prairie Clover	<i>Dalea purpurea</i>
Queen Anne's Lace	<i>Daucus carota</i>
Pale Purple Coneflower	<i>Echinacea pallida</i>
Barnyard Grass	<i>Echinochloa crusgalli</i>
Rattlesnake Master	<i>Eryngium yuccifolium</i>
Creeping Spurge	<i>Euphorbia supina</i>
Cream Gentian	<i>Gentiana flavida</i>
Downy Sunflower	<i>Helianthus mollis</i>
Prickly Lettuce	<i>Lactuca serriola</i>
Small Pepperweed	<i>Lepidium densiflorum</i>
Button Blazing Star	<i>Liatris aspera</i>
Bird's Foot Trefoil	<i>Lotus corniculatus</i>
Black Medic	<i>Medicago lupulina</i>
White Sweet Clover	<i>Melilotis alba</i>
Yellow Sweet Clover	<i>Melilotus officinalis</i>
Common Wood Sorrel	<i>Oxalis stricta</i>
Foxglove Beard Tongue	<i>Penstemon digitalis</i>
Reed Canary Grass	<i>Phalaris arundinacea</i>
Prairie Phlox	<i>Phlox pilosa</i>
Tall Ground Cherry	<i>Physalis subglabrata</i>
English Plantain	<i>Plantago lanceolata</i>
Common Plantain	<i>Plantago major</i>
Pennsylvania Smartweed	<i>Polygonum pensylvanicum</i>
Prairie Cinquefoil	<i>Potentilla arguta</i>
Early Wild Rose	<i>Rosa blanda</i>
Black-Eyed Susan	<i>Rudbeckia hirta</i>
Curly Dock	<i>Rumex crispus</i>
Little Bluestem Grass	<i>Schyzachyrium scoparium</i>
Tall Goldenrod	<i>Solidago altissima</i>
Pennycress	<i>Thlaspi arvense</i>
Red Clover	<i>Trifolium pratense</i>
Culver's Root	<i>Veronicastrum virginicum</i>
Golden Alexander	<i>Zizea aurea</i>

Records reflect the weeds common throughout the site which are likely product of the soil used to construct the landscape beds. Most weeds will be inconsequential to the plantings success, though some management is necessary.

Current Management

Weed management in early restorations is crucial to their future success and quality; the IARC planting was closely observed and managed in its first growing season. Most common agricultural weeds will be naturally excluded by competition from native plants within a few years; however, more aggressive invasive plants must be eradicated. Priorities this season included removing reed canary grass, bird’s foot trefoil, crown vetch, and sweet clover. Below is a complete list of target weeds.

Target Weed Species	
Black Mustard	<i>Brassica nigra</i>
Chicory	<i>Cichorium intybus</i>
Canada Thistle	<i>Cirsium arvense</i>
Crown Vetch	<i>Coronilla varia</i>
Queen Anne’s Lace	<i>Daucus carota</i>
Bird’s Foot Trefoil	<i>Lotus corniculatus</i>
White Sweet Clover	<i>Melilotis alba</i>
Yellow Sweet Clover	<i>Melilotus officinalis</i>
Reed Canary Grass	<i>Phalaris arundinacea</i>
Red Clover	<i>Trifolium pratense</i>

In order to control reed canary grass, seed heads were removed and plants were treated with herbicide early in the season. This aggressive management should be continued to eliminate this monoculture forming species from the planting. Sweet clover, bird’s foot trefoil, and crown vetch were pulled by hand throughout the summer on multiple occasions including a volunteer workday. The hours spent by volunteers, the Roads & Grounds summer students, and Ecology team ensure desired species will thrive in the future.



Volunteers show off their weed haul after an IARC Workday

Recommendations

Public Awareness

It is our experience that if landscape beds are not traditionally planted and maintained, the public wonders why such places look unkempt, especially in a high-profile area. To raise awareness and showcase restoration efforts, we recommend a sign be installed adjacent to the planted beds, near the building entrance. A simple “Prairie Planting in Progress” sign or something more expansive and educational would be appropriate. If OTE building managers are planning for indoor educational materials/signage then the planting aspect should be included when highlighting all LEED features. Even so, the benefit of a simple, outdoor sign would easily inform passing vehicles, cyclists and pedestrians of the intent.

Weed Management

Over the next few years, ongoing weed management will allow native species to become well established and naturally exclude undesirable plants. Due to weed seed in the soil used to create the landscape beds, quite a few common agricultural weeds can be found in the planting. In time, the native plants will out-compete these weeds. While these are not a threat to the success of the planting, the target weed species that we removed from the bed this year and should be managed aggressively until the planting is more mature.

Species Additions

If resources exist, the planting would benefit from the addition of the species listed below. All of the species listed are suitable for the conditions of the site and common associate species of the plants included in the original seed mix. Additional species will not only demonstrate the biodiversity of native prairie plants, but also add to the aesthetics of the plantings and increase the assemblages' ability to naturally exclude weeds.

Recommended Species Additions	
<i>High Priority Species</i>	
Prairie Dropseed	<i>Sporobolus heterolepis</i>
Prairie Violet	<i>Viola pedatifida</i>
Prairie Alum Root	<i>Heuchera richardsonii</i>
Prairie Coreopsis *	<i>Coreopsis palmata</i>
False Toadflax	<i>Comandra umbellata</i>
Cream Wild Indigo	<i>Baptisia leucophaea</i>
Pussy Toes *	<i>Antennaria plantaginifolia</i>
Seneca Snakeroot *	<i>Polygala senega</i>
Northern Bedstraw *	<i>Galium boreale</i>
Wild Madder *	<i>Galium obtusum</i>
Canada Wild Rye *	<i>Elymus canadensis</i>
<i>Other Appropriate Species</i>	
Early Goldenrod *	<i>Solidago juncea</i>
Common Blue-Eyed Grass	<i>Sisyrinchium albidum</i>
Yellow Star Grass	<i>Hypoxis hirsuta</i>
Prairie Panic Grass	<i>Panicum leiburgii</i>
Wild Hyacinth	<i>Camassia scilloides</i>
Prairie Sundrops	<i>Oenothera pilosella</i>
Prairie Parsley	<i>Polytaenia nuttallii</i>
Biennial Gaura	<i>Gaura biennis</i>
Sweet Black-Eyed Susan *	<i>Rudbeckia subtomentosa</i>
Wild Quinine *	<i>Parthenium integrifolium</i>
Wild Bergamont *	<i>Monarda fistulosa</i>
Yellow Coneflower *	<i>Ratibida pinata</i>
New England Aster *	<i>Aster novae-angliae</i>
Old-Field Goldenrod *	<i>Solidago nemoralis</i>
Downy Gentian	<i>Gentiana puberulenta</i>

* Indicates species may be able to be collected within Fermilab's existing prairie restorations

The addition of Prairie Dropseed will occur Fall 2014.

Burning

If time and resources permit, burning would be beneficial, stimulating growth of the fire-adapted native species and giving them a competitive advantage against undesirable non-native species. Burning the IARC planting would be a quick and easy process as the plantings are quite small and firebreaks exist.

Conclusion

The IARC prairie planting has the potential to demonstrate a native prairie species assemblage and show off an ecosystem that has been a huge part of Fermilab's history and continues to be the jewel of the lab's natural areas. By implementing the management practices recommended, the establishment of the desired native species assemblage will be expedited. The plantings proximity to the Illinois Accelerator Research Center, bike path, and bison pasture ensure that the planting will be seen by many, demonstrating Fermilab's commitment to both sustainability and ecological conservation. The visual appeal of the planting will increase exponentially in the upcoming years, but patience is imperative to the success of this prairie.