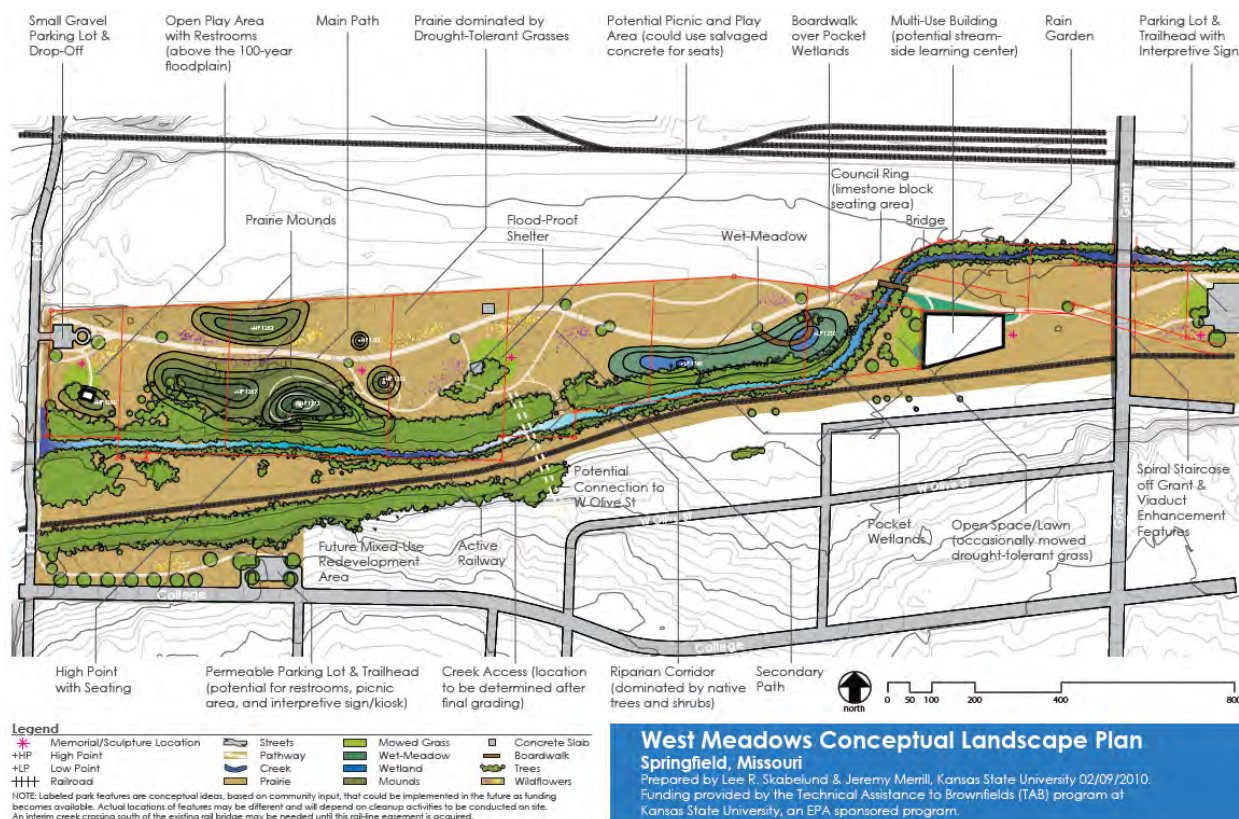


West Meadows Conceptual Landscape Plan: Narrative, Plant Lists and Notes

The intent behind the West Meadows Conceptual Landscape Plan is to provide guidance for plantings and features that could be implemented over the next ten years. More detailed study will be required to explore the feasibility and cost of the proposed features, such as the pedestrian trail and bridge along Fort, the construction of a small parking lot and restroom facility east of Fort, the re-use of the old railroad bridge across Jordan Creek (to the northwest of the Green Seed Co. building), the acquisition and/or adaptive re-use of the Green Seed Co. building, and the construction of a wetland boardwalk.

Earlier versions of the conceptual landscape plan showed potential access points to West Meadows from West Olive Street and off the North Grant Ave. viaduct. These bold ideas would require significant resources and negotiations and should be considered as possibilities rather than eventualities.

The plan shown below provides inspiration. Actual locations of features will depend upon many factors, including what the actual clean-up and grading process requires at the West Meadows property. An interim creek crossing south of the existing rail bridge may be needed until this easement is acquired.



As discussed on the following pages, after clean-up takes places on sites 1-4 (with relocation of excavated materials to sites 5-8), stabilization of exposed soils using a temporary cover crop is essential. Four to six inches of loamy, weed-free and organic soils should be added to the wetland and wet meadow areas once final grading is completed. At least three to six inches of friable, weed-free loam soils should be added on upland areas throughout the remainder of the site once final grading is completed.

Planting Notes

All tree, shrub, and herbaceous species seeded or planted in upland or wetland/wet meadow conditions need to stand a very good chance of surviving amid urban conditions—where there are sure to be a range of invasive species as well as flood flows and stormwater runoff tainted by urban development.

In a cursory search by staff at the Center for Hazardous Substance Research at Kansas State University (KSU-CHSR), the plants selected for this landscape plan were not identified as species known to take up and concentrate metals (based on comparison with “Table of Hyperaccumulators, Tables 1 - 3,” <http://en.wikipedia.org/wiki/Phytoremediation>, June 2009). However, many plants can take up moderate levels of metals if they are present and available in elevated levels in soils. Assuming cleanup goals are achieved (confirmed by soil sampling/screening in all areas of the site) residual contaminants should not present plant uptake risks. If needed, soil amendments such as lime, organic matter, and phosphate should be considered for stabilizing residual metals and to help breakdown residual organic contaminants in surface soils at the site (Blase Leven, KSU-CHSR, pers. comm., Jan. 2010). More extensive information about plants that uptake metals is available on the cd-rom database “Phytorem 2003” (Environment Canada, 2003).

Planting Guidance and Guidelines

Given that West Meadows is a brownfields site, clean-up will take time and the proposed landscape and planting plan will not be fully implemented until funding allows for finished clean-up, capping of contaminated materials, final grading, and placement of new soil atop soils relocated from on the site.

Site Stabilization - The critical intermediate step—following clean-up of **sites 1-4**—is to protect soils from both erosion and invasive species; a temporary cover crop of annual oats/wheat in upland areas and annual oats/rye in wetland and wet meadow areas is recommended as is a bio-degradable mat on mounds/slopes. It is suggested that native prairie species (especially Little Bluestem, Canada Wild Rye, and Virginia Wild Rye) be used in areas where no or minimal disturbance is likely to occur during the second phase of clean-up at West Meadows. Additionally, if it is likely to be several years before final clean-up is completed on **sites 5-8**, it may be worth seeding disturbed areas with lower-cost native prairie species as a test of how they will fare in competition with other non-native and invasive species that begin to appear in the area. A final decision on this matter should be made in consultation with experts in prairie or grassland restoration/reclamation. As with any plant and seed recommendations, availability of desired materials must be considered. Forethought and careful planning are important.

For shorter (1-3 feet tall) **upland prairie ecosystems** at least three to six inches of a sandy-loam to loam type soil is typically best. Soil containing small fractured rock is acceptable as long as soils are weed free (invasive plants/seeds are of particular concern) and the bottom layer of topsoil (immediately above heavier, on-site clay soils) is worked into the existing clays and other sub-soils. At a minimum, compacted clay soils existing and re-used on the site should be scarified (loosened up as deep as possible) prior to working in imported topsoil. A three-step process—1) breaking up existing heavy clay soils, 2) working in lighter sandy-loam to loam soils, and 3) adding at least three inches of imported sandy-loam to loam type soil on top—will create a good seedbed for upland prairie plants and greatly improve the rooting zone by facilitating air and moisture movement into the lower soil. A similar approach could also be employed in low-lying areas.

The precise specifications for imported topsoil should be discussed with a local expert with knowledge of both soils and plant ecology. Soil materials should be sampled and analyzed for agronomic parameters, and recommendations for amendments implemented, to support sustained plant growth. Nitrogen should not be applied as it tends to favor non-native vegetation. Final recommendations for new soil conditions on the site should include considerations to maintain neutral pH conditions and adequate drainage (as well as stabilization/breakdown of residual contaminants, if present in existing re-used soils).

Within the **wetland and wet prairie**, herbaceous species tolerant of urban stormwater conditions will need to be used to compete with generally undesirable invasive species such as Reed Canary Grass (*Phalaris arundinacea*) and Johnson Grass (*Sorghum halepense*), which will likely appear regardless of how well established other wetland species become. Cattails (*Typha* sp.) will also likely be present.

As confirmed by Neal Young (Wetland Services Biologist with the Natural Resources Conservation Service [NRCS]) Springfield residents and land managers should not expect nor attempt to create a place for rare, uncommon, or conservative native species of wildflowers (plants that require relatively “pristine” conditions) at West Meadows. Community leaders and citizens should also not expect to see a weed-free prairie, meadows, nor wetland. “Weed-free” ecosystems simply cannot be created given the context and dynamics of this urban landscape. With this in mind, native species tolerant of urban conditions should be selected.

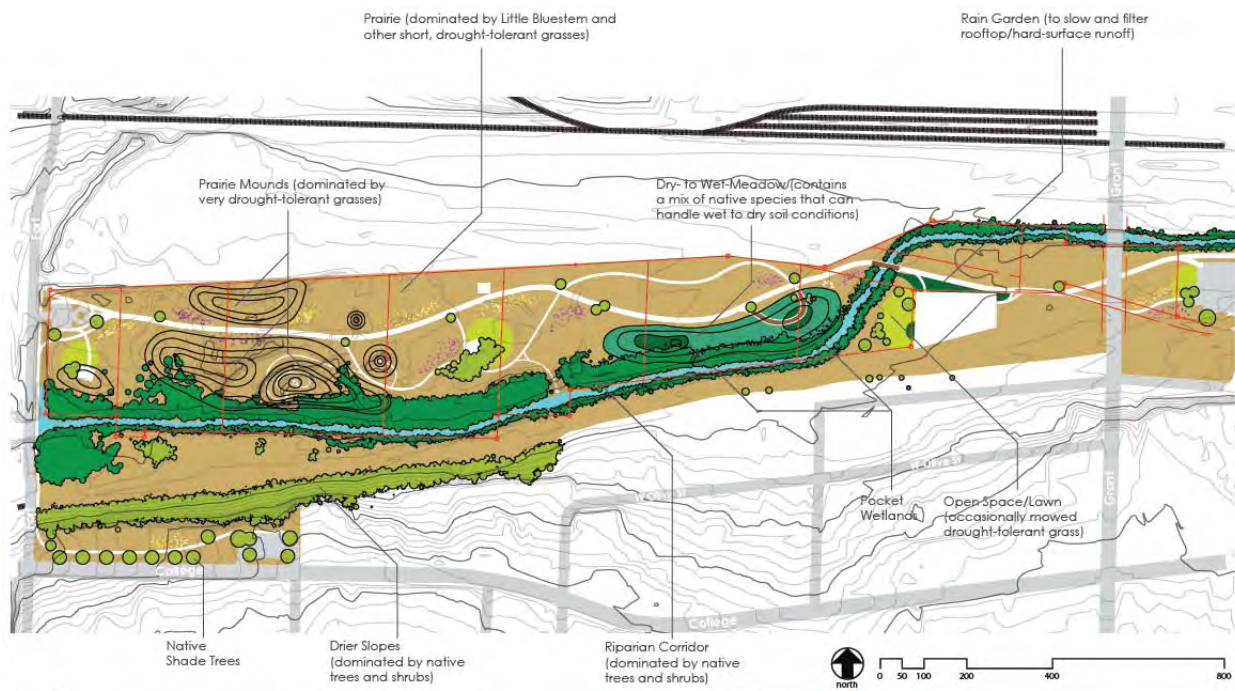
Guidelines for final plant selection, establishment and maintenance/management will need to be developed, working closely with Missouri Department of Conservation (MDC) and NRCS staff.

Appendix A (which draws from information prepared by experts in prairie restoration and prairie-type landscapes and gardens at Prairie Nursery in Wisconsin) provides guidance that should be very useful as specific methods for seeding prairie are considered and selected in the years to come.

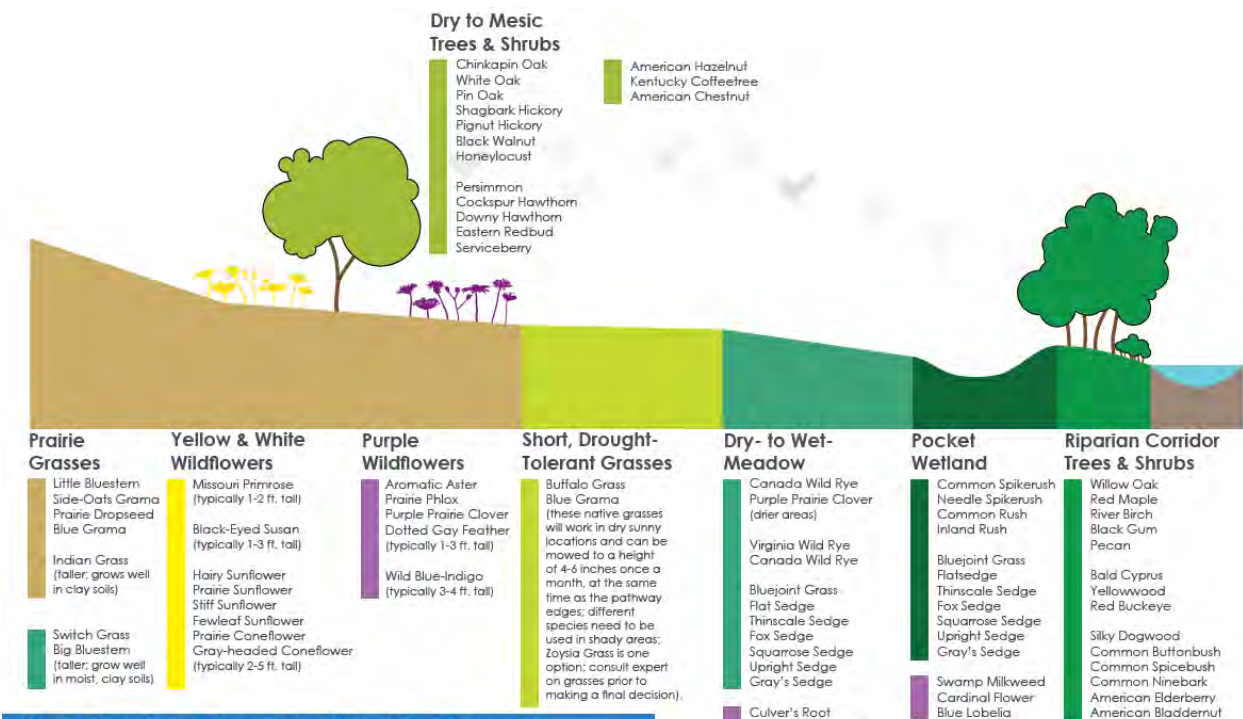
Per the USDA-NRCS Plants Database Fact Sheet for Indian Grass, warm-season grasses typically “require a soil temperature above 50°F for satisfactory germination. The optimum time to plant is from early May to late June. The planting site should be free of perennial or noxious weeds. A moist, firm seedbed is essential. Firming the soil with a roller packer before seeding helps to ensure that the seed is placed at the recommended seeding depth of ½ to ¾ inch.”

Seeding rates should be discussed with experts at USDA, Prairie Nursery, or other entities. Virginia Wild Rye, Switch Grass, Indian Grass and Big Bluestem will do best in heavier, fine-textured (silt and clay) soils—especially moist soils. Per the USDA-NRCS, adding native grass seed to “fine-textured soils where weeds are persistent may require no-till establishment to minimize the amount of exposed weed seeds. [In these conditions,] cool-season grasses must be controlled with a contact herbicide before seeding. USDA-NRCS indicates that “[t]he most common cause of failure of warm-season grasses is a loose seedbed. Conventionally-tilled seedbeds should be packed before and especially after seeding. The seedbed should be firm enough to show only a light imprint when stepped on. When using a no-till drill, coulter furrows [must be] closed [and packed] to avoid seed exposure and drying.”

(For more on establishing and managing native grasses refer to the following USDA-NRCS fact sheets: http://plants.usda.gov/factsheet/pdf/fs_sonu2.pdf/; http://plants.usda.gov/factsheet/pdf/fs_scsc.pdf/; http://plants.usda.gov/factsheet/pdf/fs_elca4.pdf/; http://plants.usda.gov/factsheet/pdf/fs_elvi3.pdf/; http://plants.usda.gov/factsheet/pdf/fs_pavi2.pdf/; http://plants.usda.gov/factsheet/pdf/fs_ange.pdf/).



West Meadows Conceptual Planting Plan
Springfield, Missouri
 Prepared by Lee R. Skabelund & Jeremy Merrill, Kansas State University 02/09/2010.
 Funding provided by the Technical Assistance to Brownfields (TAB) program at Kansas State University, an EPA sponsored program.



West Meadows Conceptual Planting Diagram
Springfield, Missouri
 Prepared by Lee R. Skabelund & Jeremy Merrill, Kansas State University 02/09/2010.
 Funding provided by the Technical Assistance to Brownfields (TAB) program at Kansas State University, an EPA sponsored program.

Native Tree & Shrub Plantings

The tree and shrub species listed below can be planted as bare root seedlings and protected with tree shelters (which need to be pushed into the soil around the trunk of each tree) to reduce the chance for browsing of bark, twigs, stems and buds by deer, rabbits, and other herbivores.

Larger (1 to 2-1/2 inch caliper) trees and multi-stemmed shrubs from commercial nurseries can be planted (as funding allows) but they also will likely need protection from browsing animals.

To keep all species of trees and shrubs alive, watering will be essential during dry periods. During establishment, trees/shrubs planted as larger specimens require more frequent watering than smaller bare-root plants, but are more readily visible after they are planted (this is important given the fact that unmarked bare root seedlings may “disappear from sight” and thus be unaccounted for *and* untended). The use of both larger and smaller plants is typically a good strategy for keeping costs down—allowing for a diversity of species and sizes of plants to be installed, and making plantings visible to those who need to monitor, water, and otherwise tend to each new plant. Using a combination of larger and smaller trees and shrubs (bare root, potted and/or ball-and-burlap) can help the City achieve each of the objectives noted above.

Where trees are to be planted away from Jordan Creek, species tolerant of xeric (dry to very dry) to mesic (frequently moist) conditions should be considered (in accord with elevation and soil hydrology), while riparian (streamside) species should be used near Jordan Creek, including on and along the levee between the stream and wetland/wet meadow areas. In all cases, species that are native to Missouri (and ideally grown in Missouri *or* within a 150 mile radius of Springfield) should be planted on the site.

Control of noxious weeds and weedy trees and shrubs will likely be essential as there are many invasive elms presently growing along Jordan Creek (upstream, on the site, and in surrounding neighborhoods). Carefully mowing around planted trees and shrubs (without damaging the young plants) will help native grasses establish and reduce competition of trees and shrubs planted on the site.

Suggested Dry to Mesic Trees & Shrubs

- Large **Chinkapin Oak , White Oak, Pin Oak, Shagbark Hickory , Pignut Hickory, Black Walnut, Thornless Honeylocust, Kentucky Coffeetree and American Chestnut**
- Med. **Persimmon, Cockspur Hawthorn, Downy Hawthorn, Eastern Redbud and Serviceberry**
- Shrub **American Hazelnut and Fragrant Sumac**

Suggested Riparian Corridor Trees & Shrubs

- Large **Willow Oak, Red Maple, River Birch, Black Gum and Pecan**
- Large **Bald Cypress** (likes very wet soils, native to SE MO) - http://plants.usda.gov/plantguide/pdf/pg_tadi2.pdf
- Med. **Kentucky Yellowwood** - <http://plants.usda.gov/java/profile?symbol=CLKE>
- Small **Red Buckeye** - <http://plants.usda.gov/java/profile?symbol=AEPA>
- Shrub **Silky Dogwood, Buttonbush, Spicebush, Ninebark, American Elderberry and American Bladdernut**

Suggested Pocket Wetland Plants

Spikerushes and rushes (to be planted in wet pools and saturated soils): The following species are “safe bets” in terms of their potential for establishment in wetland habitats (Inland Rush tolerates some shade, which most rushes do not). Of these four species both the Common Spikerush and Common Rush show up in Green County on the USDA Plants Database map, and the other two are in nearby counties (<http://plants.usda.gov/java/profile?symbol=ELEOC>).

Common Spikerush, *Eleocharis palustris* - http://plants.usda.gov/plantguide/pdf/pg_elpa3.pdf

Needle Spikerush, *Eleocharis acicularis* - <http://plants.usda.gov/java/profile?symbol=ELAC>

Inland Rush, *Juncus interior* - <http://plants.usda.gov/java/profile?symbol=JUIIN2>

Common Rush, *Juncus effusus* - http://plants.usda.gov/plantguide/pdf/cs_juef.pdf

Bluejoint grass, *Calamagrostis canadensis* - <http://plants.usda.gov/java/profile?symbol=CACA4> and Upright Sedge (*Carex stricta* - <http://plants.usda.gov/java/profile?symbol=CAST8>) can be seeded along the levee and in wet meadow/wet prairie habitats (with moist soils). Bluejoint grass likes full-sun, while Upright Sedge can tolerate shade (http://plants.usda.gov/plantguide/pdf/pg_caca4.pdf). The following sedges can be added in both wetland (saturated soils) and wet –meadow (frequently very moist soils) habitats: Flat Sedge, Thinscale Sedge, Fox Sedge, Squarrose Sedge, Upright Sedge and Gray’s Sedge (wet soils) – refer to *Carex* sp. (<http://plants.usda.gov/java/nameSearch>). Swamp Milkweed, Cardinal Flower and Blue Lobelia can be added to create two or three splashes of color along the boardwalk.

Suggested Dry- to Wet-Meadow Plants

Side slopes around the wetland will be drier and should be planted with Little Bluestem, Canada Wild Rye and Purple Prairie Clover. Within transitional areas (referred to as “wet meadows”), Bluejoint Grass, Flat Sedge, Thinscale Sedge, Fox Sedge, Squarrose Sedge, Upright Sedge and Gray’s Sedge can be seeded and/or planted. Wildflowers can also be added in sunny areas to add seasonal color and texture.

Virginia Wild Rye, *Elymus virginicus* - http://www.kswildflower.org/grass_details.php?grassID=20

Canada Wild Rye, *Elymus canadensis* - http://www.kswildflower.org/grass_details.php?grassID=19

Lady’s Tresses, *Spiranthes cernua* - <http://www.kswildflower.org/details.php?flowerID=248>

Culver’s Root, *Veronicastrum virginicum* - <http://plants.usda.gov/java/profile?symbol=VEVI4>

Purple Coneflower, *Echinacea purpurea* - http://plants.usda.gov/plantguide/pdf/cs_ecpu.pdf

Smooth or Marsh Phlox, *Phlox glaberrima* - <http://plants.usda.gov/java/profile?symbol=PHGL4>

New England Aster, *Symphotrichum novae-angliae* - http://plants.usda.gov/plantguide/pdf/cs_syno2.pdf

Note: All disturbed areas need to be stabilized with an appropriate cover crop as soon as possible after grading is completed, stage by stage. Biodegradable erosion control mats/blankets will need to be used on slopes. Consult seed suppliers for the best products to use for wetland and prairie areas.

Suggested Short, Drought-Tolerant Grasses

Buffalo Grass and **Blue Grama** (mowed once a month, at the same time as the pathway edges)
Zoysia Grass, or another suitable drought-tolerant grass (a species that will perform well with monthly mowing and semi-frequent to infrequent use as informal play areas)

Notes: Per Rhonda Headland (Community Conservation Planner, Missouri Department of Conservation, pers. comm., Dec. 2009) there are numerous suppliers in Missouri for buffalo grass seed. However, “due to weed competition it is difficult to establish a thick stand of buffalo grass from seed so it is common for people to use sod for large areas. There is a sod supplier in the Jefferson City area [Emerald View Turf Farms, 573-634-3444] and another one in the Tulsa area.” According to Rhonda, “buffalo grass...does well as long as it is in full sun (no shade or it will become patchy) and there is no competition from other plants (it does not compete well and as such tends to become a maintenance nuisance because it is difficult to keep weeds out). Buffalo grass also needs very dry soil conditions.” These sentiments were confirmed by Cindy Garner, Urban Forester with the Missouri Department of Conservation.

Because of these concerns, and the fact that Blue Grama seems to be untested in the Springfield area, it is suggested that further consultation with experts in prairie and turfgrass systems be consulted prior to selecting the species for open spaces near the Green Seed Co. Building, the central Picnic and Play Area, and the Open Play Area near Fort Street. Zoysia Grass is another types of warm-season grass that could potentially be used in these three areas, however, consultations may highlight other, better possibilities. Since final prairie planting and establishment is likely 3-5 years out, there is plenty of time to investigate options for a short, drought-tolerant grass that has turfgrass qualities.

Suggested Prairie Grasses

The majority of West Meadows should be seeded with a hardy mix of native grasses. Below are options that Springfield City staff and residents should carefully consider, recognizing that if mowing is desired and undertaken mid-season (late July or August) , then late blooming wildflowers in areas mowed will be disadvantaged. The notes from Neil Diboll (President of Prairie Nursery, Inc. in Westfield, Wisconsin) address these issues in greater detail (refer to page 7).

Little Bluestem, *Schizachyrium scoparium* (mesic to dry soils) - http://plants.usda.gov/factsheet/pdf/fs_scsc.pdf

Side-Oats Grama, *Bouteloua curtipendula* (dry soils) - http://plants.usda.gov/plantguide/pdf/pg_bocu.pdf

Blue Grama, *Bouteloua gracilis* (very dry soils) - http://plants.usda.gov/plantguide/pdf/pg_bogr2.pdf

Prairie Dropseed, *Sporobolus heterolepis* (mesic soils)- <http://plants.usda.gov/java/charProfile?symbol=SPHE>

Indian Grass, *Sorghastrum nutans* (3-4 ft. tall; grows well in dry to moist clay soils)

http://plants.usda.gov/factsheet/pdf/fs_sonu2.pdf

Switch Grass, *Panicum virgatum* and **Big Bluestem**, *Andropogon gerardii* (3-7 ft. tall; grow well in moist, clay soils)

http://plants.usda.gov/factsheet/pdf/fs_pavi2.pdf / http://plants.usda.gov/plantguide/pdf/pg_ange.pdf

Western Wheatgrass, *Pascopyrum smithii* - http://plants.usda.gov/plantguide/pdf/pg_pasm.pdf

‘Flintlock’ western wheatgrass – slopes and other drier areas; ‘Barton’ western wheatgrass – moist clay soils

Jan. 14, 2010 Note from Neil Diboll (President of Prairie Nursery, Inc.), in response to the questions posed by Lee R. Skabelund (see below):

Regarding the specifics of your site, I have a few concerns:

- 1) The shorter prairie grasses typically are not very competitive on clay soils, and are often invaded by non-native grasses and weeds. The taller grasses, such as Big Bluestem, Switchgrass, and Indiangrass are better adapted to clay soils, and are capable of shutting down most non-native weeds, grasses, etc.*
- 2) You did not mention whether you would be planting forbs with the prairie grasses. If you plan to do so, the tall grasses mentioned above will compete strongly with them, so you will want to use long-lived, large forbs such as the Silphiums, Baptisias, Prairie Clovers, Coneflowers. etc. Early season species also combine well with the tall, warm season prairie grasses, since they are active prior to the peak growth period of the grasses.*
- 3) All of the above notwithstanding, if you seed short prairie grasses at a sufficiently high rate and manage the prairie aggressively using late spring burning, you will likely have success.*
- 4) Mowing in mid-summer is another option to control the height of the tall grasses, as you point out. Mowing in late July to early August as the tall grasses begin to send up their flower stalks works well. However, it tends to favor spring flowers over summer and fall flowers, as the later bloomers will be mowed prior to, or when in full flower. This will often prevent seed formation, reducing recruitment of new individuals in the prairie.*

Questions posed to Prairie Nursery by Lee R. Skabelund (KSU-LARCP) on Jan. 13, 2010:

I am wondering if you have suggestions for temporarily stabilizing a site following initial brownfield site clean-up, when the long-term goal (likely 3 to 5 years out) is to plant prairie and wetland vegetation on the site but where much of the site will be disturbed a second time (3-5 years from phase 1 clean-up)? I was thinking of recommending that all areas likely to be redisturbed be stabilized using annual oats and/or annual rye and annual wheat—with some tough natives such as Little Bluestem, Hairy Grama, Virginia Wild Rye, and Canada Wild Rye (and perhaps some native sedges in low, wet areas).

Per the geotechnical report, underlying the existing fill (as documented by multiple soil borings) is native lean clay, lean to fat clay, fat clay, and gravel. The native clay is generally brown, gray, and reddish brown, contains varying amounts of dark brown and black, contained varying amounts of silt, sand, and gravel, and is soft to very stiff in consistency. Borings GP-21 through GP-24, and GP-29, were terminated at the planned depth of 15 feet within the native soil. The native soil extends to depths in the remaining borings of approximately 11.5 to 13.7 feet. Water content of clay soils three to 10 feet down typically range from 20-28%, with one boring showing 34% water content.

What do you recommend if the long term goal is to create a prairie dominated by shorter grasses (the client and community are concerned about safety, although I think that mowing mid-summer may be the best way to address this concern)?

Drifts of Wildflowers (Forbs)

The following wildflowers (typically called “forbs” by ecologists and other scientists) will provide a striking accent in key areas along the proposed West Meadows trails. It is suggested that these (and possibly other) selected forbs be seeded into 10-12 areas as colorful drifts or spots, accounting for specific soil moisture and sun/shade conditions and species tolerances.

Suggested Orange, Yellow & White Wildflowers

Missouri Evening Primrose, *Oenothera macrocarpa* (typically 1-2 ft. tall)

<http://www.kswildflower.org/details.php?flowerID=225>

Black-Eyed Susan, *Rudbeckia hirta* (typically 1-3 ft. tall)

<http://www.kswildflower.org/details.php?flowerID=180>

Sunflowers and Coneflowers (typically 3-4 ft. tall):

Stiff Sunflower, *Helianthus pauciflorus* - http://plants.usda.gov/factsheet/pdf/fs_hepa19.pdf

Prairie Sunflower, *Helianthus petiolaris* - <http://plants.usda.gov/java/profile?symbol=HEPE>

Fewleaf Sunflower, *Helianthus occidentalis* - <http://plants.usda.gov/java/profile?symbol=HEPA19>

Prairie Coneflower, *Ratibida columnifera* - http://plants.usda.gov/plantguide/pdf/cs_raco3.pdf

Yellow Coneflower, *Ratibida pinnata* - http://plants.usda.gov/plantguide/pdf/cs_rapi.pdf

Pale Purple Coneflower, *Echinacea pallida* - http://plants.usda.gov/factsheet/pdf/fs_ecpa.pdf

Butterfly Milkweed, *Asclepias tuberosa* - http://plants.usda.gov/plantguide/pdf/cs_astu.pdf

Suggested Blue & Purple Wildflowers

Prairie Clover, Prairie Phlox and Gayfeather (typically 2-3 ft. tall):

Purple Prairie Clover, *Dalea purpurea* - <http://www.kswildflower.org/details.php?flowerID=86>

http://plants.usda.gov/factsheet/pdf/fs_dapu5.pdf

Prairie or Downy Phlox, *Phlox pilosa* - <http://www.kswildflower.org/details.php?flowerID=301>

Dotted Blazing Star or Gay Feather, *Liatris punctata* - <http://www.kswildflower.org/details.php?flowerID=61>

http://plants.usda.gov/plantguide/pdf/pg_lipu.pdf

Silky Aster, *Symphotrichum sericeum* (1-2 ft. tall) - <http://plants.usda.gov/java/profile?symbol=SYSE2>

<http://www.kswildflower.org/details.php?flowerID=67>

Aromatic Aster, *Symphotrichum oblongifolium* (6-18 in. tall) - <http://plants.usda.gov/java/profile?symbol=SYOB>

Wild Blue Indigo, *Baptisia australis* (3-4 ft. tall) - http://plants.usda.gov/plantguide/pdf/cs_baau.pdf

Woodland Wildflower:

Blue Phlox, *Phlox divaricata* (6-20 in. tall) - <http://www.kswildflower.org/details.php?flowerID=203>

Key Contacts for Follow-up Discussions by Springfield and/or their Consultants:

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Questions related to these documents should be addressed to Sabine Martin (smartin1@ksu.edu) or Blase Leven (baleven@ksu.edu), at Kansas State University (785-532-6519).

Phytoremediation Reference:

Environment Canada. 2003. Phytorem – Potential Green Solutions for Metal Contaminated Sites.