Tallgrass Prairie Reconstruction: Seed Collection

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Introduction

In 2012, the St. Louis Metropolitan Sewer District (MSD) began Project Clear, a 6 billion dollar, 28-year initiative to improve water quality and infrastructure. This included updates to the city's sewer system and the construction of new tunnels and storage tanks that limit overflow and wastewater contamination. One element of this project was the construction of a new sewer pipeline, which runs through the Litzsinger Road Ecology Center (LREC). This 39 acre study site, managed by the Missouri Botanical Garden, includes reconstructed tallgrass prairie, restored woodland, and urban creek ecosystems. After the construction process began in 2019, 4.81 acres of vegetation were removed, and deep trenches were excavated into the bedrock along a 0.5 mile path of bottomland prairie and woodland. This resulted in significant habitat alterations, as well as the compaction and homogenization of soil backfilled on top of the pipeline.

After installation was completed three years later, restoration staff began the process of reconstructing tallgrass prairie along the path. A series of annual cover crops were planted in Fall 2022 and Spring 2023. Early successional species began to colonize the pipeline path in late 2022, dispersed by flood waters, wind, wildlife, and other non-anthropogenic means. Some species may also have been introduced by construction equipment. The next step in this project is the seeding of longer-lived native plant species in Fall 2023, then overseeding in future years. In the initial reconstruction stages, plants will be selected based on conservatism rankings as used in Floristic Quality Assessments (Ladd & Thomas 2015). The coefficient of conservatism, or C-value, quantifies fidelity to a specific habitat and tolerance to disturbance as reported on a scale of 0 to 10. High C-values indicate a species requiring a very specific, high-quality habitat that is minimally modified or disturbed. Low C-value species establish more easily in disturbed areas, so these will be seeded in the reconstruction zone first. Over time, as the soil's structure and microbial communities restore their ecological functions, plant composition can transition from weedier species to a higher quality mix of native grasses, sedges, and forbs.

An important consideration for this project is seed source location. Ideally, seeds should be collected from prairies as close to the reconstruction site as possible to preserve

local adaptations and promote successful germination and establishment (Gallagher & Wagenius 2015). Seeds for this project will be collected from LREC and surrounding sites in the St. Louis area, such as the Shaw Nature Reserve (SNR), another division of the Missouri Botanical Garden. It is also necessary to consider specific habitat conditions along the reconstruction path. This bottomland habitat is prone to periodic, intense flooding from Deer Creek. Hydrology and topography vary along the path, creating microhabitats such as wetlands, woodland edges, creek banks, and glades, which will each require specific seed mixes.

Throughout the seeding process, plant communities will be monitored, and restoration plans will be adapted. After the pipeline completion, a flora inventory was conducted and will be used as a baseline for tracking changes in species composition (Kathriner & Faupel 2022). Assessing changes in mean C-value and Floristic Quality Index, which incorporates species richness, can indicate the effectiveness of the project and guide future plans, as well as provide land managers with insights into using tallgrass prairie reconstruction in urban construction remediation zones like the MSD pipeline at LREC. This project will begin the process of identifying, collecting, and documenting target seed species for the MSD reconstruction.

Methods

Using the STL Prairie Flora (Baranski & Faupel 2021), target species were selected, and a list was compiled (refer to target list below). These included native prairie plants with C-value ≤ 6 of the growth habitats: forb, grass, and sedge. This list was then compared to the LREC Complete Flora to determine which species could be collected on site. For species not present, iNaturalist was used to identify collection locations. This species list will be used by LREC volunteers, interns, and full-time staff to be more intentional in the selection of target species and their seed collection priorities.

In the field, seeds were collected for each target species. Key features were photographed, and an observation of each species was documented in iNaturalist. After collection, seeds were dried, cleaned, and weighed. Using a macro-lens, seeds were then photographed and added to iNaturalist to create a seed guide.

All collection information, as well C-value, physiognomy, wetland status, and germination mechanism (Prairie Moon Nursery) was recorded in a spreadsheet.

Target List:
https://docs.google.com/spreadsheets/d/1gRoRyDWmxIMOYEed_ppKFwHfYGdN4KmKGsCxwW3AvO8/edit?usp=sharing

MSD Seed Collection Protocol:
https://docs.google.com/document/d/1vvP54eLPMwbs2nZuXqv-55LzYK3T4nniLzyaeam4T-c/edit

Results

In Summer 2023, 20 seed species were collected: 7 forbs, 7 grasses, and 6 sedges. Families collected were Apiaceae, Asteraceae, Commelinaceae, Cyperaceae, Iridaceae, Juncaceae, Poaceae, and Polygonaceae. In total, 18 species were collected from LREC, and 3 species were collected from SNR. Additional target species will need to be collected later this summer and throughout the fall.

Table 1. Summer 2023 Collection Record
(**clean seed**, contains chaff - not equivalent to seed weight)

ntific Name	mon Name	ction Date	ction tion	ht Collected (g)	lue	iognomy
us scens	woodland e			26		GRASS
x "ovales" mix	e mix	6/22	C			SEDGE
x crinita	ed sedge		C			SEDGE
x cristatella	ed sedge	7/19, 8/1	C			SEDGE
x frankii	's sedge	7/28, 8/1	C			SEDGE
opsis lanceolata	-leaved coreopsis		C	34		FORB
us hystrix	brush grass	7/27, 7/31	C, SNR			GRASS
us riparius	bank wild rye	7/17	C	54		GRASS
us villosus	wild rye	9/15		24		GRASS
ron annuus	al fleabane		C			FORB
ria striata	manna	6/21	C			GRASS
us tenuis	rush		C			FORB
ex altissimus	dock		C			FORB
us atrovirens	green rush		C	60		SEDGE

us pendulus	ulrush	/10, 7/17	C			SEDGE
inchium stifolium	eyed grass		C			FORB
escantia sis	spiderwort		C			FORB
acum dactyloides	rn grass	/5, 9/13	C			GRASS
um aestivum	non wheat		C	26		-GRASS
aurea	n nders	3/2, 8/8	C	50		FORB

iNaturalist Seed Guide:
https://www.inaturalist.org/observations?place_id=any&q=LREC%20Seeds

Figure 1. Examples of photos used in iNaturalist observations of *Arnoglossum atriplicifolium*.

Results Updated

At the end of the Fall of 2023, an additional 97 species were collected for the MSD path: 69 forbs, 21 grasses, and 7 sedges. The families collected totaled to 19 including: Agavaceae, Apiaceae, Apocynaceae, Asteraceae, Campanulaceae, Commelinaceae, Cyperaceae, Euphorbiaceae, Fabaceae, Iridaceae, Juncaceae, Lamiaceae, Malvaceae, Melanthiaceae, Onagraceae, Orobanchaceae, Plantaginaceae, Poaceae, Polygonaceae, and Scrophulariaceae. In total, 82 species were collected from LREC, 12 from Shaw Nature Reserve, and 3 from other locations in the St. Louis area. Overall, there was 48.84 kg (107.7 lbs.) of seed collected for the MSD path this year. An additional 16 species will be procured from Pure Air Natives seed supplier, raising the total species count to 113. Pure Air Natives collects their seed from sites in Missouri and adjacent states.

Overall, we successfully procured 91 of the 107 species on the original target list. Of these 80 were hand collected in 2023 as mentioned above, as well as another 4 being procured from Pure Air Natives, and 7 included from old seed collections. The other 33 species collected this year were not included in the list and are late additions to the prairie reconstruction seeding.

Table 2. Fall 2023 Collection Record

(**clean seed**, contains chaff - not equivalent to seed weight)

entific Name	mmon Name	lection Date	lection cation	ight Collected	alue	ysiognomy
lypha gracilens	nder three-seeded rcury	16-Oct	EC	4.9	5	A-FORB
illea gracilis	row	8/31/23	EC	**0.5**	1	P-FORB
orpha fruticosa	e Indigo bush	3/23 (Ongoing)	EC	**263.24**	6	Shrub
dropogon gerardii	bluestem	16-Oct	EC	215.52	5	P-Grass
oglossum olicifolium	e indian plantain	16-Oct	EC	110.38	4	P-FORB
lepias incarnata	amp milkweed	19-Oct	on's House, am's house, EC	263.24	4	P-FORB
lepias syriaca	mmon milkweed	4, 9/15, 9/18, 0, 9/22	EC	258.78	0	P-FORB
lepias tuberosa	terfly milkweed	10/26/23	EC	1.12	5	P-FORB
lepias verticillata	orled milkweed	16-Oct	EC	3.54	5	P-FORB
otisia Alba	te wild indigo	22-Sep	EC	813.32	6	P-FORB
landiera texana	tas green eyes	16-Oct	EC	3.2	5	P-FORB
ens aristosa	amp marigold	8-Nov	EC	63.54	1	A-FORB
ohilia hirsuta	od mint	2, 9/5	EC	25.1	7	P-FORB
mpanulastrum ericanum	erican bell flower	9, 11/15	EC	93.12	4	A-FORB
rex grayi	be sedge	22-Oct	on's House	15.94	7	P-SEDGE
amaecrista ciculata	tridge pea	23-Oct	R	0.48	2	A-FORB
asmanthium folium	r oats	9, 10/20	EC	13789.21	4	P-GRASS
na arundinacea	mmon wood reed	29-Sep	EC	447.68	7	P-GRASS
sium discolor	d thistle	3-Oct	EC	37.52	3	P-FORB
eataenia anceps	ked panicgrass	18-Oct	R	**1897.16**	3	P-GRASS

noclinium lestinum	e mist flower	9-Oct	EC, Aarons use	67.5	3	P-FORB
eopsis tripteris	coreopsis	16, 10/23, 10/26	EC	188.2		P-FORB
anchum laeve	eyvine	16-Oct	EC	11.74	0	P-FORB
smanthus illinoensis	ois bundle flower	5, 9/18	EC	485.8	3	P-FORB
rrhena obovata	vate beak grass	18-Sep	EC	**74.64**	6	P-GRASS
illosus and E. adensis mix	l rye	9/15/23	EC	173.14		P-GRASS
inochloa muricata	erican barnyard ss	12-Oct	EC	**12.2**	2	A-GRASS
mus canadensis	ada wild rye	15-Sep	EC	6065.25	5	P-GRASS
mus virginicus	inia wild rye	15-Sep	EC	**1018.36**	5	P-GRASS
ngium yuccifolium	lesnake master	16, 10/23, 10/26	EC	1746.95	8	P-FORB
phorbia marginata	w on the mountain	10/6/23	EC	177	3	A-FORB
hamia graminifolia	ss-leaved denrod	7-Nov	EC	1059.54	3	P-FORB
rochium fistulosum	pye weed	5, 9/18	EC	1069	6	P-FORB
rochium purpureum	ple Joe pye weed	8/25/23	EC	21.6	6	P-FORB
enium autumnale	ezeweed	11/6/23	EC	101.12	5	P-FORB
ianthus mollis	y sunflower	23-Oct	R	14.28	6	P-FORB
erotheca axillaris	ad-leaved golden er	23-Sep	s Island	8.78	2	A-FORB
iscus laevis	berd rose mallow	18-Oct	R	129.94	4	P-FORB
iscus lasiocarpos	lly rose mallow	8, 9/20	EC	226.64	5	P-FORB
pedeza capitata	h clover	23-Oct	R	1120.2	6	P-FORB
ris pycnostachya	rie blazing star	1-Nov	EC	33.64	6	P-FORB
elia sp.	dinal flower, blue elia	30, 11/1	EC	10.68		P-FORB
lwigia alternifolia	dbox	0, 9/22	EC	47.48	4	P-FORB
nfreda virginica	e aloe	9/8/23	EC	**36.16**	7	P-FORB
anthium virginicum	ch flower	3, 9/15, 9/18, 0, 9/22	EC	57.68	9	P-FORB
narda fistulosa	l bergamot	3, 9/14, 9/18, 0, 9/22	EC	129.44	4	P-FORB

nothera biennis	mmon evening nrose	19/2023, 11/1/23	LCC FP, LREC	438.88	0	3-FORB
ypolis rigidior	bane	3, 10/16	EC	**313.92**	7	P-FORB
ckera glabella	terweed	5-Jun	EC	**21.82**	1	A-FORB
nicum virgatum	tchgrass	5, 10/3, 10/19	EC, SNR	4.56	4	P-GRASS
nicum virgatum/ eataenia anceps	tchgrass/beaked iicgrass	9/25/23	EC	**15.84**	3-Apr	P-GRASS
dicularis lanceolata	mp lousewort	7-Nov	EC	344.3	9	P-FORB
nstemon digitalis	glove beardtongue	3, 9/19, 9/20, 2	EC	265.86	3	P-FORB
sicaria virginiana	pseed	3-Oct	EC	20.36	1	P-FORB
nanthemum sp.	untain mint (mix)	26-Oct	EC	117.96	6	P-FORB
ibida pinnata	y headed eflower	19-Oct	am's House, on's House	386.02	4	P-FORB
dbeckia tomentosa	eet black-eyed san	11/13/23	EC	1655.07	5	P-FORB
dbeckia triloba	wn-eyed Susan	30, 11/1	EC	136.74	3	P-FORB
izachyrium parium	e blue stem	18-Oct	R	82.58	5	P-GRASS
ophularia rilandica	figwort	20-Oct	EC	**20.7**	3	P-FORB
tellaria incana	llcap	9/12/23	EC	4.22	5	P-FORB
na marilandica	ryland senna	18-Oct	R, LREC	205.14	4	P-FORB
hium integrifolium	rie rosinweed	3, 9/15, 9/18, 9	EC	623.52	4	P-FORB
hium laciniatum	npass plant	18, 10/23	R	246.34	6	P-FORB
idago missouriensis	souri goldenrod	23-Oct	R	59.58	6	P-FORB
idago rigida	d goldenrod	23, 11/1	R, LREC	551.98	5	P-FORB
idago speciosa	wy goldenrod	23-Oct	R	2.04	7	P-FORB
ghastrum nutans	an grass	5 9/29, 10/3, 16	EC	615.06	4	P-GRASS
rtina pectinata	rie cordgrass	18-Oct	R	**42.2**	5	P-GRASS
nphyotrichum riflorum	co aster	8-Nov	EC	232.46	3	P-FORB
nphyotrichum ealtum	ow-leaved aster	7-Nov	EC	830.28	6	P-FORB
nphyotrichum spp.	icled aster, frost er	10-Nov	EC	152.24		P-FORB

ucrium canadense	erican germander	3/, 9/14, 9/18, 9, 9/22	EC	240.58	2	P-FORB
nonia mix.	souri ironweed	3, 9/14, 9/18, 0	EC	1237.12	5	P-FORB
onicastrum inicum	vers root	22-Sep	EC	2106.16	7	P-FORB

Discussion

Using target species collected, the MSD path will be seeded in Fall 2023. LREC staff and volunteers will broadcast seeds collected from Spring and Summer 2023. Limited annual cover crops will be included in the mixture. These species will help exclude weeds and stabilize soil, and they have not been found to reduce the establishment of native species (Espeland & Perkins 2013). More specific seed mixes will be used in microhabitats such as wetlands, edges, and creek banks. DJM Ecological Services will also return to LREC to seed a native prairie mix using a no-till drill.

In addition to seeding, another important part of the reconstruction process is invasive species management. Before Fall 2023 seeding, there will be a targeted herbicide spray and mowing of larger weeds. In future years, invasive species will be monitored and removed as needed. Burning will be incorporated into management plans on a three-year cycle. Existing research from pipeline installation in North Dakota found that, although weed frequency increases with disturbance, levels can return to pre-disturbance levels within four years (Espeland & Perkins 2017). Invasive weeds should also be limited by ensuring non-contaminated seed sources and equipment.

As reconstruction progresses, LREC staff will continue overseeding, incorporating plugs for woody species like indigo bush (Amorpha fruticosa). Development will be tracked using plot monitoring and species inventories. A similar reconstruction in northwest Missouri found this combination of invasive species removal and local ecotype seeding to be successful in post-agricultural prairie reconstruction. Over 20 years, the project found that native species cover and mean C-value increased significantly, and weedy nonnative species transitioned to more characteristic prairie species (Leahy et al. 2020).

Although there is limited existing research on applications to construction remediation, the MSD pipeline project will hopefully lead to the development of a more functional ecosystem and new insights into prairie reconstruction. The target species list, iNaturalist seed guide, and seed collection documentation will all be important resources in the planning and implementing of this project, as well as in the development of similar urban reconstructions.

Discussion Updated

On October 13th of 2023, the first native seeding took place which included plants that bloom in the spring and early summer, to mimic when these species would naturally disperse their seeds. This seeding coincided with the first rain we had following drought conditions during the entirety of the summer. All of these species were mixed together, and hand seeded onto the soil surface by LREC restoration staff and one volunteer over the entirety of the MSD path. This seeding included both the seeds collected this year and any seeds in storage from previous years that were collected between April and June. Of the species seeded 20 were collected this year, 3 were collected both this year and previous years and, 9 were from older collection years. Seeds from previous years have less viability but were still added since survival probability is only lowered due to age and not reduced entirely. In total 33 species were sowed including 8 forbs, 1 grass, 3 rushes and 21 sedges (mostly Carex species). This seeding totaled to 1.97 kg of seed.

Figure 2. Staff and volunteer hand seeding spring and summer flowering species. Photo by Thomas Kibby.

On December 8th of 2023, DJM Ecological Services drilled in a total of 39 species. Of these species, 7 were grasses, 2 were sedges, and the other 30 were forbs. Within these species, 16 had not been collected elsewhere in the collection season, and 4 are new to LREC: *Ratibida columnifera*, *Sporobolus compositus*, *Baptisia australis*, *Solidago nemoralis*. Overall, DJM will be drilling 16.60 kg (36.61 lbs) of seed. The list of 39 species purchased by Pure Air Natives, and then drilled by DJM, can be found below (Table 3.).

Figure 3. DJM drilling seeds into the MSD path. Photo by James Faupel.

Pure Air Natives Inc. 4630 W. Florissant Ave. ~ St. Louis, MO 63115 ~ Phone: 636-357-6433 ~ Fax: 844-357-6444 E-mail: sales@pureairnatives.com ~ www.PureAirNatives.com			DATE: 11/8/2023	**Pricing is valid for 30 days from the date listed on quoted seed mix.		Price Per Acre: Subtotal:	
Client:	DJM	PLS lbs/acre	10.46	Spring Bloom:	10	Annual/Biannual:	17.77%
Job Name/Mix:	Pollinator Prairie 29 Species	PLS per SqFt:	64.70	Summer Bloom:	10	Monarch Preferred:	37.25%
Acres:	3.50	Grass/Sedge:	0.28	Fall Bloom:	10	Milkweed:	0.85%
Common Name	**Botanical Name**	**Seeds/Lb**	**Lb./Acre**	**Oz./Acre**	**Seeds/SF.**	**CEC**	**Bloom Period**
Little Bluestem	*Schizachyrium scoparium*	240,670	0.543	8.69	3.000	5	N/A
Sideoats Grama	*Bouteloua curtipendula*	159,200	1.368	21.89	5.000	7	N/A
Indiangrass	*Sorghastrum nutans*	174,720	0.374	5.98	1.500	4	N/A
Big Bluestem	*Andropogon gerardii*	144,240	0.604	9.66	2.000	5	N/A
Switchgrass	*Panicum virgatum*	259,000	0.210	3.36	1.250	4	N/A
Virginia Wildrye	*Elymus virginicus*	100,000	0.523	8.36	1.200	5	N/A
Composite Dropseed	*Sporobolus compositus*	759,362	0.057	0.92	1.000	4	N/A
Troublesome Sedge	*Carex molesta*	400,000	0.027	0.44	0.250	3	N/A
Plains Coreopsis (A)	*Coreopsis tinctoria*	3,222,222	0.095	1.51	7.000	1	1,2
Lanceleaf Coreopsis	*Coreopsis lanceolata*	221,000	0.788	12.61	4.000	5	1,2
Golden Alexanders	*Zizia aurea*	172,000	0.317	5.07	1.250	5	1,2
Foxglove Beardtongue	*Penstemon digitalis*	1,602,620	0.082	1.30	3.000	3	1
Blue Wild Indigo	*Baptisia australis*	24,000	0.182	2.90	0.100	8	1,2
White Wild Indigo	*Baptisia alba*	27,200	0.080	1.28	0.050	6	1,2
Purple Coneflower	*Echinacea purpurea*	115,664	1.506	24.10	4.000	5	1,2,3
Pale Purple Coneflower	*Echinacea pallida*	106,000	0.205	3.29	0.500	7	1,2
Black-Eyed Susan (B)	*Rudbeckia hirta*	1,575,760	0.083	1.33	3.000	1	2,3
Partridge Pea (A)	*Chamaecrista fasciculata*	65,000	0.335	5.36	0.500	2	2,3
Illinois Bundleflower	*Desmanthus illinoensis*	85,000	0.512	8.20	1.000	3	1,2
Purple Prairie Clover	*Dalea purpurea*	279,000	0.195	3.12	1.250	8	1,2
White Prairie Clover	*Dalea candida*	278,000	0.196	3.13	1.250	8	1,2
Gray-Headed Coneflower	*Ratibida pinnata*	427,500	0.204	3.26	2.000	4	1,2,3
Upright Prairie Coneflower	*Ratibida columnifera*	737,104	0.236	3.78	4.000	0	1,2,3
Rattlesnake Master	*Eryngium yuccifolium*	177,700	0.245	3.92	1.000	8	2
Wild Quinine	*Parthenium integrifolium*	112,000	0.389	6.22	1.000	6	1,2
Stiff Goldenrod	*Oligoneuron rigidum, Solidago rigida*	1,009,000	0.097	1.55	2.250	5	2,3
Smooth Aster	*Symphyotrichum laeve*	1,014,000	0.032	0.52	0.750	7	2
Gray Goldenrod	*Solidago nemoralis*	1,008,000	0.024	0.38	0.550	2	2,3
Slender Mountain Mint	*Pycnanthemum tenuifolium*	6,048,000	0.014	0.23	2.000	4	1,2
False Sunflower	*Heliopsis helianthoides*	109,200	0.399	6.38	1.000	5	1,2,3
Tickseed Sunflower (A/B)	*Bidens aristosa*	130,000	0.168	2.68	0.5000	1	2
Gerardia	*Agalinis tenuifolia*	12,800,000	0.003	0.05	1.0000	4	3
Common Evening Primrose (B)	*Oenothera biennis*	1,376,000	0.016	0.25	0.5000	0	2,3
Sneezeweed	*Helenium autumnale*	1,464,516	0.015	0.24	0.500	5	3
Wild Bergamot	*Monarda fistulosa*	1,272,500	0.034	0.55	1.000	4	2,3
Fox Sedge	*Carex vulpinoidea*	1,297,000	0.101	1.61	3.000	3	N/A
Tall Boneset	*Eupatorium altissimum*	800,000	0.027	0.44	0.500	3	3
New England Aster	*Symphyotrichum novae-angliae*	1,100,000	0.020	0.32	0.500	4	2
Swamp Milkweed	*Asclepias incarnata*	153,761	0.156	2.49	0.550	4	3

Table 3. DJM Ecological Services Seeding List

This upcoming winter, 147 species will be sown onto the MSD path. Of the species seeded, 36 were only collected this year, 49 were collected both this year and previous years, and 62 were from older collection years. These species will be a part of 32 different families: Acanthaceae, Alismataceae, Apiaceae, Apocynaceae, Asparagaceae, Asteraceae, Balsaminaceae, Brassicaceae, Campanulaceae, Cucurbitaceae, Cyperaceae, Euphorbiaceae, Fabaceae, Gentianaceae, Iridaceae, Juncaceae, Lamiaceae, Malvaceae, Melanthiaceae, Melastomataceae, Onagraceae, Orobanchaceae, Penthoraceae, Phrymaceae, Plantaginaceae, Poaceae, Polygonaceae, Ranunculaceae, Rubiaceae, Saxifragaceae, Scrophulariaceae, Verbenaceae. These collections will be separated into 4 seed mixes: wetland/creek bank, woodland edges, Ameren path (rocky, upland area) and the prairie path mix. Seeds will be hand sown onto the bare soil by both volunteers and staff. This seeding totaled 52.87 kg (116.56 lbs) of seed.

Overall, 196 species will be sown including the 33 from the fall seeding, 39 from Pure Air Natives, and 147 from the winter seeding. The total weight of the seed being put onto the path is 71.50 kg (157.63 lbs).

Conclusion

Throughout the collection process, all plant species were uploaded to iNaturalist under the tag “LREC Seeds”, where you can find pictures for species identification and magnified pictures of their seeds.

Although we did not collect all species on the target list, 85.5% of the species on the original target list will be seeded this year. Of the species on the target list 75% were hand collected this year by staff and volunteers, 4% were purchased by Pure Air Natives, and 6.5% were included from past years collections. The other 14.5% will likely be added in upcoming years in supplemental seedings. In addition to the target list, 97 initially untargeted species will also be added onto the path. All these species have C-Values ranging from 0 to 7.

Figure 4. Picture of intern Cailyn Haubein with seed being prepared for winter seeding. Photo by Adam Rembert.

In the next few years restoration efforts will continue to take place according to common prairie restoration procedures. This upcoming year, plants will be mowed to 6 inches to suppress annual weed competition and promote root growth. The following year, plants will be mowed to 1 foot. The third-year plants will be allowed to grow unincumbered, followed by monitoring with spot spraying of invasive species and potentially a controlled burn (Smith et al. 2020). Other restoration efforts are taking place along the MSD path including plantings on the banks of Deer Creek using leftover plugs of various prairie species grown for LREC partner schools. Willow stakes collected from Shaw Nature Reserve have also been planted along the stream bank to help secure soils and prevent erosion. Additionally, invasive species including sweet clover, Japanese hops, Johnson grass, and sericea lespedeza are continually being removed and monitored to prevent spread into the MSD path.

The results of this restoration have the potential to show how major construction projects can influence the success of restoration efforts. Specifically, this project will test the impacts of soil compaction, the homogenization of soil and bedrock, and decreased soil nutrient availability and microbial activity, giving new insights into how we can improve restoration efforts following future construction projects. Not only will this be important scientific evidence, but this process will be used as a teaching tool for both schools that partner with the Litzsinger Road Ecology Center, and our volunteers.

Bringing this context for restoration to people of all ages will hopefully inspire a new generation of advocates for the maintenance and expansion of our ecosystems.

References

Baranski, K., & Faupel, J. (2021). Revised Prairie Restoration Flora of the St. Louis Region of
Illinois and Missouri. Missouriensis, 39, 24–27.

Espeland, E. K., & Perkins, L. B. (2013). Annual Cover Crops Do Not Inhibit Early Growth of
Perennial Grasses on a Disturbed Restoration Soil in the Northern Great Plains, USA. Ecological Restoration, 31(1), 69–78. https://doi.org/10.3368/er.31.1.69

Espeland, E. K., & Perkins, L. B. (2017). Weed Establishment and Persistence after Water
Pipeline Installation and Reclamation in the Mixed Grass Prairie of Western North Dakota. Ecological Restoration, 35(4), 303–310. https://doi.org/10.3368/er.35.4.303

Gallagher, M. K., & Wagenius, S. (2015). Seed source impacts germination and early establishment of dominant grasses in prairie restorations. Journal of Applied Ecology, 53(1), 251–263. https://doi.org/10.1111/1365-2664.12564

Kathriner, O., & Faupel, J. (2022). Botanical inventory of early successional species following
pipeline construction along a dynamic urban creek. Missouriensis, 40, 17–27.

Ladd, D., & Thomas, J. R. (2015). Ecological checklist of the Missouri flora for Floristic Quality
Assessment. Phytoneuron, 1–274.

Leahy, M. J., Buback, S., & Maginel, C. J. (2020). Twenty Years of tallgrass prairie reconstruction and restoration at Pawnee Prairie Natural Area, Missouri. Natural Areas Journal, 40(1), 62. https://doi.org/10.3375/043.040.0108

Smith, D., Williams, D., Houseal, G. & Henderson, K. The Tallgrass Prairie Center guide to
prairie restoration in the Upper Midwest. University of Iowa Press, 2010.