Toronto and Region Conservation Authority

The Meadoway: Vegetation, Bird, and Butterfly Monitoring 2016, 2018-2024

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INTRODUCTION

The Meadoway project involves the revitalization of a 16 km linear hydro corridor, formerly known as the Gatineau Hydro Corridor (Figure 1 and 2). The goals of the revitalization are to create and maintain meadow habitat and to create an active east-west link between downtown Toronto and Rouge National Urban Park becoming one of the largest urban greenspaces in Canada (Sharma 2018).

Restoration and maintenance activities have included seeding portions of the corridor with flora species native to meadows in the region, selective mowing, and invasive species management. Restoration began in 2012 with the section near McCowan Road and Lawrence Avenue East being prepared and seeded. Several other sections were seeded between 2013 and 2016; however, some sections remained un-restored as highly manicured turfgrass. Several of these turfgrass areas started undergoing restoration (spraying, tilling, seeding cover crops) in the summer of 2019 while other sections began in 2020 and 2023. Mowing and herbicide application have occurred intermittently in different sections over the years.

Monitoring activities occurred in 2016 and 2018-2024 to document changes in species composition related to the vegetation, breeding birds, and butterfly presence. This report is an update to the 2023 monitoring report (TRCA 2023) but focusing more on comprehensive reporting of all species and percent cover across all years of monitoring. We have also included a summary of data collected at an experimental plot called the Xerces plot that tested a unique site preparation method. We also summarized the results of bird and butterfly surveys throughout The Meadoway and conducted pre- and post-restoration comparisons where possible.

Figure 1. Hairy beardtongue (*Penstemon hirsutus*) in late May 2024 at The Meadoway.

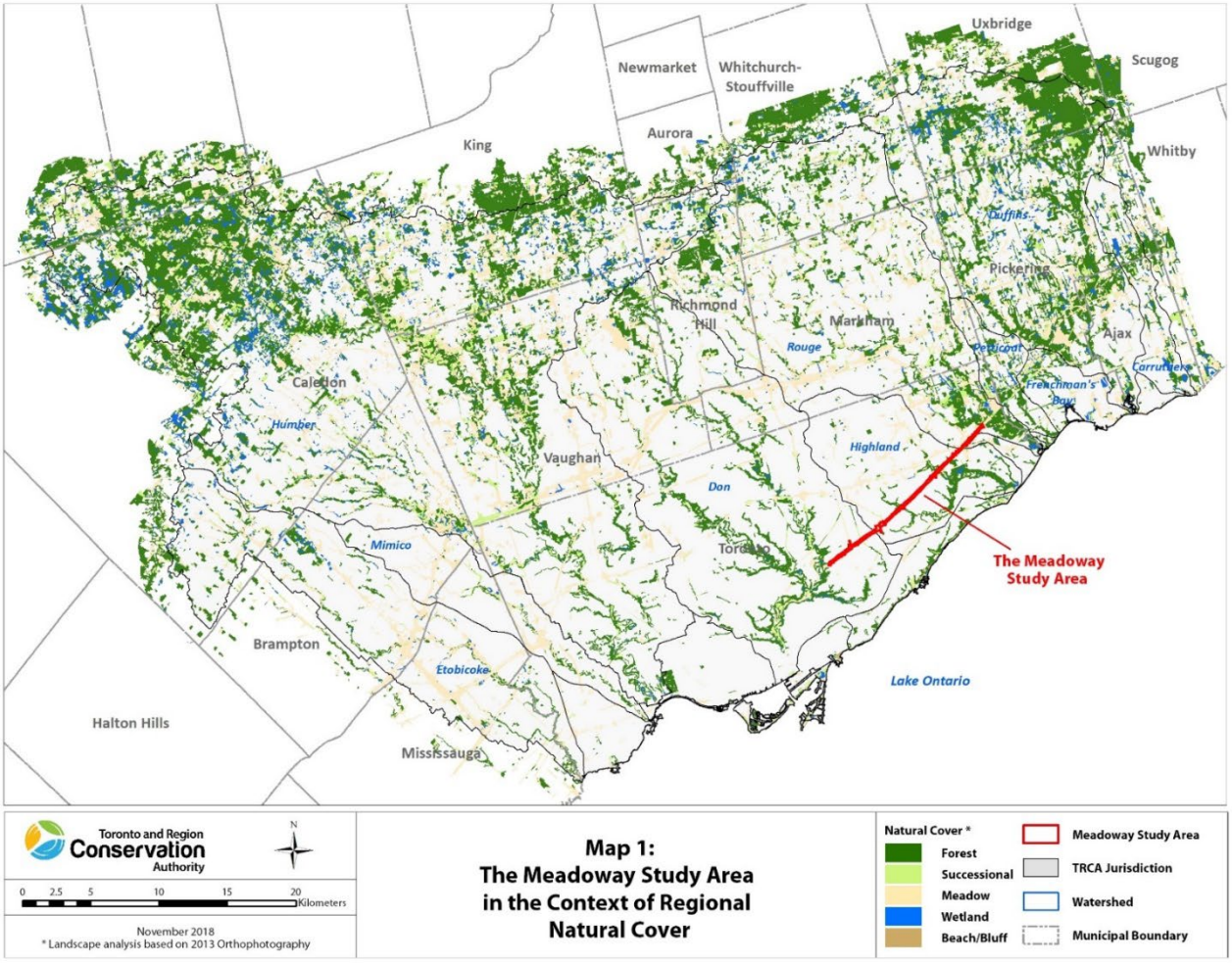

Figure 2. Geographic location of The Meadoway related to TRCA's jurisdiction.

METHODOLOGY

Vegetation plots

The methodology for monitoring meadow ecosystems used by Toronto and Region Conservation Authority (TRCA) is based on the Ecological Monitoring and Assessment Network (EMAN) endorsed terrestrial vegetation biodiversity monitoring protocols identified by Roberts-Pichette and Gillespie (1999). As the EMAN protocol was originally intended for forest communities, adaptations to the protocol were made making it specific to meadow ecosystems (Figure 3)

Each meadow plot consisted of one 20 x 20 m (400 m^2) main plot, five 2 x 2 m (4 m^2) shrub and sapling regeneration sub-plots and five 1 x 1 m (1 m^2) ground cover vegetation sub-plots (nested within the larger regeneration sub-plots). Shrub and sapling regeneration sub-plots were monitored once during the growing season (September). Sites were visited approximately the same time each year coinciding with the second ground vegetation visit. All shrubs and seedlings that were <10 cm diameter-at-breast-height and ≥16 cm in height were considered in regeneration sub-plots. Only live plants were recorded in regeneration sub-plots. The boundaries of the 2 x 2 m sub-plots were identified and delineated. All qualifying plant species originating within the sub-plot were identified. Individuals within each species were then measured with a metre stick and recorded into the appropriate height class located on the data sheet. Height measurements were taken from the ground to the upper most living portion of the plant. For plants that leaned, the vertical distance from the ground to the highest part of the plant was recorded as the height. The percent cover that each species provides was estimated.

Figure 3. Monitoring vegetation plots at The Meadoway in 2023.

All herbaceous plants, regardless of size, as well as shrub, tree, and woody vines <16 cm in height were considered in ground vegetation sub-plots. Ground vegetation sub-plot monitoring was conducted twice during the growing season to capture early and late growing meadow/prairie species. The first visit was in early June and the second in late summer (September). Sites were visited approximately the same time each year. Each plant species originating within or hanging over into the 1 x 1 m sub-plot was identified. A 50 x 50 cm grid square consisting of smaller 10 x 10 cm grids was positioned over corner "A" of the sub-plot and shifted to the other three corners. The number of 10 x 10 cm squares that each species occupies was summed to determine their total percentage of cover within the sub-plot. It was also noted if a species was solitary. The cover of dead vegetation (thatch) was also measured in the ground vegetation plots (only in the spring visit).

Species lists were created for the plot as a whole using data combined from the 20 x 20, all 2 x 2s and all 1 x 1s. For a detailed description of vegetation monitoring methodology please see the Meadow Vegetation LTMP Monitoring Protocol (TRCA 2022).

Vegetation data were interpreted using TRCA's local rank (L-rank) system for flora (TRCA 2017). The L-rank system is a species scoring and ranking system developed at TRCA to provide guidance for natural heritage protection and management within the jurisdiction. The L-rank system uses simple ranks to convey individual species' ecological needs and sensitivities rather than just "rarity" in order to portray such complexities on a

simple ordinal scale. Flora are scored using four criteria: local occurrence, population trend, habitat dependence and sensitivity to development impacts. For example, species ranked L1 would have: a limited local occurrence, declining population trends, habitat specialist preferences, and a sensitivity to development. Species ranked L5 would have: a widespread local occurrence, increasing population trends, habitat generalist preferences, and a tolerance to development. These are extreme examples and species can be ranked L1, L2, L3, L4 or L5 based on the scores associated with this combination of ecological needs and population status assessments. In addition, flora species can be categorized as follows: L1-L3 species are of regional conservation concern, L4 species are of conservation concern in urban areas, L5 species are not of conservation concern at this time, L* species are native to southern Ontario but with no known natural records in TRCA jurisdiction, LX species have been extirpated from the TRCA jurisdiction (but have been planted since extirpation), L+ species are introduced species not native to the TRCA jurisdiction, L+? species are probably introduced.

Bird stations

Meadow bird monitoring followed an adapted Ontario Forest Bird Monitoring Protocol (Figure 4). This protocol is also used for meadow bird surveys conducted through TRCA's Terrestrial Long-term Monitoring Program (TRCA 2011). Meadow birds were monitored twice during the field season with the first visit occurring between May 15th and May 30th, and the second visit between May 30th and June 15th, with at least 10 days between visits. Counts were conducted between 05:00 and 10:00 hours and at approximately the same time of day on subsequent visits from year to year. Counts were only conducted in good weather conditions (no rain, light winds). All birds seen or heard within a 100 m radius circle and during a 10-minute time period were recorded. This report only contains species potentially breeding at the site.

Figure 4. Biologist conducting bird monitoring.

Butterfly transects

Butterflies were surveyed by slowly walking a specified path through the meadow and identifying/counting butterfly species observed (e.g., Figure 5). Butterflies were identified to species where possible or to genus if species-level identification was not possible. Four visits were made each year to capture variation in adult emergence dates among resident and migratory species. Surveys were conducted between 09:00 and 16:00 and only in good weather conditions (>10°C, no rain, light winds). Start and end times were recorded and were generally consistent among years.

Figure 5. Eastern Tailed Blue (*Cupido comyntas*) at The Meadoway.

RESULTS

Thirty-five vegetation plots were set up between 2016 and 2024 (Table 1, Figure 6). Plots were set up in different years corresponding to the occurrence of management activities. Bird and butterfly monitoring were completed in 2016, and 2018-2024. In 2016 and 2018, five sections were surveyed for butterflies with transects situated on the paved trail that runs the length of the corridor. In 2019, transects were moved slightly in each section to run beneath the northmost hydro wires for the entire length of the corridor (instead of along the trail).

Table 1. Vegetation plots, bird surveys, and butterfly survey locations and years surveyed. If blank, no surveys were done.

Section	Veg plot name	Vegetation plot monitoring years	Bird survey station #	Bird survey years	Butterfly transect	Butterfly survey years
1.1	MV-24_1.1X	2019-2024	11	2021-2024	1C	2021-2024
	MV-24_1.1Y	2020-2024				
1.2	MV-24_1.2P	2018-2024	8	2020-2024	Bermondsey to Soccer Field	2022, 2024
					1F	2020-2024
1.3	MV-24_1.3Q	2018, 2020-2024	12	2021-2024	1H	2021-2024
	MV-24_1.3V	2019, 2020				
1.4	MV-24_1.4W	2019	6	2018, 2019, 2021-2024	1J	2019, 2021-2024
	MV-24_1.4R	2018				
	MV-24_1.4AI	2023, 2024				
2.2	MV-24_2.2AJ	2023, 2024	15	2022, 2024	2	2022-2024
	MV-24_2.2S	2018, 2019, 2021-2024				
2.3	MV-24_2.3T	2018, 2019, 2021-2024				
2.4	MV-24_2.4U	2018, 2019, 2021-2024	7	2018, 2019-2024	2K	2019, 2021-2024
3.2	MV-24_3.2AA	2020, 2024	16	2024	3.2A, 3.2B	2024
3.3	MV-24_3.3AB	2020, 2024	17	2024	3.3A	2024
4.1	MV-24_4.1G	2016, 2018-2024	1	2016, 2018-2024	A	2016, 2018-2024
	MV-24_4.1H	2016, 2018-2024			B	2016, 2018, 2019, 2021-2024
	MV-24_4.1I	2016, 2018, 2019, 2021-2024				
4.2	MV-24_4.2A	2016, 2018-2024	2	2016, 2018-2024	A, B, C, D	2016, 2018-2024
	MV-24_4.2B	2016, 2018-2024				
	MV-24_4.2C	2016, 2018-2024				
4.3	MV-24_4.3D	2016, 2018-2024	3	2016, 2018-2024	A, B, D	2016, 2018-2024
	MV-24_4.3E	2016, 2018-2024				
	MV-24_4.3F	2016, 2018-2024				
4.4	MV-24_4.4J	2016, 2018-2024	4	2016, 2018-2024	B	2016, 2018-2024

Section	Veg plot name	Vegetation plot monitoring years	Bird survey station #	Bird survey years	Butterfly transect	Butterfly survey years
	MV-24_4.4K	2016, 2018-2024			E	2021-2024
	MV-24_4.4L	2016, 2018-2024				
5.1	MV-24_5.1AC	2020, 2023, 2024				
5.2	N/A	N/A	9	2020, 2024	D	2020, 2023, 2024
5.3	MV-24_5.3AD	2020, 2023, 2024	10	2020, 2024	E, F	
5.4	MV-24_5.4AE	2020, 2023, 2024			G	
6.1	MV-24_6.1AF	2020, 2024				
6.2	MV-24_6.2AG	2020, 2024	13	2021, 2022	B	2021-2022
6.4	MV-24_6.4AH	2020, 2024	14	2021, 2022, 2024	C	2021-2024
7.1	MV-24_7.1M	2016, 2018-2024	5	2016, 2018-2024	A, B, C, D, E	2016, 2018-2024 (E only surveyed in 2019)
	MV-24_7.1N	2016, 2018-2024				
	MV-24_7.1O	2016, 2018-2024				

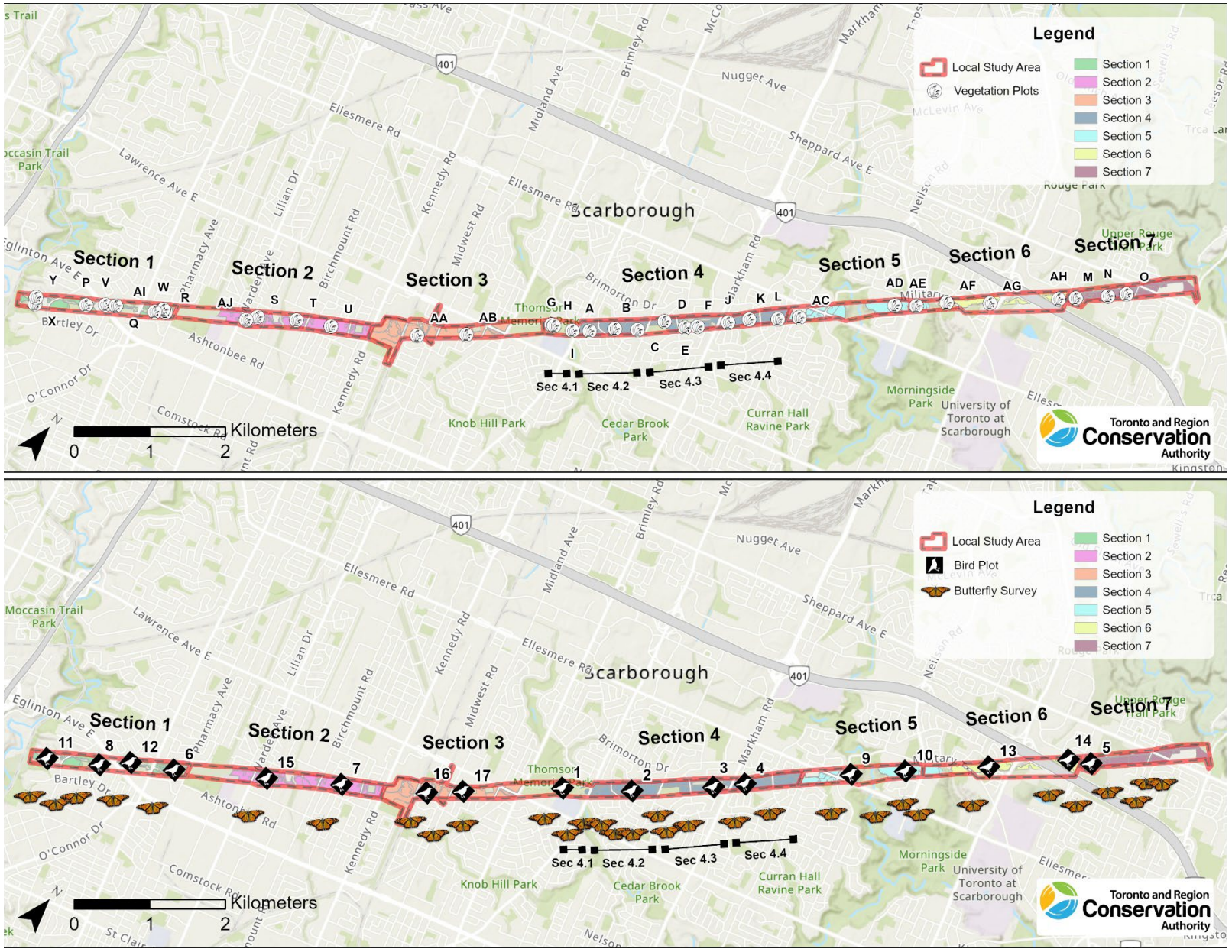

Figure 6. Vegetation plot, bird, and butterfly survey locations at The Meadoway in 2016, 2018-2024.

Vegetation plots

Data collected at vegetation monitoring plots are comprehensively presented in this section of the report in tabular format. This allows for a visual representation of changes in plant communities and percent cover over time. Tables group species by plant type as graminoid, forb, targeted invasive, or woody species. Plant species are also grouped as native or non-native based on whether or not they are native to Ontario. Cover values are presented from highest to lowest for each of the groupings (plant type, native, or non-native) and are shaded to allow easy visualization of changes. Thatch and bare soil cover are also presented at the bottom of each table.

In each table, the percent cover value represents the highest average cover by species from the spring and summer visits. For example, assume that at plot A during the spring visit, sub-plots 1-5 each had 10% cover of common milkweed (*Asclepias syriaca*) and during the summer visit, sub-plots 1-5 each had 20% cover of common milkweed. This means the average cover in spring was 10% and the average cover in summer was 20%. The tables use the maximum cover of the spring and summer visits, and based on this example, cover of common milkweed in the table would be reported as 20%. Darkening shades of green represent higher cover values as indicated in the legend for each table. Text summaries are provided by section, with plot-specific details found directly in tables.

Section 1

Section 1.1

Two plots were monitored in section 1.1 (plots 1.1X and 1.1Y; Table 2 and 3). Pre-restoration in 2019, plot 1.1X was dominated by non-native graminoids and dog-strangling vine (*Vincetoxicum rossicum*). Post-restoration plots had a higher cover of native graminoids and forbs than pre-restoration. Plot 1.1Y had a high cover of panic grass (*Panicum capillare*) and oats in 2020, but covers of these species decreased to virtually zero in subsequent years. Oats are part of the cover crops and is expected to disappear in the first couple of years. Panic grass is a native plant that is common in disturbed areas and disappeared in these plots, which is the natural successional process.

The cover of tall goldenrod (*Solidago altissima* var. *altissima*) in plot 1.1X has increased from 4.6% in 2019 to 22% in 2024, and in plot 1.1Y from 4.4% in 2020 to 61.4% in 2024. False dragonhead (*Physostegia virginiana* ssp. *virginiana*), a notable species of regional conservation concern, was found to have established in both plots X and Y.

Section 1.2

One plot was monitored in section 1.2 (plot 1.2P; Table 4). In 2018 and 2019, plot 1.2P was dominated by non-native graminoids and forbs. By 2024, dominant species include tall goldenrod (37.2%), and several non-native forbs. Creeping thistle (*Cirsium arvense*) cover was high in 2023 (12.2%) and 2024 (9.9%).

Section 1.3

One plot was monitored in section 1.3 (plot 1.3Q; Table 5). In 2018, plot 1.3Q contained only non-native graminoids and forbs. By 2024, the plot contained a variety of native forbs with high covers such as ox-eye (*Heliopsis helianthoides*) with a cover of 29.2%.

Section 1.4

One plot was monitored in section 1.4 (plot 1.4AI; Table 6). In 2024, plot 1.4AI was dominated by tall goldenrod (48.4% in 2024) along with several other native and non-native grasses and forbs.

Table 2. Plot 1.1X percent cover by species

Species	Common Name	L-rank	Native or Non-native	Plant Type	2019*	2020	2021	2022	2023	2024
Panicum capillare	panic grass	L5	Native	Graminoids	0	17.4	0	0	0	0
Panicum virgatum	switch grass	L3	Native	Graminoids	0	2.4	2.8	3.1	3.7	2
Andropogon gerardii	big bluestem	L3	Native	Graminoids	0	1.2	1.6	4.2	5.2	1.3
Sorghastrum nutans	copper savannah grass	L2	Native	Graminoids	0	1.2	1.2	1.2	2.2	1.8
Elymus canadensis	Canada wild rye	L4	Native	Graminoids	0	0.4	1.5	0.4	0.5	0
Elymus virginicus var. virginicus	Virginia wild rye	L5	Native	Graminoids	0	0	0.9	0.2	0.3	0
Echinochloa muricata var. microstachya	small-spiked barnyard grass	L5	Native	Graminoids	0	0.6	0	0	0	0
Bromus ciliatus	fringed brome grass	L3	Native	Graminoids	0	0	0.1	0.1	0.2	0
Juncus dudleyi	Dudley's rush	L5	Native	Graminoids	0	0	0	0	0	0.4
Lolium pratense	meadow fescue	L+	Non-native	Graminoids	15.6	6	7	6.4	6.6	9.4
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	12.6	0	0	0	0.8	8.2
Poa compressa	flat-stemmed blue grass	L+	Non-native	Graminoids	3.2	0	0.3	3.2	4.4	3.2
Festuca rubra ssp. rubra	red fescue	L+	Non-native	Graminoids	6	0	0.1	0	0	0
Avena sativa	oats	L+	Non-native	Graminoids	0	4	0	0	0	0
Setaria pumila ssp. pumila	yellow foxtail	L+	Non-native	Graminoids	0	2	0.2	0.1	0	0
Elymus repens	quack grass	L+	Non-native	Graminoids	0.1	0	0.6	0.1	0.4	0.2
Digitaria sanguinalis	hairy crab grass	L+	Non-native	Graminoids	0	0.8	0	0	0	0
Solidago altissima	tall goldenrod	L5	Native	Forbs	4.6	2.8	13.2	14.4	20.8	22
Desmodium canadense	showy tick-trefoil	L5	Native	Forbs	0	3.4	7.8	6.2	13	10
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	0	3.2	6.6	12	4.2	2.7
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	0	2.6	2.6	3	8.4	9
Oenothera biennis	common evening-primrose	L5	Native	Forbs	0	11	11.8	0.4	0.6	0.1
Monarda fistulosa	wild bergamot	L5	Native	Forbs	0	0.6	1.7	1.7	2.4	1.7
Asclepias incarnata ssp. incarnata	swamp milkweed	L4	Native	Forbs	0	1.2	1.6	0.7	2	2.1
Symphyotrichum ericoides var. ericoides	heath aster	L5	Native	Forbs	0.1	0.2	0.4	1.5	3.2	1.8
Symphyotrichum lanceolatum var. lanceolatum	panicled aster	L5	Native	Forbs	0.8	0.6	0.6	1.6	2	1.2
Asclepias syriaca	common milkweed	L5	Native	Forbs	0	0.6	1.2	1.6	0.6	2.4
Achillea borealis var. borealis	woolly yarrow	L5	Native	Forbs	1	0	0.6	1	0.8	0.8
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	0	1.2	0.8	1.6	0.1	0
Equisetum arvense	field horsetail	L5	Native	Forbs	1.8	0.2	0.2	0.4	0.5	0.2
Euthamia graminifolia	grass-leaved goldenrod	L5	Native	Forbs	0	0	1	1	0.6	0.4
Solidago gigantea	late goldenrod	L5	Native	Forbs	1.8	0	0	0.2	0.2	0.8
Rudbeckia laciniata	cut-leaved coneflower	L5	Native	Forbs	0	0.6	0.2	0.1	0.1	0
Symphyotrichum novae-angliae	New England aster	L5	Native	Forbs	0	0	0.1	0.2	0.2	0.2
Erigeron annuus	daisy fleabane	L5	Native	Forbs	0	0	0	0.2	0.4	0
Erigeron canadensis	horse-weed	L5	Native	Forbs	0	0.3	0.2	0	0.1	0
Oxalis dillenii	deflexed yellow wood-sorrel	L5	Native	Forbs	0	0	0.1	0.2	0.2	0.1
Oxalis stricta	common yellow wood-sorrel	L5	Native	Forbs	0	0.3	0.2	0	0	0
Physostegia virginiana ssp. virginiana	false dragonhead	L3	Native	Forbs	0	0	0	0	0	0.4
Potentilla norvegica	rough cinquefoil	L+?*	Native	Forbs	0	0.2	0.1	0	0	0
Acalypha rhomboidea	three-seeded mercury	L5	Native	Forbs	0	0.2	0	0	0	0
Epilobium ciliatum ssp. ciliatum	sticky willow-herb	L5	Native	Forbs	0	0	0	0	0.1	0
Symphyotrichum laeve var. laeve	smooth aster	L3	Native	Forbs	0	0	0.1	0	0	0
Vicia cracca	cow vetch	L+	Non-native	Forbs	5.8	11.8	8.2	6.8	5.2	5.5
Medicago lupulina	black medick	L+	Non-native	Forbs	0	0.9	1	1.2	12.1	6.2
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	0.2	7.8	2.2	2.4	3.5	2.4
Cichorium intybus	chicory	L+	Non-native	Forbs	0	1.4	3.8	0.6	1.4	1.5
Melilotus albus	white sweet clover	L+	Non-native	Forbs	0.1	3.8	2.7	0.2	0.4	0
Taraxacum officinale	dandelion	L+	Non-native	Forbs	0	0.5	0	1.2	2.9	1.6
Plantago lanceolata	English plantain	L+	Non-native	Forbs	0	0	0	0.4	1	1.4
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	0	0.2	0.1	0.4	1.5	0.2
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	0.1	0.1	0.3	0.5	0.9	0.1
Hypericum perforatum	common St. John's-wort	L+	Non-native	Forbs	0	0.1	1	0	0.2	0.5
Lotus corniculatus	bird's foot trefoil	L+	Non-native	Forbs	0.1	0	0.4	0.4	0.6	0
Lythrum salicaria	purple loosestrife	L+	Non-native	Forbs	0	0	0.5	0.2	0.4	0.4
Leucanthemum vulgare	ox-eye daisy	L+	Non-native	Forbs	0	0	0	0.2	0.6	0.2
Trifolium pratense	red clover	L+	Non-native	Forbs	0	0	0.1	0.1	0.2	0.2
Lactuca serriola	prickly lettuce	L+	Non-native	Forbs	0	0	0.2	0.1	0.1	0
Cirsium vulgare	bull thistle	L+	Non-native	Forbs	0	0	0	0	0.2	0.1
Verbascum thapsus	common mullein	L+	Non-native	Forbs	0	0.2	0.1	0	0	0
Chenopodium album	lamb's quarters	L+	Non-native	Forbs	0	0.1	0.1	0	0	0
Trifolium repens	white clover	L+	Non-native	Forbs	0	0.2	0	0	0	0
Amaranthus albus	tumbleweed	L+	Non-native	Forbs	0	0.1	0	0	0	0
Dipsacus fullonum	teasel	L+	Non-native	Forbs	0	0	0	0.1	0	0
Ranunculus acris	tall buttercup	L+	Non-native	Forbs	0.1	0	0	0	0	0
Tragopogon dubius	lemon-yellow goat's beard	L+	Non-native	Forbs	0	0	0	0	0.1	0
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	29.4	0.6	1	1.3	2.5	2.6
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	0.2	0.7	0.8	1	1.1	1.5
Acer negundo	Manitoba maple	L+?*	Native	Woody	0.1	0.2	0	0	0	0
Vitis riparia	riverbank grape	L5	Native	Woody	0.1	0.2	0	0	0	0
Rhus typhina	staghorn sumach	L5	Native	Woody	0	0.2	0	0	0	0
Rhamnus cathartica	common buckthorn	L+	Non-native	Woody	0.1	0.1	0	0	0	0
Ailanthus altissima	tree-of-heaven	L+	Non-native	Woody	0	0.1	0	0	0	0
Morus alba	white mulberry	L+	Non-native	Woody	0	0.1	0	0	0	0
Thatch	Thatch			Thatch	48	4.5	19.6	27.4	7.8	23
Bare soil	Bare soil			Bare soil	0	54.6	6.8	5.8	2.8	0

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0
*Only spring survey completed

Table 3. Plot 1.1Y percent cover by species

Species	Common Name	L-rank	Native or Non-native	Plant Type	2020	2021	2022	2023	2024
Panicum capillare	panic grass	L5	Native	Graminoids	65	0.1	0	0	0
Panicum virgatum	switch grass	L3	Native	Graminoids	1	3.2	3.5	2	0.5
Elymus virginicus var. virginicus	Virginia wild rye	L5	Native	Graminoids	0	2.9	1.4	1.2	0.8
Sorghastrum nutans	copper savannah grass	L2	Native	Graminoids	2.2	0.6	0.8	1.2	1
Andropogon gerardii	big bluestem	L3	Native	Graminoids	1.1	0.6	1.1	1	0.3
Bromus ciliatus	fringed brome grass	L3	Native	Graminoids	0	0.7	0.3	0.3	0.1
Echinochloa muricata var. microstachya	small-spiked barnyard grass	L5	Native	Graminoids	1.2	0	0	0	0
Juncus dudleyi	Dudley's rush	L5	Native	Graminoids	0	0	0.1	0.2	0.5
Elymus canadensis	Canada wild rye	L4	Native	Graminoids	0	0.1	0.1	0	0
Carex bebbii	Bebb's sedge	L5	Native	Graminoids	0	0	0	0	0.1
Avena sativa	oats	L+	Non-native	Graminoids	23	0	0	0	0
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	0	0	0	0.4	1.6
Setaria pumila ssp. pumila	yellow foxtail	L+	Non-native	Graminoids	0.6	0.1	0	0	0
Digitaria sanguinalis	hairy crab grass	L+	Non-native	Graminoids	0.4	0	0	0	0
Agrostis gigantea	redtop	L+	Non-native	Graminoids	0	0	0.1	0	0
Elymus repens	quack grass	L+	Non-native	Graminoids	0	0.1	0	0	0
Solidago altissima	tall goldenrod	L5	Native	Forbs	4.4	37.6	38	64.8	61.4
Physostegia virginiana ssp. virginiana	false dragonhead	L3	Native	Forbs	0	2.7	8.2	12.8	13.4
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	1.6	4.6	7.4	4.2	6.1
Monarda fistulosa	wild bergamot	L5	Native	Forbs	0.8	2.2	2.7	4.6	2.4
Oenothera biennis	common evening-primrose	L5	Native	Forbs	4.2	4.6	2.1	1.2	0.2
Asclepias incarnata ssp. incarnata	swamp milkweed	L4	Native	Forbs	1.2	2	2	1.8	1.8
Rudbeckia laciniata	cut-leaved coneflower	L5	Native	Forbs	2.2	2.3	2.1	1.2	0.5
Penstemon digitalis	foxglove beard-tongue	L4	Native	Forbs	0.1	0.1	0.9	2.4	2.9
Asclepias syriaca	common milkweed	L5	Native	Forbs	1	0.9	1.6	1.4	1
Symphyotrichum lanceolatum var. lanceolatum	panicled aster	L5	Native	Forbs	0.2	0.6	1.2	1.8	0.9
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	0.8	0.3	0.7	0.7	1.8
Symphyotrichum novae-angliae	New England aster	L5	Native	Forbs	0.1	0.3	1.3	1.8	0.8
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	2.2	1.1	0.2	0.1	0
Symphyotrichum laeve var. laeve	smooth aster	L3	Native	Forbs	0	0.2	0.8	1.1	1.2
Euthamia graminifolia	grass-leaved goldenrod	L5	Native	Forbs	0	0.1	1.2	0.7	0.8
Potentilla norvegica	rough cinquefoil	L+?*	Native	Forbs	0.4	1	1	0.1	0.1
Symphyotrichum ericoides var. ericoides	heath aster	L5	Native	Forbs	0	0.1	0.6	0.4	0.8
Epilobium ciliatum ssp. ciliatum	sticky willow-herb	L5	Native	Forbs	0.1	0.2	0.4	0.6	0.5
Equisetum arvense	field horsetail	L5	Native	Forbs	0.4	0.1	0.3	0.6	0.3
Oxalis dillenii	deflexed yellow wood-sorrel	L5	Native	Forbs	0.6	0.4	0.2	0.1	0
Physalis virginiana	Virginia ground-cherry	LU	Native	Forbs	0	0	0	0.8	0
Solidago canadensis var. canadensis	Canada goldenrod	L5	Native	Forbs	0	0	0	0	0.8
Erigeron canadensis	horse-weed	L5	Native	Forbs	0	0.6	0.1	0	0
Eupatorium perfoliatum	boneset	L5	Native	Forbs	0.1	0.2	0.2	0.1	0.1
Desmodium canadense	showy tick-trefoil	L5	Native	Forbs	0.4	0	0.2	0	0
Verbena hastata	blue vervain	L5	Native	Forbs	0	0.2	0.3	0	0
Penstemon hirsutus	hairy beard-tongue	L3	Native	Forbs	0	0.1	0.1	0.2	0
Eutrochium maculatum var. maculatum	spotted Joe-Pye weed	L5	Native	Forbs	0	0.1	0.1	0	0.1
Hypoxis hirsuta	yellow star-grass	LX	Native	Forbs	0.2	0	0	0	0
Amphicarpaea bracteata	hog-peanut	L5	Native	Forbs	0	0	0.1	0	0
Drymocallis arguta	tall cinquefoil	L3	Native	Forbs	0	0	0.1	0	0
Erigeron annuus	daisy fleabane	L5	Native	Forbs	0	0	0	0.1	0
Liatris spicata	spike blazing-star	L2	Native	Forbs	0.1	0	0	0	0
Lobelia cardinalis	cardinal flower	L1	Native	Forbs	0.1	0	0	0	0
Ratibida pinnata	grey-headed coneflower	L+*	Native	Forbs	0	0	0	0.1	0
Solidago nemoralis ssp. nemoralis	grey goldenrod	L5	Native	Forbs	0.1	0	0	0	0
Vicia cracca	cow vetch	L+	Non-native	Forbs	5.4	7.4	7.2	7.2	7
Lythrum salicaria	purple loosestrife	L+	Non-native	Forbs	1.4	1	1.3	2.6	2.8
Taraxacum officinale	dandelion	L+	Non-native	Forbs	0.9	1.2	1.3	1.7	1.4
Hypericum perforatum	common St. John's-wort	L+	Non-native	Forbs	0.8	2.7	0.2	0.5	1.3
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	1.1	1.4	0.9	1	0.9
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	0.2	0.1	0.4	1.1	0.5
Sonchus arvensis ssp. arvensis	glandular perennial sow-thistle	L+	Non-native	Forbs	0	0.2	0.6	0.6	0
Medicago lupulina	black medick	L+	Non-native	Forbs	0	0.3	0.4	0.3	0
Plantago major	common plantain	L+	Non-native	Forbs	0	0.1	0.4	0.2	0.2
Plantago lanceolata	English plantain	L+	Non-native	Forbs	0	0.1	0.1	0.4	0.2
Oenothera fruticosa ssp. glauca	sundrops	L+	Non-native	Forbs	0.4	0	0	0	0
Chenopodium album	lamb's quarters	L+	Non-native	Forbs	0.2	0.1	0	0	0
Trifolium pratense	red clover	L+	Non-native	Forbs	0	0.1	0.1	0	0.1
Chaenorhinum minus ssp. minus	dwarf snapdragon	L+	Non-native	Forbs	0.2	0	0	0	0
Sonchus asper	spiny sow-thistle	L+	Non-native	Forbs	0	0.2	0	0	0
Alliaria petiolata	garlic mustard	L+	Non-native	Forbs	0	0	0	0	0.1
Cirsium vulgare	bull thistle	L+	Non-native	Forbs	0	0	0	0	0.1
Lactuca serriola	prickly lettuce	L+	Non-native	Forbs	0	0.1	0	0	0
Rumex crispus	curly dock	L+	Non-native	Forbs	0	0	0	0	0.1
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	3.6	3.7	2.6	2.3	2.2
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	1.5	1.2	3.7	2.6	3.1
Acer negundo	Manitoba maple	L+?*	Native	Woody	0.1	0.1	0.4	0.1	0.2
Rhus typhina	staghorn sumach	L5	Native	Woody	0.2	0	0	0.1	0
Vitis riparia	riverbank grape	L5	Native	Woody	0.1	0	0.1	0	0
Parthenocissus vitacea	thicket creeper	L5	Native	Woody	0	0	0	0	0.1
Rhamnus cathartica	common buckthorn	L+	Non-native	Woody	0.2	0	0.2	0.2	0
Ailanthus altissima	tree-of-heaven	L+	Non-native	Woody	0.2	0.1	0.2	0	0
Morus alba	white mulberry	L+	Non-native	Woody	0.1	0.1	0.1	0.1	0
Rosa canina	dog rose	L+	Non-native	Woody	0	0.1	0.1	0.1	0
Thatch	Thatch			Thatch	0	22.4	13	16	24
Bare soil	Bare soil			Bare soil	56.8	4	0	0.2	0

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0

Table 4. Plot 1.2P percent cover by species

Species	Common Name	L-rank	Native vs Non-native	Plant Type	2018	2019*	2020	2021	2022	2023	2024
Panicum virgatum	switch grass	L3	Native	Graminoids	0	0	0.2	0.2	0.2	0.2	0.1
Panicum capillare	panic grass	L5	Native	Graminoids	0	0	0.1	0	0	0.2	0
Andropogon gerardii	big bluestem	L3	Native	Graminoids	0	0	0	0	0.1	0	0.1
Elymus virginicus var. virginicus	Virginia wild rye	L5	Native	Graminoids	0	0	0	0	0	0.1	0.1
Sorghastrum nutans	copper savannah grass	L2	Native	Graminoids	0	0	0.1	0.1	0	0	0
Schizachyrium scoparium	little bluestem	L2	Native	Graminoids	0	0	0.1	0	0	0	0
Festuca rubra ssp. rubra	red fescue	L+	Non-native	Graminoids	15.8	40	0.1	0	0	0	0.7
Lolium pratense	meadow fescue	L+	Non-native	Graminoids	25	23.6	0	0.1	1.6	1	0.1
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	12.2	1.1	1.2	2.2	3	7	4
Phleum pratense	timothy grass	L+	Non-native	Graminoids	1.8	0	0.6	1.6	3.5	3.2	0.7
Dactylis glomerata	orchard grass	L+	Non-native	Graminoids	0.3	2	0.1	0.4	1.3	4.6	2.2
Poa compressa	flat-stemmed blue grass	L+	Non-native	Graminoids	0	0	0.2	0.8	1.2	1.5	2.6
Triticum aestivum	wheat	L+	Non-native	Graminoids	0	0	0.6	0.3	0	0	0
Avena sativa	oats	L+	Non-native	Graminoids	0	0	0.8	0	0	0	0
Agrostis gigantea	redtop	L+	Non-native	Graminoids	0	0	0	0.1	0.6	0	0
Elymus repens	quack grass	L+	Non-native	Graminoids	0	0	0.1	0.3	0.1	0.1	0
Panicum miliaceum	millet	L+	Non-native	Graminoids	0	0	0.4	0	0	0	0
Setaria pumila ssp. pumila	yellow foxtail	L+	Non-native	Graminoids	0	0	0.1	0	0	0	0
Solidago altissima	tall goldenrod	L5	Native	Forbs	0.2	0.1	0.4	2.1	4.6	16.2	37.2
Solidago ptarmicoides	upland white goldenrod	L2	Native	Forbs	0	0	0.1	0.9	1.2	1	0.6
Symphyotrichum ericoides var. ericoides	heath aster	L5	Native	Forbs	0.1	0	0.3	0.2	0.3	1.1	1.1
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	0	0	0.1	0.4	0.7	0.7	0.8
Symphyotrichum lanceolatum var. lanceolatum	panicled aster	L5	Native	Forbs	0.1	0	0.1	0	0.2	1.4	0.4
Erigeron canadensis	horse-weed	L5	Native	Forbs	0	0	0.1	0.1	0	0.9	1
Symphyotrichum novae-angliae	New England aster	L5	Native	Forbs	0.1	0.1	0	0	0.2	0.7	0.9
Fragaria virginiana ssp. virginiana	common wild strawberry	L5	Native	Forbs	0.8	0.8	0	0	0	0	0
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	0	0	0.1	0.2	0.8	0.1	0.2
Fragaria vesca ssp. americana	woodland strawberry	L5	Native	Forbs	0	0	0	0	0.2	0.4	0.6
Symphyotrichum cordifolium	heart-leaved aster	L5	Native	Forbs	0.4	0.5	0	0.1	0	0	0
Monarda fistulosa	wild bergamot	L5	Native	Forbs	0	0	0.1	0.1	0.4	0.1	0.1
Penstemon digitalis	foxglove beard-tongue	L4	Native	Forbs	0	0	0	0	0.2	0.2	0.2
Desmodium canadense	showy tick-trefoil	L5	Native	Forbs	0	0	0.1	0	0.1	0.1	0
Oenothera biennis	common evening-primrose	L5	Native	Forbs	0	0	0	0	0.2	0.1	0
Prunella vulgaris ssp. lanceolata	heal-all (native)	L5	Native	Forbs	0	0	0.1	0	0.2	0	0
Symphyotrichum oolentangiense	sky-blue aster	L4	Native	Forbs	0	0	0	0	0.2	0.1	0
Erigeron annuus	daisy fleabane	L5	Native	Forbs	0	0	0	0	0	0	0.2
Linum virginianum	Virginia yellow flax	LX	Native	Forbs	0	0	0	0	0	0	0.2
Sisyrinchium montanum	blue-eyed grass	L4	Native	Forbs	0	0	0.1	0.1	0	0	0
Symphyotrichum laeve var. laeve	smooth aster	L3	Native	Forbs	0	0	0	0	0	0	0.2
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	0	0	0	0	0.1	0	0
Asclepias syriaca	common milkweed	L5	Native	Forbs	0.1	0	0	0	0	0	0
Epilobium ciliatum ssp. ciliatum	sticky willow-herb	L5	Native	Forbs	0	0	0	0	0	0	0.1
Solanum ptychanthum	American black nightshade	L5	Native	Forbs	0	0	0.1	0	0	0	0
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	0.2	0.2	2.4	11.2	29.4	26.6	8.1
Taraxacum officinale	dandelion	L+	Non-native	Forbs	6.8	2.8	24.2	10.4	3.1	11.6	12.4
Medicago lupulina	black medick	L+	Non-native	Forbs	3.2	1.3	29.8	23.6	3.8	3.6	2.1
Trifolium pratense	red clover	L+	Non-native	Forbs	4.2	2.4	9.4	18.5	6.2	4.1	0.4
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	0.2	0.4	11.9	1.2	0.5	0.3	0.1
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	0.4	0.2	0.3	1.3	1.3	1.8	0.6
Plantago lanceolata	English plantain	L+	Non-native	Forbs	0	0.1	0.6	1	0.7	2.1	1.3
Convolvulus arvensis	field bindweed	L+	Non-native	Forbs	0	0	0.1	0.3	0.8	1.8	1.4
Vicia cracca	cow vetch	L+	Non-native	Forbs	0.2	0.3	0.4	1.4	0.7	0.5	0.8
Cirsium vulgare	bull thistle	L+	Non-native	Forbs	0	0	2.6	0	0.1	0	0.6
Leucanthemum vulgare	ox-eye daisy	L+	Non-native	Forbs	0	0	0	0	0.2	1.4	1
Melilotus albus	white sweet clover	L+	Non-native	Forbs	0	0	0.2	0.8	0.3	0	0.2
Cichorium intybus	chicory	L+	Non-native	Forbs	0	0	0	0	0	0.5	0.8
Carduus acanthoides	plumeless thistle	L+	Non-native	Forbs	0	0	1	0.2	0	0	0
Tragopogon pratensis	meadow goat's beard	L+	Non-native	Forbs	0.2	0.1	0.2	0.2	0.1	0.1	0.1
Sonchus arvensis ssp. arvensis	glandular perennial sow-thistle	L+	Non-native	Forbs	0	0	0	0.4	0.2	0.2	0
Melilotus officinalis	yellow sweet clover	L+	Non-native	Forbs	0	0	0	0.4	0	0.2	0
Plantago major	common plantain	L+	Non-native	Forbs	0	0	0.2	0.3	0.1	0	0
taraxacum officinale	dandelion	L+	Non-native	Forbs	0.6	0	0	0	0	0	0
Potentilla recta	sulphur cinquefoil	L+	Non-native	Forbs	0.2	0.1	0	0	0.1	0	0
Ranunculus acris	tall buttercup	L+	Non-native	Forbs	0.1	0.2	0	0.1	0	0	0
Sonchus oleraceus	annual sow-thistle	L+	Non-native	Forbs	0	0	0.4	0	0	0	0
Chenopodium album	lamb's quarters	L+	Non-native	Forbs	0	0	0.1	0.1	0	0	0
Trifolium hybridum	alsike clover	L+	Non-native	Forbs	0	0	0	0.2	0	0	0
Atriplex patula	halberd-leaved orache	L+?	Non-native	Forbs	0	0	0	0	0.1	0	0
Lactuca serriola	prickly lettuce	L+	Non-native	Forbs	0	0	0	0.1	0	0	0
Stellaria graminea	grass-leaved chickweed	L+	Non-native	Forbs	0.1	0	0	0	0	0	0
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	0	0	2.8	2.4	2.4	12.2	9.9
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	2.9	5	0.1	0.2	0.8	1.2	1.8
Acer negundo	Manitoba maple	L+?*	Native	Woody	0	0.1	0	0	0	0	0
Vitis riparia	riverbank grape	L5	Native	Woody	0.1	0	0	0	0	0	0
Rhamnus cathartica	common buckthorn	L+	Non-native	Woody	0.5	0.1	0	0	0	0	0
Morus alba	white mulberry	L+	Non-native	Woody	0	0	0	0.1	0.1	0	0
Thatch	Thatch			Thatch	40	39	0	0.6	7.6	5.8	16
Bare soil	Bare soil			Bare soil	0	0	26.8	4	4.6	3.2	10.2

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0
*Only spring survey completed

Table 5. Plot 1.3Q percent cover by species

Species	Common Name	L-rank	Native or Non-native	Plant Type	2018	2020	2021	2022	2023	2024
Elymus canadensis	Canada wild rye	L4	Native	Graminoids	0	0.1	3.4	1.7	1.4	0.6
Panicum virgatum	switch grass	L3	Native	Graminoids	0	2.6	1.1	2.4	1	0
Andropogon gerardii	big bluestem	L3	Native	Graminoids	0	1.6	0.5	1	0.8	0.7
Elymus virginicus var. virginicus	Virginia wild rye	L5	Native	Graminoids	0	0	0.7	0.5	0.8	0.4
Sorghastrum nutans	copper savannah grass	L2	Native	Graminoids	0	0.3	0.3	0.2	0.1	1.4
Schizachyrium scoparium	little bluestem	L2	Native	Graminoids	0	0	0	0.4	0.4	0
Panicum capillare	panic grass	L5	Native	Graminoids	0	0.4	0	0	0	0
Avena sativa	oats	L+	Non-native	Graminoids	0	47	0.1	0	0	0
Lolium pratense	meadow fescue	L+	Non-native	Graminoids	21.4	0	0.4	0	0	0
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	21	0	0	0	0.2	0.4
Elymus repens	quack grass	L+	Non-native	Graminoids	0	0	1.2	2.2	3.6	0.1
Digitaria sanguinalis	hairy crab grass	L+	Non-native	Graminoids	0	3.6	0	0	0.1	0
Festuca rubra ssp. rubra	red fescue	L+	Non-native	Graminoids	2.2	0	0	0	0	0
Phleum pratense	timothy grass	L+	Non-native	Graminoids	2	0	0	0	0	0
Setaria pumila ssp. pumila	yellow foxtail	L+	Non-native	Graminoids	0	0.9	0	0	0	0
Triticum aestivum	wheat	L+	Non-native	Graminoids	0	0.4	0.1	0	0	0
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	0	0.6	3.3	9.5	19.4	29.2
Monarda fistulosa	wild bergamot	L5	Native	Forbs	0	1.2	3.4	17.4	13.8	7
Oenothera biennis	common evening-primrose	L5	Native	Forbs	0	3.4	4.8	0.5	16.2	14.8
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	0	2.4	4.6	13	4.7	2.9
Solidago altissima	tall goldenrod	L5	Native	Forbs	0	0	0.3	1.7	8.1	10.6
Asclepias syriaca	common milkweed	L5	Native	Forbs	0	0.2	0.2	1.5	1.6	4.8
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	0	0.6	6	0.1	0.1	0.1
Erigeron canadensis	horse-weed	L5	Native	Forbs	0	0.2	4.9	0.1	0.1	1
Epilobium ciliatum ssp. ciliatum	sticky willow-herb	L5	Native	Forbs	0	0	0	0	0.5	3.1
Desmodium canadense	showy tick-trefoil	L5	Native	Forbs	0	0.1	0.2	0	0	0
Symphyotrichum novae-angliae	New England aster	L5	Native	Forbs	0	0	0	0.2	0	0.1
Erigeron annuus	daisy fleabane	L5	Native	Forbs	0	0	0.1	0	0	0
Symphyotrichum ericoides var. ericoides	heath aster	L5	Native	Forbs	0	0.1	0	0	0	0
Trifolium pratense	red clover	L+	Non-native	Forbs	9.6	5.4	34.4	0.5	0.5	0.1
Taraxacum officinale	dandelion	L+	Non-native	Forbs	7.8	1.1	3.4	5.4	10.8	6.6
Vicia cracca	cow vetch	L+	Non-native	Forbs	0	6	7.8	10.1	3.2	3.5
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	0.4	1.4	4.2	14	4.2	1.9
Medicago lupulina	black medick	L+	Non-native	Forbs	1	2.8	6.6	1.5	0.1	0.8
Convolvulus arvensis	field bindweed	L+	Non-native	Forbs	0.8	2.8	1.8	2.2	3.4	1.2
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	1.1	0.8	4	2.8	2.8	0.6
Lactuca serriola	prickly lettuce	L+	Non-native	Forbs	0	0	5.9	2.1	0.2	1.2
Chenopodium album	lamb's quarters	L+	Non-native	Forbs	0	1.4	7	0	0	0.6
Cirsium vulgare	bull thistle	L+	Non-native	Forbs	0	0	0	0.4	0.5	7
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	1.4	0	0.2	0.4	0.1	2
Plantago major	common plantain	L+	Non-native	Forbs	0.8	0.4	0.2	0	0	0.1
Plantago lanceolata	English plantain	L+	Non-native	Forbs	1.1	0	0	0	0	0
Rumex crispus	curly dock	L+	Non-native	Forbs	0	0	0	0	0	1
Cichorium intybus	chicory	L+	Non-native	Forbs	0	0	0.4	0.2	0	0
Amaranthus retroflexus	red-root pigweed	L+	Non-native	Forbs	0	0.6	0	0	0	0
Cerastium arvense ssp. arvense	field chickweed	L+	Non-native	Forbs	0	0	0	0	0	0.6
Veronica arvensis	corn speedwell	L+	Non-native	Forbs	0	0	0.3	0.2	0	0
Sonchus arvensis ssp. arvensis	glandular perennial sow-thistle	L+	Non-native	Forbs	0	0	0	0	0.1	0.1
Arctium minus	common burdock	L+	Non-native	Forbs	0	0	0	0	0.1	0
Ranunculus acris	tall buttercup	L+	Non-native	Forbs	0.1	0	0	0	0	0
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	0	0	0.3	2.8	6.8	4.6
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	0.9	0.1	0.1	0.2	0.3	0.4
Vitis riparia	riverbank grape	L5	Native	Woody	0	0.1	0	0	0	0
Morus alba	white mulberry	L+	Non-native	Woody	0.2	0.2	0.1	0	0	0
Catalpa speciosa	northern catalpa	L+	Non-native	Woody	0	0	0.1	0	0	0
Rhamnus cathartica	common buckthorn	L+	Non-native	Woody	0.1	0	0	0	0	0
Thatch	Thatch			Thatch	42	0	8	26	29	8.6
Bare soil	Bare soil			Bare soil	0	41.6	1	2.6	5.6	6.4

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0

Table 6. Plot 1.4AI percent cover by species

Species	Common Name	L-rank	Native or Non-native	Plant Type	2023	2024
Elymus canadensis	Canada wild rye	L4	Native	Graminoids	21.4	1.6
Elymus virginicus var. virginicus	Virginia wild rye	L5	Native	Graminoids	0.5	0
Panicum virgatum	switch grass	L3	Native	Graminoids	0.2	0
Sorghastrum nutans	copper savannah grass	L2	Native	Graminoids	0	0.1
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	9.4	13.6
Poa compressa	flat-stemmed blue grass	L+	Non-native	Graminoids	2.8	0.6
Elymus repens	quack grass	L+	Non-native	Graminoids	1.4	1
Solidago altissima	tall goldenrod	L5	Native	Forbs	21	48.4
Oenothera biennis	common evening-primrose	L5	Native	Forbs	10.2	5.4
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	5.8	7.5
Symphyotrichum lanceolatum var. lanceolatum	panicled aster	L5	Native	Forbs	6.3	2
Drymocallis arguta	tall cinquefoil	L3	Native	Forbs	3.4	3.1
Monarda fistulosa	wild bergamot	L5	Native	Forbs	3.8	1.5
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	3.5	1.5
Verbena hastata	blue vervain	L5	Native	Forbs	2.6	2
Asclepias syriaca	common milkweed	L5	Native	Forbs	1.6	1.4
Symphyotrichum laeve var. laeve	smooth aster	L3	Native	Forbs	0.6	1.8
Penstemon digitalis	foxglove beard-tongue	L4	Native	Forbs	0.8	0.6
Solidago juncea	early goldenrod	L5	Native	Forbs	0.7	0
Silphium terebinthinaceum	prairie dock	L+*	Native	Forbs	0.6	0.4
Epilobium ciliatum ssp. ciliatum	sticky willow-herb	L5	Native	Forbs	0.1	0.2
Erigeron canadensis	horse-weed	L5	Native	Forbs	0.1	0.2
Oxalis dillenii	deflexed yellow wood-sorrel	L5	Native	Forbs	0.1	0.1
Potentilla norvegica	rough cinquefoil	L+?*	Native	Forbs	0	0.2
Solidago canadensis var. canadensis	Canada goldenrod	L5	Native	Forbs	0	0.2
Symphyotrichum novae-angliae	New England aster	L5	Native	Forbs	0	0.2
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	0.1	0
Oxalis stricta	common yellow wood-sorrel	L5	Native	Forbs	0.1	0
Solidago ptarmicoides	upland white goldenrod	L2	Native	Forbs	0.1	0
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	13.8	5
Medicago lupulina	black medick	L+	Non-native	Forbs	18.4	0.4
Taraxacum officinale	dandelion	L+	Non-native	Forbs	1.3	3
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	1	0.4
Lactuca serriola	prickly lettuce	L+	Non-native	Forbs	1.1	0.1
Trifolium pratense	red clover	L+	Non-native	Forbs	1.1	0
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	0.4	0.5
Potentilla recta	sulphur cinquefoil	L+	Non-native	Forbs	0.2	0.2
Alliaria petiolata	garlic mustard	L+	Non-native	Forbs	0.2	0
Fallopia convolvulus	black bindweed	L+	Non-native	Forbs	0.2	0
Arctium minus	common burdock	L+	Non-native	Forbs	0	0.1
Chenopodium album	lamb's quarters	L+	Non-native	Forbs	0.1	0
Melilotus albus	white sweet clover	L+	Non-native	Forbs	0.1	0
Sisymbrium altissimum	tumble mustard	L+	Non-native	Forbs	0.1	0
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	3	6.4
Acer negundo	Manitoba maple	L+?*	Native	Woody	0.1	0
Thatch	Thatch			Thatch	4.4	17
Bare soil	Bare soil			Bare soil	0.6	0.6

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0

Section 2

Section 2.2

Two plots were monitored in section 2.2 (plots 2.2AJ and 2.2S; Table 7 and 8). Plot 2.2AJ was monitored for the first time in 2023 after being seeded in November 2022. The seed mix was also supplemented with additional blue vervain (*Verbena hastata*). Tall goldenrod dominated with a cover of 28.4% in 2024. In 2018 and 2019, plot 2.2S contained almost exclusively non-native species; however, restoration led to the introduction of numerous native grasses and forbs with high covers that included common evening primrose (*Oenothera biennis*), sticky willow-herb (*Epilobium ciliatum* ssp. *ciliatum*), and foxglove beard-tongue (*Penstemon digitalis*).

Section 2.3

One plot was monitored in section 2.3 (plot 2.3T; Table 9). Prior to restoration in 2020, this plot was dominated by non-native grasses such as meadow fescue (*Lolium pratense*) (45% cover) and Kentucky blue grass (*Poa pratensis* ssp. *pratensis*) (26.4% cover). Post-restoration, many of these non-native species decreased to near zero covers, with many more native species occurring and establishing. Tall goldenrod cover increased from 0.2% pre-restoration to 68% post-restoration.

Section 2.4

One plot was monitored in section 2.4 (plot 2.4U; Table 10). Similar to section 2.3, non-native graminoids and forbs dominated the plot pre-restoration. Unlike many of the other plots, tall goldenrod is not dominating this site. Instead, and likely due to the moist conditions, switchgrass (*Panicum virgatum*) cover is very high (42.2% in 2023 and 36.6% in 2024), along with creeping bent grass at 24.6% (*Agrostis stolonifera*; non-native), and panicled aster (*Symphyotrichum lanceolatum* var. *lanceolatum*; a native forb; 13% in 2024) .

Table 7. Plot 2.2AJ percent cover by species

Species	Common Name	L-rank	Native or Non-native	Plant Type	2023	2024
Carex granularis	meadow sedge	L5	Native	Graminoids	1	0.4
Andropogon gerardii	big bluestem	L3	Native	Graminoids	0.2	0.4
Juncus dudleyi	Dudley's rush	L5	Native	Graminoids	0.1	0.1
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	18.2	6.8
Agrostis stolonifera	creeping bent grass	L+?	Non-native	Graminoids	0	7.4
Poa compressa	flat-stemmed blue grass	L+	Non-native	Graminoids	4	3
Carex spicata	spiked sedge	L+	Non-native	Graminoids	0	0.1
Elymus repens	quack grass	L+	Non-native	Graminoids	0.1	0
Solidago altissima	tall goldenrod	L5	Native	Forbs	18	28.4
Symphyotrichum lanceolatum var. lanceolatum	panicled aster	L5	Native	Forbs	2.8	12.4
Oenothera biennis	common evening-primrose	L5	Native	Forbs	8.6	6.4
Verbena hastata	blue vervain	L5	Native	Forbs	7.6	5.3
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	1.6	4
Epilobium ciliatum ssp. ciliatum	sticky willow-herb	L5	Native	Forbs	0.6	4.2
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	3.1	0.1
Symphyotrichum novae-angliae	New England aster	L5	Native	Forbs	0.6	2.1
Monarda fistulosa	wild bergamot	L5	Native	Forbs	1.2	1.2
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	1.5	0.6
Equisetum arvense	field horsetail	L5	Native	Forbs	0.3	0.4
Penstemon digitalis	foxglove beard-tongue	L4	Native	Forbs	0.1	0.6
Asclepias syriaca	common milkweed	L5	Native	Forbs	0	0.6
Euthamia graminifolia	grass-leaved goldenrod	L5	Native	Forbs	0	0.6
Oxalis stricta	common yellow wood-sorrel	L5	Native	Forbs	0.4	0
Erigeron annuus	daisy fleabane	L5	Native	Forbs	0.2	0.1
Potentilla norvegica	rough cinquefoil	L+?*	Native	Forbs	0.1	0.1
Acalypha rhomboidea	three-seeded mercury	L5	Native	Forbs	0.1	0
Drymocallis arguta	tall cinquefoil	L3	Native	Forbs	0.1	0
Fragaria virginiana ssp. virginiana	common wild strawberry	L5	Native	Forbs	0	0.1
Oxalis dillenii	deflexed yellow wood-sorrel	L5	Native	Forbs	0	0.1
Rudbeckia laciniata	cut-leaved coneflower	L5	Native	Forbs	0.1	0
Symphyotrichum ericoides var. ericoides	heath aster	L5	Native	Forbs	0	0.1
Lotus corniculatus	bird's foot trefoil	L+	Non-native	Forbs	16.6	5.8
Taraxacum officinale	dandelion	L+	Non-native	Forbs	2.7	3.4
Lactuca serriola	prickly lettuce	L+	Non-native	Forbs	1	2.9
Medicago lupulina	black medick	L+	Non-native	Forbs	3.6	0.3
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	0.9	2.3
Sonchus arvensis ssp. arvensis	glandular perennial sow-thistle	L+	Non-native	Forbs	2.4	0
Convolvulus arvensis	field bindweed	L+	Non-native	Forbs	0.6	1
Cirsium vulgare	bull thistle	L+	Non-native	Forbs	1.2	0.3
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	0.8	0.6
Fallopia convolvulus	black bindweed	L+	Non-native	Forbs	0.4	0.1
Stellaria graminea	grass-leaved chickweed	L+	Non-native	Forbs	0.2	0.1
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	0.2	0
Hypericum perforatum	common St. John's-wort	L+	Non-native	Forbs	0.2	0
Lysimachia arvensis	scarlet pimpernel	L+	Non-native	Forbs	0.1	0.1
Vicia cracca	cow vetch	L+	Non-native	Forbs	0.1	0.1
Alliaria petiolata	garlic mustard	L+	Non-native	Forbs	0.1	0
Sinapis arvensis	charlock	L+	Non-native	Forbs	0	0.1
Trifolium pratense	red clover	L+	Non-native	Forbs	0.1	0
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	5.3	8.1
Thatch	Thatch			Thatch	16.8	27
Bare soil	Bare soil			Bare soil	5.6	0.9

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0

Table 8. Plot 2.2S percent cover by species

Species	CommonName	L-rank	Native vs Non-native	Plant Type	2018	2019*	2021	2022	2023	2024
Elymus canadensis	Canada wild rye	L4	Native	Graminoids	0	0	0.7	3.8	6.8	0.7
Panicum virgatum	switch grass	L3	Native	Graminoids	0	0	0.4	1.4	2.2	6.2
Elymus virginicus var. virginicus	Virginia wild rye	L5	Native	Graminoids	0	0	0	0.2	1.4	0
Panicum capillare	panic grass	L5	Native	Graminoids	0	0	1.2	0	0	0
Carex vulpinoidea	fox sedge	L5	Native	Graminoids	0	0	0	0	0	0.4
Andropogon gerardii	big bluestem	L3	Native	Graminoids	0	0	0.2	0	0	0
Lolium pratense	meadow fescue	L+	Non-native	Graminoids	32	18.6	0	0	0	0
Festuca rubra ssp. rubra	red fescue	L+	Non-native	Graminoids	19.4	31	0	0	0	0
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	12	24	0.4	0.6	8	3.6
Agrostis stolonifera	creeping bent grass	L+?	Non-native	Graminoids	0	0	0.1	0.8	5	3.8
Phleum pratense	timothy grass	L+	Non-native	Graminoids	1.8	2.5	0.1	0	0	0
Poa annua	annual blue grass	L+	Non-native	Graminoids	0	0	2.4	0	0	0
Agrostis gigantea	redtop	L+	Non-native	Graminoids	2	0	0	0	0	0
Dactylis glomerata	orchard grass	L+	Non-native	Graminoids	0	0.8	0	0	0	0
Triticum aestivum	wheat	L+	Non-native	Graminoids	0	0	0.3	0.4	0.1	0
Elymus repens	quack grass	L+	Non-native	Graminoids	0.2	0	0	0	0	0
Oenothera biennis	common evening-primrose	L5	Native	Forbs	0	0	29.6	4.3	16.6	22.6
Epilobium ciliatum ssp. ciliatum	sticky willow-herb	L5	Native	Forbs	0	0	0	0.1	8.8	22.6
Penstemon digitalis	foxglove beard-tongue	L4	Native	Forbs	0	0	1.7	3.4	4.2	13.8
Symphyotrichum lanceolatum var. lanceolatum	panicled aster	L5	Native	Forbs	0	0	0.1	1.7	9.1	9.6
Solidago altissima	tall goldenrod	L5	Native	Forbs	0	0	0.3	1.8	6	8.8
Verbena hastata	blue vervain	L5	Native	Forbs	0	0	1.2	4.6	4.6	2.8
Equisetum arvense	field horsetail	L5	Native	Forbs	0.1	0	1.5	2	3	4
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	0	0	1	3	1.4	2.4
Oxalis stricta	common yellow wood-sorrel	L5	Native	Forbs	0	0	2.3	4.4	0.5	0.5
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	0	0	1.1	2	2.1	1.4
Asclepias syriaca	common milkweed	L5	Native	Forbs	0	0	0.6	1	2.4	2.4
Erigeron canadensis	horse-weed	L5	Native	Forbs	0	0	0	5.8	0.4	0
Symphyotrichum laeve var. laeve	smooth aster	L3	Native	Forbs	0	0	0.4	1.6	2.3	1.6
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	0	0	2.2	0.6	1.5	0.2
Penstemon hirsutus	hairy beard-tongue	L3	Native	Forbs	0	0	1.3	0.6	0.2	0.1
Fragaria vesca ssp. americana	woodland strawberry	L5	Native	Forbs	0	0	0	0.2	0.6	0.4
Solidago ptarmicoides	upland white goldenrod	L2	Native	Forbs	0	0	0.5	0.3	0	0
Monarda fistulosa	wild bergamot	L5	Native	Forbs	0	0	0.1	0.5	0.1	0.1
Drymocallis arguta	tall cinquefoil	L3	Native	Forbs	0	0	0.5	0	0	0.1
Solidago nemoralis ssp. nemoralis	grey goldenrod	L5	Native	Forbs	0	0	0.2	0.3	0	0
Solanum ptychanthum	American black nightshade	L5	Native	Forbs	0	0	0	0	0.4	0
Symphyotrichum novae-angliae	New England aster	L5	Native	Forbs	0	0	0	0	0	0.4
Acalypha rhomboidea	three-seeded mercury	L5	Native	Forbs	0	0	0.2	0	0.1	0
Oxalis dillenii	deflexed yellow wood-sorrel	L5	Native	Forbs	0	0	0.2	0	0	0
Lepidium virginicum	Virginia pepper-grass	L4	Native	Forbs	0	0	0	0.1	0	0
Trifolium pratense	red clover	L+	Non-native	Forbs	1.8	1	9.4	10.6	0.3	0.1
Chenopodium album	lamb's quarters	L+	Non-native	Forbs	0	0	18.4	0.5	0	0
Taraxacum officinale	dandelion	L+	Non-native	Forbs	9.2	4.2	1.2	1.8	1.7	0.8
Stellaria graminea	grass-leaved chickweed	L+	Non-native	Forbs	0.3	0	6.4	7.7	1.2	0.1
Medicago lupulina	black medick	L+	Non-native	Forbs	0.5	0	2.7	1.5	5.3	0.1
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	0	0	1.2	2.5	4.6	1.5
Trifolium hybridum	alsike clover	L+	Non-native	Forbs	0.1	0	0	4.6	4.8	0
Fallopia convolvulus	black bindweed	L+	Non-native	Forbs	0	0	5.8	0.4	0.2	0.1
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	0.2	0.1	2	3.2	0.6	0.2
Lactuca serriola	prickly lettuce	L+	Non-native	Forbs	0	0	0	3.2	2.7	0.1
Sonchus asper	spiny sow-thistle	L+	Non-native	Forbs	0	0	1.2	2.3	0.1	0
Rumex crispus	curly dock	L+	Non-native	Forbs	0	0	0.4	1.2	0.4	0.2
Persicaria maculosa	lady's thumb	L+	Non-native	Forbs	0	0	1.2	0.6	0	0
Amaranthus albus	tumbleweed	L+	Non-native	Forbs	0	0	1.4	0	0	0
Sisymbrium altissimum	tumble mustard	L+	Non-native	Forbs	0	0	0	1.2	0.2	0
Ranunculus acris	tall buttercup	L+	Non-native	Forbs	0.3	0.5	0	0	0.1	0.2
Chaenorhinum minus ssp. minus	dwarf snapdragon	L+	Non-native	Forbs	0	0	0.8	0.1	0	0
Cirsium vulgare	bull thistle	L+	Non-native	Forbs	0	0	0	0	0.4	0.5
Thlaspi arvense	penny-cress	L+	Non-native	Forbs	0	0	0.6	0.2	0	0
Erysimum cheiranthoides	wormseed mustard	L+	Non-native	Forbs	0	0	0.6	0.1	0	0
Plantago major	common plantain	L+	Non-native	Forbs	0	0	0.2	0	0.2	0.2
Vicia cracca	cow vetch	L+	Non-native	Forbs	0.4	0.2	0	0	0	0
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	0	0	0	0.1	0.1	0.2
Veronica serpyllifolia ssp. serpyllifolia	thyme-leaved speedwell	L+	Non-native	Forbs	0	0	0.2	0	0	0.1
Dipsacus fullonum	teasel	L+	Non-native	Forbs	0	0	0	0	0.2	0
Polygonum achoreum	striate knotweed	L+	Non-native	Forbs	0	0	0.1	0.1	0	0
Sonchus arvensis ssp. arvensis	glandular perennial sow-thistle	L+	Non-native	Forbs	0	0	0	0	0.2	0
Rumex obtusifolius	bitter dock	L+	Non-native	Forbs	0	0	0.1	0	0	0
Tragopogon pratensis	meadow goat's beard	L+	Non-native	Forbs	0.1	0	0	0	0	0
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	0.5	0.2	14.9	13.8	5.4	5.6
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	0.4	0.3	0	0	0	0
Acer negundo	Manitoba maple	L+?*	Native	Woody	0.2	0	0	0.1	0	0.1
Rhamnus cathartica	common buckthorn	L+	Non-native	Woody	0.2	0.2	0	0	0	0
Acer platanoides	Norway maple	L+	Non-native	Woody	0.1	0	0	0	0	0
Thatch	Thatch			Thatch	43	28.8	0	4.6	18	4.4
Bare soil	Bare soil			Bare soil	0	0	17.8	0.6	14.4	3.8

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0

*Only spring survey completed

Table 9. Plot 2.3T percent cover by species

Species	Common Name	L-rank	Native or Non-native	Plant Type	2018	2019*	2021	2022	2023	2024
Elymus canadensis	Canada wild rye	L4	Native	Graminoids	0	0	0.9	9.4	6.4	1.4
Panicum virgatum	switch grass	L3	Native	Graminoids	0	0	0.6	1.1	2.8	0.3
Panicum capillare	panic grass	L5	Native	Graminoids	0	0	0	0	0.4	0
Elymus virginicus var. virginicus	Virginia wild rye	L5	Native	Graminoids	0	0	0.1	0	0	0.2
Andropogon gerardii	big bluestem	L3	Native	Graminoids	0	0	0.1	0	0	0
Sorghastrum nutans	copper savannah grass	L2	Native	Graminoids	0	0	0.1	0	0	0
Lolium pratense	meadow fescue	L+	Non-native	Graminoids	41.2	45	0	0	0	0
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	7.6	26.4	0	0.5	1.6	1.1
Phleum pratense	timothy grass	L+	Non-native	Graminoids	2.4	5.6	0.5	3.5	0.5	0.8
Agrostis gigantea	redtop	L+	Non-native	Graminoids	1.3	0	0	2	1.3	0.4
Poa compressa	flat-stemmed blue grass	L+	Non-native	Graminoids	0	0	0.1	1	1.1	2.2
Elymus repens	quack grass	L+	Non-native	Graminoids	0.1	0	0.2	0	2.8	0
Panicum miliaceum	millet	L+	Non-native	Graminoids	0	0	2.9	0	0	0
Festuca rubra ssp. rubra	red fescue	L+	Non-native	Graminoids	0.6	0.8	0	0	0	0
Dactylis glomerata	orchard grass	L+	Non-native	Graminoids	0	0.4	0	0	0	0
Avena sativa	oats	L+	Non-native	Graminoids	0	0	0.1	0.1	0	0
Agrostis stolonifera	creeping bent grass	L+?	Non-native	Graminoids	0	0	0.1	0	0	0
Carex spicata	spiked sedge	L+	Non-native	Graminoids	0	0	0.1	0	0	0
Triticum aestivum	wheat	L+	Non-native	Graminoids	0	0	0.1	0	0	0
Solidago altissima	tall goldenrod	L5	Native	Forbs	0.2	0	3	19.2	42	68
Oenothera biennis	common evening-primrose	L5	Native	Forbs	0	0	10	3.1	5.4	5.3
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	0	0	1.4	11.6	1	0.9
Epilobium ciliatum ssp. ciliatum	sticky willow-herb	L5	Native	Forbs	0	0	0	0.8	4	7.2
Verbena hastata	blue vervain	L5	Native	Forbs	0	0	0.5	5	5.1	1.3
Symphyotrichum lanceolatum var. lanceolatum	panicled aster	L5	Native	Forbs	0	0	0.1	1	4.8	3.6
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	0	0	0	1.2	3.8	1.1
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	0	0	1.3	1.2	1.8	0.3
Fragaria virginiana ssp. virginiana	common wild strawberry	L5	Native	Forbs	1.8	2.4	0.1	0	0	0
Symphyotrichum laeve var. laeve	smooth aster	L3	Native	Forbs	0	0	0.5	1	2	0.3
Penstemon digitalis	foxglove beard-tongue	L4	Native	Forbs	0	0	0.4	0.5	0.8	1
Symphyotrichum novae-angliae	New England aster	L5	Native	Forbs	0	0	0	0	1.3	1.4
Asclepias syriaca	common milkweed	L5	Native	Forbs	0	0	0.2	0.2	0.6	1
Lepidium virginicum	Virginia pepper-grass	L4	Native	Forbs	0	0	0	1.8	0.1	0.1
Oxalis stricta	common yellow wood-sorrel	L5	Native	Forbs	0	0	0.4	1.2	0.2	0.1
Erigeron canadensis	horse-weed	L5	Native	Forbs	0	0	0	0.9	0.2	0.3
Fragaria vesca ssp. americana	woodland strawberry	L5	Native	Forbs	0	0	0	0.4	0.4	0.4
Monarda fistulosa	wild bergamot	L5	Native	Forbs	0	0	0.1	0.6	0.4	0.1
Oxalis dillenii	deflexed yellow wood-sorrel	L5	Native	Forbs	0.1	0	0.6	0	0	0.4
Drymocallis arguta	tall cinquefoil	L3	Native	Forbs	0	0	0.5	0	0.2	0
Solidago ptarmicoides	upland white goldenrod	L2	Native	Forbs	0	0	0.5	0	0	0
Penstemon hirsutus	hairy beard-tongue	L3	Native	Forbs	0	0	0.4	0	0	0
Potentilla norvegica	rough cinquefoil	L+?*	Native	Forbs	0	0	0	0.2	0	0.1
Erigeron annuus	daisy fleabane	L5	Native	Forbs	0	0	0.1	0	0	0
Euthamia graminifolia	grass-leaved goldenrod	L5	Native	Forbs	0	0	0.1	0	0	0
Geum aleppicum	yellow avens	L5	Native	Forbs	0	0	0	0	0	0.1
Solidago nemoralis ssp. nemoralis	grey goldenrod	L5	Native	Forbs	0	0	0	0	0	0.1
Symphyotrichum ericoides var. ericoides	heath aster	L5	Native	Forbs	0	0	0	0	0.1	0
Chenopodium album	lamb's quarters	L+	Non-native	Forbs	0	0	55	0.1	0.2	0
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	0.1	0.1	6.6	9.2	3.2	2.6
Trifolium pratense	red clover	L+	Non-native	Forbs	6.6	6	3.2	3.4	1.4	0.1
Taraxacum officinale	dandelion	L+	Non-native	Forbs	7.2	2.7	1	2.9	1.3	0.5
Lactuca serriola	prickly lettuce	L+	Non-native	Forbs	0	0	0	6	1.1	0
Medicago lupulina	black medick	L+	Non-native	Forbs	0.8	0.9	2.8	0.7	0.4	0.3
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	0.4	0.6	1.2	1.7	0.6	0.5
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	0.1	0	0.4	2.2	1.2	0.6
Rumex crispus	curly dock	L+	Non-native	Forbs	0	0	0	2.1	0.1	1.9
Cirsium vulgare	bull thistle	L+	Non-native	Forbs	0	0	1.2	1.2	0.7	0.1
Vicia cracca	cow vetch	L+	Non-native	Forbs	0.8	1.1	0	0.3	0.4	0.5
Ranunculus acris	tall buttercup	L+	Non-native	Forbs	1	1.3	0	0	0	0
Plantago major	common plantain	L+	Non-native	Forbs	0.6	0.4	0.2	0	0.1	0.3
Prunella vulgaris	heal-all	L+?	Non-native	Forbs	0.6	0.8	0	0	0	0
Sonchus asper	spiny sow-thistle	L+	Non-native	Forbs	0	0	0	0.4	0.5	0.1
Verbascum thapsus	common mullein	L+	Non-native	Forbs	0	0	0.6	0.2	0.2	0
Fallopia convolvulus	black bindweed	L+	Non-native	Forbs	0	0	0	0.4	0.1	0.1
Tragopogon pratensis	meadow goat's beard	L+	Non-native	Forbs	0.4	0.1	0	0	0	0
Sisymbrium altissimum	tumble mustard	L+	Non-native	Forbs	0	0	0	0.3	0	0
Sisymbrium officinale	hedge mustard	L+	Non-native	Forbs	0	0	0	0.3	0	0
Arctium minus	common burdock	L+	Non-native	Forbs	0	0	0	0	0.1	0
Atriplex patula	halberd-leaved orache	L+?	Non-native	Forbs	0	0	0	0.1	0	0
Chaenorhinum minus ssp. minus	dwarf snapdragon	L+	Non-native	Forbs	0	0	0.1	0	0	0
Geum urbanum	urban avens	L+	Non-native	Forbs	0	0	0	0.1	0	0
Lythrum salicaria	purple loosestrife	L+	Non-native	Forbs	0	0	0.1	0	0	0
Melilotus albus	white sweet clover	L+	Non-native	Forbs	0	0	0	0	0.1	0
Tussilago farfara	coltsfoot	L+	Non-native	Forbs	0	0	0.1	0	0	0
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	0.4	0	1.9	5.9	4.2	3.7
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	2.8	2.4	0.2	0	0	0.1
Acer negundo	Manitoba maple	L+?*	Native	Woody	0.2	0.2	0.1	0.3	0.1	0
Rhus typhina	staghorn sumach	L5	Native	Woody	0.1	0	0	0	0	0
Rhamnus cathartica	common buckthorn	L+	Non-native	Woody	0.3	0.1	0	0	0	0
Ailanthus altissima	tree-of-heaven	L+	Non-native	Woody	0	0	0	0	0.1	0
Morus alba	white mulberry	L+	Non-native	Woody	0	0	0	0.1	0	0
Thatch	Thatch			Thatch	40.2	15	0	8	48	42
Bare soil	Bare soil			Bare soil	0.2	0	52	0	2.8	0

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0

*Only spring survey completed

Table 10. Plot 2.4U percent cover by species

Species	Common Name	L-rank	Native or Non-native	Plant Type	2018	2019*	2021	2022	2023	2024
Panicum virgatum	switch grass	L3	Native	Graminoids	0	0	8.2	33	42.2	36.6
Elymus canadensis	Canada wild rye	L4	Native	Graminoids	0	0	0.2	10.1	6	0.6
Panicum capillare	panic grass	L5	Native	Graminoids	0	0	8.2	0	0	0
Elymus virginicus var. virginicus	Virginia wild rye	L5	Native	Graminoids	0	0	0	0.6	0.4	0.1
Sorghastrum nutans	copper savannah grass	L2	Native	Graminoids	0	0	0.4	0.2	0.4	0
Andropogon gerardii	big bluestem	L3	Native	Graminoids	0	0	0.1	0	0.1	0
Juncus dudleyi	Dudley's rush	L5	Native	Graminoids	0	0	0	0	0	0.2
Lolium pratense	meadow fescue	L+	Non-native	Graminoids	49	52	0	0	0	0
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	27	25	0	0.6	1.2	0.2
Agrostis stolonifera	creeping bent grass	L+?	Non-native	Graminoids	0	0	0.9	9.8	17	24.6
Phleum pratense	timothy grass	L+	Non-native	Graminoids	6.2	0.5	0	1.4	1.4	0.2
Panicum miliaceum	millet	L+	Non-native	Graminoids	0	0	6.4	0	0	0
Poa compressa	flat-stemmed blue grass	L+	Non-native	Graminoids	0	0	0.1	0.9	1.2	1.8
Carex spicata	spiked sedge	L+	Non-native	Graminoids	0.4	0	0.1	0	0.8	2
Agrostis gigantea	redtop	L+	Non-native	Graminoids	1.2	0	0	0	0	0
Avena sativa	oats	L+	Non-native	Graminoids	0	0	0.7	0	0	0
Digitaria sanguinalis	hairy crab grass	L+	Non-native	Graminoids	0	0	0.2	0	0	0
Elymus repens	quack grass	L+	Non-native	Graminoids	0	0	0.2	0	0	0
Poa annua	annual blue grass	L+	Non-native	Graminoids	0	0	0.1	0	0	0
Symphyotrichum lanceolatum var. lanceolatum	panicled aster	L5	Native	Forbs	0	0	0.1	5	12.2	13
Solidago altissima	tall goldenrod	L5	Native	Forbs	0	0	0.5	4.5	9.4	14.4
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	0	0	17.4	6.7	0	0.1
Oenothera biennis	common evening-primrose	L5	Native	Forbs	0	0	16.2	4.3	0.6	0.2
Euthamia graminifolia	grass-leaved goldenrod	L5	Native	Forbs	0	0	0	1.6	6	1.4
Verbena hastata	blue vervain	L5	Native	Forbs	0	0	4	1.4	0.7	0.5
Epilobium ciliatum ssp. ciliatum	sticky willow-herb	L5	Native	Forbs	0	0	0.1	3	0.9	0.7
Penstemon digitalis	foxglove beard-tongue	L4	Native	Forbs	0	0	0.4	1.7	0.7	0.5
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	0	0	2.4	0	0	0
Asclepias syriaca	common milkweed	L5	Native	Forbs	0	0	0.5	1	0	0.2
Symphyotrichum laeve var. laeve	smooth aster	L3	Native	Forbs	0	0	0.4	0.8	0.2	0.1
Fragaria virginiana ssp. virginiana	common wild strawberry	L5	Native	Forbs	0	0	0	0.4	0.6	0.4
Penstemon hirsutus	hairy beard-tongue	L3	Native	Forbs	0	0	1.1	0.1	0	0
Drymocallis arguta	tall cinquefoil	L3	Native	Forbs	0	0	0.4	0.1	0	0
Erigeron canadensis	horse-weed	L5	Native	Forbs	0	0	0	0.4	0	0
Silphium terebinthinaceum	prairie dock	L+*	Native	Forbs	0	0	0.8	1	0.4	0
Solidago nemoralis ssp. nemoralis	grey goldenrod	L5	Native	Forbs	0	0	0	0.3	0	0
Solidago ptarmicoides	upland white goldenrod	L2	Native	Forbs	0	0	0.3	0	0	0
Equisetum arvense	field horsetail	L5	Native	Forbs	0	0	0.1	0.1	0	0
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	0	0	0	0.2	0	0
Monarda fistulosa	wild bergamot	L5	Native	Forbs	0	0	0.1	0.1	0	0
Erigeron annuus	daisy fleabane	L5	Native	Forbs	0	0	0	0	0.1	0
Oxalis stricta	common yellow wood-sorrel	L5	Native	Forbs	0	0	0.1	0	0	0
Solanum ptychanthum	American black nightshade	L5	Native	Forbs	0	0	0.1	0	0	0
Taraxacum officinale	dandelion	L+	Non-native	Forbs	13.8	5	3.2	6.8	5.2	1.9
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	0	0	2.6	4.9	5.8	0
Trifolium pratense	red clover	L+	Non-native	Forbs	2.4	0.6	3.9	4.3	0.1	0
Ranunculus acris	tall buttercup	L+	Non-native	Forbs	2.1	2.4	0.4	3	1.2	0.3
Trifolium repens	white clover	L+	Non-native	Forbs	0	0	2	3.4	0.6	0
Sonchus arvensis ssp. arvensis	glandular perennial sow-thistle	L+	Non-native	Forbs	0	0	0.1	3	2.6	0.2
Medicago lupulina	black medick	L+	Non-native	Forbs	0.4	0.2	2.6	1	0.3	0
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	0.1	0.2	1.9	1.7	0.2	0
Sonchus asper	spiny sow-thistle	L+	Non-native	Forbs	0	0	2.4	0.8	0	0
Trifolium hybridum	alsike clover	L+	Non-native	Forbs	0.3	0	0	2.2	0.1	0
Plantago major	common plantain	L+	Non-native	Forbs	0	0	1.7	0.5	0.1	0.1
Fallopia convolvulus	black bindweed	L+	Non-native	Forbs	0	0	1.1	0.2	0	0
Vicia cracca	cow vetch	L+	Non-native	Forbs	0.4	0.1	0	0	0	0
Cirsium vulgare	bull thistle	L+	Non-native	Forbs	0	0	0.1	0.2	0	0
Lactuca serriola	prickly lettuce	L+	Non-native	Forbs	0	0	0	0.3	0	0
Cichorium intybus	chicory	L+	Non-native	Forbs	0	0	0.2	0	0	0
Persicaria maculosa	lady's thumb	L+	Non-native	Forbs	0	0	0	0.2	0	0
Atriplex patula	halberd-leaved orache	L+?	Non-native	Forbs	0	0	0.1	0	0	0
Epilobium parviflorum	small-flowered willow-herb	L+	Non-native	Forbs	0	0	0	0.1	0	0
Lythrum salicaria	purple loosestrife	L+	Non-native	Forbs	0	0	0.1	0	0	0
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	0	0	0	1.1	3.6	1.7
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	0.2	0.1	0	0	0	0
Acer negundo	Manitoba maple	L+?*	Native	Woody	0	0	0	0.2	0	0
Ulmus pumila	Siberian elm	L+	Non-native	Woody	0	0	0.1	0	0	0
Thatch	Thatch			Thatch	33.4	11.6	0	3	79	79
Bare soil	Bare soil			Bare soil	0.4	0	77.6	0	0	0.8

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0

*Only spring survey completed

Section 3

Sections 3.2 and 3.3 were monitored for the first time in 2020 (vegetation plots 3.2AA and 3.3AB) and represented pre-management, turfgrass communities. Plots primarily contained meadow fescue and Kentucky blue grass. No management activities occurred in this section in 2020 or 2021 and the plots were not monitored 2021-2023. Section 3.2 was unique for pre-restoration areas with several naturally occurring native species including golden-fruited sedge (*Carex aurea*), blue-eyed grass (*Sisyrinchium montanum*), plantain-leaved pussytoes (*Antennaria parlenii* ssp. *fallax*), and Howell's pussytoes (*Antennaria howellii* ssp. *howellii*).

In 2024, both plots were monitored providing data from the first growing season post-seeding. The number of seedlings for each species listed in the seed mix, or suspected to have originated from the seed mix, was counted in each of the 1x1m sub-plots. This count was then averaged across the five sub-plots (average number). This was compared with the projected number of seeds per sub-plot based on seed orders. We also recorded if each species was observed in the larger 20x20m plot. The germination rate was calculated as the average number of plants in the 1x1m sub-plots divided by the projected number of seeds per sub-plot.

Some of the seeded species are known to exhibit staggered germination, so it may be several years before the full diversity of the seed mix is realized.

Section 3.2

Section 3.2 was seeded in December of 2023 with 24 of the 30 seeded species found during monitoring in 2024 (Table 11). Heath aster (*Symphyotrichum ericoides* var. *ericoides*) and blue-eyed grass were observed in this plot in 2020 before restoration work started and were also in the seed mix. Virginia wild rye (*Elymus virginicus* var. *virginicus*), smooth aster (*Symphyotrichum laeve* var. *laeve*), and wild senna (*Senna hebecarpa*) were observed; however, were not listed in the seed mix and were likely substitutions. Virginia wild rye was the most commonly observed species in the subplots.

Twenty-one species from the seed mix were observed in the subplots in smaller quantities compared to the projected number of seeds. Cup-plant (*Silphium* cf *perfoliatum* var. *perfoliatum*) was the most observed species in the subplots from the seed mix and had only a 40% germination rate (Figure 7). Lance-leaved coreopsis (*Coreopsis lanceolata*), ox-eye, hoary vervain (*Verbena stricta*), and New England aster (*Symphyotrichum novae-angliae*) all had germination rates of >10%.

Certain species (e.g. tall ironweed (*Vernonia gigantea*)) may take longer to germinate and get to an identifiable size. Tall ironweed was not observed initially in the other newly seeded plots but appeared 3-4 years after seeding. Monitoring for a second growing season would be beneficial to capture some of the slower germinating and maturing species.

Table 11. Projected versus observed seed density for plot 3.2AA. Sub-plots were 1x1m. Plot refers to 20x20m plot.

Scientific Name	Common Name	Projected number of seeds per 1 m x 1 m	Average number of plants in 1 m x 1 m	Observed within plot
Rudbeckia hirta var. pulcherrima	black-eyed Susan	45	4.2	✓
Panicum virgatum	switch grass	45	1.6	✓
Sorghastrum nutans	copper savannah grass	45	1.2	✓
Andropogon gerardi	big bluestem	45		No
Monarda fistulosa var. fistulosa	wild bergamot	39	2.6	✓
Elymus canadensis var. canadensis	Canada wild rye	39	2	✓
Heliopsis helianthoides	ox-eye	32	4.8	✓
Pycnanthemum virginianum	Virginia mountain mint	32	0.4	✓
Penstemon digitalis	foxglove beard-tongue	26	2.2	✓
Ratibida pinnata	grey-headed coneflower	23		No
Verbena stricta	hoary vervain	19	2.6	✓
Symphyotrichum novae-angliae	New England aster	19	2.2	✓
Asclepias syriaca	common milkweed	19	1.6	✓
Oenothera biennis	common evening-primrose	19	1	✓
Asclepias tuberosa ssp. interior	butterfly milkweed	19	0.6	✓
Desmodium canadense	showy tick-trefoil	19	0.4	✓
Penstemon hirsutus	hairy beard-tongue	19	0.4	✓
Symphyotrichum ericoides var. ericoides	heath aster	19		✓**
Verbena hastata	blue vervain	19		✓
Schizachyrium scoparium var. scoparium	little bluestem	19		No
Silphium perfoliatum var. perfoliatum	cup-plant	13	5.2	✓_cf
Lespedeza capitata	round-headed bush-clover	13	0.6	✓_cf
Solidago nemoralis ssp. nemoralis	grey goldenrod	13	0.2	✓
Drymocallis arguta	tall cinquefoil	13	0.2	✓
Symphyotrichum oolentangiense	sky-blue aster	11		No
Euthamia graminifolia	grass-leaved goldenrod	6	0.8	✓
Sisyrinchium montanum	blue-eyed grass	6		✓**
Vernonia gigantea	tall ironweed	2		No
Coreopsis lanceolata	lance-leaved coreopsis	1	0.2	✓
Solidago rigida ssp. rigida	stiff goldenrod	1		No
Elymus virginicus var. virginicus	Virginia wild rye		6.6	✓*
Symphyotrichum laeve var. laeve	smooth aster		0.8	✓*
Senna hebecarpa	wild senna			✓*

✓* species not listed in the seed mix but suspected to come from it
✓** species from the seed mix that were also observed before restoration work started.
✓_cf identification not certain

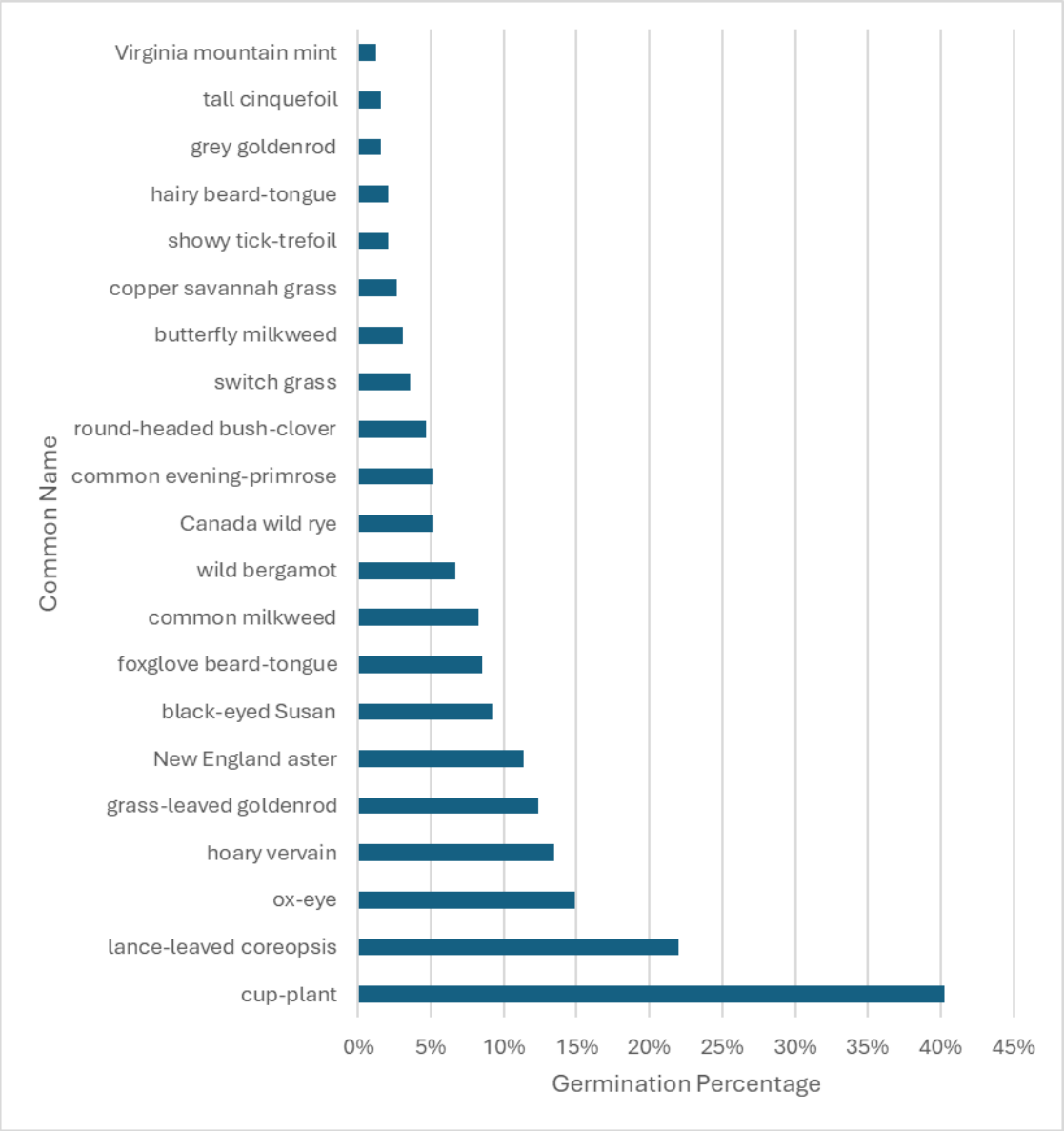

Figure 7. Germination percentage of seeded species in plot 3.2AA

Section 3.3

Section 3.3 was also seeded in December of 2023 with 19 of the 30 seeded species found during monitoring in 2024 (Table 12). Virginia wild rye and smooth aster were observed; however, were not listed in the seed mix and were likely substitutions. Virginia wild rye was the most commonly observed species in the subplots.

Fifteen species from the seed mix were observed in the subplots in smaller quantities compared to the projected number of seeds. Ox-eye, cup-plant (cf), and New England aster had germination rates of 5-10% (Figure 8). Similar to section 3.2, certain species (e.g. tall ironweed) may take longer to germinate and get to an identifiable size so monitoring a second growing season would be beneficial to capture some of the slower germinating and maturing species.

Table 12. Projected versus observed seed density for plot 3.3AB. Sub-plots were 1x1m. Plot refers to 20x20m plot.

Scientific Name	Common Name	Projected number of seeds per 1 m x 1 m	Average number of plants in 1 m x 1 m	Observed within plot
Rudbeckia hirta var. pulcherrima	black-eyed Susan	45	0.6	✓
Sorghastrum nutans	copper savannah grass	45		✓
Andropogon gerardi	big bluestem	45		No
Panicum virgatum	switch grass	45		No
Elymus canadensis var. canadensis	Canada wild rye	39	1	✓
Monarda fistulosa var. fistulosa	wild bergamot	39	0.4	✓
Heliopsis helianthoides	ox-eye	32	2.6	✓
Pycnanthemum virginianum	Virginia mountain mint	32	0.2	✓
Penstemon digitalis	foxglove beard-tongue	26	0.6	✓
Ratibida pinnata	grey-headed coneflower	23		No
Symphyotrichum novae-angliae	New England aster	19	1.2	✓
Asclepias syriaca	Common milkweed	19	0.8	✓
Verbena stricta	hoary vervain	19	0.6	✓
Oenothera biennis	common evening-primrose	19	0.4	✓
Symphyotrichum ericoides var. ericoides	heath aster	19	0.4	✓
Penstemon hirsutus	hairy beard-tongue	19	0.4	✓
Desmodium canadense	showy tick-trefoil	19	0.2	✓
Verbena hastata	blue vervain	19		✓
Schizachyrium scoparium var. scoparium	little bluestem	19		No
Asclepias tuberosa ssp. interior	butterfly milkweed	19		No
Silphium perfoliatum var. perfoliatum	cup-plant	13	1.2	✓_cf
Solidago nemoralis ssp. nemoralis	grey goldenrod	13		No
Drymocallis arguta	tall cinquefoil	13		No
Lespedeza capitata	round-headed bush-clover	13		No
Symphyotrichum oolentangiense	sky-blue aster	11	0.2	✓
Euthamia graminifolia	grass-leaved goldenrod	6		✓
Sisyrinchium montanum	blue-eyed grass	6		No
Vernonia gigantea	tall ironweed	2		No
Coreopsis lanceolata	lance-leaved coreopsis	1		✓_cf
Solidago rigida ssp. rigida	stiff goldenrod	1		No
Elymus virginicus var. virginicus	Virginia wild rye		4.4	✓*
Symphyotrichum laeve var. laeve	smooth aster		0.2	✓*

✓* species not listed in the seed mix but suspected to come from it
✓** species from the seed mix that were also observed before restoration work started.
✓_cf identification not certai

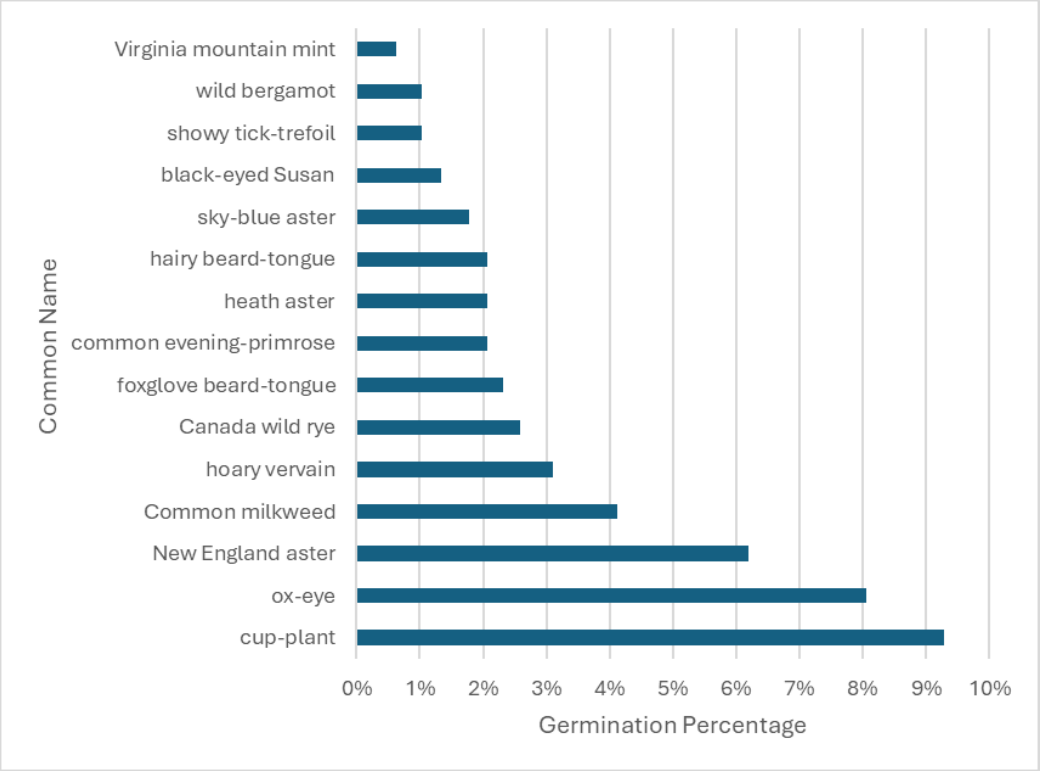

Figure 8. Germination percentage of seeded species in plot 3.3AB

Section 4

Twelve vegetation plots have been monitored in section 4 since 2016. The plots in this section underwent initial restoration between 2013 and 2016 providing one of the longest records of data collection post-restoration within The Meadoway. We provide a general summary of findings for each sub-section (4.1, 4.2, 4.3, 4.4) with detailed information on percent cover by species provided in individual tables.

Section 4.1

Plots 4.1G, H, and I demonstrated several similar patterns related to percent cover and community composition (Table 13, 14, 15). Both tall goldenrod and wild bergamot (*Monarda fistulosa* var. *fistulosa*) increased in cover over time, with ox-eye increasing over time in plot G and H. The cover of native grasses was highest post-restoration in 2018-2022; however, has decreased to lower covers by 2024. Kentucky bluegrass increased in cover over time, with the largest increases in plot I. Non-native forb cover was generally quite low and decreased over time compared to native forbs, especially in 2024. Creeping thistle cover was low and did not appear to increase or decrease over time, and was virtually absent in plot I. Dog-strangling vine (*Vincetoxicum rossicum*; DSV) cover increases slightly but remained low. The cover of thatch was high in plots ranging from 53-75% in 2024.

Table 13. Plot 4.1G percent cover by species

Species	Common Name	L-rank	Native or Non-native	Plant Type	2016*	2018	2019	2020*	2021	2022	2023	2024
Panicum virgatum	switch grass	L3	Native	Graminoids	1.6	3.6	2.7	2.7	0.3	0.1	0.2	0
Sorghastrum nutans	copper savannah grass	L2	Native	Graminoids	0.4	0.5	1.9	1.6	0.8	0.5	1.2	0.3
Andropogon gerardii	big bluestem	L3	Native	Graminoids	0	0	0.1	0.5	0.5	0	0.2	0.2
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	0	0.2	0.6	1.2	2.9	2.6	8.5	4.4
Setaria pumila ssp. pumila	yellow foxtail	L+	Non-native	Graminoids	0	4	0.2	0.3	1	0.4	0.2	0
Setaria viridis	green foxtail	L+	Non-native	Graminoids	2.1	0	0	0	0	0	0	0
Elymus repens	quack grass	L+	Non-native	Graminoids	0	0.1	0.4	0.2	0.2	0.1	0.3	0
Digitaria ischaemum	smooth crab grass	L+	Non-native	Graminoids	0	0.2	0	0	0	0	0	0
Festuca rubra ssp. rubra	red fescue	L+	Non-native	Graminoids	0	0	0	0.2	0	0	0	0
Phleum pratense	timothy grass	L+	Non-native	Graminoids	0	0	0	0	0	0	0.1	0
Solidago altissima	tall goldenrod	L5	Native	Forbs	0	1.6	4.2	7.5	13.4	27.2	23	51
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	36.6	9.6	27.4	1.8	0.9	2.1	1.3	0.7
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	0.4	4.4	8.4	8.1	12.3	15.1	9.3	17.2
Helianthus giganteus	tall sunflower	LX	Native	Forbs	1.2	10.6	13	17.2	8.6	7.1	4.2	2.6
Monarda fistulosa	wild bergamot	L5	Native	Forbs	2.6	1.3	2.2	7.1	9.3	9.8	17.6	14.4
Oenothera biennis	common evening-primrose	L5	Native	Forbs	0.8	2.8	3	0.1	0.6	0.9	0.5	1.2
Erigeron philadelphicus var. philadelphicus	Philadelphia fleabane	L5	Native	Forbs	0	0	0.2	0	0.5	1.9	1.5	1.2
Geum canadense	white avens	L5	Native	Forbs	0	0.1	0.2	0.8	0.8	1	0.6	0.2
Erigeron annuus	daisy fleabane	L5	Native	Forbs	0	0.1	0.5	0.4	0.6	0.9	0.2	0.3
Solidago canadensis var. canadensis	Canada goldenrod	L5	Native	Forbs	0	0	0	2	0	0	0	0
Erigeron canadensis	horse-weed	L5	Native	Forbs	0.1	0	0.8	0.1	0	0.8	0.1	0
Epilobium ciliatum ssp. ciliatum	sticky willow-herb	L5	Native	Forbs	0	0	0.2	0.7	0.3	0.3	0.2	0.1
Oxalis dillenii	deflexed yellow wood-sorrel	L5	Native	Forbs	0	0.1	0.1	0	0.4	0.4	0.4	0.3
Oxalis stricta	common yellow wood-sorrel	L5	Native	Forbs	1.1	0.4	0	0	0	0	0	0
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	0.5	0	0.1	0	0	0	0	0
Prunella vulgaris ssp. lanceolata	heal-all (native)	L5	Native	Forbs	0	0	0.1	0	0	0	0.1	0.1
Clinopodium vulgare	wild basil	L5	Native	Forbs	0	0.2	0	0	0	0	0	0
Galium asprellum	rough bedstraw	L5	Native	Forbs	0	0	0.1	0	0	0	0	0
Hackelia virginiana	Virginia stickseed	L5	Native	Forbs	0	0	0.1	0	0	0	0	0
Senna hebecarpa	wild senna	L+*	Native	Forbs	0	0.1	0	0	0	0	0	0
Symphyotrichum lateriflorum var. lateriflorum	calico aster	L5	Native	Forbs	0	0	0	0	0	0.1	0	0
Viola sororia var. sororia	common blue violet	L5	Native	Forbs	0	0	0	0	0	0	0	0.1
Taraxacum officinale	dandelion	L+	Non-native	Forbs	20.4	2.8	5	0.7	11.4	4.2	5.2	3.1
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	1.7	21.1	11.7	7.5	5	1.3	0.9	0.5
Plantago lanceolata	English plantain	L+	Non-native	Forbs	7.2	11.6	7.3	1.4	1.5	1.7	2.7	1.6
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	0.1	2.2	3.1	0.3	0.5	0.8	0.2	0.4
Veronica serpyllifolia ssp. serpyllifolia	thyme-leaved speedwell	L+	Non-native	Forbs	0	0.3	0.4	1	1	1.6	0.6	0.4
Trifolium pratense	red clover	L+	Non-native	Forbs	0.5	1.8	2.1	0.3	0.2	0.2	0.1	0.1
Veronica arvensis	corn speedwell	L+	Non-native	Forbs	0	0.7	2.1	0	0.7	0.3	0.5	0.4
Potentilla argentea	silvery cinquefoil	L+	Non-native	Forbs	2.6	0.6	1	0	0.1	0	0.1	0
Medicago lupulina	black medick	L+	Non-native	Forbs	0	0.3	2.1	0.2	0.6	0.2	0.1	0
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	0.2	1.2	0.4	0.1	0.1	0	0	0
Hypericum perforatum	common St. John's-wort	L+	Non-native	Forbs	0	0	0.1	0.1	0.2	0.2	0.3	0.3
Veronica officinalis	common speedwell	L+	Non-native	Forbs	0.8	0	0	0	0	0	0	0
Plantago major	common plantain	L+	Non-native	Forbs	0	0.2	0.3	0	0	0	0	0
Chenopodium album	lamb's quarters	L+	Non-native	Forbs	0	0	0.2	0	0.1	0.1	0	0
Potentilla recta	sulphur cinquefoil	L+	Non-native	Forbs	0	0	0.1	0	0	0.1	0.1	0.1
Prunella vulgaris	heal-all	L+?	Non-native	Forbs	0.4	0	0	0	0	0	0	0
Verbascum thapsus	common mullein	L+	Non-native	Forbs	0.4	0	0	0	0	0	0	0
Coreopsis grandiflora	large-flowered tickseed	L+	Non-native	Forbs	0	0.2	0.1	0	0	0	0	0
Geum urbanum	urban avens	L+	Non-native	Forbs	0	0	0.1	0.1	0	0.1	0	0
Erysimum hieraciifolium	hawkweed-leaved mustard	L+	Non-native	Forbs	0	0	0	0	0.3	0	0	0
Alliaria petiolata	garlic mustard	L+	Non-native	Forbs	0	0	0	0	0	0.1	0	0.1
Lactuca serriola	prickly lettuce	L+	Non-native	Forbs	0	0	0	0	0	0.1	0	0
Leucanthemum vulgare	ox-eye daisy	L+	Non-native	Forbs	0	0	0	0	0	0	0	0.1
Rumex crispus	curly dock	L+	Non-native	Forbs	0	0	0	0	0.1	0	0	0
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	0.1	1	1.3	1.1	1.4	3	3.4	3
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	1.2	1.9	3	2.2	1.6	2	1.1	0.4
Parthenocissus vitacea	thicket creeper	L5	Native	Woody	0	0	0	0.2	0.1	0.1	0.1	0.1
Acer saccharum ssp. nigrum	black maple	L4	Native	Woody	0	0	0	0.1	0	0.1	0.1	0.1
Rhus typhina	staghorn sumach	L5	Native	Woody	0	0.2	0	0	0.1	0.1	0	0
Acer negundo	Manitoba maple	L+?*	Native	Woody	0	0.2	0	0	0	0	0	0.1
Ulmus americana	white elm	L5	Native	Woody	0	0.2	0	0	0	0	0	0
Vitis riparia	riverbank grape	L5	Native	Woody	0	0.1	0.1	0	0	0	0	0
Acer tataricum ssp. ginnala	Amur maple	L+	Non-native	Woody	0	0	0.1	0.1	0	0	0.1	0
Robinia pseudoacacia	black locust	L+	Non-native	Woody	0.2	0	0	0	0	0	0	0
Euonymus europaeus	European spindle-tree	L+	Non-native	Woody	0	0	0	0	0	0	0.1	0
Malus pumila	apple	L+	Non-native	Woody	0	0.1	0	0	0	0	0	0
Morus alba	white mulberry	L+	Non-native	Woody	0	0.1	0	0	0	0	0	0
Thatch	Thatch			Thatch	0	0	0.5	0	22	52	57	64
Bare soil	Bare soil			Bare soil	9	1.4	0.6	1	1	2.6	1	0

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0
*Only summer survey completed

Table 14. Plot 4.1H percent cover by species

Species	Common Name	L-rank	Native or Non-native	Plant Type	2016*	2018	2019	2020*	2021	2022	2023	2024
Panicum virgatum	switch grass	L3	Native	Graminoids	0.5	2.4	1.8	2.2	0.7	0.1	0.2	0.1
Andropogon gerardii	big bluestem	L3	Native	Graminoids	0	1.8	0.7	0.7	0.8	0.6	0.9	0.8
Sorghastrum nutans	copper savannah grass	L2	Native	Graminoids	0	0.6	0.6	0.8	0.9	0.4	1.4	1.4
Setaria pumila ssp. pumila	yellow foxtail	L+	Non-native	Graminoids	0	17.2	0.2	0.2	0.5	0	0	0
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	0	0.1	0.3	0.7	1.3	1.9	6.8	4.7
Setaria viridis	green foxtail	L+	Non-native	Graminoids	5.7	0	0	0	0	0	0	0
Festuca rubra ssp. rubra	red fescue	L+	Non-native	Graminoids	0	0	0	0.2	0	0	0	3
Elymus repens	quack grass	L+	Non-native	Graminoids	0.1	0	0.2	0.1	0.1	0	0	0
Poa compressa	flat-stemmed blue grass	L+	Non-native	Graminoids	0	0	0	0	0	0.3	0.1	0.1
Digitaria ischaemum	smooth crab grass	L+	Non-native	Graminoids	0	0.2	0	0	0	0	0	0
Agrostis gigantea	redtop	L+	Non-native	Graminoids	0	0.1	0	0	0	0	0	0
Lolium pratense	meadow fescue	L+	Non-native	Graminoids	0	0	0.1	0	0	0	0	0
Monarda fistulosa	wild bergamot	L5	Native	Forbs	1.2	7.4	3.4	12.5	16.4	19	31.4	32.6
Solidago altissima	tall goldenrod	L5	Native	Forbs	0	0.4	2	9.8	11	20.2	23.1	35.4
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	12.8	27.1	44.3	7.8	1.7	1.9	2.3	1.5
Helianthus giganteus	tall sunflower	LX	Native	Forbs	3.3	14	17	13.4	5.4	2.1	1.4	1.1
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	0.5	1.4	1.5	2.4	4.6	6.8	5.9	7.4
Oenothera biennis	common evening-primrose	L5	Native	Forbs	0	2.7	2.5	0.6	0.9	1.7	0.3	0.4
Solidago canadensis var. canadensis	Canada goldenrod	L5	Native	Forbs	0	0	0	2.8	6	0	0	0
Senna hebecarpa	wild senna	L+*	Native	Forbs	0	0.1	0.8	1.2	0.9	1.4	1.2	0.8
Oxalis dillenii	deflexed yellow wood-sorrel	L5	Native	Forbs	0	0.3	0.1	0.4	0.4	0.8	0.4	0.5
Erigeron canadensis	horse-weed	L5	Native	Forbs	0	0.5	1.7	0.2	0.1	0	0	0
Erigeron annuus	daisy fleabane	L5	Native	Forbs	0	0.1	1.1	0.1	0.2	0.2	0.3	0.2
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	0	0.1	1.1	0	0.5	0.2	0.1	0
Fragaria virginiana ssp. virginiana	common wild strawberry	L5	Native	Forbs	0	0.1	0.2	0.2	0.4	0.4	0.2	0.2
Erigeron philadelphicus var. philadelphicus	Philadelphia fleabane	L5	Native	Forbs	0	0	0	0.1	0.2	0.2	0.2	0.4
Prunella vulgaris ssp. lanceolata	heal-all (native)	L5	Native	Forbs	0	0.1	0.2	0.1	0.1	0.4	0.1	0.1
Geum canadense	white avens	L5	Native	Forbs	0	0.1	0.2	0.4	0	0	0	0
Coreopsis lanceolata	lance-leaved coreopsis	L+*	Native	Forbs	0.4	0	0	0	0	0	0	0
Oxalis stricta	common yellow wood-sorrel	L5	Native	Forbs	0.4	0	0	0	0	0	0	0
Symphyotrichum cordifolium	heart-leaved aster	L5	Native	Forbs	0	0	0	0	0	0.1	0.1	0.1
Asclepias syriaca	common milkweed	L5	Native	Forbs	0	0	0	0	0	0.1	0	0.1
Epilobium ciliatum ssp. ciliatum	sticky willow-herb	L5	Native	Forbs	0	0	0	0.1	0	0	0	0
Fragaria vesca ssp. americana	woodland strawberry	L5	Native	Forbs	0	0	0	0	0	0	0.1	0
Hackelia virginiana	Virginia stickseed	L5	Native	Forbs	0	0	0	0	0.1	0	0	0
Potentilla norvegica	rough cinquefoil	L+?*	Native	Forbs	0	0	0	0	0.1	0	0	0
Silphium perfoliatum	cup-plant	L+?*	Native	Forbs	0	0	0	0	0	0	0	0.1
Taraxacum officinale	dandelion	L+	Non-native	Forbs	59.4	6	2.2	0.5	2.5	2.5	2.2	1.9
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	4.3	6.9	15.6	9	10.5	1.5	0.8	0.5
Plantago lanceolata	English plantain	L+	Non-native	Forbs	5	5.8	0.9	0.5	2	2.3	1.9	1.7
Leucanthemum vulgare	ox-eye daisy	L+	Non-native	Forbs	0	3	1.4	2.5	3	5.1	3.4	1.4
Veronica serpyllifolia ssp. serpyllifolia	thyme-leaved speedwell	L+	Non-native	Forbs	0	0.2	0.1	0.9	1.6	2.3	1.4	0.5
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	0	2.6	2.4	0.1	0.5	0.4	0.2	0.1
Hypericum perforatum	common St. John's-wort	L+	Non-native	Forbs	0	0.1	0.1	0.6	1.8	0.9	1	1
Medicago lupulina	black medick	L+	Non-native	Forbs	0	1.7	1	0.1	0.3	0.5	0.2	0.2
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	0.2	1	0.6	0	0.3	0.5	0.5	0.2
Verbascum thapsus	common mullein	L+	Non-native	Forbs	0	0.2	1.2	0	0	0.1	0.3	1
Geum urbanum	urban avens	L+	Non-native	Forbs	0	0	0.1	0.3	0.3	1.6	0.3	0.1
Potentilla argentea	silvery cinquefoil	L+	Non-native	Forbs	1.1	0.4	0.4	0.2	0.2	0.1	0	0
Veronica arvensis	corn speedwell	L+	Non-native	Forbs	0	0.3	0.8	0	0.2	0.3	0.1	0.3
Convolvulus arvensis	field bindweed	L+	Non-native	Forbs	0	0.2	0.6	0	0.4	0.2	0	0
Trifolium pratense	red clover	L+	Non-native	Forbs	0.3	0.2	0.5	0.3	0	0.1	0	0
Vicia cracca	cow vetch	L+	Non-native	Forbs	0	0	0	0	0	0.1	0.1	0.2
Cirsium vulgare	bull thistle	L+	Non-native	Forbs	0	0	0	0	0	0	0.1	0.1
Coreopsis grandiflora	large-flowered tickseed	L+	Non-native	Forbs	0	0.1	0.1	0	0	0	0	0
Euphorbia maculata	spotted spurge	L+?	Non-native	Forbs	0	0.2	0	0	0	0	0	0
Stellaria graminea	grass-leaved chickweed	L+	Non-native	Forbs	0	0.2	0	0	0	0	0	0
Trifolium repens	white clover	L+	Non-native	Forbs	0	0	0.2	0	0	0	0	0
Alliaria petiolata	garlic mustard	L+	Non-native	Forbs	0	0	0	0	0	0.1	0	0
Potentilla recta	sulphur cinquefoil	L+	Non-native	Forbs	0	0.1	0	0	0	0	0	0
Veronica officinalis	common speedwell	L+	Non-native	Forbs	0.1	0	0	0	0	0	0	0
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	0.5	1	0.6	1	1.4	2.4	1.3	1.9
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	0	1	0	0	0	0	0.2	0.2
Acer negundo	Manitoba maple	L+?*	Native	Woody	0.1	0	0	0	0	0.1	0.1	0.1
Rhus typhina	staghorn sumach	L5	Native	Woody	0	0.2	0	0	0	0	0	0
Morus alba	white mulberry	L+	Non-native	Woody	0.2	0.4	0	0	0	0	0	0
Acer tataricum ssp. ginnala	Amur maple	L+	Non-native	Woody	0	0	0.1	0	0	0	0.1	0
Rhamnus cathartica	common buckthorn	L+	Non-native	Woody	0	0	0	0	0	0	0.1	0.1
Thatch	Thatch			Thatch	0	0.8	4.1	0	30.4	31	47	53
Bare soil	Bare soil			Bare soil	11.4	0.8	0.8	0	1.8	1.6	1.2	0

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0

*Only summer survey completed

Table 15. Plot 4.1l percent cover by species

Species	Common Name	L-rank	Native or Non-native	Plant Type	2016*	2018	2019	2021	2022	2023	2024
Sorghastrum nutans	copper savannah grass	L2	Native	Graminoids	0.8	12	6.1	4.4	1.8	2.4	1.7
Andropogon gerardii	big bluestem	L3	Native	Graminoids	1	4.5	4.2	3.6	3.8	1.4	1.8
Schizachyrium scoparium	little bluestem	L2	Native	Graminoids	0.2	1.4	0.7	0.4	0.4	0.4	0.1
Panicum virgatum	switch grass	L3	Native	Graminoids	0.1	0.3	0.9	0.2	0	0	0.2
Panicum capillare	panic grass	L5	Native	Graminoids	0.1	0	0	0	0	0	0
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	0	0.8	2.1	7.9	7.1	14.8	18.8
Elymus repens	quack grass	L+	Non-native	Graminoids	0.1	0	0.4	0.4	0.5	0.2	0.1
Festuca rubra ssp. rubra	red fescue	L+	Non-native	Graminoids	0	0.8	0.4	0	0.2	0	0.1
Bromus japonicus	Japanese chess	L+	Non-native	Graminoids	0	0.2	0	0.4	0.4	0.1	0
Agrostis gigantea	redtop	L+	Non-native	Graminoids	0	0.4	0.4	0.1	0	0	0
Poa compressa	flat-stemmed blue grass	L+	Non-native	Graminoids	0.1	0.1	0.1	0.1	0.4	0	0
Setaria viridis	green foxtail	L+	Non-native	Graminoids	0.3	0	0	0	0	0	0
Setaria pumila ssp. pumila	yellow foxtail	L+	Non-native	Graminoids	0	0.2	0	0	0	0	0
Bromus commutatus	upright chess	L+	Non-native	Graminoids	0	0	0.1	0	0	0	0
Solidago altissima	tall goldenrod	L5	Native	Forbs	0.6	8.6	30.2	31.2	31	36.8	48
Monarda fistulosa	wild bergamot	L5	Native	Forbs	0.1	1.3	1.5	4	8.6	8.8	8
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	3.4	5.3	7.8	3.4	2.8	2.7	1.2
Helianthus giganteus	tall sunflower	LX	Native	Forbs	0.8	2.1	2.4	0.4	0.2	0.2	0.2
Oenothera biennis	common evening-primrose	L5	Native	Forbs	0.8	4	0.3	0.3	0.3	0.1	0
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	0.1	1.2	0.6	0.7	0.4	0.1	0
Prunella vulgaris ssp. lanceolata	heal-all (native)	L5	Native	Forbs	0	2.4	0.2	0	0.1	0	0
Erigeron annuus	daisy fleabane	L5	Native	Forbs	0	1.1	0.5	0.4	0.3	0.3	0.1
Asclepias syriaca	common milkweed	L5	Native	Forbs	0	0.8	0.2	0.1	0	0	0
Erigeron canadensis	horse-weed	L5	Native	Forbs	0	0.5	0	0	0.5	0.1	0
Erigeron philadelphicus var. philadelphicus	Philadelphia fleabane	L5	Native	Forbs	0	0.1	0.2	0	0.2	0	0
Senna hebecarpa	wild senna	L+*	Native	Forbs	0	0	0.1	0.2	0.1	0	0.1
Oxalis stricta	common yellow wood-sorrel	L5	Native	Forbs	0.2	0.1	0	0	0	0	0
Galium aparine	cleavers	L5	Native	Forbs	0	0	0	0.1	0.1	0	0
Oxalis dillenii	deflexed yellow wood-sorrel	L5	Native	Forbs	0	0.1	0	0	0	0	0.1
Symphyotrichum lanceolatum var. lanceolatum	panicled aster	L5	Native	Forbs	0	0.1	0.1	0	0	0	0
Coreopsis lanceolata	lance-leaved coreopsis	L+*	Native	Forbs	0.1	0	0	0	0	0	0
Euthamia graminifolia	grass-leaved goldenrod	L5	Native	Forbs	0	0	0	0.1	0	0	0
Taraxacum officinale	dandelion	L+	Non-native	Forbs	51.8	10.5	4.3	2.1	2.2	0.7	1.5
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	0.7	11.8	10.2	4.6	1.1	0.6	0.6
Dipsacus fullonum	teasel	L+	Non-native	Forbs	0	0	0.4	1.8	8	8	4
Plantago lanceolata	English plantain	L+	Non-native	Forbs	0.6	8	2.2	0.6	0.6	0.8	0.3
Medicago lupulina	black medick	L+	Non-native	Forbs	1.8	5.3	1.4	0.2	0.6	0.1	0.1
Leucanthemum vulgare	ox-eye daisy	L+	Non-native	Forbs	0.4	2.2	3.2	0.2	0.6	0	0.1
Verbascum thapsus	common mullein	L+	Non-native	Forbs	5.2	0	0	0	0	0.1	0
Veronica arvensis	corn speedwell	L+	Non-native	Forbs	0	0.4	0.5	0.4	2.2	0.7	0.4
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	0	2.2	1.4	0.2	0.2	0.2	0
Potentilla argentea	silvery cinquefoil	L+	Non-native	Forbs	1.1	0.2	0.1	0	0	0	0
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	0	0.2	0.5	0.2	0.1	0.1	0.1
Cirsium vulgare	bull thistle	L+	Non-native	Forbs	0.4	0	0	0	0	0	0.2
Hypericum perforatum	common St. John's-wort	L+	Non-native	Forbs	0	0.1	0	0.1	0.1	0.1	0.1
Arenaria serpyllifolia	thyme-leaved sandwort	L+	Non-native	Forbs	0	0.1	0	0.1	0.1	0.1	0
Chenopodium album	lamb's quarters	L+	Non-native	Forbs	0.2	0.1	0	0	0	0	0
Geum urbanum	urban avens	L+	Non-native	Forbs	0	0	0	0	0.1	0.1	0
Plantago major	common plantain	L+	Non-native	Forbs	0	0.1	0.1	0	0	0	0
Prunella vulgaris	heal-all	L+?	Non-native	Forbs	0.1	0	0.1	0	0	0	0
Stellaria graminea	grass-leaved chickweed	L+	Non-native	Forbs	0	0.2	0	0	0	0	0
Trifolium pratense	red clover	L+	Non-native	Forbs	0	0.1	0.1	0	0	0	0
Trifolium repens	white clover	L+	Non-native	Forbs	0	0.2	0	0	0	0	0
Coreopsis grandiflora	large-flowered tickseed	L+	Non-native	Forbs	0	0	0	0.1	0	0	0
Echium vulgare	viper's bugloss	L+	Non-native	Forbs	0	0	0	0	0.1	0	0
Euphorbia maculata	spotted spurge	L+?	Non-native	Forbs	0.1	0	0	0	0	0	0
Polygonum aviculare	prostrate knotweed	L+	Non-native	Forbs	0	0	0	0	0.1	0	0
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	0.7	2.2	1.9	1.2	2.4	2.7	3.3
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	0	0	0.2	0	0	0.1	0
Acer negundo	Manitoba maple	L+?*	Native	Woody	0	0.2	0.1	0	0.3	0	0.2
Juglans nigra	black walnut	L5	Native	Woody	0	0	0	0	0.1	0.1	0
Rhus typhina	staghorn sumach	L5	Native	Woody	0	0	0	0	0	0	0.1
Morus alba	white mulberry	L+	Non-native	Woody	0	0.1	0.3	0.1	0.1	0.2	0.1
Acer tataricum ssp. ginnala	Amur maple	L+	Non-native	Woody	0	0	0.1	0	0	0	0
Thatch	Thatch			Thatch	0	0	4.7	18	40	70.8	74.6
Bare soil	Bare soil			Bare soil	8.4	2	6.8	4.8	2.2	2.6	0.4

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0

*Only summer survey completed

Section 4.2

Plots 4.2A, B, and C demonstrated several similar patterns related to percent cover and community composition (Table 16, 17, 18). Percent cover of tall goldenrod increased over time although cover in plot A did not reach the same extent as in section 4.1. The cover of native grasses was lower than in section 4.1, never reaching the same higher values in 2018-2022. Panic grass was the only native grass in plot B and was only found in 2018. Kentucky bluegrass increased in cover over time and to a larger extent than in section 4.1 (e.g. plot A had 75% cover in 2024). Non-native forb cover generally decreased over time although bird's foot trefoil (*Lotus corniculatus*) increased in plot A and B. Creeping thistle cover decreased over time and DSV cover increased to a greater extent than in section 4.1 reaching 16.4% in plot A in 2024. The cover of thatch was very high in plots reaching almost 100% in plot C by 2024.

Section 4.3

Plots 4.3D, E, and F demonstrated several similar patterns related to percent cover and community composition (Table 19, 20, 21). There was a very high cover of native grasses (e.g. big bluestem (*Andropogon gerardi*) reaching almost 30% cover in 2019 in plot E), particularly between 2018 and 2022, with plot F having a moderate cover. Kentucky bluegrass increased over time but decreased slightly between 2023 and 2024, and there was lower cover in plot F compared to plot D and E. Percent cover of tall goldenrod increased over time to covers ranging from 24 to 51% in 2024. Non-native forb cover decreased over time with the greatest decreases for dandelion (*Taraxacum officianale*). Creeping thistle and DSV cover were generally low from 2018-2024 (0.9-5.4%). The cover of thatch was very high in plots reaching almost 100% in plot E in 2023.

Section 4.4

Plots 4.4J, K, and L demonstrated several similar patterns related to percent cover and community composition (Table 22, 23, 24). Percent cover of tall goldenrod increased over time in this section, although cover in plot J did not reach the same extent as in other areas of section 4.4. The cover of native grasses was low similar to section 4.2 (<5%). There was a moderate to high cover of non-native grasses including quack grass (*Elymus repens*), Kentucky bluegrass, and smooth brome grass (*Bromus inermis*). Non-native forb cover generally decreased over time with notable declines in dandelion (e.g. 75% in 2016 to ~5% in 2024). The cover of common milkweed, a native forb, was considerably higher in this section compared to other sections (e.g. 6.4% in plot J). Creeping thistle cover increased between 2023 and 2024 particularly in plots K and L, while DSV cover was very low to none in recent years. The cover of thatch was very high in plots reaching 93% in 2024.

Table 16. Plot 4.2A percent cover by species

Species	Common Name	L-rank	Native or Non-native	Plant Type	2016*	2018	2019	2020	2021	2022	2023	2024
Andropogon gerardii	big bluestem	L3	Native	Graminoids	1	1	0.4	0.6	0.2	0.1	0	0
Sorghastrum nutans	copper savannah grass	L2	Native	Graminoids	1	0.3	0.1	0.1	0.1	0.1	0.1	0.1
Panicum virgatum	switch grass	L3	Native	Graminoids	0.2	0.8	0.2	0.2	0.2	0.1	0	0
Schizachyrium scoparium	little bluestem	L2	Native	Graminoids	0	0.4	0	0	0	0	0	0
Panicum capillare	panic grass	L5	Native	Graminoids	0	0.2	0	0	0	0	0	0
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	2.4	18.2	19.8	33.2	27.6	16.8	50	74.6
Festuca rubra ssp. rubra	red fescue	L+	Non-native	Graminoids	14.4	5	0.8	0.4	4	1.2	0	0
Schedonorus pratensis	meadow fescue	L+	Non-native	Graminoids	10.6	0	0	0	0	0	0	0
Elymus repens	quack grass	L+	Non-native	Graminoids	0	0.4	0.7	0.7	1	1	2.2	2.2
Poa compressa	flat-stemmed blue grass	L+	Non-native	Graminoids	0	0	0.1	0	0.1	0.6	0	1
Setaria pumila ssp. pumila	yellow foxtail	L+	Non-native	Graminoids	0	0.9	0.5	0.2	0.2	0	0	0
Lolium pratense	meadow fescue	L+	Non-native	Graminoids	0	1.1	0.1	0	0	0	0	0
Phleum pratense	timothy grass	L+	Non-native	Graminoids	0.8	0.2	0	0	0	0	0	0
Dactylis glomerata	orchard grass	L+	Non-native	Graminoids	0	0	0	0	0.2	0.4	0.2	0
Solidago altissima	tall goldenrod	L5	Native	Forbs	4.2	20.6	2.4	13.2	10.2	13	14.4	19.6
Solidago canadensis var. canadensis	Canada goldenrod	L5	Native	Forbs	0.6	0	18.2	13.2	7.6	0	0	0
Monarda fistulosa	wild bergamot	L5	Native	Forbs	1.1	1.2	1.8	3.2	3.2	6.4	5.8	7
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	0.1	0.1	1	1.5	4.3	5.8	8	5.2
Ratibida pinnata	grey-headed coneflower	L+*	Native	Forbs	0.8	1.6	3.1	1.2	2.1	3.1	2.1	1
Silphium perfoliatum	cup-plant	L+?*	Native	Forbs	0	0.3	1.2	3	2.6	3.6	0.5	0.6
Helianthus giganteus	tall sunflower	LX	Native	Forbs	0.5	0.8	3.8	2.5	1	1.4	0.2	0.1
Asclepias syriaca	common milkweed	L5	Native	Forbs	0	0.6	0.2	1	1.6	0.4	0.6	0.9
Pycnanthemum virginianum	Virginia mountain-mint	L3	Native	Forbs	0.4	0.2	0.4	0.4	1.2	0.4	0.6	1
Asclepias tuberosa	butterfly milkweed	LX	Native	Forbs	0.6	0.2	1.3	0.6	0.2	0.8	0.1	0.4
Solidago rigida ssp. rigida	stiff goldenrod	LX	Native	Forbs	0	0	0	0	0.4	1.1	0.8	1.6
Coreopsis tripteris	tall tickseed	L+*	Native	Forbs	0	0.1	0.4	0.4	0.6	0.7	0.2	0.3
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	0.1	0	0.6	0.4	0.8	0.3	0	0
Oxalis dillenii	deflexed yellow wood-sorrel	L5	Native	Forbs	0	0.5	0.5	0.2	0.4	0.1	0	0
Asclepias incarnata ssp. incarnata	swamp milkweed	L4	Native	Forbs	0	0	0	0	0	0.4	0.2	0
Oxalis stricta	common yellow wood-sorrel	L5	Native	Forbs	0	0.1	0.5	0	0	0	0	0
Erigeron canadensis	horse-weed	L5	Native	Forbs	0	0	0.1	0.4	0	0	0	0
Epilobium ciliatum ssp. ciliatum	sticky willow-herb	L5	Native	Forbs	0	0	0.1	0	0.2	0	0	0
Asclepias sullivantii	smooth milkweed	LX	Native	Forbs	0.2	0	0	0	0	0	0	0
Oenothera biennis	common evening-primrose	L5	Native	Forbs	0	0	0.2	0	0	0	0	0
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	0	0	0.1	0	0	0	0	0
Potentilla norvegica	rough cinquefoil	L+?*	Native	Forbs	0	0	0.1	0	0	0	0	0
Symphyotrichum novae-angliae	New England aster	L5	Native	Forbs	0	0	0	0	0	0	0.1	0
Lotus corniculatus	bird's foot trefoil	L+	Non-native	Forbs	0.2	0.1	1.8	7	14.1	10	14	9.2
Echium vulgare	viper's bugloss	L+	Non-native	Forbs	0	12	13	2.6	10	2	0	0
Taraxacum officinale	dandelion	L+	Non-native	Forbs	14.4	5.6	8.4	5.2	1.5	1.6	0.3	0.6
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	11.7	1.9	0.8	0.6	0.4	0.3	0.4	0.2
Trifolium pratense	red clover	L+	Non-native	Forbs	14.4	0.1	0.8	0.3	0.2	0.1	0.1	0
Medicago sativa ssp. sativa	alfalfa	L+	Non-native	Forbs	3.6	0.8	0.6	1.4	2.6	2	1	0.2
Rumex crispus	curly dock	L+	Non-native	Forbs	0	2.8	5.1	1.2	0.7	0.3	0.2	0
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	1.5	1.6	1.9	1.3	0.9	0.5	0	0
Potentilla recta	sulphur cinquefoil	L+	Non-native	Forbs	0	0.4	0	0.2	0.4	0.4	2	0.4
Convolvulus arvensis	field bindweed	L+	Non-native	Forbs	0.1	0.4	1.5	0.6	0.2	0.1	0.4	0.1
Vicia cracca	cow vetch	L+	Non-native	Forbs	0.6	0.3	1	0.3	0.3	0.2	0.2	0.1
Medicago lupulina	black medick	L+	Non-native	Forbs	0.6	0	0.5	0.6	0.5	0.2	0	0
Cirsium vulgare	bull thistle	L+	Non-native	Forbs	0	0.4	0.4	0.5	0.4	0.1	0	0
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	0.1	0	0.5	0.1	0.3	0.4	0.1	0
Plantago lanceolata	English plantain	L+	Non-native	Forbs	0.4	0.2	0.2	0.1	0.2	0.2	0	0
Chenopodium album	lamb's quarters	L+	Non-native	Forbs	0	0.8	0.1	0.2	0	0.1	0	0
Coreopsis grandiflora	large-flowered tickseed	L+	Non-native	Forbs	0	0.2	0.4	0	0	0	0	0
Lepidium campestre	field pepper-grass	L+	Non-native	Forbs	0	0	0.1	0	0.4	0	0	0
Vicia tetrasperma	slender vetch	L+	Non-native	Forbs	0	0	0	0	0	0.2	0	0
Fallopia convolvulus	black bindweed	L+	Non-native	Forbs	0	0	0.1	0	0	0	0	0
Lactuca serriola	prickly lettuce	L+	Non-native	Forbs	0	0	0	0.1	0	0	0	0
Plantago major	common plantain	L+	Non-native	Forbs	0	0.1	0	0	0	0	0	0
Tragopogon pratensis	meadow goat's beard	L+	Non-native	Forbs	0	0	0	0.1	0	0	0	0
Trifolium hybridum	alsike clover	L+	Non-native	Forbs	0	0.1	0	0	0	0	0	0
Verbascum thapsus	common mullein	L+	Non-native	Forbs	0	0	0	0.1	0	0	0	0
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	1.7	2.9	5.9	9.6	5.6	13.6	13.6	16.4
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	2.8	11.4	6.4	8.6	1.4	1.6	0.6	0.3
Cornus stolonifera	red osier dogwood	L5	Native	Woody	0	0	0.3	0	0	0	0	0
Rhamnus cathartica	common buckthorn	L+	Non-native	Woody	0	0	0	0.1	0.1	0	0	0
Morus alba	white mulberry	L+	Non-native	Woody	0	0.1	0	0	0	0	0	0
Thatch	Thatch			Thatch	2	34	16.6	46.6	39.4	63	95	94.4
Bare soil	Bare soil			Bare soil	0.6	0	0	1.6	0	0	0.2	0

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0
*Only summer survey completed

Table 17. Plot 4.2B percent cover by species

Species	Common Name	L-rank	Native or Non-native	Plant Type	2016*	2018	2019	2020	2021	2022	2023	2024
Panicum capillare	panic grass	L5	Native	Graminoids	0	0.4	0	0	0	0	0	0
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	8.4	11.4	5	10.7	10.4	9.8	24.6	22
Elymus repens	quack grass	L+	Non-native	Graminoids	3.8	11.7	11.4	10.8	5.6	6.3	4.6	2.8
Setaria pumila ssp. pumila	yellow foxtail	L+	Non-native	Graminoids	0	31.6	0.2	0.3	1.3	0	0	0
Festuca rubra ssp. rubra	red fescue	L+	Non-native	Graminoids	0	0.8	0	0.2	0.6	0.4	0.1	0
Dactylis glomerata	orchard grass	L+	Non-native	Graminoids	0	0	0	0	0.2	0	0	0
Poa compressa	flat-stemmed blue grass	L+	Non-native	Graminoids	0	0	0	0.2	0	0	0	0
Setaria viridis	green foxtail	L+	Non-native	Graminoids	0.1	0	0	0	0	0	0	0
Solidago altissima	tall goldenrod	L5	Native	Forbs	23	25.3	23.4	31.4	16.4	28.2	36	65.8
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	2.6	1.9	3.5	5.6	14.2	15.2	21.9	9.4
Helianthus giganteus	tall sunflower	LX	Native	Forbs	0	0.5	2.6	4.4	4.3	6.2	1.6	1.5
Asclepias syriaca	common milkweed	L5	Native	Forbs	0	0.6	1.4	3	2.2	2.1	1.8	1.6
Silphium perfoliatum	cup-plant	L+?*	Native	Forbs	0	0.1	0.2	1.1	1.4	3	2.7	1.6
Symphyotrichum lanceolatum var. lanceolatum	panicled aster	L5	Native	Forbs	0	0	1	1.1	2.8	3.1	0.3	0.4
Monarda fistulosa	wild bergamot	L5	Native	Forbs	0	0.8	0.4	1.2	1.2	2.7	0.4	0.8
Solidago canadensis var. canadensis	Canada goldenrod	L5	Native	Forbs	0	0	5.4	0	0	0	0	0.2
Erigeron annuus	daisy fleabane	L5	Native	Forbs	0	0.1	0.1	0	0.7	2.4	0.1	0
Symphyotrichum novae-angliae	New England aster	L5	Native	Forbs	0	0	0	0.1	0.3	0.4	2.1	0.3
Coreopsis tripteris	tall tickseed	L+*	Native	Forbs	0	0.2	0.2	0.4	0.4	1	0.2	0
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	0	1.2	0.5	0.1	0.6	0	0	0
Pycnanthemum virginianum	Virginia mountain-mint	L3	Native	Forbs	0	0	0	0.1	0.2	0.3	0.7	0.6
Oxalis dillenii	deflexed yellow wood-sorrel	L5	Native	Forbs	0	0.3	0.3	0.2	0.3	0.5	0	0
Erigeron philadelphicus var. philadelphicus	Philadelphia fleabane	L5	Native	Forbs	0	0	0	0	0	0.6	0	0
Erigeron canadensis	horse-weed	L5	Native	Forbs	0	0	0.2	0	0.3	0	0	0
Epilobium ciliatum ssp. ciliatum	sticky willow-herb	L5	Native	Forbs	0	0	0	0.1	0.1	0.1	0	0
Oenothera biennis	common evening-primrose	L5	Native	Forbs	0	0.2	0	0	0	0	0	0
Ratibida pinnata	grey-headed coneflower	L+*	Native	Forbs	0	0	0	0	0	0	0.1	0
Solidago rigida ssp. rigida	stiff goldenrod	LX	Native	Forbs	0	0.1	0	0	0	0	0	0
Taraxacum officinale	dandelion	L+	Non-native	Forbs	27.8	11	4.6	3.6	2.1	1.5	1.1	2.4
Medicago sativa ssp. sativa	alfalfa	L+	Non-native	Forbs	13	6	7	4.2	5.6	2.8	0.6	1.2
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	21.8	0.9	0.2	0.1	0.4	0.6	0.1	0.1
Lotus corniculatus	bird's foot trefoil	L+	Non-native	Forbs	0	0.2	1.4	1.8	2	1.2	3	6.8
Vicia cracca	cow vetch	L+	Non-native	Forbs	1	1.4	1.4	2.7	2.2	3	2.2	1.2
Trifolium pratense	red clover	L+	Non-native	Forbs	0.6	0.5	3.8	2.2	0.7	0.9	0.2	0
Rumex crispus	curly dock	L+	Non-native	Forbs	0	2.4	3.8	1	0.5	0.5	0.2	0.4
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	0.4	1	1	2.7	1.6	0.5	0.2	0.2
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	0	0.3	0.8	0.3	0.6	0.7	0	0
Vicia tetrasperma	slender vetch	L+	Non-native	Forbs	0	0.3	1.2	0	0.5	0.5	0.1	0.1
Convolvulus arvensis	field bindweed	L+	Non-native	Forbs	0	0.4	0.5	0.1	0.2	0.1	0.1	0.1
Verbascum thapsus	common mullein	L+	Non-native	Forbs	0	0.4	0.2	0.2	0.1	0	0	0
Melilotus albus	white sweet clover	L+	Non-native	Forbs	0	0.1	0	0	0.2	0.4	0	0
Plantago major	common plantain	L+	Non-native	Forbs	0	0.4	0.1	0.1	0	0	0	0
Medicago lupulina	black medick	L+	Non-native	Forbs	0	0.2	0	0.1	0.2	0	0	0
Tragopogon pratensis	meadow goat's beard	L+	Non-native	Forbs	0	0	0.2	0	0.1	0	0	0
Chenopodium album	lamb's quarters	L+	Non-native	Forbs	0	0.2	0	0	0	0	0	0
Tragopogon dubius	lemon-yellow goat's beard	L+	Non-native	Forbs	0	0.2	0	0	0	0	0	0
Arctium minus	common burdock	L+	Non-native	Forbs	0	0	0	0	0	0	0	0.1
Epilobium parviflorum	small-flowered willow-herb	L+	Non-native	Forbs	0	0.1	0	0	0	0	0	0
Fallopia convolvulus	black bindweed	L+	Non-native	Forbs	0	0	0	0.1	0	0	0	0
Potentilla recta	sulphur cinquefoil	L+	Non-native	Forbs	0	0.1	0	0	0	0	0	0
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	30.2	11.4	8.7	4.6	3.2	2.8	1.5	1.2
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	0	1.6	1.8	2.8	4.4	6.2	7	4.5
Morus alba	white mulberry	L+	Non-native	Woody	0	0.2	0	0	0.1	0	0	0
Sorbus aucuparia	European mountain-ash	L+	Non-native	Woody	0	0	0	0.1	0	0	0	0
Thatch	Thatch			Thatch	21	34	8.3	55	40	54.8	94	94.6
Bare soil	Bare soil			Bare soil	3	1.4	0	0	0	0	0	0

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0

*Only summer survey completed

Table 18. Plot 4.2C percent cover by species

Species	Common Name	L-rank	Native or Non-native	Plant Type	2016*	2018	2019	2020	2021	2022	2023	2024
Sorghastrum nutans	copper savannah grass	L2	Native	Graminoids	1.9	2.6	2.6	5.4	3.4	2	1.2	0.5
Panicum virgatum	switch grass	L3	Native	Graminoids	0	0.4	4.1	1.6	0.4	0.4	0.4	0
Andropogon gerardii	big bluestem	L3	Native	Graminoids	0	1	0	0.3	0.7	1.2	0.4	1.2
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	0	30	58.4	49.6	25.4	24.4	25.6	20.4
Festuca rubra ssp. rubra	red fescue	L+	Non-native	Graminoids	24.4	33	0.4	10	38	2	5	7
Schedonorus pratensis	meadow fescue	L+	Non-native	Graminoids	12.8	0	0	0	0	0	0	0
Elymus repens	quack grass	L+	Non-native	Graminoids	3.2	0.2	1	1.4	1.3	0.5	0.3	0.1
Setaria pumila ssp. pumila	yellow foxtail	L+	Non-native	Graminoids	0	0.6	1.4	0.1	0.1	0	0	0
Bromus inermis	smooth brome grass	L+	Non-native	Graminoids	0	0	0	0.4	0.3	0.1	0.1	0.1
Lolium arundinaceum	tall fescue	L+	Non-native	Graminoids	0	0	0.4	0	0	0	0	0
Lolium pratense	meadow fescue	L+	Non-native	Graminoids	0	0.4	0	0	0	0	0	0
Phalaris arundinacea	reed canary grass	L+?	Non-native	Graminoids	0	0.1	0	0	0	0	0	0
Solidago altissima	tall goldenrod	L5	Native	Forbs	3.6	0	0.8	3	8.6	21.2	35.4	41
Monarda fistulosa	wild bergamot	L5	Native	Forbs	5.8	7.8	6.4	6.4	6.4	6.6	4.7	3.7
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	4.8	2.1	4.3	4	2.9	2.8	2.9	0.3
Solidago rigida ssp. rigida	stiff goldenrod	LX	Native	Forbs	2	1.2	1.8	2.6	3.6	4	3.8	1.7
Pycnanthemum virginianum	Virginia mountain-mint	L3	Native	Forbs	0.1	1.8	2.8	2	4	2.3	2.1	1.4
Asclepias syriaca	common milkweed	L5	Native	Forbs	0	1.2	1.8	2.4	1.8	3.4	1.6	1.8
Solidago canadensis var. canadensis	Canada goldenrod	L5	Native	Forbs	0	0	2	2.4	5	0	0	0
Symphyotrichum lanceolatum var. lanceolatum	panicled aster	L5	Native	Forbs	0	0.8	1.7	1	0.5	0.5	0.3	0
Silphium perfoliatum	cup-plant	L+?*	Native	Forbs	0	0.4	0.9	0.6	0.7	0.4	0.2	0.9
Asclepias tuberosa	butterfly milkweed	LX	Native	Forbs	0	0.4	0.1	0.3	0.6	1.2	0.6	0.2
Ratibida pinnata	grey-headed coneflower	L+*	Native	Forbs	1.6	0.4	0	0.2	0.2	0.1	0	0
Helianthus giganteus	tall sunflower	LX	Native	Forbs	0	0.1	0.2	0.8	0.4	0	0	0
Desmodium canadense	showy tick-trefoil	L5	Native	Forbs	0.4	0.2	0.6	0.1	0	0	0	0
Coreopsis lanceolata	lance-leaved coreopsis	L+*	Native	Forbs	1	0	0	0	0	0	0	0
Coreopsis tripteris	tall tickseed	L+*	Native	Forbs	0	0	0	0.1	0.1	0	0	0.1
Euthamia graminifolia	grass-leaved goldenrod	L5	Native	Forbs	0	0	0	0	0.1	0	0.1	0
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	0.1	0	0	0.1	0	0	0	0
Symphyotrichum novae-angliae	New England aster	L5	Native	Forbs	0	0	0	0	0	0.1	0.1	0
Oxalis dillenii	deflexed yellow wood-sorrel	L5	Native	Forbs	0	0	0.1	0	0	0	0	0
Oxalis stricta	common yellow wood-sorrel	L5	Native	Forbs	0	0.1	0	0	0	0	0	0
Taraxacum officinale	dandelion	L+	Non-native	Forbs	30.8	10.2	10.2	5.2	2.6	1.4	1.7	1.8
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	12.8	2.2	1.7	0.5	0.5	0.7	0.3	0.1
Vicia cracca	cow vetch	L+	Non-native	Forbs	0.2	1.4	1	5.4	2.8	1.2	0.7	0.8
Trifolium pratense	red clover	L+	Non-native	Forbs	12	0	0	0.8	0.1	0	0	0
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	2.8	0.1	1.3	1.5	0.1	0.1	0.2	0.1
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	0.2	0	0.2	1.5	0.1	0.2	0	0.1
Vicia tetrasperma	slender vetch	L+	Non-native	Forbs	0	0	0.1	0.2	0.1	0.4	0.4	0.8
Medicago lupulina	black medick	L+	Non-native	Forbs	0.7	0	0.2	0.8	0.1	0.1	0	0
Verbascum thapsus	common mullein	L+	Non-native	Forbs	0	0	0.2	1	0.6	0	0	0
Tragopogon pratensis	meadow goat's beard	L+	Non-native	Forbs	0	0	0.4	0	0	0	0	0
Melilotus albus	white sweet clover	L+	Non-native	Forbs	0.3	0	0	0	0	0	0	0
Chenopodium album	lamb's quarters	L+	Non-native	Forbs	0	0	0.1	0	0	0	0	0
Cirsium vulgare	bull thistle	L+	Non-native	Forbs	0	0	0	0.1	0	0	0	0
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	9.4	15.5	13	1.7	1.6	2.4	6.3	3.2
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	0.6	1.4	0.9	0.7	0.9	1.6	1.2	1.2
Cornus stolonifera	red osier dogwood	L5	Native	Woody	0	0	0.1	0	0	0	0	0
Thatch	Thatch			Thatch	0	38	73.4	63.8	78.4	79.6	98	99.8

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0
*Only summer survey completed

Table 19. Plot 4.3D percent cover by species

Andropogon gerardii	big bluestem	L3	Native	Graminoids	17.6	34.1	14.9	14.4	17	4.8	6.4	3.5
Panicum virgatum	switch grass	L3	Native	Graminoids	20.8	18.9	9.2	3.8	4.2	1.6	0.2	0
Sorghastrum nutans	copper savannah grass	L2	Native	Graminoids	3.8	3.7	0	0	0	0	0.2	0.1
Elymus virginicus var. virginicus	Virginia wild rye	L5	Native	Graminoids	0	0	0	0	0	0.1	0	0
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	0	4.6	3.9	8.2	21.1	23	34.2	16.6
Elymus repens	quack grass	L+	Non-native	Graminoids	8	0	0.8	0.2	1	0	0.4	0.1
Festuca rubra ssp. rubra	red fescue	L+	Non-native	Graminoids	1.1	0	0.6	0.2	0.2	0.1	0	0
Setaria pumila ssp. pumila	yellow foxtail	L+	Non-native	Graminoids	0	0.4	0.2	0	0.1	0	0	0
Setaria faberi	giant foxtail	L+	Non-native	Graminoids	0	0.4	0.2	0	0	0	0	0
Bromus inermis	smooth brome grass	L+	Non-native	Graminoids	0	0.1	0	0	0	0	0	0
Lolium pratense	meadow fescue	L+	Non-native	Graminoids	0	0.1	0	0	0	0	0	0
Setaria viridis	green foxtail	L+	Non-native	Graminoids	0	0.1	0	0	0	0	0	0
Solidago altissima	tall goldenrod	L5	Native	Forbs	1.2	5.4	11	10.6	10.9	32.6	30.8	39.6
Monarda fistulosa	wild bergamot	L5	Native	Forbs	4.9	11.3	9.6	6.4	8.2	7.7	6.4	4.2
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	6.3	6.8	9.4	6.2	5.5	3.8	4.6	3
Desmodium canadense	showy tick-trefoil	L5	Native	Forbs	2	10.1	5.4	2.2	7.5	0.9	0.6	0.3
Fragaria virginiana ssp. virginiana	common wild strawberry	L5	Native	Forbs	0.2	1.2	3.8	5.2	6	5.3	5	1.2
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	9.6	0.6	2	0.4	4.3	0.5	0.2	0.1
Oenothera biennis	common evening-primrose	L5	Native	Forbs	1.6	7.7	1.5	0	0.3	0	0	0.1
Solidago rigida ssp. rigida	stiff goldenrod	LX	Native	Forbs	0.4	0	0.2	1.6	2.1	2.3	2.5	1.4
Helianthus giganteus	tall sunflower	LX	Native	Forbs	0.4	1	1.7	1.8	2.1	0.2	0.2	0.1
Ratibida pinnata	grey-headed coneflower	L+*	Native	Forbs	1.4	1.4	1.6	1	0.4	0	0	0
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	0.2	1.2	0.3	0	0.1	0	0	0
Oxalis dillenii	deflexed yellow wood-sorrel	L5	Native	Forbs	0.3	0.1	0.3	0.2	0.4	0.1	0.2	0.2
Pycnanthemum virginianum	Virginia mountain-mint	L3	Native	Forbs	0	0.8	0.4	0.1	0.1	0.2	0	0
Erigeron canadensis	horse-weed	L5	Native	Forbs	0.2	0.2	1.1	0	0	0	0	0
Solidago canadensis var. canadensis	Canada goldenrod	L5	Native	Forbs	0	0	1.4	0	0	0	0	0
Asclepias tuberosa	butterfly milkweed	LX	Native	Forbs	0.6	0.2	0.2	0.1	0.2	0	0	0
Fragaria vesca ssp. americana	woodland strawberry	L5	Native	Forbs	0	0	0.4	0.8	0	0	0	0
Coreopsis tripteris	tall tickseed	L+*	Native	Forbs	0	0.2	0.3	0.2	0.2	0	0.1	0.2
Asclepias syriaca	common milkweed	L5	Native	Forbs	0	0	0.1	0.2	0.4	0.2	0.1	0
Oxalis stricta	common yellow wood-sorrel	L5	Native	Forbs	0	0.4	0.2	0	0	0	0.1	0
Oenothera parviflora	smaller evening-primrose	L4	Native	Forbs	0.6	0	0	0	0	0	0	0
Epilobium ciliatum ssp. ciliatum	sticky willow-herb	L5	Native	Forbs	0	0	0	0.1	0.1	0	0	0
Lespedeza capitata	round-headed bush-clover	L3	Native	Forbs	0	0	0	0	0.2	0	0	0
Erigeron annuus	daisy fleabane	L5	Native	Forbs	0	0	0.1	0	0	0	0	0
Fragaria virginiana ssp. glauca	blue-leaved wild strawberry	L5	Native	Forbs	0	0.1	0	0	0	0	0	0
Penstemon digitalis	foxglove beard-tongue	L4	Native	Forbs	0	0	0	0	0	0.1	0	0
Symphyotrichum lanceolatum var. lanceolatum	panicled aster	L5	Native	Forbs	0	0	0	0	0	0	0.1	0
Taraxacum officinale	dandelion	L+	Non-native	Forbs	7.6	8.8	5.6	5.9	2	1	1.2	0.2
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	7.8	1.2	0.8	0.2	0.3	0.7	0.1	0.1
Trifolium pratense	red clover	L+	Non-native	Forbs	4.3	0.5	1.9	3.8	0.1	0	0.2	0
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	1.2	1.3	0.8	1.6	0.3	0.4	0.2	0.1
Cirsium vulgare	bull thistle	L+	Non-native	Forbs	0	1	2	0.1	0.2	0.1	0.1	0
Potentilla recta	sulphur cinquefoil	L+	Non-native	Forbs	0	0.1	0.8	1	0.6	0.4	0.4	0.2
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	0.2	0.4	1.1	0.8	0.2	0.2	0.1	0.1
Verbascum thapsus	common mullein	L+	Non-native	Forbs	0	0	0	0	0.1	0.6	1.6	0
Vicia tetrasperma	slender vetch	L+	Non-native	Forbs	0	0.1	0.5	0	0.3	0.1	0	0
Plantago lanceolata	English plantain	L+	Non-native	Forbs	0.2	0.6	0.1	0	0	0	0	0
Plantago major	common plantain	L+	Non-native	Forbs	0	0.1	0.4	0	0.1	0	0	0
Chenopodium album	lamb's quarters	L+	Non-native	Forbs	0	0.1	0.1	0	0.1	0	0	0
Trifolium hybridum	alsike clover	L+	Non-native	Forbs	0	0	0.2	0	0	0	0	0
Vicia cracca	cow vetch	L+	Non-native	Forbs	0.2	0	0	0	0	0	0	0
Hypericum perforatum	common St. John's-wort	L+	Non-native	Forbs	0	0	0.1	0	0	0	0	0
Lotus corniculatus	bird's foot trefoil	L+	Non-native	Forbs	0	0.1	0	0	0	0	0	0
Medicago lupulina	black medick	L+	Non-native	Forbs	0	0	0	0	0	0	0	0.1
Potentilla argentea	silvery cinquefoil	L+	Non-native	Forbs	0	0	0.1	0	0	0	0	0
Sonchus asper	spiny sow-thistle	L+	Non-native	Forbs	0	0.1	0	0	0	0	0	0
Tragopogon dubius	lemon-yellow goat's beard	L+	Non-native	Forbs	0	0.1	0	0	0	0	0	0
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	2	2.5	2	0.9	0.7	4	3.5	3
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	1.2	2.1	0.8	1	1.2	3.4	5.2	3.6
Thatch	Thatch			Thatch	0	40	67	60	48	76	82	89.6
Bare soil	Bare soil			Bare soil	0	0.4	0.4	0	0	0	0	0.4

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0

*Only summer survey completed

Table 20. Plot 4.3E percent cover by species

Species	Common Name	L-rank	Native or Non-native	Plant Type	2016*	2018	2019	2020	2021	2022	2023	2024
Andropogon gerardii	big bluestem	L3	Native	Graminoids	5.2	21.4	29.2	21.2	21.8	23.4	19.6	11
Panicum virgatum	switch grass	L3	Native	Graminoids	14.8	4.1	1.2	5.3	3.3	3	0.8	0
Sorghastrum nutans	copper savannah grass	L2	Native	Graminoids	4.2	4.4	0.6	0.9	0.4	0.1	0.1	0
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	0	5.8	22.2	7.4	30	22	53	25.6
Elymus repens	quack grass	L+	Non-native	Graminoids	13.1	0.6	1.1	0	0.6	0.4	0.3	0.4
Bromus inermis	smooth brome grass	L+	Non-native	Graminoids	0	0.8	1.6	0.4	4	3	3.2	0
Festuca rubra ssp. rubra	red fescue	L+	Non-native	Graminoids	7	0	1	4.8	0	0	0	0
Agrostis gigantea	redtop	L+	Non-native	Graminoids	0	4	0.2	0.2	0	0	0	0
Agrostis stolonifera	creeping bent grass	L+?	Non-native	Graminoids	2.2	0	0	0	0	0	0	0
Carex spicata	spiked sedge	L+	Non-native	Graminoids	0	0.2	0.6	0.6	0.2	0.1	0.1	0.1
Schedonorus pratensis	meadow fescue	L+	Non-native	Graminoids	1.2	0	0	0	0	0	0	0
carex spicata	spiked sedge	L+	Non-native	Graminoids	0	0	0	0	0	0	1	0
Setaria pumila ssp. pumila	yellow foxtail	L+	Non-native	Graminoids	0.3	0.1	0	0	0	0	0	0
Dactylis glomerata	orchard grass	L+	Non-native	Graminoids	0	0	0	0	0	0	0	0.1
Poa compressa	flat-stemmed blue grass	L+	Non-native	Graminoids	0	0	0	0	0	0	0.1	0
Solidago altissima	tall goldenrod	L5	Native	Forbs	3.8	14	16	19.6	23	30.6	26	24.4
Monarda fistulosa	wild bergamot	L5	Native	Forbs	9.4	11.8	10.1	9.6	6.8	6.6	5	5.6
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	5.8	11.2	13.2	7.6	6.2	6.7	4.2	4.1
Coreopsis tripteris	tall tickseed	L+*	Native	Forbs	4	10.4	7.7	1.2	4	0.2	0.1	0.2
Asclepias syriaca	common milkweed	L5	Native	Forbs	4.8	1.8	1.8	2.2	2.6	3	1.4	0.5
Helianthus giganteus	tall sunflower	LX	Native	Forbs	4.2	2.3	3.4	1.6	0.6	1.3	0.3	0
Silphium perfoliatum	cup-plant	L+?*	Native	Forbs	0	1.4	1.2	1	1.4	1.8	1.2	4.9
Solidago canadensis var. canadensis	Canada goldenrod	L5	Native	Forbs	0.4	0	5	1.2	1.2	0.1	0	0
Desmodium canadense	showy tick-trefoil	L5	Native	Forbs	2.2	1.4	1.2	1	0.4	0.1	0	0
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	2.3	0.3	0.1	0	0.1	0	0	0
Asclepias tuberosa	butterfly milkweed	LX	Native	Forbs	0.4	0.1	0.8	0.2	0.5	0.4	0.1	0.2
Asclepias sullivantii	smooth milkweed	LX	Native	Forbs	0	0.4	0.4	0	0.2	0.1	0.6	0.4
Vernonia missurica	Missouri ironweed	L+*	Native	Forbs	0	0.4	0.2	0	0.2	0.2	0.4	0.6
Pycnanthemum virginianum	Virginia mountain-mint	L3	Native	Forbs	0	0.1	0.1	0.2	0.4	0.6	0.1	0.2
Coreopsis lanceolata	lance-leaved coreopsis	L+*	Native	Forbs	1.6	0	0	0	0	0	0	0
Oxalis stricta	common yellow wood-sorrel	L5	Native	Forbs	0	1.2	0.3	0	0	0	0	0
Ratibida pinnata	grey-headed coneflower	L+*	Native	Forbs	0.6	0.4	0.2	0	0	0	0	0
Oenothera biennis	common evening-primrose	L5	Native	Forbs	0.8	0.2	0	0.1	0	0	0	0
Oxalis dillenii	deflexed yellow wood-sorrel	L5	Native	Forbs	0.8	0	0	0	0.1	0	0	0
Oenothera parviflora	smaller evening-primrose	L4	Native	Forbs	0.8	0	0	0	0	0	0	0
Lespedeza capitata	round-headed bush-clover	L3	Native	Forbs	0.2	0	0	0	0	0	0	0
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	0	0.1	0	0	0	0	0	0
Erigeron annuus	daisy fleabane	L5	Native	Forbs	0	0	0	0	0.1	0	0	0
Erigeron canadensis	horse-weed	L5	Native	Forbs	0.1	0	0	0	0	0	0	0
Hibiscus moscheutos	swamp rose-mallow	L+?*	Native	Forbs	0.1	0	0	0	0	0	0	0
Vernonia gigantea	tall ironweed	L+*	Native	Forbs	0	0	0	0	0	0	0.1	0
Taraxacum officinale	dandelion	L+	Non-native	Forbs	13.4	6.6	4.6	0	0.5	0.7	0.2	0
Trifolium pratense	red clover	L+	Non-native	Forbs	4.2	0.3	0.2	0	0	0	0	0
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	2.3	0.5	0.5	0.1	0.1	0	0	0
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	0.2	0.5	0.8	0.1	0.2	0.1	0.1	0.1
Stellaria graminea	grass-leaved chickweed	L+	Non-native	Forbs	1.1	0	0	0	0	0.1	0	0
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	0	0.2	0.2	0	0	0.1	0	0
Medicago lupulina	black medick	L+	Non-native	Forbs	0.1	0	0	0	0.1	0.1	0	0
Vicia tetrasperma	slender vetch	L+	Non-native	Forbs	0	0.1	0	0	0	0.1	0.1	0
Potentilla argentea	silvery cinquefoil	L+	Non-native	Forbs	0.2	0	0	0	0	0	0	0
Stellaria media	common chickweed	L+	Non-native	Forbs	0	0	0	0	0	0	0	0.1
Veronicastrum virginicum	Culver's root	L+	Non-native	Forbs	0	0	0	0.1	0	0	0	0
Vicia cracca	cow vetch	L+	Non-native	Forbs	0	0	0	0	0	0	0	0.1
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	6	1.3	1.3	0.1	0.4	0.2	0.1	0.1
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	0	0.1	1	0.1	0.2	0.3	0.3	0.4
Rhus typhina	staghorn sumach	L5	Native	Woody	0	0	0	0	0	0.1	0	0.1
Morus alba	white mulberry	L+	Non-native	Woody	0.1	0	0	0	0	0	0	0
Thatch	Thatch			Thatch	0	27.4	77.2	0	67	90	99.2	94.6
Bare soil	Bare soil			Bare soil	0	0	0	0.6	0	0.2	0	0

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0
*Only summer survey completed

Table 21. Plot 4.3F percent cover by species

Species	Common Name	L-rank	Native or Non-native	Plant Type	2016*	2018	2019	2020*	2021	2022	2023	2024
Andropogon gerardii	big bluestem	L3	Native	Graminoids	3.3	11	4.2	4.8	8.4	2	5	5
Panicum virgatum	switch grass	L3	Native	Graminoids	0.5	3.6	2.2	3	0.8	2.6	2	0
Sorghastrum nutans	copper savannah grass	L2	Native	Graminoids	1	0.5	0.5	1.6	0.8	0.2	0.9	0.1
Dichanthelium implicatum	hairy panic grass	L4	Native	Graminoids	0	0	0	0	0	0	0	0.1
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	0	11	5.5	7.1	11	6.3	7.4	12.4
Elymus repens	quack grass	L+	Non-native	Graminoids	9.6	2.6	0.9	1.2	1.1	0.8	0.4	0.1
Setaria pumila ssp. pumila	yellow foxtail	L+	Non-native	Graminoids	0.3	3.2	1.5	1.3	0.4	0.1	0	0
Agrostis stolonifera	creeping bent grass	L+?	Non-native	Graminoids	6.6	0	0	0	0	0	0	0
Schedonorus pratensis	meadow fescue	L+	Non-native	Graminoids	6	0	0	0	0	0	0	0
Festuca rubra ssp. rubra	red fescue	L+	Non-native	Graminoids	1	0	0	3.2	0	0	0	0
Agrostis gigantea	redtop	L+	Non-native	Graminoids	1.8	0	0.4	0	0.8	0.2	0	0
Phleum pratense	timothy grass	L+	Non-native	Graminoids	0.2	0.5	0.6	0	0.4	0	0	0
Dactylis glomerata	orchard grass	L+	Non-native	Graminoids	0.8	0	0	0	0.2	0.2	0	0
Lolium pratense	meadow fescue	L+	Non-native	Graminoids	0	0.2	0.4	0	0	0	0	0
Solidago altissima	tall goldenrod	L5	Native	Forbs	0	2.4	4.7	14	33.7	49	55.4	51.4
Monarda fistulosa	wild bergamot	L5	Native	Forbs	13.8	4.7	3.7	5.4	4.7	6.4	11.4	5.6
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	3	7.2	15.4	4.8	5	7.8	5	4
Helianthus giganteus	tall sunflower	LX	Native	Forbs	4.6	5.2	5	3.5	2	2.9	2.7	0.1
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	5.2	0.9	2.2	4.8	1	0.6	0.3	0.2
Silphium perfoliatum	cup-plant	L+?*	Native	Forbs	2.6	5.8	2.4	1	2.1	0.3	0.6	0.2
Coreopsis tripteris	tall tickseed	L+*	Native	Forbs	3	4.5	4.3	0.3	1	1	0.4	0.3
Asclepias tuberosa	butterfly milkweed	LX	Native	Forbs	0	0.4	0.6	2.2	3.2	1.2	3.8	1.8
Asclepias syriaca	common milkweed	L5	Native	Forbs	0.8	1.8	2	0.5	0.8	1.4	1.6	1.1
Erigeron canadensis	horse-weed	L5	Native	Forbs	0	0.1	5.2	2.2	0	0	0	0
Oenothera biennis	common evening-primrose	L5	Native	Forbs	2.6	0.5	1.6	0	0.2	0.1	0	0.2
Solidago canadensis var. canadensis	Canada goldenrod	L5	Native	Forbs	0	0	0	2.6	2	0	0	0
Coreopsis lanceolata	lance-leaved coreopsis	L+*	Native	Forbs	2.9	0	0	0	0	0	0	0
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	0	0	1.4	1	0.3	0.1	0	0
Potentilla norvegica	rough cinquefoil	L+?*	Native	Forbs	0	0.5	1.7	0.4	0.1	0	0	0
Erigeron annuus	daisy fleabane	L5	Native	Forbs	0.4	0	0.1	1.6	0	0	0	0
Epilobium ciliatum ssp. ciliatum	sticky willow-herb	L5	Native	Forbs	0.2	1.3	0.1	0	0.1	0	0	0
Symphyotrichum lanceolatum var. lanceolatum	panicled aster	L5	Native	Forbs	0	0	0.4	0.4	0.3	0.2	0.1	0
Desmodium canadense	showy tick-trefoil	L5	Native	Forbs	0	0.8	0.3	0.2	0	0	0	0
Ratibida pinnata	grey-headed coneflower	L+*	Native	Forbs	0.2	0	0	0	0.4	0	0.1	0.1
Hibiscus moscheutos	swamp rose-mallow	L+?*	Native	Forbs	0	0.1	0.2	0.2	0.1	0.1	0.1	0
Oxalis dillenii	deflexed yellow wood-sorrel	L5	Native	Forbs	0.2	0	0.2	0.1	0.2	0	0	0
Oenothera parviflora	smaller evening-primrose	L4	Native	Forbs	0.4	0.2	0	0	0	0	0	0
Galium aparine	cleavers	L5	Native	Forbs	0	0	0	0	0.1	0.2	0.1	0.1
Geum canadense	white avens	L5	Native	Forbs	0	0	0.1	0.4	0	0	0	0
Taraxacum officinale	dandelion	L+	Non-native	Forbs	13.8	4	3	0.2	2.8	3	1.8	0.5
Vicia tetrasperma	slender vetch	L+	Non-native	Forbs	0	0.8	21.5	1.1	1	0.7	0.3	0.1
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	14.4	0.6	0.6	0.3	0.4	0.9	0.3	0.2
Chenopodium album	lamb's quarters	L+	Non-native	Forbs	0	8.1	2.9	0	0.1	0	0	0
Trifolium pratense	red clover	L+	Non-native	Forbs	3.8	0.4	3.8	0.4	0.4	0.3	0	0.1
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	2.7	0.4	0.3	0.8	0.6	0.4	0.5	0.1
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	0.1	0.5	3.3	0.2	0.2	0.3	0.1	0.1
Vicia cracca	cow vetch	L+	Non-native	Forbs	0.4	0.1	0	0.4	0.5	1.4	0.6	1.3
Stellaria graminea	grass-leaved chickweed	L+	Non-native	Forbs	0.5	3.6	0.1	0	0.1	0.2	0	0.1
Hypericum perforatum	common St. John's-wort	L+	Non-native	Forbs	0.1	0.4	0.1	0.2	0.3	0.7	0.3	0.2
Vicia sativa var. angustifolia	common vetch	L+	Non-native	Forbs	0	0.2	0.8	0	0.4	0.6	0.2	0.1
Veronica serpyllifolia ssp. serpyllifolia	thyme-leaved speedwell	L+	Non-native	Forbs	0	0	0	0.8	0.1	0.4	0	0
Plantago lanceolata	English plantain	L+	Non-native	Forbs	0.4	0.2	0.4	0	0	0	0	0
Convolvulus arvensis	field bindweed	L+	Non-native	Forbs	0	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Cirsium vulgare	bull thistle	L+	Non-native	Forbs	0	0	0.2	0.1	0.2	0.1	0	0
Medicago lupulina	black medick	L+	Non-native	Forbs	0	0	0	0.1	0.1	0.2	0.1	0
Artemisia vulgaris	common mugwort	L+	Non-native	Forbs	0	0	0	0	0.1	0.1	0	0
Geum urbanum	urban avens	L+	Non-native	Forbs	0	0	0	0	0.1	0.1	0	0
Tragopogon pratensis	meadow goat's beard	L+	Non-native	Forbs	0	0	0.1	0	0.1	0	0	0
Lactuca serriola	prickly lettuce	L+	Non-native	Forbs	0	0	0	0	0.1	0	0	0
Melilotus albus	white sweet clover	L+	Non-native	Forbs	0	0	0	0.1	0	0	0	0
Potentilla recta	sulphur cinquefoil	L+	Non-native	Forbs	0	0	0	0	0.1	0	0	0
Silene latifolia	evening lychnis	L+	Non-native	Forbs	0	0	0	0	0.1	0	0	0
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	10	11.4	1.6	3.8	1.4	1.4	1.5	1
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	0.8	0.4	0.2	0.2	0.2	0.4	0.8	0.8
Parthenocissus vitacea	thicket creeper	L5	Native	Woody	0	0	0.2	0	0.1	0.6	0.8	0.1
Thatch	Thatch			Thatch	0	24.4	41.4	0	33.2	58.6	94	86.6
Bare soil	Bare soil			Bare soil	0	0.8	2.2	0	0	0	1	0.2

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0

*Only summer survey completed

Table 22. Plot 4.4J percent cover by species

Species	Common Name	L-rank	Native or Non-native	Plant Type	2016*	2018	2019	2020*	2021	2022	2023	2024
Andropogon gerardii	big bluestem	L3	Native	Graminoids	0	0.3	0.2	0	0.2	2.6	0.8	0.2
Panicum capillare	panic grass	L5	Native	Graminoids	0.1	4	0	0	0	0	0	0
Sorghastrum nutans	copper savannah grass	L2	Native	Graminoids	0.2	0	0	0.8	0.1	0	0	0
Panicum virgatum	switch grass	L3	Native	Graminoids	0	0	0.2	0.1	0.1	0.2	0	0
Elymus repens	quack grass	L+	Non-native	Graminoids	0.6	10.1	27	18	20.4	15.5	28.2	30.6
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	0.3	7.4	21.6	19.6	28.6	14	30.2	18.2
Dactylis glomerata	orchard grass	L+	Non-native	Graminoids	0	0	6.5	17	8	7.6	3	1.5
Festuca rubra ssp. rubra	red fescue	L+	Non-native	Graminoids	0.1	0.1	4	31.6	0	0.1	0.1	0.8
Setaria pumila ssp. pumila	yellow foxtail	L+	Non-native	Graminoids	1.5	3.5	0.1	0.2	0	1.1	0.1	0
Bromus inermis	smooth brome grass	L+	Non-native	Graminoids	0	0	0	0	0	0.1	3	0
Bromus japonicus	Japanese chess	L+	Non-native	Graminoids	0	0	0.1	0.1	0.1	0.5	0.8	1
Phleum pratense	timothy grass	L+	Non-native	Graminoids	0	0	1.6	0	0	0	0	0
Lolium pratense	meadow fescue	L+	Non-native	Graminoids	0	1.2	0	0	0	0	0	0
Bromus tectorum	downy chess	L+	Non-native	Graminoids	0.1	0	0	0	0	0	0	0
Solidago altissima	tall goldenrod	L5	Native	Forbs	0	0	2	1.5	2	4.4	10.4	10.2
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	1.8	1.9	2.1	0.8	0.4	2.6	7.8	3.6
Asclepias syriaca	common milkweed	L5	Native	Forbs	0	0	0.6	0.3	0.2	1.2	3.9	6.4
Erigeron canadensis	horse-weed	L5	Native	Forbs	0	0	0.4	0	0	4.3	0.1	0.1
Oenothera biennis	common evening-primrose	L5	Native	Forbs	0	0.2	0	0.3	0	0.6	1.8	1
Helianthus giganteus	tall sunflower	LX	Native	Forbs	0	0	0.1	0	0.1	0.4	0.6	2.4
Monarda fistulosa	wild bergamot	L5	Native	Forbs	0	0.1	0.5	0	0.2	0.1	0.4	2
Senna hebecarpa	wild senna	L+*	Native	Forbs	0	0	1.4	0.8	0.2	0	0	0
Oxalis dillenii	deflexed yellow wood-sorrel	L5	Native	Forbs	0.4	0	0.1	0.1	0.1	0.2	0.4	0.2
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	0	0	0	0.2	0	0.2	0	0.2
Erigeron annuus	daisy fleabane	L5	Native	Forbs	0	0	0	0	0	0.1	0.4	0.1
Epilobium ciliatum ssp. ciliatum	sticky willow-herb	L5	Native	Forbs	0	0	0	0	0	0.2	0.1	0.2
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	0.2	0	0	0	0	0	0	0
Oxalis stricta	common yellow wood-sorrel	L5	Native	Forbs	0	0.1	0	0	0	0	0	0
Symphyotrichum ericoides var. ericoides	heath aster	L5	Native	Forbs	0	0	0	0.1	0	0	0	0
Symphyotrichum lanceolatum var. lanceolatum	panicled aster	L5	Native	Forbs	0	0	0	0	0.1	0	0	0
Taraxacum officinale	dandelion	L+	Non-native	Forbs	75.4	18.2	14.4	2	5.8	11	6.2	2.7
Vicia cracca	cow vetch	L+	Non-native	Forbs	14.1	26.4	7.1	2.2	0.8	3.9	4.8	6.2
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	0	10.2	1.9	1.3	0.3	1.1	1.8	0.5
Trifolium pratense	red clover	L+	Non-native	Forbs	2.8	3	4.4	0.1	0	0.5	1.7	0
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	0.1	4.8	4.2	0	0.2	2.6	0.4	0.1
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	4.3	2.4	1.2	0.5	0.2	0.4	0.3	0.5
Vicia tetrasperma	slender vetch	L+	Non-native	Forbs	0	0.3	0	0	0.1	5.4	1.9	0.1
Medicago lupulina	black medick	L+	Non-native	Forbs	1.1	0.2	3.2	0.2	0.1	1.3	1.2	0.1
Rumex crispus	curly dock	L+	Non-native	Forbs	0.1	0	2.1	0.1	0.1	1.2	0.2	0.2
Tragopogon pratensis	meadow goat's beard	L+	Non-native	Forbs	0.7	0	0	0.1	0	0	0	0
Chenopodium album	lamb's quarters	L+	Non-native	Forbs	0.1	0.1	0.1	0	0	0.1	0	0
Cirsium vulgare	bull thistle	L+	Non-native	Forbs	0	0	0	0	0	0	0.4	0
Melilotus albus	white sweet clover	L+	Non-native	Forbs	0	0.4	0	0	0	0	0	0
Silene vulgaris	bladder campion	L+	Non-native	Forbs	0	0	0	0.1	0	0	0	0
Verbascum thapsus	common mullein	L+	Non-native	Forbs	0	0	0.1	0	0	0	0	0
Vicia sativa var. angustifolia	common vetch	L+	Non-native	Forbs	0	0	0	0	0	0.1	0	0
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	1.5	8	8.6	7.2	7.4	3.2	4.7	6.4
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	0	0	0.1	0.2	0.3	0	0	0
Acer platanoides	Norway maple	L+	Non-native	Woody	0	0	0.1	0	0	0	0	0
Thatch	Thatch			Thatch	0	1	40	0	74.6	90	87.4	92
Bare soil	Bare soil			Bare soil	0	0	0	0	0	0.4	0.4	0

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0

*Only summer survey completed

Table 23. Plot 4.4K percent cover by species

Species	Common Name	L-rank	Native or Non-native	Plant Type	2016*	2018	2019	2020*	2021	2022	2023	2024
Andropogon gerardii	big bluestem	L3	Native	Graminoids	0	0	0.2	0	0	2.4	0.1	0
Panicum virgatum	switch grass	L3	Native	Graminoids	0.4	0.2	0	0	0	0	0	0
Elymus virginicus var. virginicus	Virginia wild rye	L5	Native	Graminoids	0	0	0	0	0	0.2	0	0
Panicum capillare	panic grass	L5	Native	Graminoids	0	0.2	0	0	0	0	0	0
Sorghastrum nutans	copper savannah grass	L2	Native	Graminoids	0.2	0	0	0	0	0	0	0
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	0.6	9.2	8.2	28.6	41	26.4	37	24
Bromus inermis	smooth brome grass	L+	Non-native	Graminoids	0.6	3.4	8.2	12.8	8	9	10	4.1
Dactylis glomerata	orchard grass	L+	Non-native	Graminoids	0	0.3	2.8	4.2	1.8	1.5	5.8	1.5
Setaria pumila ssp. pumila	yellow foxtail	L+	Non-native	Graminoids	6	8	0.5	2.5	0	0.6	0.1	0
Elymus repens	quack grass	L+	Non-native	Graminoids	1.2	0.2	5	1.6	1.4	1.3	0.4	0.4
Festuca rubra ssp. rubra	red fescue	L+	Non-native	Graminoids	0.4	1	0.1	0	0.6	0.8	0	0
Schedonorus pratensis	meadow fescue	L+	Non-native	Graminoids	0.5	0	0	0	0	0	0	0
Poa compressa	flat-stemmed blue grass	L+	Non-native	Graminoids	0	0	0	0	0	0.1	0.2	0
Lolium pratense	meadow fescue	L+	Non-native	Graminoids	0	0.1	0	0	0	0.1	0	0
Avena sativa	oats	L+	Non-native	Graminoids	0	0	0.1	0	0	0	0	0
Solidago altissima	tall goldenrod	L5	Native	Forbs	0	0.1	2	2.2	4	5.2	14.4	27.8
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	2.4	0.9	5	0.4	0.3	0.5	2.8	0.5
Symphyotrichum lanceolatum var. lanceolatum	panicled aster	L5	Native	Forbs	0	0	0	0.4	0.4	1.4	4.4	3.5
Monarda fistulosa	wild bergamot	L5	Native	Forbs	0	0.2	1.2	1.1	1	2	1.2	0.8
Oenothera biennis	common evening-primrose	L5	Native	Forbs	1.2	0.8	2	0	0.2	0.8	0.6	0.5
Erigeron canadensis	horse-weed	L5	Native	Forbs	0	0.1	0.8	0	0.1	0.3	3.4	0.2
Helianthus giganteus	tall sunflower	LX	Native	Forbs	0	2.4	1.2	0.4	0.1	0.1	0	0
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	1.2	0.1	0	0	0	0	0	0
Galium aparine	cleavers	L5	Native	Forbs	0	0	0	0	0	0	0.2	0.8
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	0	0.8	0	0	0	0	0	0.1
Asclepias syriaca	common milkweed	L5	Native	Forbs	0	0	0	0	0	0	0	0.8
Epilobium ciliatum ssp. ciliatum	sticky willow-herb	L5	Native	Forbs	0	0	0	0	0	0	0.2	0.4
Oxalis dillenii	deflexed yellow wood-sorrel	L5	Native	Forbs	0.2	0.1	0.1	0	0	0.1	0	0
Coreopsis tripteris	tall tickseed	L+*	Native	Forbs	0.4	0	0	0	0	0	0	0
Erigeron annuus	daisy fleabane	L5	Native	Forbs	0	0.1	0	0	0	0	0	0
Oxalis stricta	common yellow wood-sorrel	L5	Native	Forbs	0	0.1	0	0	0	0	0	0
Potentilla norvegica	rough cinquefoil	L+?*	Native	Forbs	0	0	0	0	0	0.1	0	0
Taraxacum officinale	dandelion	L+	Non-native	Forbs	75	54	32	6.8	5.8	5.6	3.4	2.2
Trifolium pratense	red clover	L+	Non-native	Forbs	4.6	4.8	19.1	13.2	8.6	0.1	1.3	0.1
Lotus corniculatus	bird's foot trefoil	L+	Non-native	Forbs	0	6	4	5	1.8	1	2.6	4
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	0.1	14.8	2.7	3	0.3	0.3	1.5	0.8
Vicia cracca	cow vetch	L+	Non-native	Forbs	5.2	4.4	2.8	0.8	1.2	1.3	2.2	1.8
Convolvulus arvensis	field bindweed	L+	Non-native	Forbs	0.1	0.8	2	2.6	1.8	4	2	2.6
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	0	3.7	8.6	0	0.2	0.5	1.2	0.1
Medicago lupulina	black medick	L+	Non-native	Forbs	4.6	0.3	3.2	0.3	0.1	0.5	1.9	0.2
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	0.9	2.8	0.5	0	0.1	0.1	0	0.1
Vicia tetrasperma	slender vetch	L+	Non-native	Forbs	0	0.1	0.4	0	0.1	0.3	1.4	0
Cirsium vulgare	bull thistle	L+	Non-native	Forbs	0	0	0	0	0.1	0.4	1.2	0
Lactuca serriola	prickly lettuce	L+	Non-native	Forbs	0	0	0	0	0	0	1.7	0
Medicago sativa ssp. sativa	alfalfa	L+	Non-native	Forbs	0	0.8	0.1	0	0.2	0	0.2	0
Plantago major	common plantain	L+	Non-native	Forbs	0.1	0.2	0.8	0.1	0	0	0	0
Potentilla recta	sulphur cinquefoil	L+	Non-native	Forbs	0	0	0.1	0	0	0	0.6	0.3
Geum urbanum	urban avens	L+	Non-native	Forbs	0	0.4	0.2	0	0	0	0	0
Verbascum thapsus	common mullein	L+	Non-native	Forbs	0	0.2	0.4	0	0	0	0	0
Chenopodium album	lamb's quarters	L+	Non-native	Forbs	0.2	0	0	0	0	0	0	0
Coreopsis grandiflora	large-flowered tickseed	L+	Non-native	Forbs	0	0.2	0	0	0	0	0	0
Vicia sativa var. angustifolia	common vetch	L+	Non-native	Forbs	0	0	0.1	0	0	0.1	0	0
Rumex crispus	curly dock	L+	Non-native	Forbs	0	0	0	0	0	0.1	0	0
Tragopogon pratensis	meadow goat's beard	L+	Non-native	Forbs	0	0	0	0	0.1	0	0	0
Trifolium hybridum	alsike clover	L+	Non-native	Forbs	0	0	0	0	0	0	0.1	0
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	3.2	13.1	6.2	4.2	6	6.8	6.1	10.8
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	0.2	0.8	0.8	0.4	0.5	0.7	1.4	1.8
Morus alba	white mulberry	L+	Non-native	Woody	0	0.1	0	0	0	0	0	0
Thatch	Thatch	#N/A	#N/A	Thatch	0	4.4	6.4	0	54	92	91.4	83.6
Bare soil	Bare soil	#N/A	#N/A	Bare soil	0	0	0	0	0	1	0.2	0.4

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0

*Only summer survey completed

Table 24. Plot 4.4L percent cover by species

Species	Common Name	L-rank	Native or Non-native	Plant Type	2016*	2018	2019	2020*	2021	2022	2023	2024
Andropogon gerardii	big bluestem	L3	Native	Graminoids	0	2	3	5	2	1	5	4.6
Elymus virginicus var. virginicus	Virginia wild rye	L5	Native	Graminoids	0.1	2.6	4.2	1.3	1.3	2.3	1.1	0.5
Sorghastrum nutans	copper savannah grass	L2	Native	Graminoids	0.4	0.4	0.2	1.2	0.4	0.8	0.8	0.8
Panicum virgatum	switch grass	L3	Native	Graminoids	0	0	0	0.1	0	0.1	0.1	0.1
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	0.9	10.6	25	47	42	20	10.2	12.4
Elymus repens	quack grass	L+	Non-native	Graminoids	0.7	6.2	20.2	4.3	14	9.6	13.8	6.6
Festuca rubra ssp. rubra	red fescue	L+	Non-native	Graminoids	0	0	0.6	0	5	2.6	0.6	3
Lolium pratense	meadow fescue	L+	Non-native	Graminoids	0	3.5	1.6	0.4	0	0	0	0
Phleum pratense	timothy grass	L+	Non-native	Graminoids	0	0	0.9	0.5	0.3	0.2	0.8	0
Avena sativa	oats	L+	Non-native	Graminoids	0	0	0	2.4	0	0	0	0
Dactylis glomerata	orchard grass	L+	Non-native	Graminoids	0	1	0.4	0	0.1	0	0	0
Setaria pumila ssp. pumila	yellow foxtail	L+	Non-native	Graminoids	0.7	0	0	0	0	0	0	0
Schedonorus pratensis	meadow fescue	L+	Non-native	Graminoids	0.5	0	0	0	0	0	0	0
Helianthus giganteus	tall sunflower	LX	Native	Forbs	0	1.3	8	5.4	5.9	6.6	4.5	2.3
Solidago altissima	tall goldenrod	L5	Native	Forbs	0	0	0.1	0.6	0.9	2.6	12.2	17.2
Symphyotrichum lanceolatum var. lanceolatum	panicled aster	L5	Native	Forbs	0	0	0.3	0.1	0	0	5.2	5
Symphyotrichum novae-angliae	New England aster	L5	Native	Forbs	0	0	0	0	0	0.6	3	5
Oenothera biennis	common evening-primrose	L5	Native	Forbs	0	0.5	0.1	0.1	0.1	0.1	5.3	1.4
Monarda fistulosa	wild bergamot	L5	Native	Forbs	0	0.1	0.1	0.6	0.5	1.1	0.8	1.4
Asclepias syriaca	common milkweed	L5	Native	Forbs	0	0	0.4	0	0.2	0	1.4	2
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	1.2	0.2	0	0.1	0.1	0.1	1.4	0.8
Erigeron annuus	daisy fleabane	L5	Native	Forbs	0	0.4	1.5	0	0	0.1	0	0
Epilobium ciliatum ssp. ciliatum	sticky willow-herb	L5	Native	Forbs	0	0.6	0.2	0	0	0	0.2	0.1
Oxalis dillenii	deflexed yellow wood-sorrel	L5	Native	Forbs	0.3	0.2	0.1	0.1	0	0	0.1	0.1
Erigeron canadensis	horse-weed	L5	Native	Forbs	0	0	0.1	0	0	0.1	0.4	0
Solidago canadensis var. canadensis	Canada goldenrod	L5	Native	Forbs	0	0.2	0	0.4	0	0	0	0
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	0.2	0	0.1	0	0	0.1	0.1	0.1
Fragaria virginiana ssp. virginiana	common wild strawberry	L5	Native	Forbs	0	0	0.1	0	0.1	0	0	0
Taraxacum officinale	dandelion	L+	Non-native	Forbs	74	34	24.8	6	9.8	11.6	5.8	5.2
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	0.5	44.4	2.4	1.7	1.1	1.5	2.3	0.3
Vicia cracca	cow vetch	L+	Non-native	Forbs	8	10.8	8.2	5.4	4.7	3.9	4	3
Trifolium pratense	red clover	L+	Non-native	Forbs	9.6	2.4	5.6	2.5	0.3	0.3	0.1	0
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	5.1	2.4	0.7	1.2	1.7	1.4	0.4	0.3
Cirsium vulgare	bull thistle	L+	Non-native	Forbs	0.8	0	0	0.1	2.1	6.4	1.7	0.7
Medicago lupulina	black medick	L+	Non-native	Forbs	4	0.1	0.6	0.1	0.1	0.1	1.4	0
Rumex crispus	curly dock	L+	Non-native	Forbs	0	0	0	0	0	0	2	0.4
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	0.2	0.7	0.6	0.1	0.3	0.1	0	0
Vicia tetrasperma	slender vetch	L+	Non-native	Forbs	0	0	0	0	1.2	0.5	0.2	0
Plantago major	common plantain	L+	Non-native	Forbs	1.7	0	0	0	0	0	0	0
Veronica serpyllifolia ssp. serpyllifolia	thyme-leaved speedwell	L+	Non-native	Forbs	0	0.2	0.4	0.2	0	0	0	0
Chenopodium album	lamb's quarters	L+	Non-native	Forbs	0	0	0	0.1	0	0.1	0	0
Dipsacus fullonum	teasel	L+	Non-native	Forbs	0	0	0	0	0	0.2	0	0
Tragopogon pratensis	meadow goat's beard	L+	Non-native	Forbs	0.1	0.1	0	0	0	0	0	0
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	0	0.2	0.9	3.8	0.8	0.9	2.6	7.8
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	0.2	1	1	0.8	0.4	0.4	0.6	1.7
Ulmus pumila	Siberian elm	L+	Non-native	Woody	0	0	0	0	0.1	0	0	0
Thatch	Thatch			Thatch	0	0.8	5.4	0	70	83.4	84	80.8
Bare soil	Bare soil			Bare soil	0	0	0	4	0	1.4	0.8	0

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0

*Only summer survey completed

In the spring of 2021, a portion of section 4.3 was burned due to an unknown cause. In natural tallgrass prairie ecosystems, fires occur intermittently and are an important process as part of a positive feedback system (Packard and Mutel 2005). Prairie grasses provide excellent fuel for fire, and the fire in turn, stimulates the growth of the prairie grasses. Prairie ecosystems respond differently to fire, grazing, and mowing with both fire and grazing occurring in more natural ecosystems while mowing may be considered more suitable in urban areas such as The Meadoway. Burning often causes short-term changes in soils including increased soil temperature and decreased soil moisture (Ojima et al. 1994). Annual burning can stimulate root growth and both burning and mowing tend to favour C4 grasses while decreasing cover of woody species and forbs (Gibson et al. 1993, Johnson and Matchett 2001).

In June 2021, we set up one new plot (consisting of five sub-plots) in the burned area and one in an adjacent unburned area to examine variation in species composition (% native species), the number of woody stems, and % cover. We monitored vegetation in these plots each year between 2021 and 2024.

There were consistently fewer woody stems in the burned plot compared to the unburned plot (Figure 9).

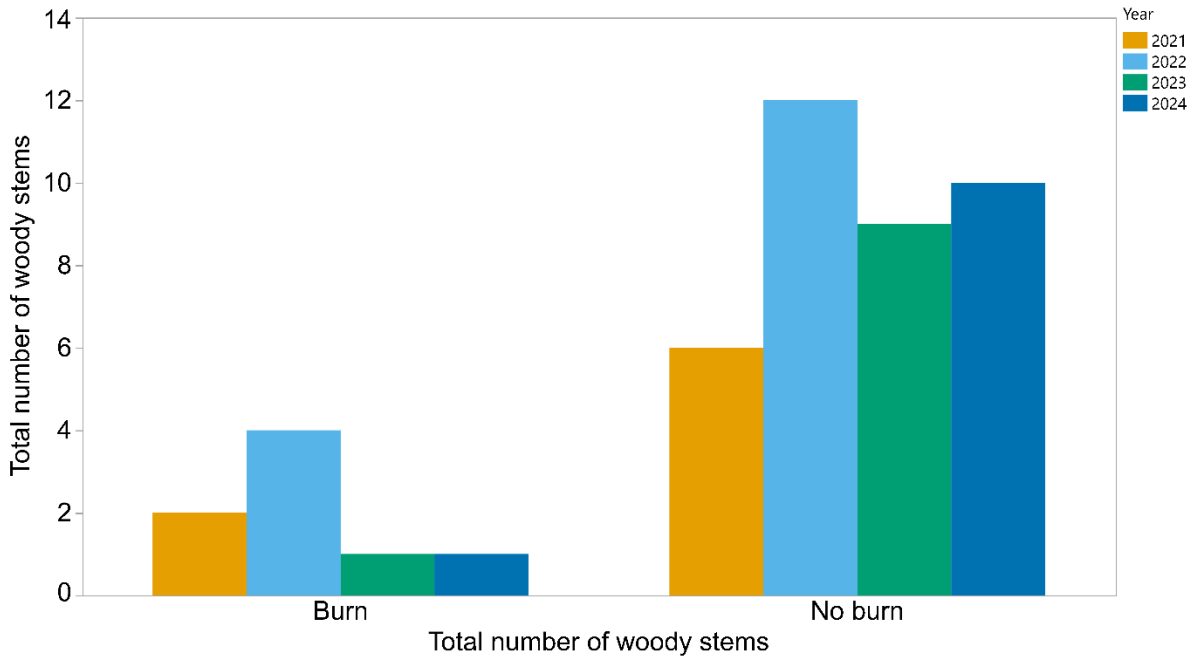

Figure 9. Total number of woody stems in burned and unburned plots between 2021 and 2024.

The average percent cover of grasses was highest during the summer visit and during 2021 and 2023 (Figure 10). The burned and unburned sub-plots did not show any clear variation in grass cover but the burned areas may have a consistently higher cover of forbs.

The burned sub-plots contained more species in general compared to the unburned sub-plots in 2021-2023, but in 2024 more species were observed in the unburned sub-plots (Table 25). In the burned plot, the number of exotic species was high in 2021 (early post-disturbance) but has decreased over time. The unburned plot contained fewer species between 2021 and 2023 and contained more native species than exotic species. It is possible that the burning disturbance led to the immigration of more exotic species, or native species common to disturbed areas, compared to the unburned plot but without pre-burn data it is difficult to determine if these differences are a result of burning or pre-existing conditions.

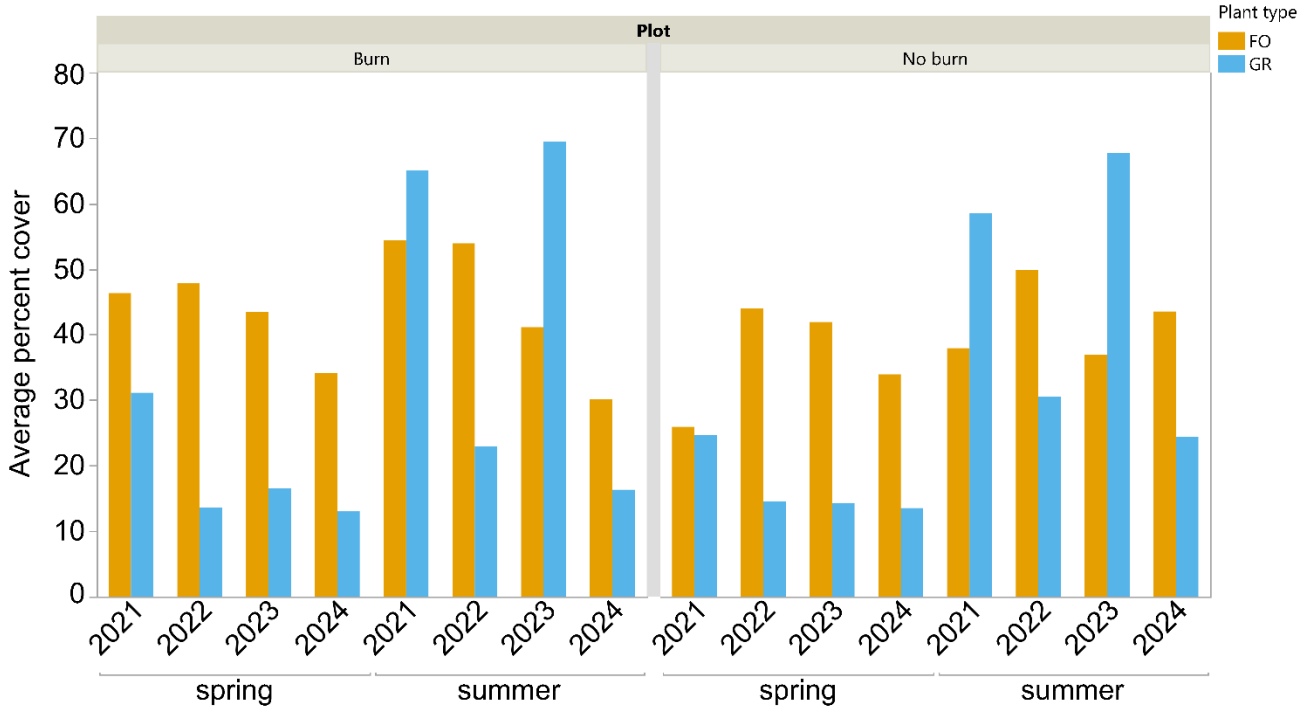

Figure 10. Average percent cover of forb (FO) and grass (GR) plant types in burned and unburned sub-plots by season and year.

Table 25. The total number of flora species, native species, and exotic species in burned and unburned plots between 2021 and 2024.

Plot type	Year	Number of species		
		Total	Native	Exotic
Burn	2021	42	16	26
	2022	37	18	19
	2023	33	15	18
	2024	32	18	14
No burn	2021	28	14	14
	2022	20	11	9
	2023	21	14	7
	2024	34	18	16

Section 5

Section 5.1

Plot 5.1AC was monitored in 2020 (pre-restoration) and in 2023 and 2024 after seeding in 2023 (Table 26). The cover of native grasses was low but still increasing since 2020 at which time the plot was dominated by red fescue (*Festuca rubra* ssp. *rubra*) and orchard grass (*Dactylis glomerata*) (non-native grasses) which were no longer present in 2023 and 2024. Native forbs with the highest cover in 2024 were common ragweed (*Ambrosia artemisiifolia*; 13.6%) and common milkweed (9%). Red clover (*Trifolium pratense*), a non-native forb, had a cover of 58% in 2024. The percent cover of creeping thistle and DSV and thatch were very low.

Section 5.3

Plot 5.3AD was monitored pre-restoration (2020) and in 2023 and 2024 with seeding occurring in 2022, 2023, and 2024 (Table 27). This area was turfgrass in 2020 consisting of primarily Kentucky bluegrass and dandelion. By 2024, the cover of native grasses was rising with Canada wild rye (*Elymus canadensis* var. *canadensis*) dominating (1.6%). Many native forbs previously not present were found including common evening primrose with the highest cover (15.2%). The cover of non-native forbs changed between 2020 and 2024, increasing for red clover and decreasing for dandelion. The percent cover of creeping thistle and DSV were very low (0-1%).

Section 5.4

Plot 5.4AE was monitored pre-restoration (2020) and in 2023 and 2024 with seeding occurring in 2022 and 2024 (Table 28). In 2020 (pre-restoration), the plot primarily consisted of red fescue, Kentucky bluegrass, and dandelion. The cover of native grasses was low in 2023 and 2024 (<0.6%), with non-native grasses still present but with lower cover (e.g. 6.4% cover of Kentucky bluegrass). Native forbs with the highest cover in 2023 and 2024 included black-eyed Susan (*Rudbeckia hirta* var. *pulcherrima*;3.6%), wild bergamot (3.5%), and tall goldenrod (2.7%). Non-native forbs with high cover in 2023 and 2024 included white clover (*Trifolium repens*; 53%), dandelion (29%), and red clover (23%).

Table 26. Plot 5.1AC percent cover by species

Species	CommonName	L-rank	Native or Non-native	Plant Type	2020	2023	2024
Andropogon gerardii	big bluestem	L3	Native	Graminoids	0	1	2
Panicum virgatum	switch grass	L3	Native	Graminoids	0	0.5	1.8
Elymus canadensis	Canada wild rye	L4	Native	Graminoids	0	0.2	1.6
Sorghastrum nutans	copper savannah grass	L2	Native	Graminoids	0	0.3	1.1
Sporobolus vaginiflorus	ensheathed dropseed	L+?*	Native	Graminoids	0.4	0.4	0.2
Elymus virginicus var. virginicus	Virginia wild rye	L5	Native	Graminoids	0	0	0.2
Panicum capillare	panic grass	L5	Native	Graminoids	0	0.2	0
Festuca rubra ssp. rubra	red fescue	L+	Non-native	Graminoids	24.8	0	0
Dactylis glomerata	orchard grass	L+	Non-native	Graminoids	17.8	0	0
Avena sativa	oats	L+	Non-native	Graminoids	0	5.8	0.8
Lolium pratense	meadow fescue	L+	Non-native	Graminoids	4.2	0	0
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	0.3	0.1	0.3
Triticum aestivum	wheat	L+	Non-native	Graminoids	0	0.6	0.1
Elymus repens	quack grass	L+	Non-native	Graminoids	0	0.1	0.1
Phalaris arundinacea	reed canary grass	L+?	Non-native	Graminoids	0.2	0	0
Setaria pumila ssp. pumila	yellow foxtail	L+	Non-native	Graminoids	0	0	0.1
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	0	10.2	13.6
Asclepias syriaca	common milkweed	L5	Native	Forbs	0	4.1	9
Solidago altissima	tall goldenrod	L5	Native	Forbs	0	0.4	5.6
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	0	0.2	4
Fragaria virginiana ssp. virginiana	common wild strawberry	L5	Native	Forbs	3.4	0	0
Oenothera biennis	common evening-primrose	L5	Native	Forbs	0	1.5	1
Oxalis dillenii	deflexed yellow wood-sorrel	L5	Native	Forbs	0	0.3	0.5
Erigeron canadensis	horse-weed	L5	Native	Forbs	0	0	0.7
Asclepias tuberosa	butterfly milkweed	LX	Native	Forbs	0	0.2	0.1
Symphyotrichum novae-angliae	New England aster	L5	Native	Forbs	0	0	0.3
Lespedeza capitata	round-headed bush-clover	L3	Native	Forbs	0	0	0.2
Oxalis stricta	common yellow wood-sorrel	L5	Native	Forbs	0	0.1	0
Symphyotrichum ericoides var. ericoides	heath aster	L5	Native	Forbs	0.1	0	0
Trifolium pratense	red clover	L+	Non-native	Forbs	4	21	58
Trifolium repens	white clover	L+	Non-native	Forbs	0	25.4	3.2
Taraxacum officinale	dandelion	L+	Non-native	Forbs	11.4	1.8	3.8
Medicago lupulina	black medick	L+	Non-native	Forbs	0.8	4.2	3.8
Plantago lanceolata	English plantain	L+	Non-native	Forbs	2.1	1.1	2.5
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	0.1	0.4	2.9
Lactuca serriola	prickly lettuce	L+	Non-native	Forbs	0	0	3.3
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	0	0	1.2
Tragopogon pratensis	meadow goat's beard	L+	Non-native	Forbs	0.9	0	0
Fallopia convolvulus	black bindweed	L+	Non-native	Forbs	0	0.6	0.2
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	0	0	0.4
Trifolium hybridum	alsike clover	L+	Non-native	Forbs	0.4	0	0
Chenopodium album	lamb's quarters	L+	Non-native	Forbs	0	0.2	0
Cirsium vulgare	bull thistle	L+	Non-native	Forbs	0	0	0.1
Sonchus asper	spiny sow-thistle	L+	Non-native	Forbs	0	0	0.1
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	0	0	1.2
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	0.4	0	0
Acer negundo	Manitoba maple	L+?*	Native	Woody	0	0	0.1
Rhamnus cathartica	common buckthorn	L+	Non-native	Woody	0.1	0	0
Thatch	Thatch	#N/A	#N/A	Thatch	6	0	2.2
Bare soil	Bare soil	#N/A	#N/A	Bare soil	2.8	90	3.8

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0

Table 27. Plot 5.3 AD percent cover by species

Species	Common Name	L-rank	Native or Non-native	Plant Type	2020	2023	2024
Elymus canadensis	Canada wild rye	L4	Native	Graminoids	0	0.6	1.6
Andropogon gerardii	big bluestem	L3	Native	Graminoids	0	0.1	1
Sorghastrum nutans	copper savannah grass	L2	Native	Graminoids	0	0.1	0.2
Juncus bufonius	toad rush	L5	Native	Graminoids	0	0.2	0
Panicum virgatum	switch grass	L3	Native	Graminoids	0	0.1	0.1
Panicum capillare	panic grass	L5	Native	Graminoids	0	0.1	0
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	25.2	0.2	4.3
Dactylis glomerata	orchard grass	L+	Non-native	Graminoids	15.2	0.1	4.8
Festuca rubra ssp. rubra	red fescue	L+	Non-native	Graminoids	16.2	0	0
Avena sativa	oats	L+	Non-native	Graminoids	0	9.2	0
Lolium pratense	meadow fescue	L+	Non-native	Graminoids	6	0	0
Phleum pratense	timothy grass	L+	Non-native	Graminoids	0.7	1.4	0
Poa compressa	flat-stemmed blue grass	L+	Non-native	Graminoids	0	0.8	0
Elymus repens	quack grass	L+	Non-native	Graminoids	0	0.4	0.2
Setaria pumila ssp. pumila	yellow foxtail	L+	Non-native	Graminoids	0.1	0.4	0
Triticum aestivum	wheat	L+	Non-native	Graminoids	0	0.2	0
Oenothera biennis	common evening-primrose	L5	Native	Forbs	0	12.6	15.2
Erigeron canadensis	horse-weed	L5	Native	Forbs	0	8	2.9
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	0	4.6	6.2
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	0	2.3	8.4
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	0	6.6	3.6
Solidago altissima	tall goldenrod	L5	Native	Forbs	0	0.8	2.1
Monarda fistulosa	wild bergamot	L5	Native	Forbs	0	0.2	2.4
Oxalis stricta	common yellow wood-sorrel	L5	Native	Forbs	0	2.2	0.1
Verbena hastata	blue vervain	L5	Native	Forbs	0	0.6	1.6
Acalypha rhomboidea	three-seeded mercury	L5	Native	Forbs	0	1.1	0.3
Oxalis dillenii	deflexed yellow wood-sorrel	L5	Native	Forbs	0	0.6	0.6
Desmodium canadense	showy tick-trefoil	L5	Native	Forbs	0	0	1
Asclepias syriaca	common milkweed	L5	Native	Forbs	0	0.2	0.6
Penstemon digitalis	foxglove beard-tongue	L4	Native	Forbs	0	0.1	0.3
Symphyotrichum novae-angliae	New England aster	L5	Native	Forbs	0	0.4	0
Silphium perfoliatum	cup-plant	L+?*	Native	Forbs	0	0.2	0.1
Solidago nemoralis ssp. nemoralis	grey goldenrod	L5	Native	Forbs	0	0	0.3
Coreopsis tripteris	tall tickseed	L+*	Native	Forbs	0	0.1	0.1
Asclepias tuberosa	butterfly milkweed	LX	Native	Forbs	0	0.1	0
Erigeron annuus	daisy fleabane	L5	Native	Forbs	0	0.1	0
Symphyotrichum pilosum var. pilosum	hairy aster	L3	Native	Forbs	0	0	0.1
Verbena stricta	hoary vervain	L3	Native	Forbs	0	0.1	0
Taraxacum officinale	dandelion	L+	Non-native	Forbs	21.8	8.8	12.6
Trifolium pratense	red clover	L+	Non-native	Forbs	0.5	22.2	10.2
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	0.4	24	1.6
Pilosella caespitosa	yellow hawkweed	L+	Non-native	Forbs	9	0	0
Chenopodium album	lamb's quarters	L+	Non-native	Forbs	0	5.8	0
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	0	0.2	2
Medicago lupulina	black medick	L+	Non-native	Forbs	0.1	1.8	0.1
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	0.1	1.4	0.4
Rumex crispus	curly dock	L+	Non-native	Forbs	0	1.2	0.6
Trifolium repens	white clover	L+	Non-native	Forbs	0	0.3	1.4
Stellaria graminea	grass-leaved chickweed	L+	Non-native	Forbs	0	0.1	1.2
Veronica serpyllifolia ssp. serpyllifolia	thyme-leaved speedwell	L+	Non-native	Forbs	0	0.3	0.6
Silene latifolia	evening lychnis	L+	Non-native	Forbs	0	0.8	0
Vicia tetrasperma	slender vetch	L+	Non-native	Forbs	0	0.2	0.4
Fallopia convolvulus	black bindweed	L+	Non-native	Forbs	0	0.6	0
Trifolium hybridum	alsike clover	L+	Non-native	Forbs	0.6	0	0
Plantago major	common plantain	L+	Non-native	Forbs	0	0.2	0.1
Vicia cracca	cow vetch	L+	Non-native	Forbs	0.3	0	0
Sonchus asper	spiny sow-thistle	L+	Non-native	Forbs	0	0.2	0
Tragopogon pratensis	meadow goat's beard	L+	Non-native	Forbs	0.2	0	0
Hypericum perforatum	common St. John's-wort	L+	Non-native	Forbs	0.1	0	0
Ranunculus acris	tall buttercup	L+	Non-native	Forbs	0.1	0	0
Stellaria media	common chickweed	L+	Non-native	Forbs	0	0.1	0
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	1	0.2	0.1
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	0.4	0	0
Acer saccharum ssp. saccharum	sugar maple	L5	Native	Woody	0	0.2	0
Acer negundo	Manitoba maple	L+?*	Native	Woody	0	0.1	0
Rhamnus cathartica	common buckthorn	L+	Non-native	Woody	0.3	0	0
Malus pumila	apple	L+	Non-native	Woody	0.1	0	0
Thatch	Thatch			Thatch	26	0	27
Bare soil	Bare soil			Bare soil	0.2	44.2	0

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0

Table 28. Plot 5.4AE percent cover by species

Species	Common Name	L-rank	Native or Non-native	Plant Type	2020	2023	2024
Panicum capillare	panic grass	L5	Native	Graminoids	0	0.6	0
Sorghastrum nutans	copper savannah grass	L2	Native	Graminoids	0	0	0.6
Andropogon gerardii	big bluestem	L3	Native	Graminoids	0	0.1	0
Festuca rubra ssp. rubra	red fescue	L+	Non-native	Graminoids	29	0	0
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	13.2	1.5	6.4
Avena sativa	oats	L+	Non-native	Graminoids	0	10.4	1.2
Lolium pratense	meadow fescue	L+	Non-native	Graminoids	5.8	0	0
Triticum aestivum	wheat	L+	Non-native	Graminoids	0	4.2	0
Phleum pratense	timothy grass	L+	Non-native	Graminoids	3	0.1	0.1
Dactylis glomerata	orchard grass	L+	Non-native	Graminoids	2	0.1	0.2
Poa compressa	flat-stemmed blue grass	L+	Non-native	Graminoids	0	1.8	0
Elymus repens	quack grass	L+	Non-native	Graminoids	0	0.1	0.2
Setaria pumila ssp. pumila	yellow foxtail	L+	Non-native	Graminoids	0.1	0.1	0
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	0	11.9	3.6
Monarda fistulosa	wild bergamot	L5	Native	Forbs	0	0.4	3.5
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	0	3.4	0.2
Solidago altissima	tall goldenrod	L5	Native	Forbs	0	0.4	2.7
Oenothera biennis	common evening-primrose	L5	Native	Forbs	0	0.8	1.2
Verbena hastata	blue vervain	L5	Native	Forbs	0	0.5	1.4
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	0	0.8	0.9
Oxalis dillenii	deflexed yellow wood-sorrel	L5	Native	Forbs	0.1	0.7	0.4
Symphyotrichum novae-angliae	New England aster	L5	Native	Forbs	0	0.2	0.7
Plantago rugelii	red-stemmed plantain	L5	Native	Forbs	0	0.8	0
Verbena stricta	hoary vervain	L3	Native	Forbs	0	0.4	0.3
Symphyotrichum pilosum var. pilosum	hairy aster	L3	Native	Forbs	0	0	0.6
Asclepias syriaca	common milkweed	L5	Native	Forbs	0	0.1	0.2
Epilobium ciliatum ssp. ciliatum	sticky willow-herb	L5	Native	Forbs	0	0.1	0.2
Oxalis stricta	common yellow wood-sorrel	L5	Native	Forbs	0	0.2	0
Symphyotrichum ericoides var. ericoides	heath aster	L5	Native	Forbs	0	0.1	0.1
Acalypha rhomboidea	three-seeded mercury	L5	Native	Forbs	0	0.1	0
Symphyotrichum lanceolatum var. lanceolatum	panicled aster	L5	Native	Forbs	0	0	0.1
Taraxacum officinale	dandelion	L+	Non-native	Forbs	14.2	18	29.4
Trifolium repens	white clover	L+	Non-native	Forbs	0.3	0.8	53
Trifolium pratense	red clover	L+	Non-native	Forbs	0.2	11.2	23
Medicago lupulina	black medick	L+	Non-native	Forbs	5	5.2	0.5
Convolvulus arvensis	field bindweed	L+	Non-native	Forbs	0	6.8	1.4
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	0.1	4.3	1.3
Plantago major	common plantain	L+	Non-native	Forbs	0.2	1.8	1.4
Atriplex patula	halberd-leaved orache	L+?	Non-native	Forbs	0	2	0
Chenopodium album	lamb's quarters	L+	Non-native	Forbs	0	1.6	0.1
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	0	0.2	1.5
Lotus corniculatus	bird's foot trefoil	L+	Non-native	Forbs	0	0	1.6
Chenopodium bonus-henricus	good King Henry	L+	Non-native	Forbs	0	1	0
Melilotus albus	white sweet clover	L+	Non-native	Forbs	1	0	0
Lactuca serriola	prickly lettuce	L+	Non-native	Forbs	0	0.8	0.1
Tragopogon pratensis	meadow goat's beard	L+	Non-native	Forbs	0.4	0	0
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	0	0	0.3
Polygonum aviculare ssp. aviculare	prostrate knotweed	L+	Non-native	Forbs	0	0.3	0
Medicago sativa ssp. sativa	alfalfa	L+	Non-native	Forbs	0.2	0	0
Sonchus arvensis ssp. arvensis	glandular perennial sow-thistle	L+	Non-native	Forbs	0	0.1	0.1
Sonchus arvensis ssp. uliginosus	smooth perennial sow-thistle	L+	Non-native	Forbs	0.2	0	0
Fallopia convolvulus	black bindweed	L+	Non-native	Forbs	0	0.1	0
Taraxacum erythrospermum	red-seeded dandelion	L+	Non-native	Forbs	0	0.1	0
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	0.6	1.2	1.6
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	1.2	0	0
Acer negundo	Manitoba maple	L+?*	Native	Woody	0	0	0.1
Sambucus canadensis	common elderberry	L5	Native	Woody	0	0.1	0
Thatch	Thatch			Thatch	42	0	4.2
Bare soil	Bare soil			Bare soil	0.6	51.4	0

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0

Section 6

Section 6.1

Section 6.1 was seeded in December of 2023 with 17 of the 30 seeded species found during monitoring in 2024 (Plot 6.1AF; Table 29). Common milkweed was observed in this plot in 2020 before restoration work started and were also in the seed mix. Virginia wild rye, smooth aster, hairy aster (*Symphyotrichum pilosum* var. *pilosum*), and tall sunflower (*Helianthus giganteus*) were observed; however, were not listed in the seed mix and were likely substitutions. Virginia wild rye was the second most commonly observed species in the subplots.

Fifteen species from the seed mix were observed in the subplots in smaller quantities compared to the projected number of seeds. Canada wild rye was the most observed species in the subplots from the seed mix and had only a 49% germination rate (Figure 11). Ox-eye, cup-plant (cf), hoary vervain, New England aster, and common milkweed all had germination rates of >10%. Wild bergamot and foxglove beard-tongue (*Penstemon digitalis*) had between a 5% to 10% germination rate.

Similar to section 3, monitoring for a second growing season would be beneficial to capture some of the slower germinating and maturing species.

Table 29. Projected versus observed seed density for plot 6.1AF

Scientific Name	Common Name	Projected number of seeds per 1 m x 1 m	Average number of plants in 1 m x 1 m	Observed within plot
Rudbeckia hirta var. pulcherrima	black-eyed Susan	45	1.6	✓
Panicum virgatum	switch grass	45		No
Sorghastrum nutans	copper savannah grass	45		No
Andropogon gerardi	big bluestem	45		No
Elymus canadensis var. canadensis	Canada wild rye	39	19	✓
Monarda fistulosa var. fistulosa	wild bergamot	39	2.2	✓
Heliopsis helianthoides	ox-eye	32	5.4	✓
Pycnanthemum virginianum	Virginia mountain mint	32		No
Penstemon digitalis	foxglove beard-tongue	26	1.4	✓
Ratibida pinnata	grey-headed coneflower	23		No
Symphyotrichum novae-angliae	New England aster	19	2.8	✓
Verbena stricta	hoary vervain	19	2.8	✓
Asclepias syriaca	common milkweed	19	2	✓**
Desmodium canadense	showy tick-trefoil	19	1	✓
Penstemon hirsutus	hairy beard-tongue	19	0.6	✓
Oenothera biennis	common evening-primrose	19	0.4	✓
Asclepias tuberosa ssp. interior	butterfly milkweed	19	0.2	✓
Verbena hastata	blue vervain	19	0.2	✓
Schizachyrium scoparium var. scoparium	little bluestem	19		No
Symphyotrichum ericoides var. ericoides	heath aster	19		No
Silphium perfoliatum var. perfoliatum	cup-plant	13	3	✓_cf
Lespedeza capitata	round-headed bush-clover	13	0.2	✓_cf
Drymocallis arguta	tall cinquefoil	13		Yes_cf
Solidago nemoralis ssp. nemoralis	grey goldenrod	13		No
Symphyotrichum oolentangiense	sky-blue aster	11		No
Sisyrinchium montanum	blue-eyed grass	6		No
Euthamia graminifolia	grass-leaved goldenrod	6		✓
Vernonia gigantea	tall ironweed	2		No
Coreopsis lanceolata	lance-leaved coreopsis	1		No
Solidago rigida ssp. rigida	stiff goldenrod	1		No
Symphyotrichum laeve var. laeve	smooth aster		0.8	✓*
Symphyotrichum pilosum var. pilosum	hairy aster		0.4	✓*
Helianthus giganteus	tall sunflower			✓*
Elymus virginicus var. virginicus	Virginia wild rye		18	✓*

✓* species not listed in the seed mix but suspected to come from it

✓** species from the seed mix that were also observed before restoration work started.

✓_cf identification not certain

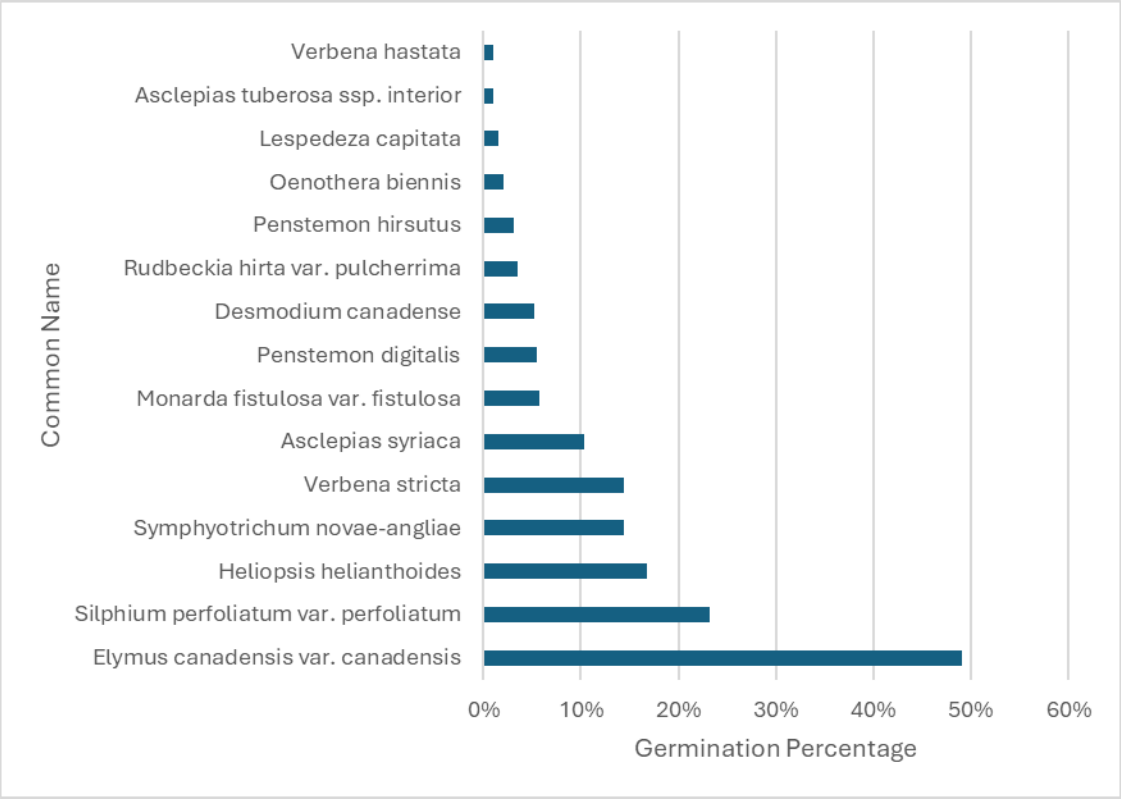

Figure 11. Germination percentage of seeded species in plot 6.1AF

Section 6.2

Section 6.2 was seeded in January 2024 with 20 of the 29 seeded species found during monitoring in 2024 (Plot 6.2AG; Table 30). Tall sunflower was also observed in the plot; however, were not listed in the seed mix and was likely a substitution. Twenty species from the seed mix were observed in the subplots in smaller quantities compared to the projected number of seeds. This plot had the highest average number of plants per square meter compared to all newly seeded plots of 2024.

Ox-eye was the most commonly observed species in the subplots from the species list, and had a 40% germination rate (Figure 12). The germination rate of hoary vervain and cup-plan (cf) were 55% and 44%, respectively. The germination rates of black-eyed Susan, Canada wild rye, common evening-primrose and round-headed bush-clover (*Lespedeza* cf *capitata*) (cf) were over 20%. The germination rates of wild bergamot, blue vervain and hairy beard-tongue were between 10% to 20%. Monitoring for a second growing season would be beneficial to capture some of the slower germinating and maturing species.

Table 30. Projected versus observed seed density for plot 6.2AG

Scientific Name	Common Name	Projected number of seeds per 1 m x 1 m	Average number of plants in 1 m x 1 m	Observed within plot
Rudbeckia hirta var. pulcherrima	black-eyed Susan	45	10.4	✓
Andropogon gerardi	big bluestem	45		No
Panicum virgatum	switch grass	45		No
Sorghastrum nutans	copper savannah grass	45		No
Elymus canadensis var. canadensis	Canada wild rye	39	9	✓
Monarda fistulosa var. fistulosa	wild bergamot	39	7.6	✓
Heliopsis helianthoides	ox-eye	32	13	✓
Pycnanthemum virginianum	Virginia mountain mint	32	0.4	✓
Penstemon hirsutus	hairy beard-tongue	26	3.4	✓
Penstemon digitalis	foxglove beard-tongue	26	0.8	✓
Verbena stricta	hoary vervain	19	10.6	✓
Oenothera biennis	common evening-primrose	19	5.6	✓
Verbena hastata	blue vervain	19	3.4	✓
Asclepias syriaca	common milkweed	19	1.4	✓_cf
Desmodium canadense	showy tick-trefoil	19	1	✓
Symphyotrichum novae-angliae	New England Aster	19	0.8	✓
Asclepias tuberosa ssp. interior	butterfly milkweed	19	0.2	✓_cf
Schizachyrium scoparium var. scoparium	little bluestem	19		No
Symphyotrichum ericoides var. ericoides	heath aster	19		No
Lespedeza capitata	round-headed bush-clover	13	2.6	✓_cf
Ratibida pinnata	grey-headed coneflower	13	1.2	✓_cf
Drymocallis arguta	tall cinquefoil	13	0.6	✓
Solidago nemoralis ssp. nemoralis	grey goldenrod	13	0.6	✓_cf
Silphium perfoliatum var. perfoliatum	cup-plant	9	4	✓_cf
Symphyotrichum laeve var. laeve	smooth aster	9	0.6	✓
Euthamia graminifolia	grass-leaved goldenrod	6		No
Solidago rigida ssp. rigida	stiff goldenrod	6		No
Vernonia gigantea	tall ironweed	2		No
Coreopsis tripteris	tall coreopsis	1		No
Helianthus giganteus	tall sunflower			✓*

✓* species not listed in the seed mix but suspected to come from it
✓_cf identification not certain (most observed only in spring)

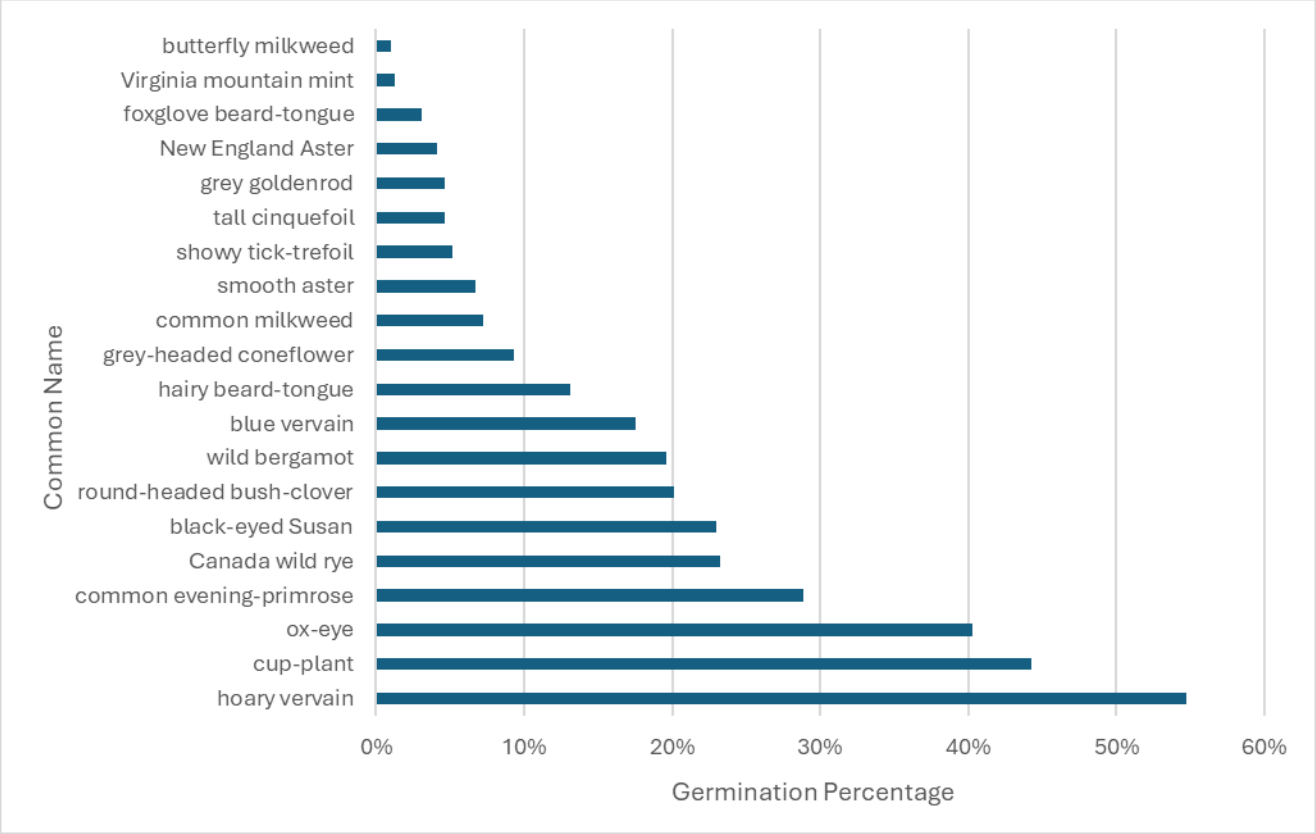

Figure 12. Germination percentage of seeded species in plot 6.2AG

Section 6.4

Section 6.4 was seeded in May 2024 with 13 of the 17 seeded species found during monitoring in 2024 (Plot 6.4AH; Table 31). Wild senna was also observed in the plot; however, was not listed in the seed mix and was likely a substitution. Wild senna was never listed in the Meadoway seed mixes, but it was observed in many plots in 2024 and in previous years (12 of 34 plots).

Eleven species from the seed mix were observed in the subplots in smaller quantities compared to the projected number of seeds (Figure 13). Ox-eye was the most commonly observed species in the subplots from the seed mix, and had a 42% germination rate. The germination rates of black-eyed Susan, Canada wild rye, and showy tick-trefoil were over 10%. The germination rates of common evening-primrose, common milkweed, switch grass, and wild bergamot were between 5% and 10%.

Considering that native seeds were sown in spring 2024, it is probable that many of the projected seeds did not break dormancy this year and will likely germinate in the following year or two. Monitoring for a second growing season would be beneficial to capture some of the slower germinating and maturing species.

Table 31. Projected versus observed seed density for plot 6.4AH

Scientific Name	Common Name	Projected number of seeds per 1 m x 1 m	Average number of plants in 1 m x 1 m	Observed within plot
Heliopsis helianthoides	ox-eye	39	16.6	✓
Rudbeckia hirta var. pulcherrima	black-eyed Susan	39	7.6	✓
Elymus canadensis var. canadensis	Canada wild rye	45	7.4	✓
Desmodium canadense	showy tick-trefoil	19	2	✓
Oenothera biennis	common evening-primrose	42	3.8	✓
Asclepias syriaca	common milkweed	21	1.6	✓
Monarda fistulosa var. fistulosa	wild bergamot	32	2	✓
Panicum virgatum	switch grass	97	6	✓
Elymus virginicus var. virginicus	Virginia wild rye	47	0.8	✓
Sorghastrum nutans	copper savannah grass	113	1.8	✓
Andropogon gerardi	big bluestem	103	0.6	✓
Symphyotrichum novae-angliae	New England aster	21		✓
Silphium perfoliatum var. perfoliatum	cup-plant	1		✓_cf
Verbena hastata	blue vervain	19		No
Symphyotrichum lateriflorum var. lateriflorum	calico aster	16		No
Verbena stricta	hoary vervain	7		No
Solidago juncea	early goldenrod	2		No
Senna hebecarpa	wild senna			✓*

✓* species not listed in the seed mix but suspected to come from it
✓_cf identification not certain (most observed only in spring)

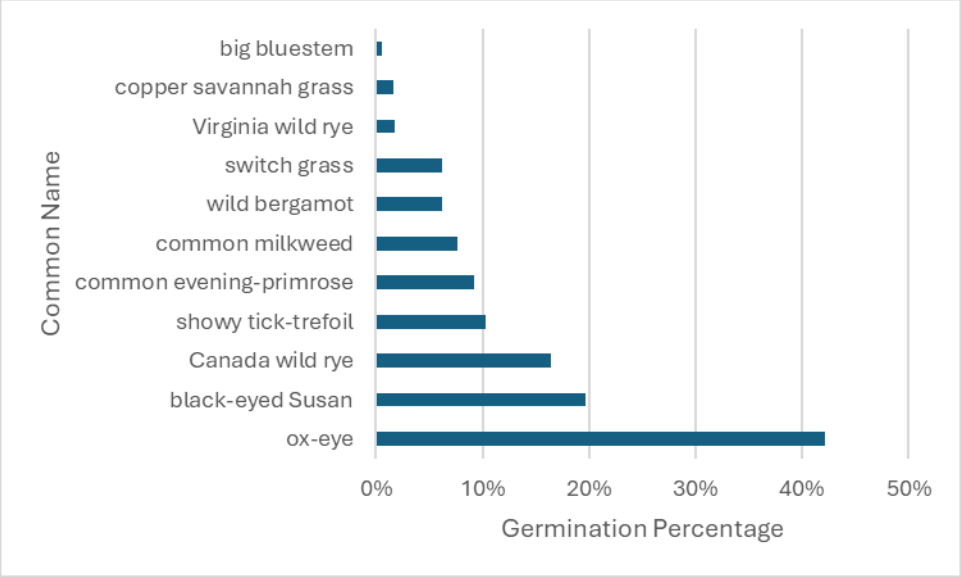

Figure 13. Germination percentage of seeded species in plot 6.4AH

Section 7

Section 7.1

Section 7.1 was initially restored in 2016 and has been seeded repeatedly since that time. Three plots were monitored each year since 2016 (plots 7.1M, N, and O).

Plot 7.1M initially consisted of low cover of all species in 2016 and few species (12 species); however, by 2024 97 species were observed including many newly seeded native species (Table 32). The cover of native grasses ranged from 0 to 1.7% between 2018 and 2024. The cover of Kentucky Bluegrass has been increasing since 2019 with a cover of 11% by 2024. A variety of native forbs were observed post-seeding with tall goldenrod now dominating in 2024 (88% cover). The percent cover of non-native forbs was higher between 2018 and 2021 (e.g. reaching 12% for evening lychnis (*Silene latifolia*)) but has been lower since 2023 (<1%). The cover of targeted invasives was generally low, but the cover of DSV has risen to between 6.2 and 8.2% during 2022-2024. Spotted knapweed (*Centaurea stoebe* ssp. *micranthos*) continues to occur at the plot with a cover of 0.1%.

Plot 7.1N initially consisted of low cover of all species in 2016 and few species (25 species); however, by 2024 88 species were observed including many newly seeded native species (Table 33). The cover of native grasses was high between 2018 and 2024 with the cover of copper savannah grass (*Sorghastrum nutans*) reaching 44% in 2023 and this is likely due to the dry, sandy conditions present in section 7 (and particularly near plot N). The cover of flat-stemmed blue grass (*Poa compressa*) and Kentucky blue grass were highest in 2022 and 2023. A variety of native forbs were observed post-seeding with multiple species found at moderate covers by 2024 such as tall goldenrod (3.8%), heath aster (2.7%), daisy fleabane (*Erigeron annuus*; 5%), black-eyed Susan (4.7%), and wild bergamot (2.1%). The percent cover of non-native forbs was highest between 2018 and 2019 (e.g. reaching 35% for ox-eye daisy) but has been lower since 2023 (<2.9%). The cover of targeted invasives was very low with zero cover of DSV and creeping thistle since 2023. The cover of spotted knapweed has been low since 2022 (0.2-0.3%).

Plot 7.1O initially consisted of few species (11 species); however, by 2024 88 species were observed including many newly seeded native species (Table 34). The cover of two native grasses was high including panic grass in 2018 and 2019 (17-23%), and Virginia wild rye (3-9.4%). The cover of Kentucky blue grass and quack grass (non-native grasses) have increased since 2021 with Kentucky blue grass reaching 34% cover by 2024. A variety of native forbs were observed post-seeding with tall goldenrod (20.6%) and ox-eye (12.2%) having the highest cover in 2024. The percent cover of non-native forbs was highest between 2018 and 2023 (e.g. reaching 34% for black medick) but were lower in 2024 (<3.4%). The cover of targeted invasives was fairly low with 4.3% cover of DSV and 0.2% cover of creeping thistle in 2024. There was no spotted knapweed in this plot; however, it has been found in the larger 20x20m plot every year since 2022.

Table 32. Plot 7.1M percent cover by species

Species	Common Name	L-rank	Native or Non-native	Plant Type	2016*	2018	2019	2020	2021	2022	2023	2024
Sorghastrum nutans	copper savannah grass	L2	Native	Graminoids	0	1.1	1.3	1.7	1.5	0.8	0.3	0.1
Panicum virgatum	switch grass	L3	Native	Graminoids	0	0.5	1.3	1	0.7	1.3	0.9	0.1
Carex echinodes (cf)	marsh straw sedge	L5	Native	Graminoids	0	0	1.2	2	1	1.4	1.4	0.1
Carex pellita	woolly sedge	L4	Native	Graminoids	0	1.2	0	0	0	0	0	0
Andropogon gerardii	big bluestem	L3	Native	Graminoids	0	0	0	0.2	0.2	0.2	0	0
Panicum capillare	panic grass	L5	Native	Graminoids	0	0.6	0	0	0	0	0	0
Schizachyrium scoparium	little bluestem	L2	Native	Graminoids	0	0.2	0	0	0	0	0	0
Juncus tenuis	path rush	L5	Native	Graminoids	0	0	0	0.1	0	0	0	0
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	0	0	1.8	2.4	2.8	4.6	3.2	11
Poa compressa	flat-stemmed blue grass	L+	Non-native	Graminoids	0	0.1	0	0.4	0.4	0.4	1	6
Bromus japonicus	Japanese chess	L+	Non-native	Graminoids	0	0	0.9	0.8	0.3	1.3	1.3	0
Festuca rubra ssp. rubra	red fescue	L+	Non-native	Graminoids	0.7	0	0	2.4	0	0	0	0
Elymus repens	quack grass	L+	Non-native	Graminoids	0	0	0.2	0.6	0.6	0.2	0.1	0
Phalaris arundinacea	reed canary grass	L+?	Non-native	Graminoids	0	0	0.2	0.4	0.4	0.2	0	0
Bromus inermis	smooth brome grass	L+	Non-native	Graminoids	0.8	0.1	0	0	0	0	0	0.1
Phragmites australis ssp. australis	common reed	L+	Non-native	Graminoids	0.6	0	0	0	0	0	0	0
Carex spicata	spiked sedge	L+	Non-native	Graminoids	0	0	0	0.2	0	0	0	0
Agrostis gigantea	redtop	L+	Non-native	Graminoids	0	0	0	0.1	0	0	0	0
Digitaria sanguinalis	hairy crab grass	L+	Non-native	Graminoids	0	0.1	0	0	0	0	0	0
Setaria pumila ssp. pumila	yellow foxtail	L+	Non-native	Graminoids	0	0.1	0	0	0	0	0	0
Solidago altissima	tall goldenrod	L5	Native	Forbs	3.8	4.4	21.2	40.4	53.4	64	67	87.6
Symphyotrichum ericoides var. ericoides	heath aster	L5	Native	Forbs	0.2	0.9	4	3	1.8	1.3	0.5	0.1
Ratibida pinnata	grey-headed coneflower	L+*	Native	Forbs	0	1	2.2	1.6	0.8	0.1	0	0
Helianthus giganteus	tall sunflower	LX	Native	Forbs	0	2	0.6	0.9	0.4	0.6	0.1	0
Monarda fistulosa	wild bergamot	L5	Native	Forbs	0	0.5	0.3	0.3	0.5	1	1.7	0.2
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	0	0.9	0.4	0.8	0.3	1.2	0.5	0.1
Erigeron canadensis	horse-weed	L5	Native	Forbs	0	2.2	0.8	0.1	0.1	0.5	0	0
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	0	0	0	0	0.2	0.5	1	1.8
Oxalis dillenii	deflexed yellow wood-sorrel	L5	Native	Forbs	0	2.2	0.5	0.1	0.1	0.3	0.1	0.1
Asclepias syriaca	common milkweed	L5	Native	Forbs	0.1	0.7	1.1	0.1	0	0	0	0
Solanum ptychanthum	American black nightshade	L5	Native	Forbs	0	1.2	0.3	0	0	0	0	0
Chenopodium simplex	maple-leaved goosefoot	L5	Native	Forbs	0	1	0	0	0	0	0	0
Symphyotrichum novae-angliae	New England aster	L5	Native	Forbs	0	0.1	0.6	0.1	0.1	0	0	0
Solidago canadensis var. canadensis	Canada goldenrod	L5	Native	Forbs	0	0	0	0.8	0	0	0	0
Erigeron annuus	daisy fleabane	L5	Native	Forbs	0	0	0	0	0	0.1	0.6	0
Oenothera biennis	common evening-primrose	L5	Native	Forbs	0	0.1	0.4	0	0.2	0	0	0
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	0	0	0.3	0	0	0	0	0
Chenopodiastrum simplex	maple-leaved goosefoot	L5	Native	Forbs	0	0.2	0	0	0	0	0	0
Potentilla norvegica	rough cinquefoil	L+?*	Native	Forbs	0	0	0.1	0.1	0	0	0	0
Achillea borealis var. borealis	woolly yarrow	L5	Native	Forbs	0	0	0	0	0	0	0.1	0
Echinacea pallida	pale purple coneflower	L+*	Native	Forbs	0	0	0	0	0	0.1	0	0
Epilobium ciliatum ssp. ciliatum	sticky willow-herb	L5	Native	Forbs	0	0	0.1	0	0	0	0	0
Persicaria lapathifolia	pale smartweed	L5	Native	Forbs	0	0	0.1	0	0	0	0	0
Symphyotrichum lanceolatum var. lanceolatum	panicled aster	L5	Native	Forbs	0	0	0	0.1	0	0	0	0
Silene latifolia	evening lychnis	L+	Non-native	Forbs	0	5.5	12.2	8.9	4.5	3.3	1	0.2
Vicia cracca	cow vetch	L+	Non-native	Forbs	0.5	4.8	7.8	2.2	1.4	1	0.5	0.2
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	0	1.6	3.6	5.5	0.8	0.4	0.2	0.1
Verbascum thapsus	common mullein	L+	Non-native	Forbs	0	7.8	1.6	0	0	0.1	0.7	0
Chenopodium album	lamb's quarters	L+	Non-native	Forbs	0	6.4	0.5	0	0	0	0	0
Lactuca serriola	prickly lettuce	L+	Non-native	Forbs	0	2.5	3.8	0.1	0.1	0	0.4	0
Polygonum achoreum	striate knotweed	L+	Non-native	Forbs	0	6.2	0	0	0	0	0	0
Hypericum perforatum	common St. John's-wort	L+	Non-native	Forbs	0	2.2	1.8	0.5	0.3	0.5	0.2	0.4
Taraxacum officinale	dandelion	L+	Non-native	Forbs	0.2	0.9	1	1.4	0.9	1.1	0.1	0.1
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	0	1.1	1.4	1.8	0.2	0.1	0.1	0.1
Lepidium campestre	field pepper-grass	L+	Non-native	Forbs	0	2	1.6	0.1	0.1	0.1	0.1	0
Silene vulgaris	bladder campion	L+	Non-native	Forbs	0	0.6	0.8	1.2	0.2	1	0.1	0
Amaranthus albus	tumbleweed	L+	Non-native	Forbs	0	3.8	0	0	0	0	0	0
Convolvulus arvensis	field bindweed	L+	Non-native	Forbs	0.6	0	0.1	0.2	0.3	1.1	0.5	0.4
Melilotus albus	white sweet clover	L+	Non-native	Forbs	0	0.8	2.2	0	0	0	0	0
Nepeta cataria	catnip	L+	Non-native	Forbs	0	0.8	1.4	0	0	0.1	0.4	0.2
Thlaspi arvense	penny-cress	L+	Non-native	Forbs	0	1.6	0.5	0	0.1	0.3	0.1	0
Vicia tetrasperma	slender vetch	L+	Non-native	Forbs	0	0.2	1.2	0	0	0.3	0.2	0.4
Fallopia convolvulus	black bindweed	L+	Non-native	Forbs	0	0.8	1.1	0.1	0	0	0	0
Veronica arvensis	corn speedwell	L+	Non-native	Forbs	0	0.3	0.2	0.1	0.1	1	0.1	0.1
Amaranthus retroflexus	red-root pigweed	L+	Non-native	Forbs	0	1.8	0	0	0	0	0	0
Potentilla recta	sulphur cinquefoil	L+	Non-native	Forbs	0	0.3	0.3	0.2	0.2	0.1	0	0.1
Medicago lupulina	black medick	L+	Non-native	Forbs	0	0.3	0.5	0	0	0.2	0	0.1
Sisymbrium altissimum	tumble mustard	L+	Non-native	Forbs	0	0.3	0.6	0	0	0.1	0	0
Camelina microcarpa	small-seeded false flax	L+	Non-native	Forbs	0	0.4	0.2	0	0.1	0.1	0.1	0
Trifolium repens	white clover	L+	Non-native	Forbs	0	0.1	0.8	0	0	0	0	0
Sonchus asper	spiny sow-thistle	L+	Non-native	Forbs	0	0.8	0	0	0	0	0	0
Vicia sativa var. angustifolia	common vetch	L+	Non-native	Forbs	0	0.4	0.2	0	0	0.1	0	0
Taraxacum erythrospermum	red-seeded dandelion	L+	Non-native	Forbs	0	0.4	0.2	0	0	0	0	0
Rumex obtusifolius	bitter dock	L+	Non-native	Forbs	0	0.6	0	0	0	0	0	0
Arenaria serpyllifolia	thyme-leaved sandwort	L+	Non-native	Forbs	0	0	0	0	0	0.2	0.3	0
Erysimum cheiranthoides	wormseed mustard	L+	Non-native	Forbs	0	0	0.1	0	0	0.1	0.2	0
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	0	0.1	0	0.1	0	0	0.1	0
Rumex crispus	curly dock	L+	Non-native	Forbs	0	0	0.2	0.1	0	0	0	0
Sonchus arvensis ssp. arvensis	glandular perennial sow-thistle	L+	Non-native	Forbs	0	0	0.1	0.1	0	0	0	0
Trifolium hybridum	alsike clover	L+	Non-native	Forbs	0	0.2	0	0	0	0	0	0
Barbarea vulgaris	winter cress	L+	Non-native	Forbs	0	0	0	0	0	0	0	0.1
Cirsium vulgare	bull thistle	L+	Non-native	Forbs	0	0	0.1	0	0	0	0	0
Coreopsis grandiflora	large-flowered tickseed	L+	Non-native	Forbs	0	0	0.1	0	0	0	0	0
Trifolium pratense	red clover	L+	Non-native	Forbs	0	0	0.1	0	0	0	0	0
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	2.8	2.5	5.5	4.2	5	8.2	6.2	7.1
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	0.3	0.9	1.4	1.4	0.2	0.2	0.2	0.2
Centaurea stoebe ssp. micranthos	spotted knapweed	L+	Non-native	Targeted Invasive	0	0	0.1	0.1	0	0.1	0.4	0.1
Toxicodendron radicans var. rydbergii	poison ivy (shrub form)	L5	Native	Woody	2.9	0.6	0	0.3	0.1	0.1	0	0
Vitis riparia	riverbank grape	L5	Native	Woody	0	0.2	0.1	0	0	0	0	0.1
Cornus stolonifera	red osier dogwood	L5	Native	Woody	0	0.2	0	0	0	0	0	0
Sambucus canadensis	common elderberry	L5	Native	Woody	0	0.2	0	0	0	0	0	0
Acer negundo	Manitoba maple	L+?*	Native	Woody	0	0	0.1	0	0	0	0	0
Celastrus scandens	American bittersweet	L3	Native	Woody	0	0	0.1	0	0	0	0	0
Cornus alternifolia	alternate-leaved dogwood	L5	Native	Woody	0	0.1	0	0	0	0	0	0
Rhus typhina	staghorn sumach	L5	Native	Woody	0	0	0.1	0	0	0	0	0
Morus alba	white mulberry	L+	Non-native	Woody	0	0.3	0.1	0.1	0	0.1	0	0.1
Rhamnus cathartica	common buckthorn	L+	Non-native	Woody	0	0	0.1	0	0	0	0	0
Thatch	Thatch			Thatch	93.8	7	2	26.4	22.6	37.4	51	48
Bare soil	Bare soil			Bare soil	0	8.4	0	1.8	2.2	2	5.4	8

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0

*Only summer survey completed

Table 33. Plot 7.1N percent cover by species

Species	Common Name	L-rank	Native or Non-native	Plant Type	2016*	2018	2019	2020	2021	2022	2023	2024
Sorghastrum nutans	copper savannah grass	L2	Native	Graminoids	0	2.1	3.6	6.8	20.2	32.8	44	21.2
Panicum virgatum	switch grass	L3	Native	Graminoids	0	0	0.8	2.2	4.5	6.8	6.2	3.1
Dichanthelium implicatum	hairy panic grass	L4	Native	Graminoids	0	0	0	3.4	5	2.4	0.4	0.1
Carex granularis	meadow sedge	L5	Native	Graminoids	0	0	0.5	0.5	0.6	1.6	0.5	0.5
Andropogon gerardii	big bluestem	L3	Native	Graminoids	0	0.1	0	0.3	0.1	0.6	1	0.4
Panicum capillare	panic grass	L5	Native	Graminoids	0	1.2	0.2	0.1	0.2	0.4	0.4	0
Dichanthelium acuminatum ssp. acuminatum	hairy panic grass	L4	Native	Graminoids	0	0.6	1.6	0	0	0	0	0
Schizachyrium scoparium	little bluestem	L2	Native	Graminoids	0	0	0	0	0.5	0	0.2	0
Elymus virginicus var. virginicus	Virginia wild rye	L5	Native	Graminoids	0	0.2	0.1	0	0	0.1	0	0
Danthonia spicata	poverty oat grass	L4	Native	Graminoids	0.1	0	0.1	0.1	0	0	0	0
Carex aurea	golden-fruited sedge	L4	Native	Graminoids	0	0	0	0.1	0.1	0	0	0
Poa compressa	flat-stemmed blue grass	L+	Non-native	Graminoids	0.7	0.8	1.1	3.4	4	8	4.2	2.8
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	0.1	0	0	0	0	0.4	3.2	0
Setaria pumila ssp. pumila	yellow foxtail	L+	Non-native	Graminoids	0	0.3	0.2	0	0	0	0	0
Agrostis gigantea	redtop	L+	Non-native	Graminoids	0	0	0.1	0	0.1	0.1	0	0
Bromus japonicus	Japanese chess	L+	Non-native	Graminoids	0	0.1	0	0	0	0	0	0
Carex spicata	spiked sedge	L+	Non-native	Graminoids	0	0	0.1	0	0	0	0	0
Eragrostis minor	little love grass	L+	Non-native	Graminoids	0	0.1	0	0	0	0	0	0
Solidago altissima	tall goldenrod	L5	Native	Forbs	1.1	4	6.2	10.7	10	5.4	4.7	3.8
Symphyotrichum ericoides var. ericoides	heath aster	L5	Native	Forbs	0.7	1.9	5.2	9.4	6.7	4.6	3.6	2.7
Erigeron annuus	daisy fleabane	L5	Native	Forbs	0.2	11	10.2	0.5	0.3	1	1.1	5
Solidago nemoralis ssp. nemoralis	grey goldenrod	L5	Native	Forbs	0.3	0.2	4.8	10.6	5.3	1.8	1.7	0.2
Ratibida pinnata	grey-headed coneflower	L+*	Native	Forbs	0	0.4	1.6	3	2.6	3.4	5	2
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	0	0.5	0.5	1.1	0.7	2.4	4	4.7
Monarda fistulosa	wild bergamot	L5	Native	Forbs	0	0.2	0.3	0.6	3.2	1.9	2.5	2.1
Euthamia graminifolia	grass-leaved goldenrod	L5	Native	Forbs	0	0.6	1.3	1.3	1	0.9	0.8	0.6
Helianthus giganteus	tall sunflower	LX	Native	Forbs	0	0.5	1.4	1	0.2	0	0.1	0
Symphyotrichum pilosum var. pilosum	hairy aster	L3	Native	Forbs	0	0.4	1.2	1	0.2	0	0.1	0
Oenothera biennis	common evening-primrose	L5	Native	Forbs	0	0.8	1.2	0.1	0.1	0.1	0.2	0.3
Sisyrinchium montanum	blue-eyed grass	L4	Native	Forbs	0	0.2	0.4	1	0.6	0.2	0.1	0
Coreopsis lanceolata	lance-leaved coreopsis	L+*	Native	Forbs	0	0	0.4	0.6	0	0	0	0.4
Oxalis dillenii	deflexed yellow wood-sorrel	L5	Native	Forbs	0	0	0	0.1	0.3	0.5	0.3	0.2
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	0	0.3	0.3	0.2	0	0	0	0
Echinacea pallida	pale purple coneflower	L+*	Native	Forbs	0	0	0.1	0.2	0.2	0.2	0.1	0
Solidago canadensis var. canadensis	Canada goldenrod	L5	Native	Forbs	0	0	0	0.6	0	0	0	0
Symphyotrichum lanceolatum var. lanceolatum	panicled aster	L5	Native	Forbs	0.1	0.1	0.2	0.1	0	0	0	0
Erigeron canadensis	horse-weed	L5	Native	Forbs	0	0.3	0.1	0	0	0	0	0
Achillea borealis var. borealis	woolly yarrow	L5	Native	Forbs	0	0	0	0.1	0	0	0	0.1
Erigeron philadelphicus var. philadelphicus	Philadelphia fleabane	L5	Native	Forbs	0	0	0.2	0	0	0	0	0
Potentilla norvegica	rough cinquefoil	L+?*	Native	Forbs	0	0	0	0.1	0	0	0.1	0
Achillea millefolium ssp. lanulosa	woolly yarrow	L5	Native	Forbs	0.1	0	0	0	0	0	0	0
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	0	0	0	0	0.1	0	0	0
Antennaria howellii ssp. howellii	Howell's pussytoes	L5	Native	Forbs	0.1	0	0	0	0	0	0	0
Asclepias incarnata ssp. incarnata	swamp milkweed	L4	Native	Forbs	0	0	0	0	0	0	0	0.1
Oxalis stricta	common yellow wood-sorrel	L5	Native	Forbs	0	0	0.1	0	0	0	0	0
Solanum ptychanthum	American black nightshade	L5	Native	Forbs	0	0.1	0	0	0	0	0	0
Leucanthemum vulgare	ox-eye daisy	L+	Non-native	Forbs	0.3	20	35	2.1	0.8	1.7	2.9	2.4
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	0.5	25.8	11	0.4	0.2	0.4	0.8	0.4
Plantago lanceolata	English plantain	L+	Non-native	Forbs	0.1	3	3.6	3	1.6	2.2	0.6	0.2
Hypericum perforatum	common St. John's-wort	L+	Non-native	Forbs	0.1	3	4.1	0.2	0.3	0.4	0.6	0.9
Medicago lupulina	black medick	L+	Non-native	Forbs	0.5	2	3.1	0.2	0.1	0.6	0.9	0.4
Potentilla recta	sulphur cinquefoil	L+	Non-native	Forbs	0.1	0.7	0.6	1.4	1.4	1.8	0.8	0.5
Coreopsis grandiflora	large-flowered tickseed	L+	Non-native	Forbs	0	0.5	0.2	1.4	0.7	0.8	0.5	0
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	0	0.5	0.5	1.5	0.2	0.2	0.4	0.4
Silene vulgaris	bladder campion	L+	Non-native	Forbs	0	0.2	0.4	0.6	0.1	0	0.6	0
Verbascum thapsus	common mullein	L+	Non-native	Forbs	0	1.2	0.6	0	0	0	0	0.1
Taraxacum officinale	dandelion	L+	Non-native	Forbs	0.7	0.1	0.2	0.1	0.2	0.2	0	0
Arabidopsis thaliana	mouse-ear cress	L+	Non-native	Forbs	0	0.3	0	0	0.5	0.4	0	0
Trifolium pratense	red clover	L+	Non-native	Forbs	0	0.3	0.4	0.1	0	0	0	0
Arenaria serpyllifolia	thyme-leaved sandwort	L+	Non-native	Forbs	0	0	0.1	0.2	0.1	0.2	0.1	0
Cardamine hirsuta	hairy bitter cress	L+	Non-native	Forbs	0	0.6	0	0	0	0	0	0
Tragopogon pratensis	meadow goat's beard	L+	Non-native	Forbs	0.6	0	0	0	0	0	0	0
Melilotus albus	white sweet clover	L+	Non-native	Forbs	0	0.3	0.2	0	0	0	0	0
Pilosella caespitosa	yellow hawkweed	L+	Non-native	Forbs	0.3	0	0	0	0.1	0	0	0
Veronica arvensis	corn speedwell	L+	Non-native	Forbs	0	0	0	0	0	0	0.4	0
Cirsium vulgare	bull thistle	L+	Non-native	Forbs	0	0.2	0.1	0	0	0	0	0
Amaranthus retroflexus	red-root pigweed	L+	Non-native	Forbs	0	0.2	0	0	0	0	0	0
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	0	0	0	0.1	0	0	0	0.1
Tanacetum vulgare	tansy	L+	Non-native	Forbs	0.2	0	0	0	0	0	0	0
Trifolium hybridum	alsike clover	L+	Non-native	Forbs	0	0.1	0.1	0	0	0	0	0
Asparagus officinalis	asparagus	L+	Non-native	Forbs	0.1	0	0	0	0	0	0	0
Barbarea vulgaris	winter cress	L+	Non-native	Forbs	0	0	0	0	0	0	0	0.1
Plantago major	common plantain	L+	Non-native	Forbs	0	0	0	0	0	0.1	0	0
Polygonum aviculare ssp. aviculare	prostrate knotweed	L+	Non-native	Forbs	0	0	0	0	0	0	0	0.1
Stellaria graminea	grass-leaved chickweed	L+	Non-native	Forbs	0	0.1	0	0	0	0	0	0
Stellaria media	common chickweed	L+	Non-native	Forbs	0	0	0	0	0	0	0.1	0
Centaurea stoebe ssp. micranthos	spotted knapweed	L+	Non-native	Targeted Invasive	0.2	0.6	0.7	3	1.8	0.2	0.3	0.2
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	1	0.3	0	0.1	0.1	0.1	0	0
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	0	0.2	0.1	0	0	0	0	0
Acer negundo	Manitoba maple	L+?*	Native	Woody	0	0.3	0.2	0.1	0	0.1	0.1	0
Cornus stolonifera	red osier dogwood	L5	Native	Woody	0	0.3	0.2	0	0	0	0	0
Prunus virginiana var. virginiana	choke cherry	L5	Native	Woody	0.2	0	0	0.1	0	0	0	0
Rhus typhina	staghorn sumach	L5	Native	Woody	0	0.1	0.2	0	0	0	0	0
Vitis riparia	riverbank grape	L5	Native	Woody	0	0	0.1	0.1	0	0.1	0	0
Juniperus virginiana	red cedar	L5	Native	Woody	0.1	0	0	0	0	0	0	0
Parthenocissus vitacea	thicket creeper	L5	Native	Woody	0	0	0	0.1	0	0	0	0
Ailanthus altissima	tree-of-heaven	L+	Non-native	Woody	0	0.1	0	0	0	0	0	0
Robinia pseudoacacia	black locust	L+	Non-native	Woody	0	0	0.1	0	0	0	0	0
Thatch	Thatch			Thatch	59.6	0	0.6	3.7	16.2	13.8	44	35
Bare soil	Bare soil			Bare soil	16.8	29	3.2	23.4	11.6	12.8	7.4	3.8

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0

*Only summer survey completed

Table 34. Plot 7.1O percent cover by species

Species	Common Name	L-rank	Native or Non-native	Plant Type	2016*	2018	2019	2020	2021	2022	2023	2024
Panicum capillare	panic grass	L5	Native	Graminoids	0	16.6	23.4	0.4	0	0	0	0
Elymus virginicus var. virginicus	Virginia wild rye	L5	Native	Graminoids	0	0	0	3.4	9	8.7	8.2	9.2
Andropogon gerardii	big bluestem	L3	Native	Graminoids	0	0	0	0.1	0	0.2	0.8	0.1
Elymus villosus	hairy wild rye	L2	Native	Graminoids	0	0	0	0	0	0.6	0	0
Panicum virgatum	switch grass	L3	Native	Graminoids	0	0.5	0	0.1	0	0	0	0
Elymus canadensis	Canada wild rye	L4	Native	Graminoids	0	0	0	0	0.1	0	0	0
Sorghastrum nutans	copper savannah grass	L2	Native	Graminoids	0	0	0	0	0	0.1	0	0
Poa pratensis ssp. pratensis	Kentucky blue grass	L+	Non-native	Graminoids	0.3	0	0	0.5	14	20	22.2	34
Elymus repens	quack grass	L+	Non-native	Graminoids	0	0.1	0.1	1	1	4	16	2.6
Festuca rubra ssp. rubra	red fescue	L+	Non-native	Graminoids	11.2	0	0	0.2	1.4	0	0	0
Setaria pumila ssp. pumila	yellow foxtail	L+	Non-native	Graminoids	0	3.1	4.2	1.4	0.2	0.1	0	0
Schedonorus pratensis	meadow fescue	L+	Non-native	Graminoids	1.7	0	0	0	0	0	0	0
Poa compressa	flat-stemmed blue grass	L+	Non-native	Graminoids	0	0	0	0	0.1	0.3	0.2	1
Elymus sp.	wild rye sp.			Graminoids	0	1	0	0	0	0	0	0
Dactylis glomerata	orchard grass	L+	Non-native	Graminoids	0.7	0	0	0	0	0	0	0
Bromus japonicus	Japanese chess	L+	Non-native	Graminoids	0	0	0	0	0	0	0.1	0.4
Bromus tectorum	downy chess	L+	Non-native	Graminoids	0	0	0	0	0	0.4	0	0
Setaria viridis	green foxtail	L+	Non-native	Graminoids	0	0	0.4	0	0	0	0	0
Setaria verticillata	bristly foxtail	L+	Non-native	Graminoids	0	0	0	0.2	0	0	0	0
Triticum aestivum	wheat	L+	Non-native	Graminoids	0	0	0	0.2	0	0	0	0
Secale cereale	rye	L+	Non-native	Graminoids	0	0	0	0	0	0.1	0	0
Setaria faberi	giant foxtail	L+	Non-native	Graminoids	0	0	0.1	0	0	0	0	0
Solidago altissima	tall goldenrod	L5	Native	Forbs	0	1.6	0	0.2	1	3.6	6	20.6
Heliopsis helianthoides	ox-eye	L2	Native	Forbs	0	4.6	0.1	0.5	1.4	3.5	7.2	12.2
Helianthus giganteus	tall sunflower	LX	Native	Forbs	0	12.4	0.2	1.3	1.3	2.4	0.8	0.8
Oxalis dillenii	deflexed yellow wood-sorrel	L5	Native	Forbs	0	2.6	0	6	1.2	0.1	0	0
Ambrosia artemisiifolia	common ragweed	L5	Native	Forbs	0	0	0.1	4	1.2	0.4	0	0
Erigeron annuus	daisy fleabane	L5	Native	Forbs	0	0	0	0.1	1.3	2.3	1	0.2
Erigeron canadensis	horse-weed	L5	Native	Forbs	0	0	0	1.4	2.9	0.5	0	0
Symphyotrichum laeve var. laeve	smooth aster	L3	Native	Forbs	0	0	0	0	0.4	1	2.2	0.1
Rudbeckia hirta	black-eyed Susan	L4	Native	Forbs	0	1.2	0	0.6	0.6	0.1	0.3	0.1
Solanum ptychanthum	American black nightshade	L5	Native	Forbs	0	2.4	0.2	0.1	0	0.1	0	0
Oenothera biennis	common evening-primrose	L5	Native	Forbs	0	1.4	0.4	1	0	0	0	0
Veronica peregrina ssp. peregrina	purslane speedwell	L+?*	Native	Forbs	0	0.2	0	1.6	0	0	0	0
Ratibida pinnata	grey-headed coneflower	L+*	Native	Forbs	0	1.2	0	0	0	0	0	0
Symphyotrichum novae-angliae	New England aster	L5	Native	Forbs	0	0.8	0	0	0	0.1	0	0.2
Potentilla norvegica	rough cinquefoil	L+?*	Native	Forbs	0	0	0	0.2	0.2	0.2	0	0
Symphyotrichum ericoides var. ericoides	heath aster	L5	Native	Forbs	0	0.4	0	0	0	0	0	0
Asclepias syriaca	common milkweed	L5	Native	Forbs	0	0.2	0	0.1	0	0	0	0
Symphyotrichum lanceolatum var. lanceolatum	panicled aster	L5	Native	Forbs	0	0	0	0	0.2	0	0	0
Monarda fistulosa	wild bergamot	L5	Native	Forbs	0	0	0	0	0	0	0.1	0
Solidago ptarmicoides	upland white goldenrod	L2	Native	Forbs	0	0	0	0	0.1	0	0	0
Medicago lupulina	black medick	L+	Non-native	Forbs	0	1.4	0.6	31.8	34	7.6	0.5	0
Berteroa incana	hoary alyssum	L+	Non-native	Forbs	0	0	0	0	4.6	12	11	0.8
Chenopodium album	lamb's quarters	L+	Non-native	Forbs	0	3.6	8.9	12	0.1	0	0	0
Sisymbrium altissimum	tumble mustard	L+	Non-native	Forbs	0	0	0	17	3.8	1.4	0	0
Linaria vulgaris	butter-and-eggs	L+	Non-native	Forbs	0	1.2	0	0.4	4.4	4.4	4.2	3.4
Taraxacum officinale	dandelion	L+	Non-native	Forbs	2.3	3.6	0.1	0.5	0.8	3.2	1.8	2.8
Lactuca serriola	prickly lettuce	L+	Non-native	Forbs	0	0	0	1	7.6	4.2	0.4	0
Vicia cracca	cow vetch	L+	Non-native	Forbs	0.4	3.8	0.2	1	0.2	0.6	0.6	2.2
Daucus carota	Queen Anne's lace	L+	Non-native	Forbs	0	4.2	0	2	1	0.8	0.4	0.1
Cerastium fontanum	mouse-ear chickweed	L+	Non-native	Forbs	0	0.4	0	0.9	1.5	2.7	0.3	0.1
Arabidopsis thaliana	mouse-ear cress	L+	Non-native	Forbs	0	0	0	3.6	1.5	0	0	0
Thlaspi arvense	penny-cress	L+	Non-native	Forbs	0	0	0	1.7	1.4	1.4	0	0
Silene latifolia	evening lychnis	L+	Non-native	Forbs	0	0	0	0	0.2	1.7	1	0.5
Amaranthus blitoides	prostrate pigweed	L+	Non-native	Forbs	0	0	3	0	0	0	0	0
Plantago lanceolata	English plantain	L+	Non-native	Forbs	0	0	0	0.2	1	1.4	0.3	0.1
Amaranthus retroflexus	red-root pigweed	L+	Non-native	Forbs	0	0	2.4	0.2	0	0	0	0
Barbarea vulgaris	winter cress	L+	Non-native	Forbs	0	0	0	0.4	1.2	0.8	0	0
Amaranthus albus	tumbleweed	L+	Non-native	Forbs	0	0	2.4	0	0	0	0	0
Malva neglecta	common mallow	L+	Non-native	Forbs	0	0.4	1	1	0	0	0	0
Tragopogon pratensis	meadow goat's beard	L+	Non-native	Forbs	0.2	0.9	0	0.1	0.4	0.1	0.6	0
Polygonum achoreum	striate knotweed	L+	Non-native	Forbs	0	2.2	0	0	0	0	0	0
Verbascum thapsus	common mullein	L+	Non-native	Forbs	0	0	0	0.2	1.4	0.4	0	0
Trifolium pratense	red clover	L+	Non-native	Forbs	0.2	0	0	0.1	1.1	0	0	0
Capsella bursa-pastoris	shepherd's purse	L+	Non-native	Forbs	0	0	0	0.6	0.6	0.2	0	0
Arenaria serpyllifolia	thyme-leaved sandwort	L+	Non-native	Forbs	0	0	0	0.1	0.1	0.4	0	0
Cardamine hirsuta	hairy bitter cress	L+	Non-native	Forbs	0	0.1	0	0.4	0	0	0	0
Cirsium vulgare	bull thistle	L+	Non-native	Forbs	0	0.1	0	0	0	0.4	0	0
Veronica arvensis	corn speedwell	L+	Non-native	Forbs	0	0	0.1	0	0.1	0.3	0	0
Geranium pusillum	small-flowered crane's-bill	L+	Non-native	Forbs	0	0	0	0	0	0.4	0	0
Sonchus asper	spiny sow-thistle	L+	Non-native	Forbs	0	0	0	0.4	0	0	0	0
Fallopia convolvulus	black bindweed	L+	Non-native	Forbs	0	0	0	0.1	0.1	0.1	0	0
Camelina microcarpa	small-seeded false flax	L+	Non-native	Forbs	0	0	0	0	0.2	0	0	0
Cichorium intybus	chicory	L+	Non-native	Forbs	0.1	0	0	0	0	0	0	0.1
Descurainia sophia	flixweed	L+	Non-native	Forbs	0	0	0	0	0.1	0	0	0
Hypericum perforatum	common St. John's-wort	L+	Non-native	Forbs	0	0.1	0	0	0	0	0	0
Melilotus albus	white sweet clover	L+	Non-native	Forbs	0	0.1	0	0	0	0	0	0
Sonchus oleraceus	annual sow-thistle	L+	Non-native	Forbs	0	0.1	0	0	0	0	0	0
Trifolium repens	white clover	L+	Non-native	Forbs	0	0.1	0	0	0	0	0	0
Vincetoxicum rossicum	dog-strangling vine	L+	Non-native	Targeted Invasive	0.3	1	0.7	0.7	2.3	5.2	4.8	4.3
Cirsium arvense	creeping thistle	L+	Non-native	Targeted Invasive	0	2.9	0.1	0.2	0	0.1	0.4	0.2
Acer negundo	Manitoba maple	L+?*	Native	Woody	0	0	0	0.1	0	0.1	0	0
Cornus stolonifera	red osier dogwood	L5	Native	Woody	0	0.1	0	0	0	0	0	0
Vitis riparia	riverbank grape	L5	Native	Woody	0	0.1	0	0	0	0	0	0
Rhamnus cathartica	common buckthorn	L+	Non-native	Woody	0.1	0.1	0	0	0	0	0	0
Solanum dulcamara	bittersweet nightshade	L+	Non-native	Woody	0	0	0.1	0.1	0	0	0	0
Acer tataricum ssp. ginnala	Amur maple	L+	Non-native	Woody	0	0	0	0	0	0.1	0	0
Thatch	Thatch			Thatch	85.4	23	2.4	1.4	9	6	54.8	77.6
Bare soil	Bare soil			Bare soil	0	7	83.2	6.2	3.6	2.2	0	0

Average Percent Cover
80-100
60-80
40-60
20-40
10-20
5-10
2-5
1-2
0.1-1
0
*Only summer survey completed

Xerces experimental plots

In 2022, an experimental site preparation trial plot was set up in section 5.3. The broad goal of the study was to determine how a unique site preparation technique (termed the Xerces technique) affects seeding success in The Meadoway. The Xerces site preparation method included performing a deep plow, flipping the soil, followed by a light discing, and seeding in mid-June 2022. Common evening-primrose seed was also added in fall/winter 2022. Additionally, no spraying with glyphosate occurs in the Xerces method. This leads to less disturbance to the seed bed, the soil is less compact, and there is no use of glyphosate. This contrasts with the currently used site preparation method that involves more thorough rototilling in multiple rounds and spraying of glyphosate. By conducting this study, we would like to understand how the percent cover of native species and stem count of species from the seed mix varies between the Xerces method and the current method.

For this assessment, the most effective method was defined as the one that maximized both the percent cover of native species and total stem count of species from the seed mix.

In 2023 and 2024, 10 plots (1m x 1m) treated with the Xerces method and 4 plots (1m x 1m) treated with the current method were monitored. While we aimed for consistency of all factors other than the site preparation method, there were several differences between the Xerces method plots and the current method plots including using different seed mixes, different timing of seeding, and different treatments for invasives. These differences should be considered when interpreting results.

The percent cover of native and exotic species varied among plots treated with the Xerces method and those treated with the current method (Figures 14 and 15). Plots treated with the Xerces method had on average 54% and 65% cover of native species in 2023 and 2024, respectively, while plots treated with the current method had on average 49% and 52% cover of native species in 2023 and 2024, respectively. Plots treated with the Xerces method had on average 48% and 33% cover of exotic species in 2023 and 2024, respectively, while plots treated with the current method had 27% and 23% cover of exotic species in 2023 and 2024, respectively. It is important to note that there was more variation in percent cover among the Xerces method plots compared to the current method plots in both 2023 and 2024. This means that while on average the Xerces plots had a slightly higher percent cover of native species and a higher cover of exotic species, some plots had considerably higher cover than average, while others had considerably lower cover than average.

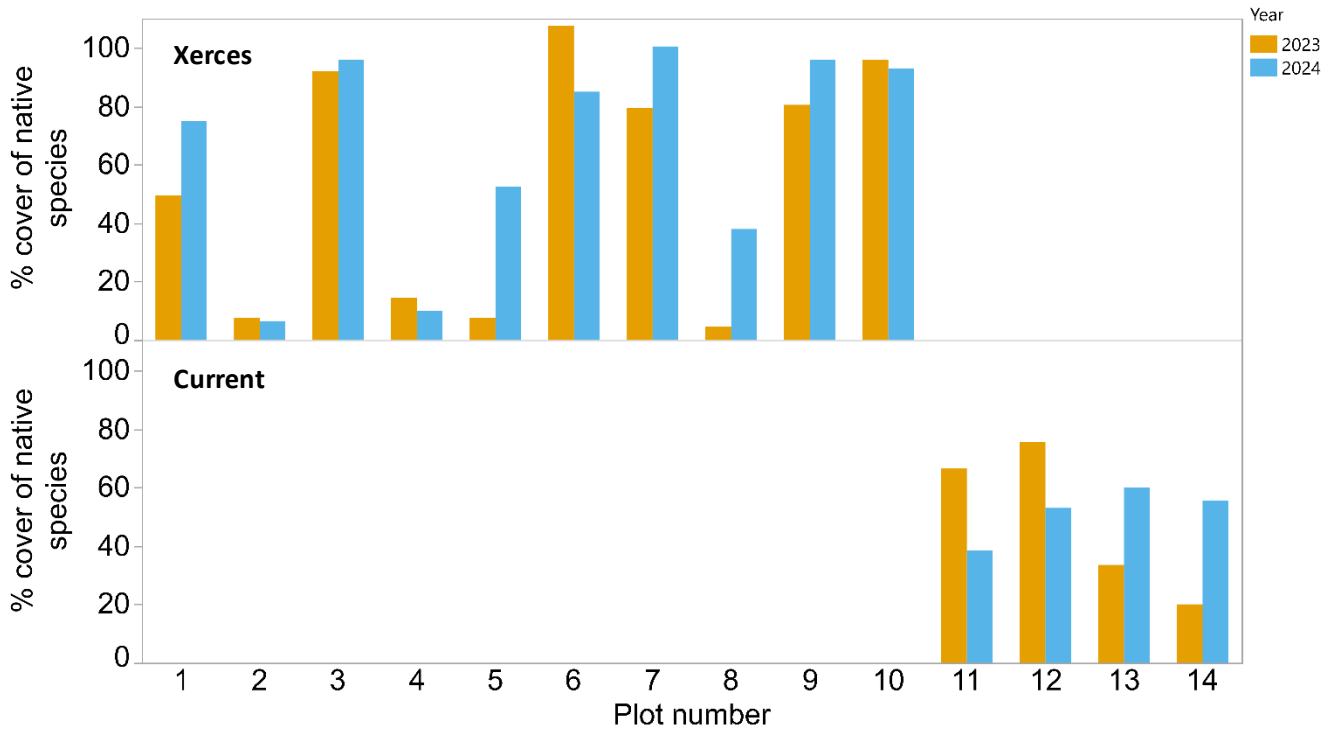

Figure 14. Total percent cover of native plant species in plots treated with the Xerces method or the current method.

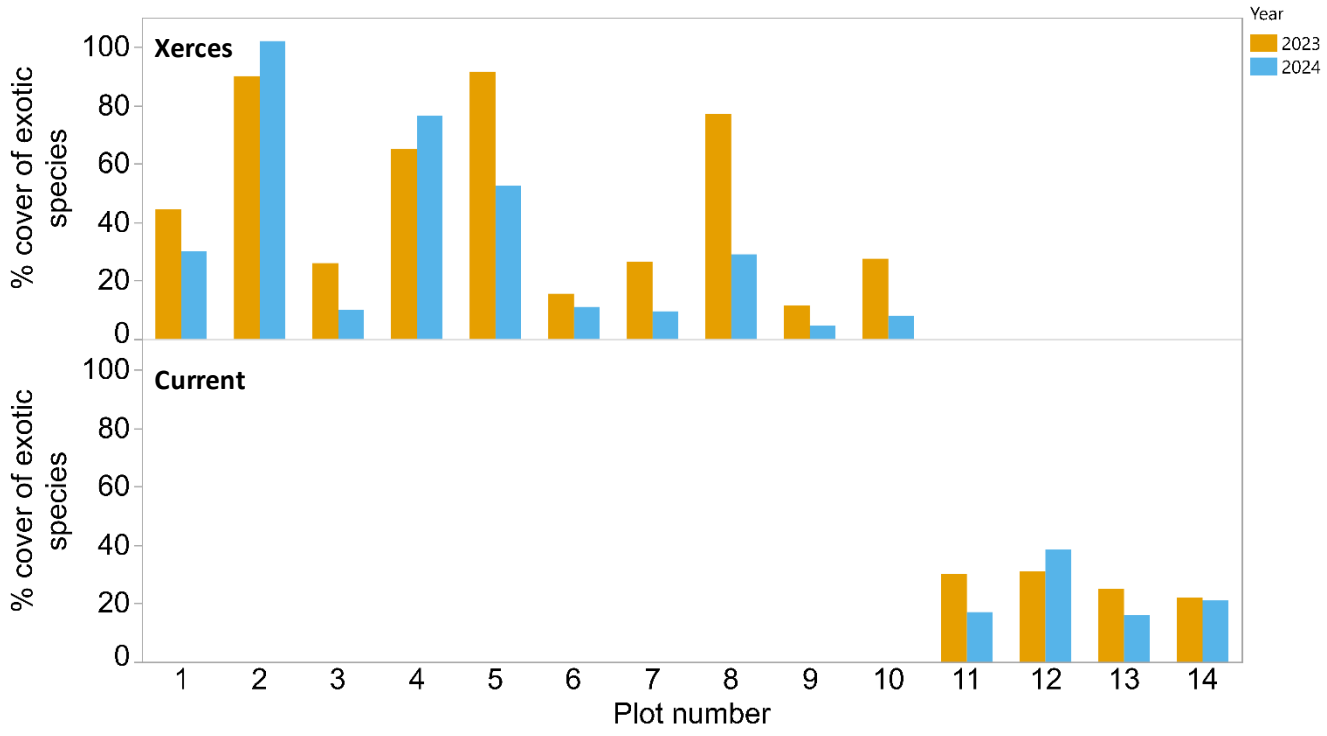

Figure 15. Total percent cover of exotic plant species in plots treated with the Xerces method or the current method.

Breeding Bird Surveys

Bird surveys have been conducted in The Meadoway since 2016 (Table 1). Sections 4 and 7 (all post-restoration), have the longest record of data (eight years). In sections 1.2, 1.4, 2.4, and 5.3 there are pre- and post-restoration data for comparisons. Two new bird stations (station 16 and 17) were added in 2024 in sections 3.2 and 3.3, respectively.

Forty-seven breeding bird species were detected during surveys between 2016 and 2024 (Appendix 1). These included three species of conservation concern in the Toronto Region (ranked L3): Eastern Meadowlark (*Sturnella magna*), Wild Turkey (*Meleagris gallopavo*), and Least Flycatcher (*Empidonax minimus*). Eastern Meadowlark is a meadow-dependent species and a species-at-risk, while the other two other species are forest-edge species that use various shrubs and other successional or forest habitats for nesting. There were four additional meadow-dependent species ranked L4 detected during surveys: Savannah Sparrow (*Passerculus sandwichensis*), Willow Flycatcher (*Empidonax traillii*), Field Sparrow (*Spizella pusilla*), and Eastern Kingbird (*Tyrannus tyrannus*). Red-winged Blackbird (*Agelaius phoeniceus*), Song Sparrow (*Melospiza melodia*), and American Robin (*Turdus migratorius*) (all ranked as L5) were the most frequently occurring and most abundant species detected during surveys. The striking Indigo Bunting (*Passerina cyanea*; ranked L4) was observed for the first time at The Meadoway in 2024. This species builds a concealed nest in low vegetation in fields or along the edges of woods, roadsides, or rights-of-way and eats a varied diet of seeds, berries, buds, and insects (Figure 16).

Figure 16. Indigo Bunting (*Passerina cyanea*).

Section 1

Birds have been surveyed in section 1 variably across years. Surveys found a variety of species include meadow-dependent species such as Savannah Sparrow, Eastern Kingbird, and Willow Flycatcher (Figure 17-20).

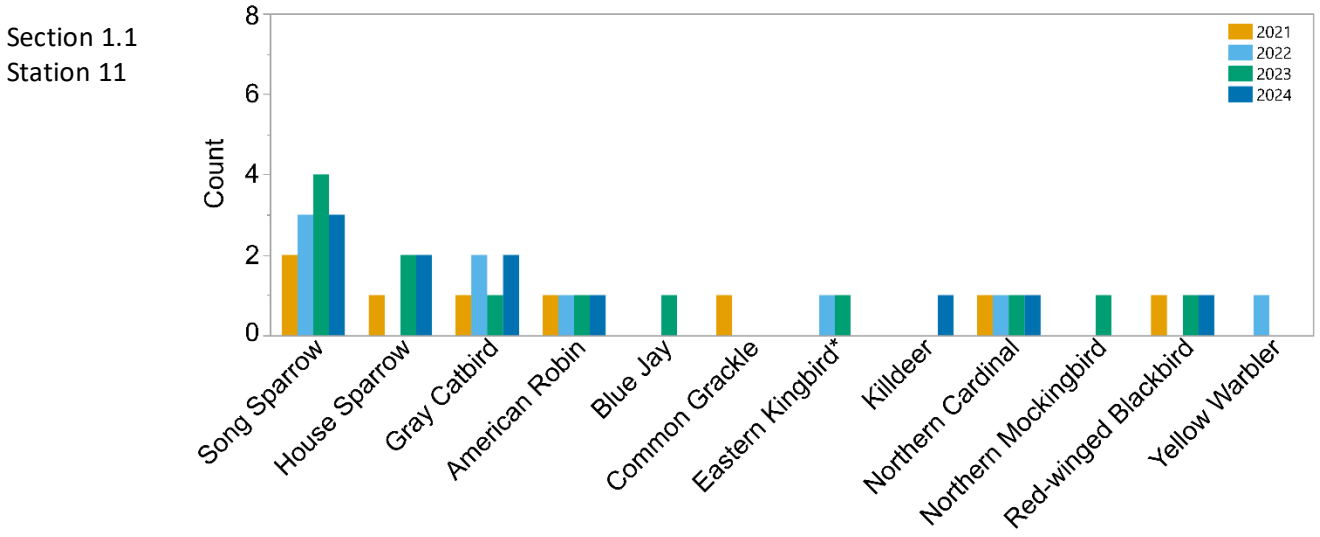

Figure 17. Bird community composition and abundance section 1.1 (station 11). An asterisk (*) indicates a meadow-dependent species.

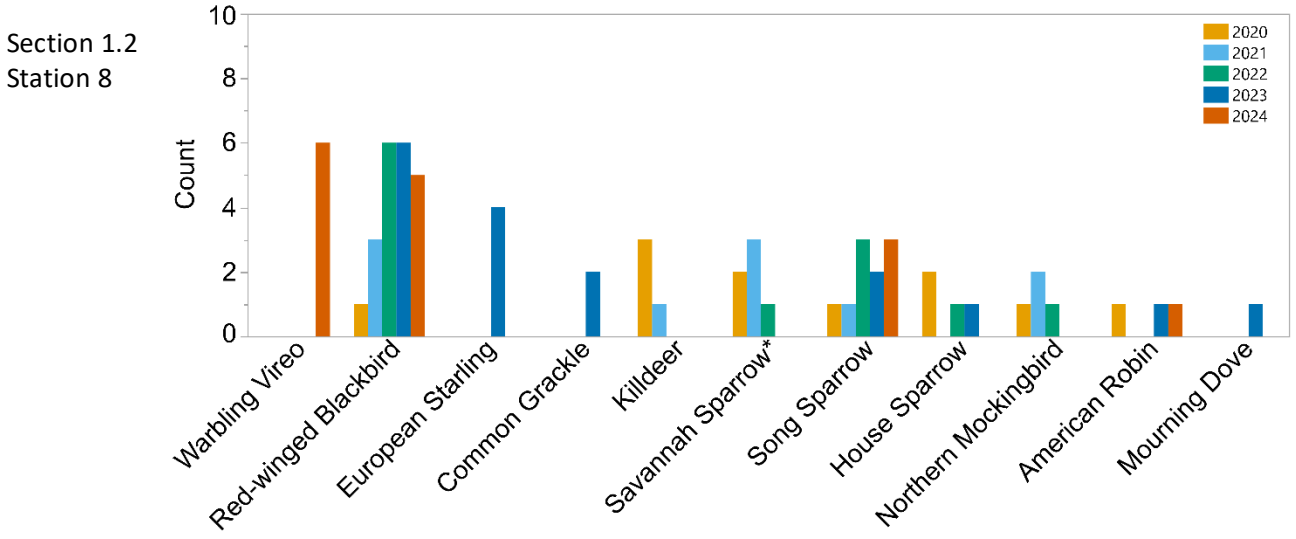

Figure 18. Bird community composition and abundance in section 1.2 (station 8). An asterisk (*) indicates a meadow-dependent species.

Section 1.3
Station 12

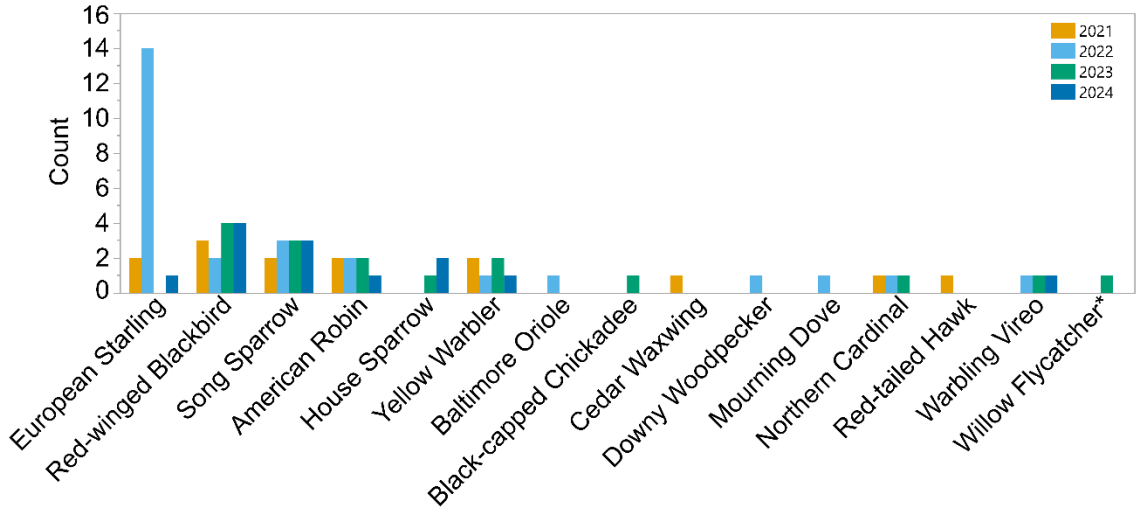

Figure 19. Bird community composition and abundance in section 1.3 (station 12). An asterisk (*) indicates a meadow-dependent species.

Section 1.4
Station 6

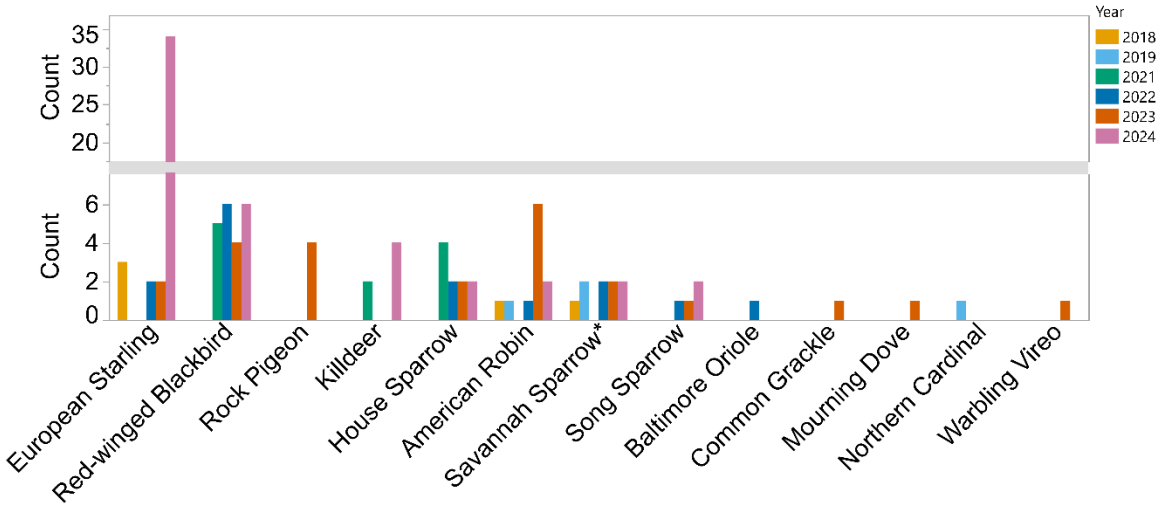

Figure 20. Bird community composition and abundance in section 1.4 (station 6). An asterisk (*) indicates a meadow-dependent species.

Section 2

Bird communities have been monitored in section 2.2 since 2022 and in section 2.4 since 2018. There were fewer species in section 2.2 (11 species) compared to section 2.4 (16 species) (Figure 21 and 22). Both sections contained primarily generalist species, with fewer meadow-dependent species.

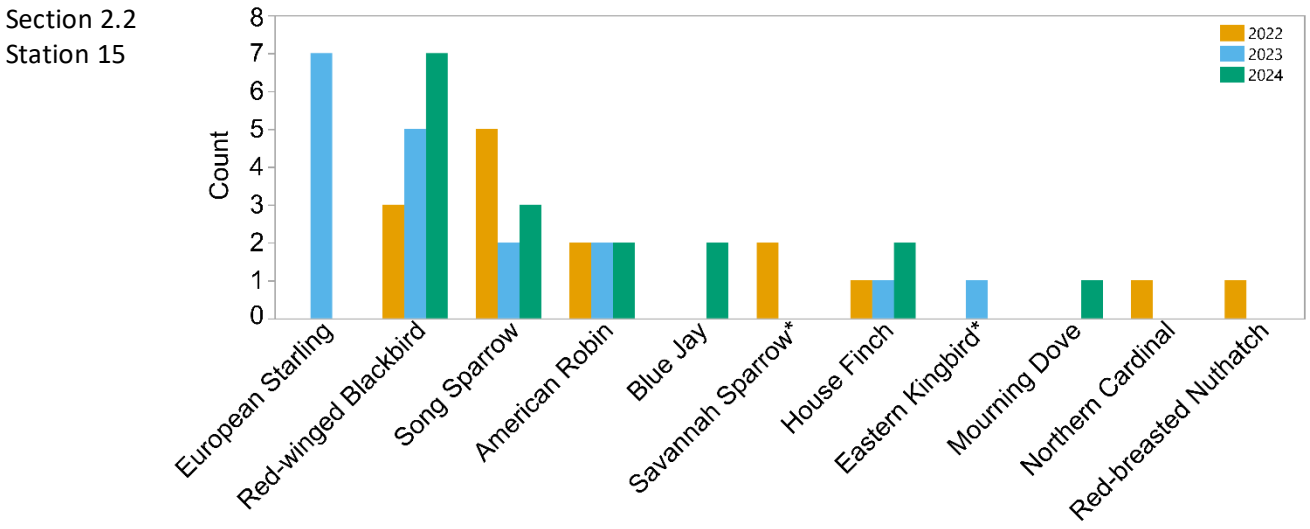

Figure 21. Bird community composition and abundance in section 2.2 (station 15). An asterisk (*) indicates a meadow-dependent species.

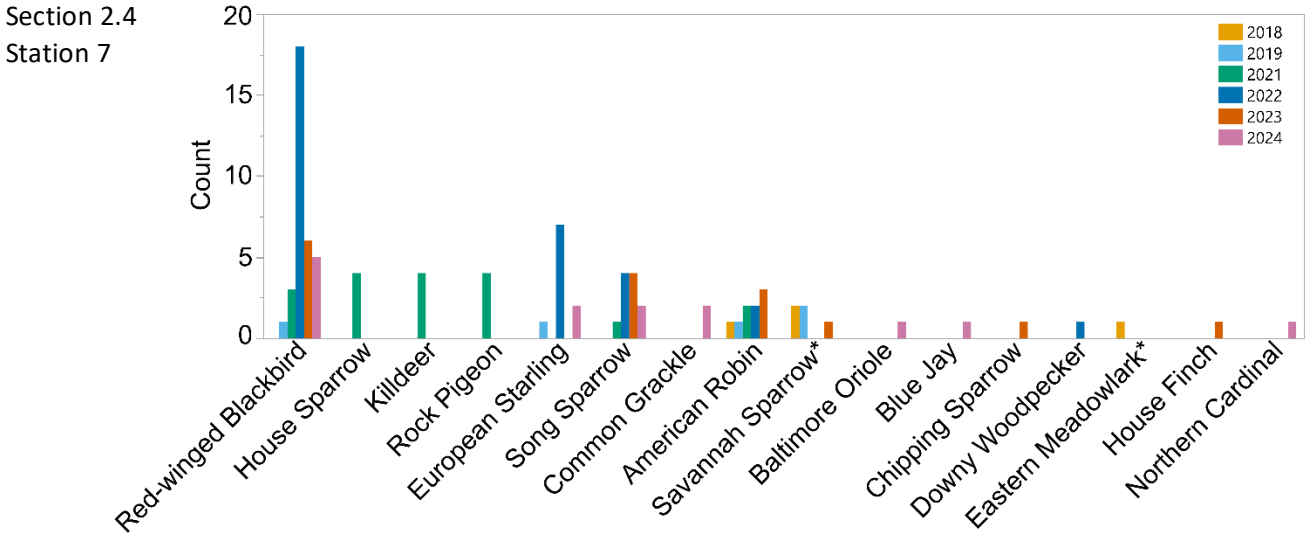

Figure 22. Bird community composition and abundance in section 2.4 (station 7). An asterisk (*) indicates a meadow-dependent species.

Section 3

In 2024, two new bird survey stations were added in sections 3.2 (station 16) and section 3.3 (station 17). Surveys found several bird species commonly occurring across The Meadoway along with several non-native species more associated with urban environments (Figure 23).

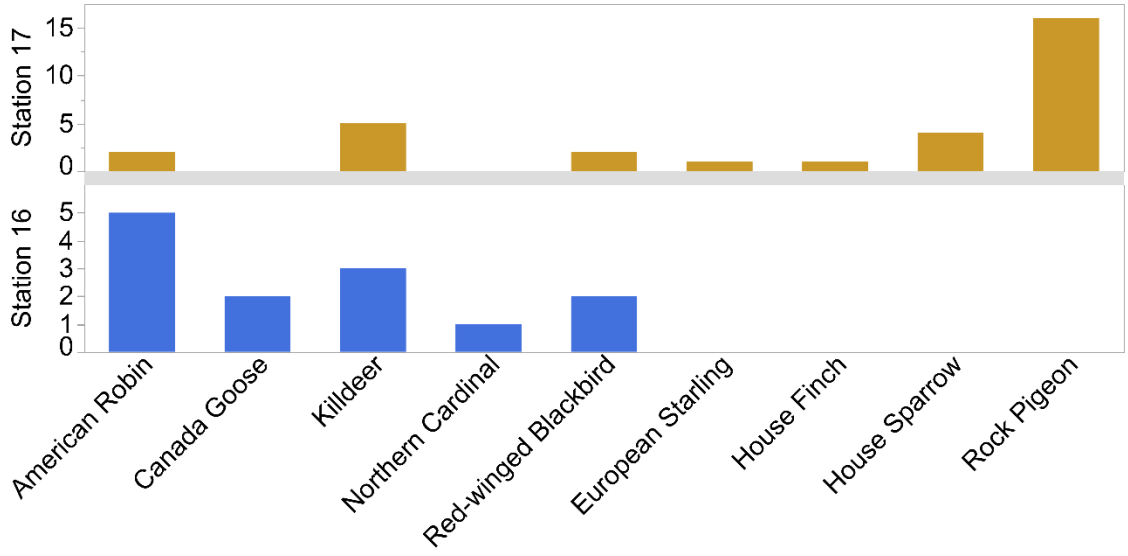

Figure 23. Bird communities in section 3.2 (station 16) and section 3.3 (station 17) in 2024. An asterisk (*) indicates a meadow-dependent species.

Sections 4 and 7

We compared bird communities in sections 4 and 7 using ordination (Nonmetric Multidimensional Scaling – NMS, R Core Team 2021). This method provides a comparison of bird communities over time. Earlier restoration years had several species not in the later time period including Savannah Sparrow (SAVS), Eastern Meadowlark (EAME), Northern Mockingbird (*Mimus polyglottos*; NOMO), Northern Flicker (*Colaptes auratus*; NOFL), and Cedar Waxwing (*Bombycilla cedrorum*; CEDW; Figure 24). Later years post-restoration had several species not found in earlier years or found in a higher abundance including American Redstart (AMRE), Orchard Oriole (*Icterus spurius*; OROR), Cooper's Hawk (*Accipiter cooperii*; COHA), Rose-breasted Grosbeak (*Pheucticus ludovicianus*; RBGR), Field Sparrow (FISP), and Least Flycatcher (LEFL), Warbling Vireo (WAVI). Surveys specifically in 2024 in these sections found generally fairly common species seen in multiple other years.

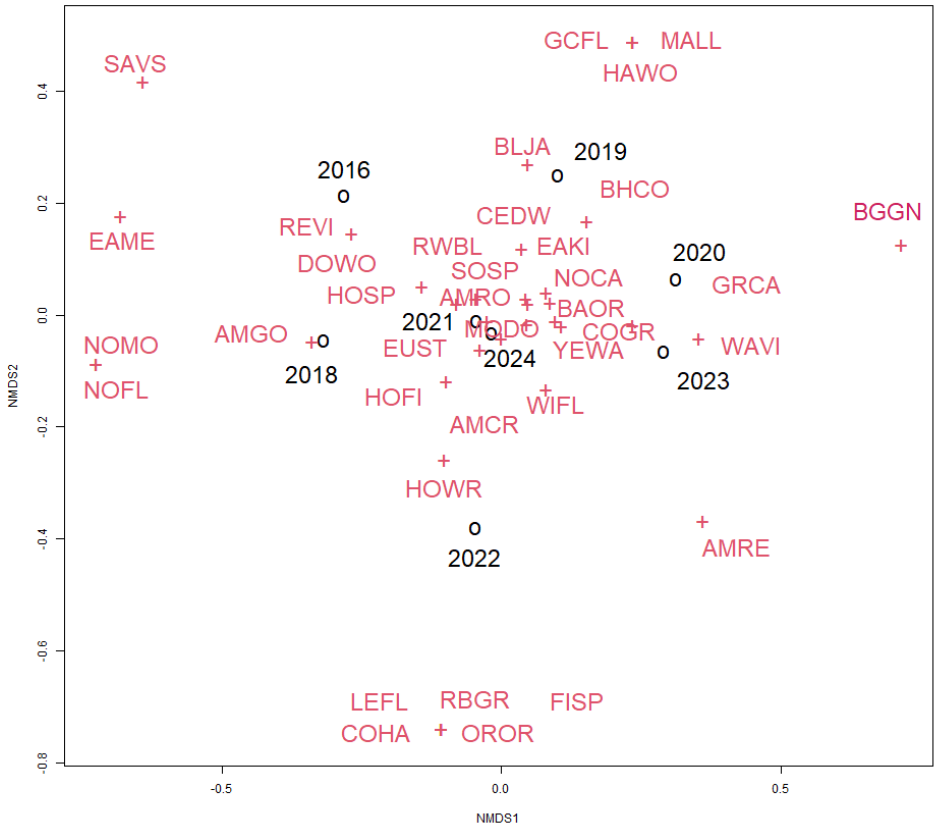

Figure 24. An ordination of bird community composition in sections 4 and 7 between 2016 and 2024 (earlier and later post-restoration). The location of species codes represents their relationship with specific years (e.g., if a species name is located near a year point, that species was found in higher abundance during that year). Species found in the centre of the plot often were found in multiple years (e.g. AMRO – American Robin, or RWBL – Red-winged Blackbird).

Section 5

Stations 9 and 10 had bird communities consisting of one meadow-dependent species, Savannah Sparrow, along with several other species using the meadow habitat for breeding and/or foraging (Figure 25). Other species found most consistently across years included Red-winged Blackbird, American Robin, and Song Sparrow.

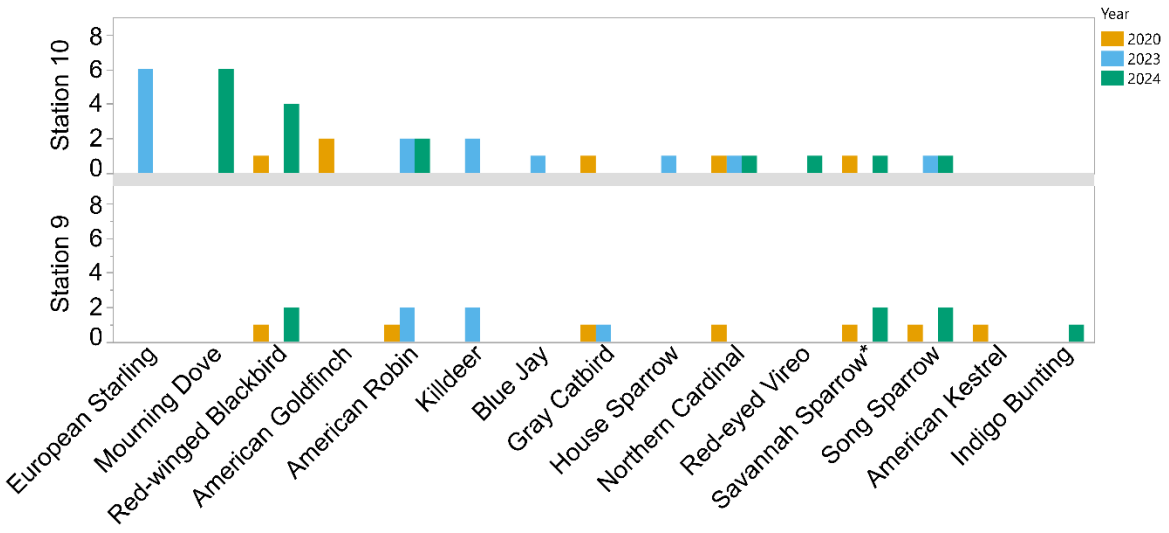

Figure 25. Bird communities in section 5.2 (station 9) and section 5.3 (station 10) in 2020, 2023, 2024. An asterisk (*) indicates a meadow-dependent species.

Section 6

Three meadow-dependent birds were observed in sections 6.2 and 6.4 including Savannah Sparrow, Willow Flycatcher, and Eastern Kingbird (Figure 26 and 27). In 2024, several species occurred in higher abundance including Killdeer, American Robin, European Starling, and Red-winged Blackbird.

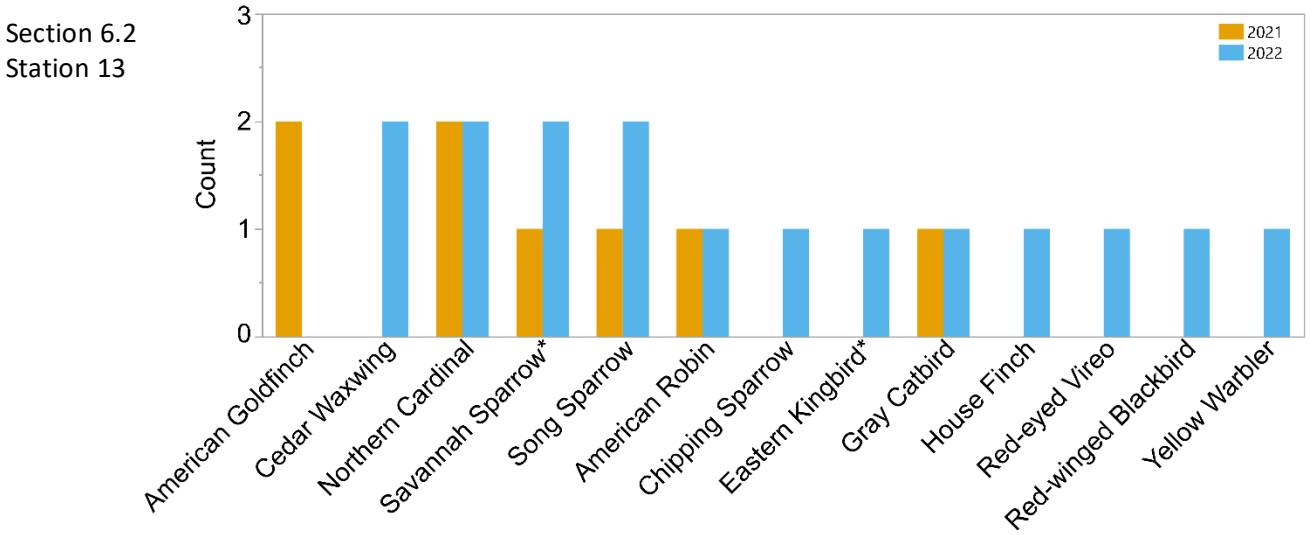

Figure 26. Bird community composition and abundance in section 6.2 (station 13). An asterisk (*) indicates a meadow-dependent species.

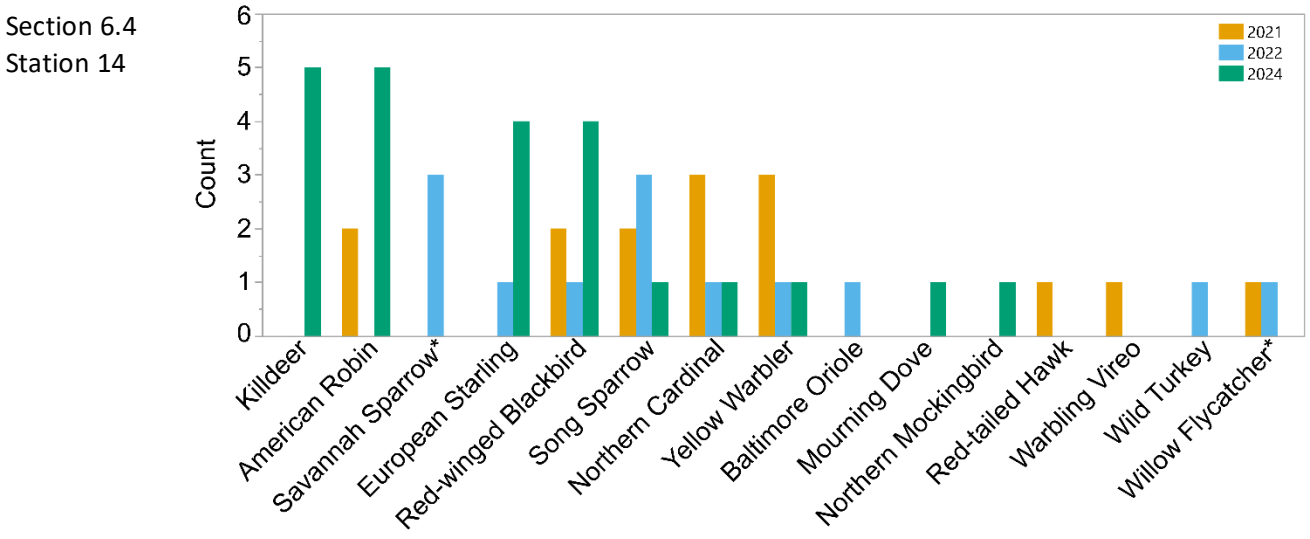

Figure 27. Bird community composition and abundance in section 6.4 (station 14). An asterisk (*) indicates a meadow-dependent species.

Butterfly surveys

Forty-six butterfly species were observed between 2016 and 2024 (Appendix 2). Of these 46 species, the Acadian Hairstreak (*Satyrium acadica*), Giant Swallowtail (*Papilio cresphontes*), Delaware Skipper (*Anatrytone logan*), Silver-spotted Skipper (*Epargyreus clarus*), Pearl Crescent (*Phyciodes tharos*), and Wild Indigo Duskywing (*Erynnis baptisiae*) are ranked at the provincial level as S4 species. Species with an S4 rank are not rare species, but are uncommon, and there is some cause for long-term concern due to population declines or other factors (Nature Serve 2018). Monarch (*Danaus plexippus*) were also found using The Meadoway in very high numbers although numbers varied from year-to-year. For example, 280 monarchs were counted using section 4.3 (between Bellamy Road North and Markham Road) in 2019; however, only 26 were recorded in 2024. In 2024, Little Yellow (*Pyrisitia lisa*) was observed for the first time at The Meadoway in section 7; this was the first Toronto record of this vagrant species since 2015.

Sections 1 and 2

Sections 1.4 (transect 1J) and 2.4 (transect 2K) were monitored both pre-restoration (2019) and post-restoration (2021-2024). Butterfly communities appeared to have changed between 2019 and 2021-2024 by increasing in either species richness or abundance of specific species (Figures 28 and 29). In section 1, species richness has remained relatively similar with 8 or 9 species observed each year except for in 2023 when 14 species were recorded. Species only present post-restoration included Acadian Hairstreak (*Satyrium acadica*), an unknown Blue species, Common Wood-Nymph (*Cercyonis pegala*), European Common Blue, Pearl Crescent, Peck's Skipper (*Polites peckius*), and Silvery Blue (*Glaucopsyche lygdamus*). Pre-restoration in section 2, only 6 species were present, while post-restoration species richness was higher (2021 – 10 species, 2022 – 10 species, 2023 – 11 species, 2024 – 13 species). New species found post-restoration include European Common Blue which has been increasing in other areas of The Meadoway, and four other resident species including Eastern Tailed Blue (*Cupido comyntas*), European Skipper (*Thymelicus lineola*), Peck's Skipper, and Silvery Blue.

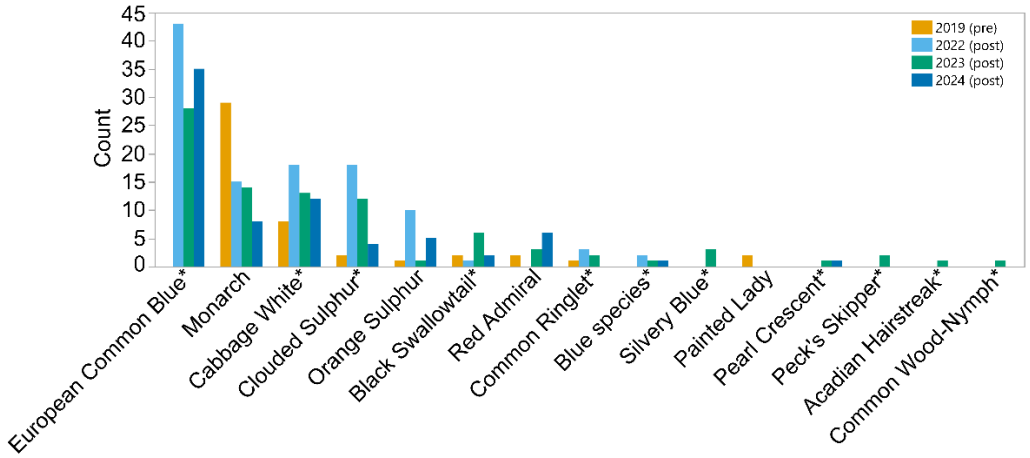

Figure 28. Temporal changes in butterfly species composition and abundance on transect 1J in section 1.4 pre- and post-restoration. An asterisk (*) indicates a resident species.

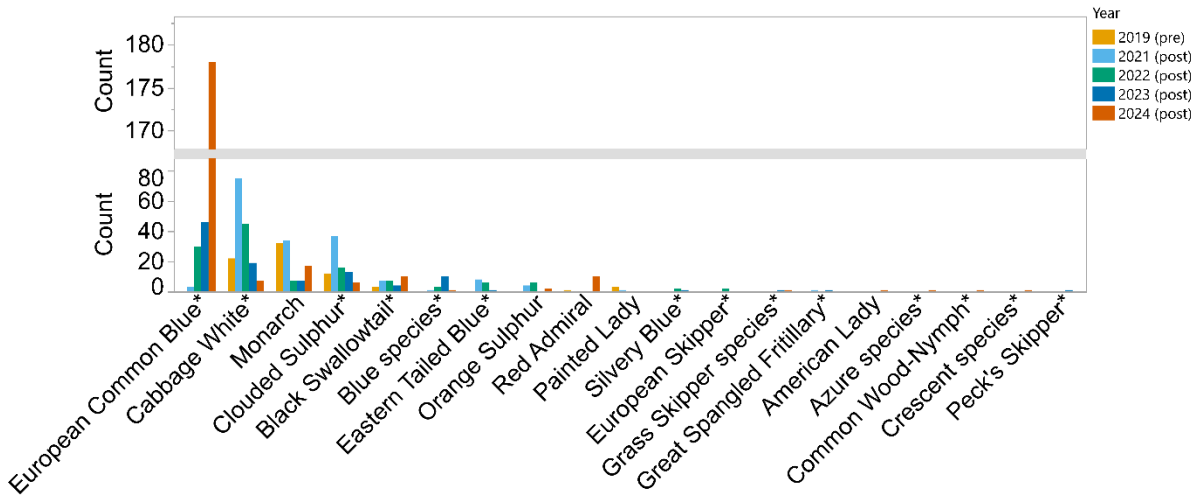

Figure 29. Temporal changes in butterfly species composition and abundance on transect 2K in section 2.4 pre- and post-restoration. An asterisk (*) indicates a resident species.

Section 3

Section 3 was surveyed for the first time in 2024. Three transects were surveyed and were dominated by European Common Blue (453 individuals), followed distantly by several other species (Figure 30).

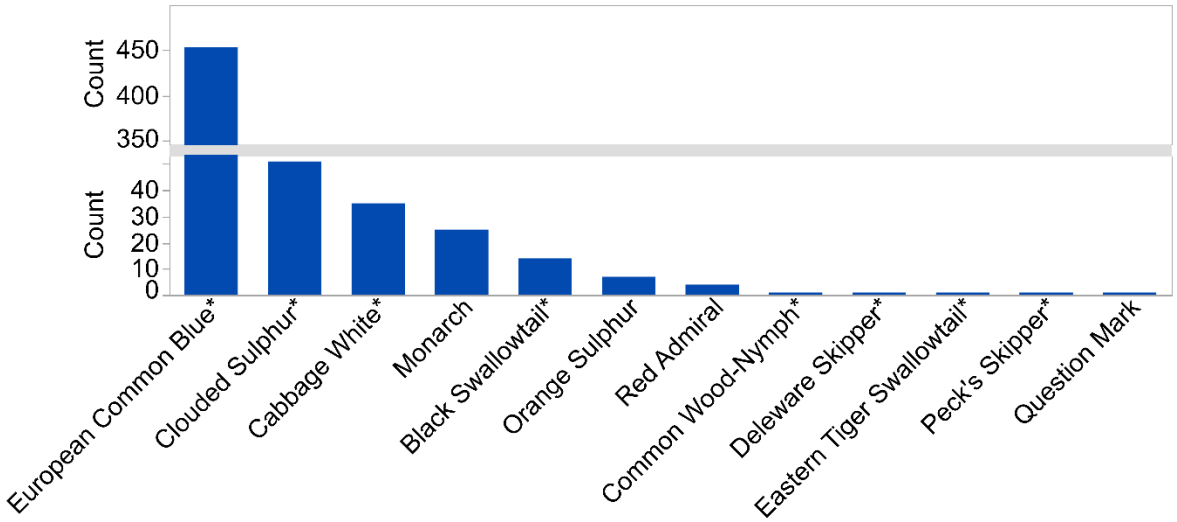

Figure 30. Butterfly abundance and species composition in section 3 in 2024. An asterisk (*) indicates a resident species.

Section 4

Forty species were observed in section 4, including 32 resident butterfly species. Resident species are those that have at least one stage of their life cycle occur in the Toronto region. Non-residents include migratory species such as Monarch. Between 2016 and 2024, resident and non-resident abundance varied with residents species more abundant in all years except for 2019 (Figure 31). We compared butterfly communities in section 4 using correlations of year and count by species in transects 4.1 A-B, 4.2 A-D, 4.3 A, B, D, and 4.4 B). Most species had non-significant trends over time; however, several species had significant increasing or decreasing trends. Species with increasing trends including Common Wood-Nymph (*Cercyonis pegala*; $p = 0.012$), European Common Blue (*Polymmatus icarus*; $p < 0.001$), Tawny-edged Skipper (*Polites themistocles*; $p = 0.005$). Species with decreasing trends included Black Swallowtail (*Papilio polyxenes*; $p = 0.010$) and Clouded Sulphur (*Colias philodice*; $p= 0.028$; Figure 35). In addition to section 4, European Common Blue has been increasing in abundance across The Meadoway since 2020 (Figure 32). It is a non-native species discovered in North America first in 2007 near Montreal and has since spread both to the east and west of Montreal being observed in Ontario for the first time in 2017.

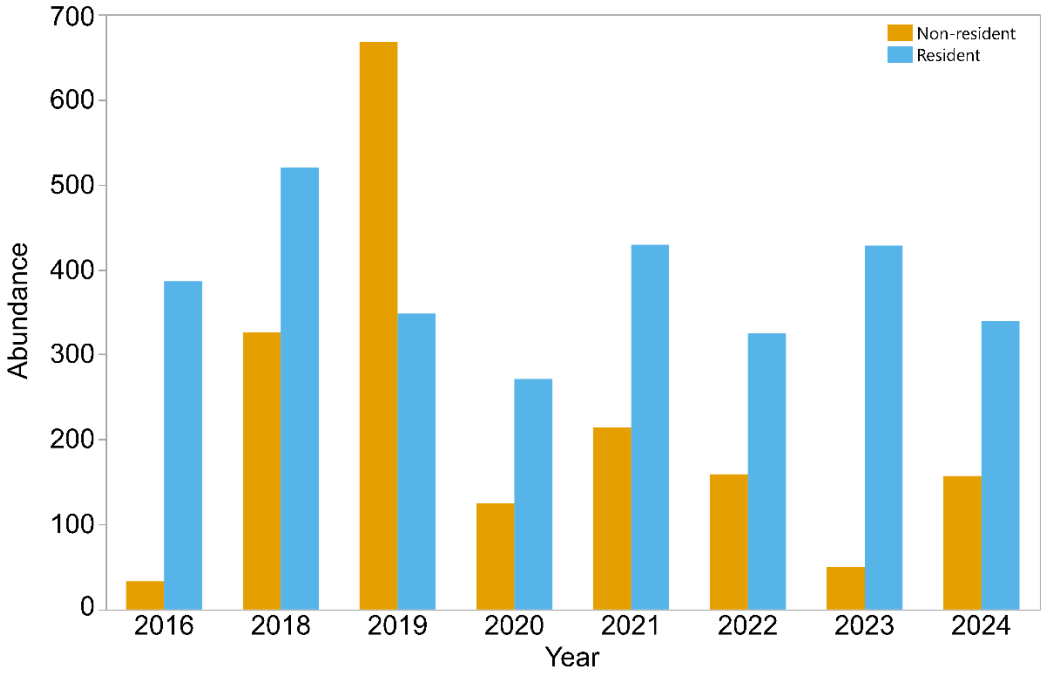

Figure 31. Abundance of resident and non-resident butterflies is section 4 between 2016 and 2024.

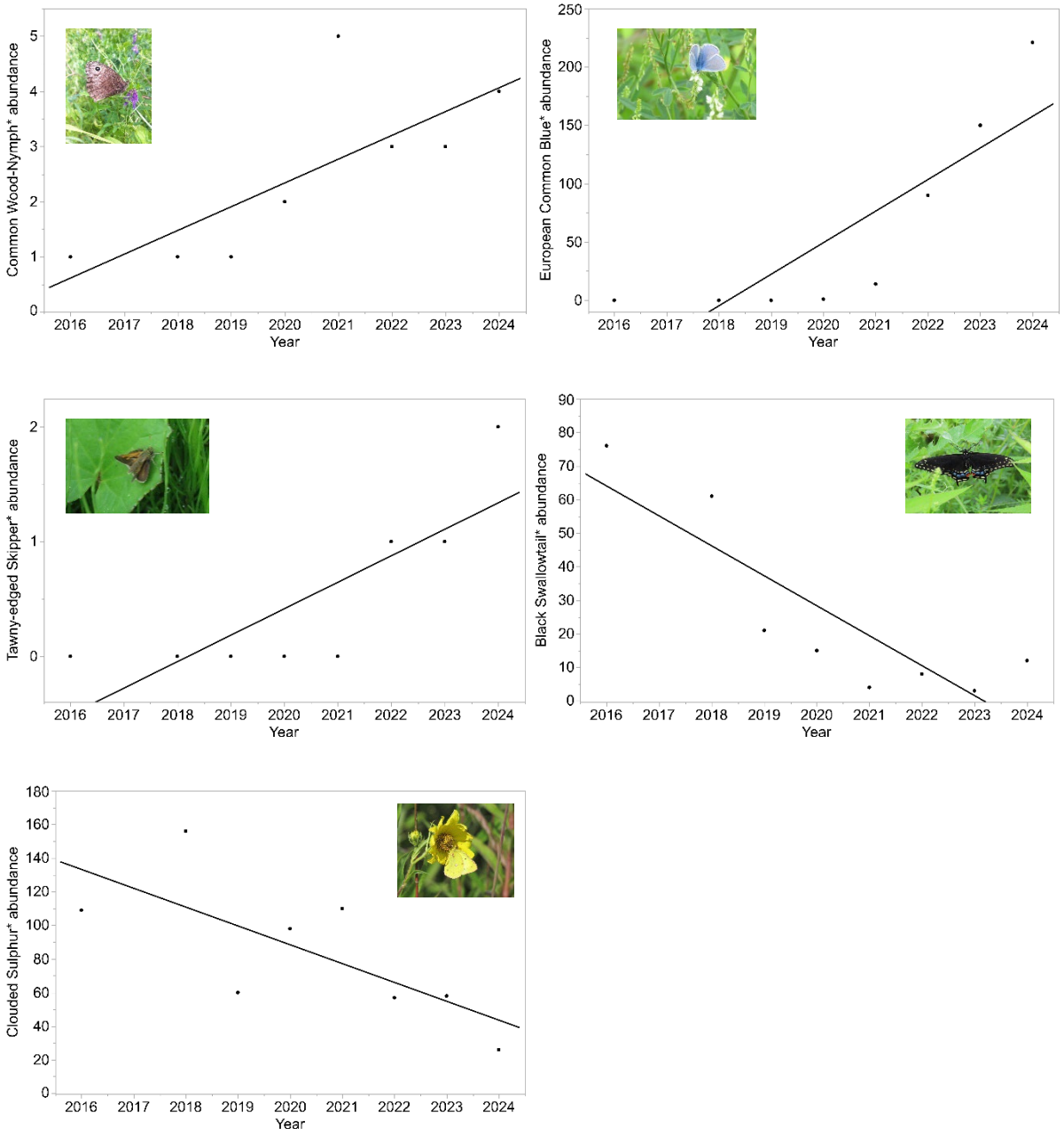

Figure 32. Butterfly species with significant temporal trends in section 4. An asterisk (*) indicates a resident species.

Section 5

Sections 5.3 (transects E and F) and 5.4 (transect G) were monitored both pre-restoration in 2020 and post-restoration in 2023 and 2024. Butterfly species richness was similar both pre- and post-restoration with high abundance of European Common Blue post-restoration (Figure 33). New species only found post-restoration include European Common Blue, an unknown Blue species, Little Wood Satyr (*Megisto cymela*), Red Admiral (*Vanessa atalanta*), White Admiral (*Limenitis arthemis*), and Painted Lady (*Vanessa cardui*).

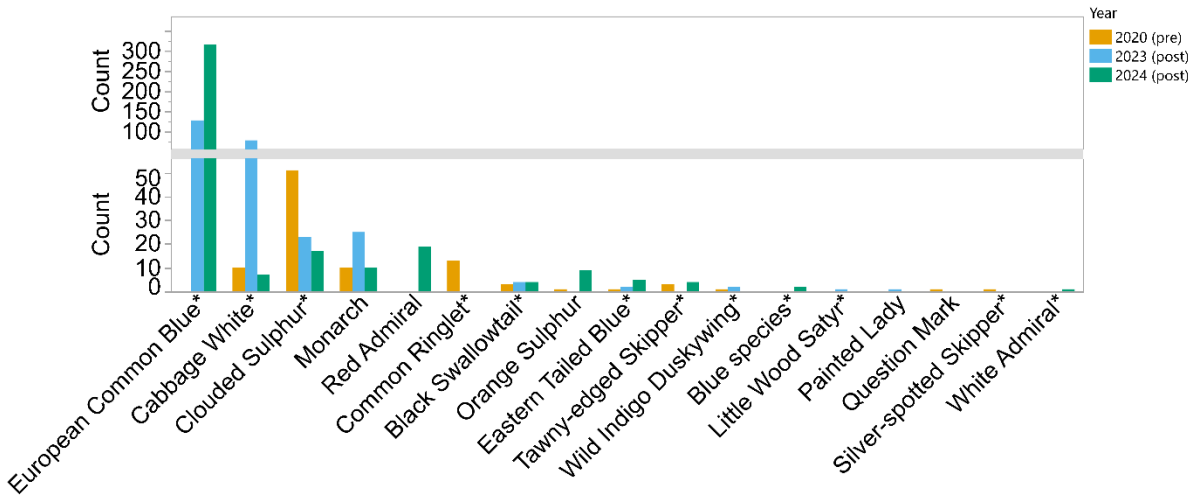

Figure 33. Temporal changes in butterfly species composition and abundance on transects E, F, and G in sections 5.3 and 5.4 pre- and post-restoration. An asterisk (*) indicates a resident species.

Section 6

Section 6.4 (butterfly transect C) was surveyed in 2021, 2022, and 2024. In 2023, a maintenance mow was conducted along with work on shrub nodes. Cabbage White dominated surveys, particularly in 2024, with fewer numbers of several other species (Figure 34).

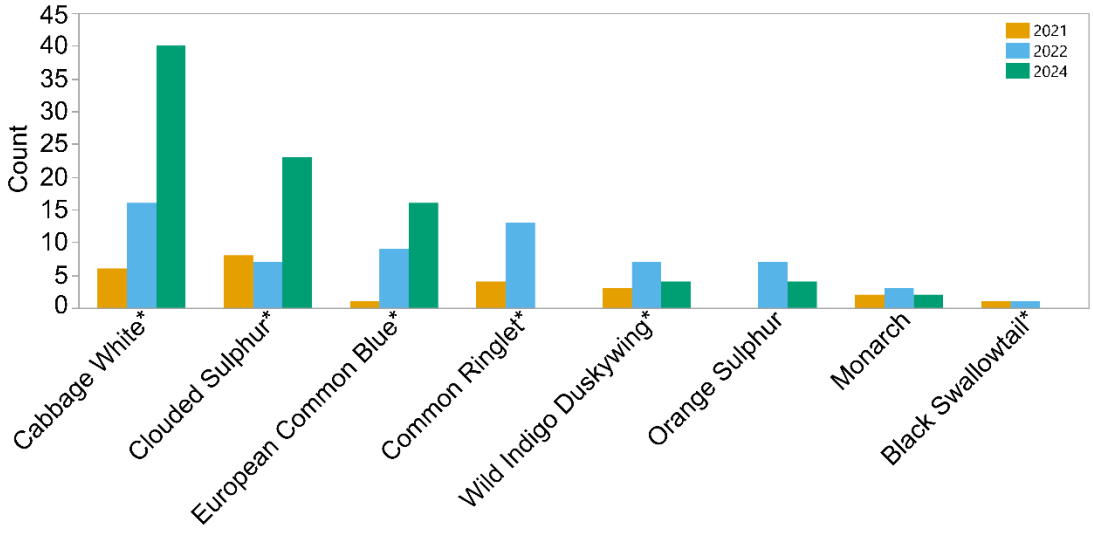

Figure 34. Butterfly abundance and species composition in section 6 in 2024. An asterisk (*) indicates a resident species.

Section 7

Similar to section 4, section 7 only has post-restoration data from 2016 and 2018-2024 on transects A, B, C, and D. Section 7 supports 32 butterfly species including 26 resident species. The abundance of resident butterflies was highest in 2018, and was higher than non-residents in all other years except for 2019 (Figure 35). There were fewer significant temporal trends for butterfly species in this section compared to section 4 although Silvery Blue (*Glaucopsyche lygdamus*) declined between 2016 and 2024 ($p = 0.015$) and European Common Blue increased ($p = 0.002$) (Figure 36).

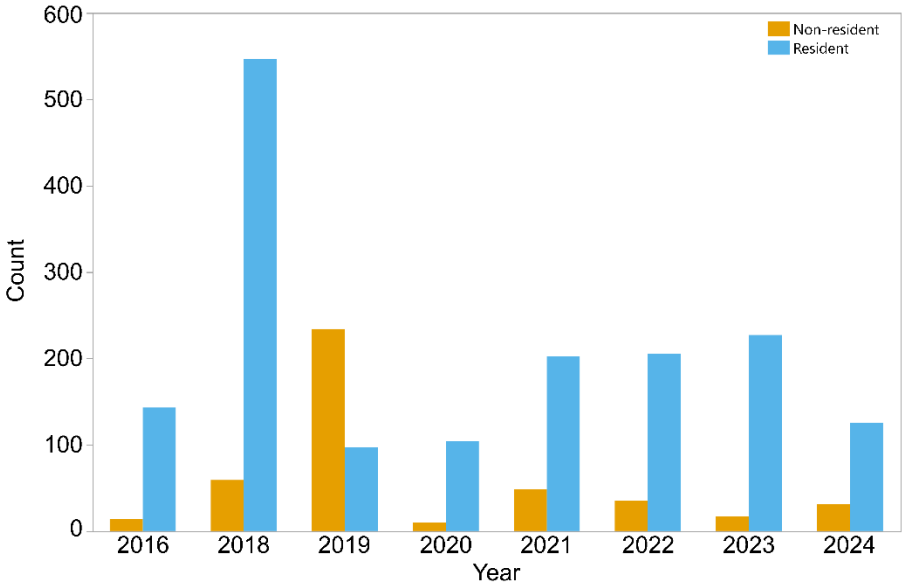

Figure 35. Abundance of resident and non-resident butterflies is section 7 between 2016 and 2024.

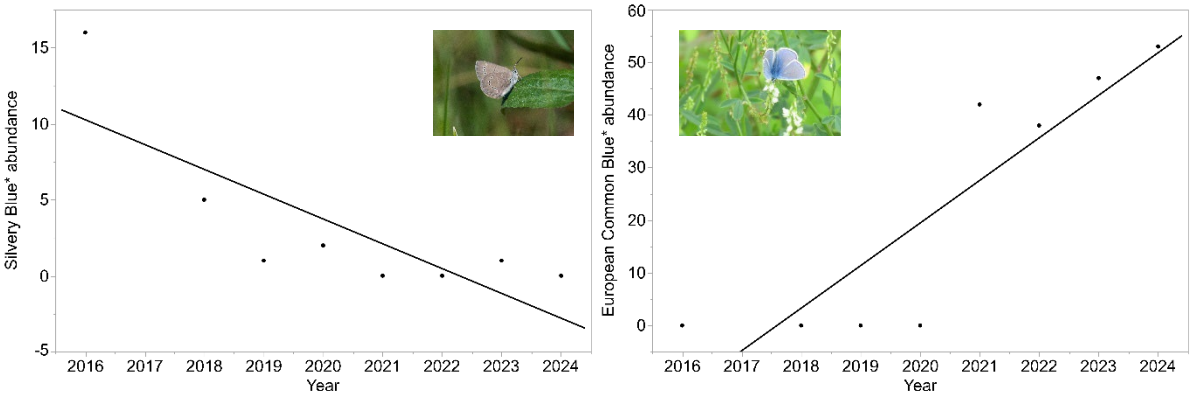

Figure 36. Butterfly species with significant temporal trends in section 7. An asterisk (*) indicates a resident species.

SUMMARY

Meadow monitoring during 2016, and 2018-2024 generally indicated that restoration work in The Meadoway has successfully introduced a variety of meadow flora through seeding, provides habitat used by breeding birds, and foraging opportunities for butterflies. A wide range of species were found during monitoring including numerous rare and sensitive species and species of conservation concern. In addition to these sensitive species, invasive flora species are persisting in The Meadoway although recent management initiatives have been successful at reducing their extent.

Detailed analyses of percent cover for all vegetation species in this report highlight the success of restoration through a transition from fewer often non-native grasses and forbs to species-rich flora communities including a variety of native grasses and forbs. Butterfly communities appeared to respond to these changes with higher species richness post-restoration including species likely using the seeded species as host plants. Some changes could also be due to broader changes in butterfly populations including the large increase in European Common Blue which occurred across The Meadoway. Bird communities did not appear to respond as strongly to changes although both Red-winged Blackbird and Song Sparrow increased in abundance post-restoration and this may be due to changes in vegetation structure.

After seven years of monitoring, several patterns emerged related to the longer term success of restoration efforts. In general, multiple seeded species have increased in cover and remained high into 2023 including wild bergamot, ox-eye, common milkweed, stiff goldenrod, cup-plant, big bluestem, tall sunflower, and Indian grass. The longer monitoring record demonstrated the competitive processes between species after disturbance with some species, such as tall goldenrod, dominating communities (Figure 37). Sections with the longest record of restoration and monitoring indicated that many of the seeded species were establishing populations although again, there was variation among sections and species, and native grasses may be declining in some sections in the most recent years.

In sections 3 and 6, detailed observations of germination were made is 2024 and found a large degree of variation. It is expected that not all of the seeds will germinate, and different species have different germination and predation rates. The absence of some species included in the seed mix could be a result of several factors, either alone or in concert such as time passed since completion of the restoration work, specific habitat requirements not being met, low seed viability, and others. Monitoring germination for a second growing season would be beneficial to capture some of the slower maturing species.

Figure 37. Tall goldenrod (*Solidago altissima* var. *altissima*) in section 1.2 in September 2024.

Invasive species management has been effective throughout The Meadoway with most sub-plots showing decreases in cover of thistle and DSV. Overall, current methods appear to be most effective for controlling thistle and DSV although cover appears to be increasing slowly in many sub-plots such as creeping thistle increasing in sections 1.2, 1.3, and 4.4 and DSV increasing in sections 4.1, 4.2, 4.3, and 7.1. Even with these increases, without management, it is likely that DSV would quickly spread and outcompete other species.

The Xerces experimental plots trialed a new site preparation method that would help to limit both glyphosate application and disturbance to the seed bed. Monitoring plots treated with the Xerces method and the current method may help to provide insight into how site preparation affects the success of seeded species. In both 2023 and 2024, plots treated with the Xerces method had a higher percent cover of native species and exotic species compared to plots treated with the current method. While there appear to be differences in seeding success and exotic cover between treatments, variation in other factors between treatments (e.g., seed mix, seed timing) may have affected results and as such, these results should be interpreted cautiously.

Bird communities in The Meadoway consist of a mix of meadow, forest-edge, and early successional species along with several species that have adapted to urban environments. Several meadow-dependent species have been observed in multiple years including Eastern Kingbird, Willow Flycatcher, and Field Sparrow. Other meadow-dependent species such as Savannah Sparrow have been less abundant although their occurrence largely depends on the section and availability of suitable nesting habitat. Song Sparrow, a generalist which often uses meadow habitat, has increased in abundance post-restoration in several sections. Point counts

provide important information on habitat use and species occurrence, but the quality of the habitat for breeding birds is better reflected through nest success. A large proportion of meadow-dependent birds are ground-nesters and are often subject to higher levels of nest predation in urban meadows although nest success remains unknown in The Meadoway. The Meadoway also provides important foraging opportunities for birds as the restored areas attract and provide habitat for invertebrates and other species that might be consumed by birds nesting either in the corridor or in adjacent natural areas. For example, Cooper's Hawk has been found in more recent years and this could indicate that they are benefitting from increased numbers of songbirds foraging in The Meadoway. Although speculation about an increasing small mammal population requires further research, it correlates well with anecdotal observations by botanists of increased herbivory in The Meadoway. In addition to important breeding and foraging habitat, The Meadoway likely serves as an important stopover area for migratory birds.

Butterfly monitoring continues to detect species characteristic of meadows in more urbanized areas of southern Ontario. Monarch, Clouded Sulphur (*Colias philodice*), and Cabbage White remain the most abundant species in The Meadoway. European Common Blue (a non-native species first observed in 2020) has now been found in all sections of The Meadoway and increasing in abundance. The Meadoway also provides habitat for several relatively uncommon native resident species such as Acadian Hairstreak, Delaware Skipper (*Anatrytone logan*), Pearl Crescent, Silver-spotted Skipper, and Wild Indigo Duskywing. In addition to resident species, The Meadoway continues to be used by numerous migratory butterfly species due to the abundant nectaring opportunities.

Pre- and post-restoration monitoring suggests that restoration increases the number of butterfly species and this could be related to both seeded species that are host plants and/or improved nectaring opportunities. Many resident butterfly species either only occurred post-restoration or increased in abundance post-restoration including Acadian Hairstreak, Eastern Tailed Blue, European Skipper, Silvery Blue, and Silver-spotted Skipper. This is important to consider since resident butterflies occupy an area year-round and are non-migratory. These pre- and post-restoration data suggest that restoration efforts are creating habitat for many butterfly species including resident species. Additional pre- and post-restoration data collected in future years for vegetation, birds, and butterflies should continue to provide evidence of the overall effectiveness of restoration efforts in The Meadoway.

REFERENCES

Burghardt, F., P. Proksch, and K. Fiedler. 2001. Flavonoid sequestration by the common blue butterfly *Polyommatus icarus*: quantitative intraspecific variation in relation to larval hostplant, sex and body size. Biochemical Systematics and Ecology 29: 875-889.

Endangered Species Act. 2007. Ontario Regulation 242/08 and 230/08.

Gibson, D. J., T. R. Seastedt, and J. M. Briggs. 1993. Management practices in tallgrass prairie: large- and small-scale experimental effects on species composition. Journal of Applied Ecology 30:247-255.

Johnson, L. C. and J. R. Matchett. 2001. Fire and grazing regulate belowground processes in tallgrass prairie. Ecology 82:3377-3389.

Nature Serve. 2018. Nature Serve Explorer. Retrieved from: http://explorer.natureserve.org/nsranks.htm on December 5, 2018

Nebel, S., A. Mills, J. McCracken, and P. Taylor. 2010. Declines of aerial insectivores in North America follow a geographic gradient. Avian Conservation and Ecology 5:1. http://www.ace-eco.org/vol5/iss2/art1/

Ojima, D. S., D. S. Schimel, W. J. Parton, and C. E. Owensby. 1994. Long- and short-term effects of fire on nitrogen cycling in tallgrass prairie. Biogeochemistry 24:67-84.

Packard, S., and C. Mutel (Eds.). 2005. The tallgrass restoration handbook: for prairies, savannas and woodlands. Island Press. Washington, D.C.

R Core Team (2021). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.

Roberts-Pichette, P. and L. Gillespie. 1999. Terrestrial vegetation biodiversity monitoring protocols. EMAN Occasional Paper Series, Report No. 9. Ecological Monitoring Coordinating Office, Burlington, Ontario

Sharma, C. 2018. The Meadoway Project, Update and Authorization. Toronto and Region Conservation Authority Meeting #17/18, September 28, 2018

Toronto and Region Conservation Authority (TRCA). 2011. Meadow Bird Monitoring Protocol - Terrestrial Long-term Monitoring Program – Regional Watershed Monitoring and Reporting

Toronto and Region Conservation Authority (TRCA). 2022. Meadow Vegetation LTMP Monitoring Protocol.

Toronto and Region Conservation Authority (TRCA). 2017. Scoring and Ranking TRCA's Vegetation Communities, Flora, and Fauna Species.

Toronto and Region Conservation Authority (TRCA). 2023. The Meadoway: Vegetation, Bird and Butterfly Monitoring 2016, 2018-2023.

APPENDIX

Appendix 1. Bird occurrence in The Meadoway 2016, 2018-2024.

Species	L-Rank	Guild	Section 4.1									Section 4.2									Section 4.3									Section 4.4								
			Station 1									Station 2									Station 3									Station 4								
			2016	2017	2018	2019	2020	2021	2022	2023	2024	2016	2017	2018	2019	2020	2021	2022	2023	2024	2016	2017	2018	2019	2020	2021	2022	2023	2024	2016	2017	2018	2019	2020	2021	2022	2023	2024
American crow	L5	generalist upper-level nester									1																												
American goldfinch	L5	generalist mid-level nester												1						1						1	3		1	3									
American kestrel	L4	generalist upper-level nester																																					
American redstart	L3	forest-edge mid-level nester							1	1																													
American robin	L5	generalist mid-level nester			1	1	1		1	1		1		1	3	1	4	2	3	1	3			1	2	1	1	3	1	2			1	2	1	1			
Baltimore oriole	L5	generalist upper-level nester	1		1		1	1	1	2	1			1	1	1		1						1			1	2									1		
black-capped chickadee	L5	generalist mid-level nester																																					
blue jay	L5	generalist upper-level nester					1														1																		
blue-gray gnatcatcher	L4	forest upper-level nester					1																																
brown-headed cowbird	L5	special case	1					1		1																													
Canada goose	L5	wetland low-level nester																																					
cedar waxwing	L5	generalist mid-level nester				2								4									3				1					2							
chipping sparrow	L5	generalist mid-level nester																																					
common grackle	L5	generalist mid-level nester					1					1			1	3	4	7	2	2	1		1	2	2	2	1	1	4					1		3	1			
Coopers hawk	L4	forest upper-level nester																									1												
downy woodpecker	L5	forest-edge mid-level nester									1						2	1			1			1									1						
eastern kingbird	L4	meadow upper-level nester					2								1		1			2												1		2	2				
eastern meadowlark	L3	meadow low-level nester			1									1							2																		
European starling	L+	generalist mid-level nester			5	2	1	3		1				1			71	10	2	6	2				2	8	1	1	3			2	14		18		1		
field sparrow	L4	meadow low-level nester																																					
gray catbird	L4	generalist mid-level nester			1	2	1								1	1			1								1												
great crested flycatcher	L4	forest upper-level nester				1																																	
hairy woodpecker	L4	forest upper-level nester				1																																	
house finch	L+	generalist mid-level nester										1		1													1	3	1	1									
house sparrow	L+	generalist mid-level nester	1		4			6		1		2		2	1									1	1		2	1		1			1			1	1	4	
house wren	L5	generalist mid-level nester																									1	1											
indigo bunting	L4	forest-edge mid-level nester																																					
killdeer	L5	generalist low-level nester																																					
least flycatcher	L3	forest-edge upper-level nester																																					
mallard	L5	wetland low-level nester				2																																	
mourning dove	L5	generalist mid-level nester										1		1	2		1		1		1		1	1	1	1	3	9	1	2					1	1	3		1
northern cardinal	L5	generalist mid-level nester	1		1	2	2	1	1							1	1	2	1	1	1			1					1				1				1		1
northern flicker	L4	generalist upper-level nester																																					
northern mockingbird	L5	generalist mid-level nester																			1																		
orchard oriole	L5	generalist upper-level nester																																					
red-breasted nuthatch	L4	forest upper-level nester																																					
red-eyed vireo	L4	forest mid-level nester	1		1	1		1		1																													
red-tailed hawk	L5	generalist upper-level nester																																					
red-winged blackbird	L5	generalist mid-level nester	3		7	7	2	3	2	2	3	9		10	4	5	4	11	4	5	11		6	6	3	6	4	5	5	3		12	7	5	4	7	6	6	6
rock pigeon	L+	generalist mid-level nester																																					
rose-breasted grosbeak	L4	forest-edge mid-level nester							1																					1									
savannah sparrow	L4	meadow low-level nester																																					
song sparrow	L5	generalist low-level nester	1		4	3	3	3	2	4	4	4		1	3	3	2	3	4	2	3		2	2	3	2	3	2	4	2		1	2	3	2	2	3	2	4
warbling vireo	L5	generalist upper-level nester					1			1					1			1																			1	2	
wild turkey	L3	forest-edge low-level nester																																					
willow flycatcher	L4	meadow mid-level nester														1	1	2									1		1										
yellow warbler	L5	generalist mid-level nester	1		1	1	2	1	1		1			1	1	1	1	2	2	1									1										

Species	L-Rank	Guild	Section 7.1									Section 1.4									Section 2.4									Section 1.2								
			Station 5									Station 6									Station 7									Station 8								
			2016	2017	2018	2019	2020	2021	2022	2023	2024	2016	2017	2018	2019	2020	2021	2022	2023	2024	2016	2017	2018	2019	2020	2021	2022	2023	2024	2016	2017	2018	2019	2020	2021	2022	2023	2024
American crow	L5	generalist upper-level nester																																					
American goldfinch	L5	generalist mid-level nester																																					
American kestrel	L4	generalist upper-level nester																																					
American redstart	L3	forest-edge mid-level nester																																					
American robin	L5	generalist mid-level nester	1		3		3	1	4	1	1			1	1		1	6	2				1	1		2	2	3					1			1	1	
Baltimore oriole	L5	generalist upper-level nester															1											1										
black-capped chickadee	L5	generalist mid-level nester																																					
blue jay	L5	generalist upper-level nester																											1										
blue-gray gnatcatcher	L4	forest upper-level nester																																					
brown-headed cowbird	L5	special case				3	1				1																												
Canada goose	L5	wetland low-level nester																																					
cedar waxwing	L5	generalist mid-level nester					1																																
chipping sparrow	L5	generalist mid-level nester																																					
common grackle	L5	generalist mid-level nester																1											2										
Coopers hawk	L4	forest upper-level nester																																					
downy woodpecker	L5	forest-edge mid-level nester																																					
eastern kingbird	L4	meadow upper-level nester			1																																		
eastern meadowlark	L3	meadow low-level nester																						1															
European starling	L+	generalist mid-level nester			4	7		3	9	1				3				2	2	34				1		7		2								4		
field sparrow	L4	meadow low-level nester							1																														
gray catbird	L4	generalist mid-level nester							1	2	1																													
great crested flycatcher	L4	forest upper-level nester																																					
hairy woodpecker	L4	forest upper-level nester																																					
house finch	L+	generalist mid-level nester								1																		1											
house sparrow	L+	generalist mid-level nester													4	2	2	2								4									2		1	1	
house wren	L5	generalist mid-level nester						1									1																						
indigo bunting	L4	forest-edge mid-level nester																																					
killdeer	L5	generalist low-level nester													2			4								4									3	1			
least flycatcher	L3	forest-edge upper-level nester							1																														
mallard	L5	wetland low-level nester																																					
mourning dove	L5	generalist mid-level nester				1	1	2		2							1																						
northern cardinal	L5	generalist mid-level nester					1	2		2	1			1															1										
northern flicker	L4	generalist upper-level nester			1																																		
northern mockingbird	L5	generalist mid-level nester																																					
orchard oriole	L5	generalist upper-level nester						1																															
red-breasted nuthatch	L4	forest upper-level nester																																					
red-eyed vireo	L4	forest mid-level nester																																					
red-tailed hawk	L5	generalist upper-level nester																																					
red-winged blackbird	L5	generalist mid-level nester			1	1	2	4	3	3					5	6	4	6						1		3	18	6	5				1	3	6	6	5
rock pigeon	L+	generalist mid-level nester						4																		4												
rose-breasted grosbeak	L4	forest-edge mid-level nester																																					
savannah sparrow	L4	meadow low-level nester										1	2		2	2	2		2	2							1							2	3	1		
song sparrow	L5	generalist low-level nester				1	1	2							1	1	2									1	4	4	2					1	1	3	2	3
warbling vireo	L5	generalist upper-level nester						1								1													6									
wild turkey	L3	forest-edge low-level nester																																					
willow flycatcher	L4	meadow mid-level nester				2		2	1	1	1	2																											
yellow warbler	L5	generalist mid-level nester			1	2	1	2	4	2	2																												

Appendix 1. (cont'd)

Species	L-Rank	Guild	Section 5.2									Section 5.3									Section 1.1									Section 1.3								
			Station 9									Station 10									Station 11									Station 12								
			2016	2017	2018	2019	2020	2021	2022	2023	2024	2016	2017	2018	2019	2020	2021	2022	2023	2024	2016	2017	2018	2019	2020	2021	2022	2023	2024	2016	2017	2018	2019	2020	2021	2022	2023	2024
American crow	L5	generalist upper-level nester																																					
American goldfinch	L5	generalist mid-level nester														2																								
American kestrel	L4	generalist upper-level nester					1																																
American redstart	L3	forest-edge mid-level nester																																					
American robin	L5	generalist mid-level nester					1			2									2	2						1	1	1	1						2	2	2	1			
Baltimore oriole	L5	generalist upper-level nester																																		1			
black-capped chickadee	L5	generalist mid-level nester																																			1		
blue jay	L5	generalist upper-level nester																	1									1											
blue-gray gnatcatcher	L4	forest upper-level nester																																					
brown-headed cowbird	L5	special case																																					
Canada goose	L5	wetland low-level nester																																					
cedar waxwing	L5	generalist mid-level nester																																					
chipping sparrow	L5	generalist mid-level nester																																					
common grackle	L5	generalist mid-level nester																								1													
Coopers hawk	L4	forest upper-level nester																																					
downy woodpecker	L5	forest-edge mid-level nester																																					
eastern kingbird	L4	meadow upper-level nester																									1	1											
eastern meadowlark	L3	meadow low-level nester																																					
European starling	L+	generalist mid-level nester																	6																	2	14		1
field sparrow	L4	meadow low-level nester																																					
gray catbird	L4	generalist mid-level nester					1			1						1										1	2	1	2											
great crested flycatcher	L4	forest upper-level nester																																					
hairy woodpecker	L4	forest upper-level nester																																					
house finch	L+	generalist mid-level nester																																					
house sparrow	L+	generalist mid-level nester																	1								1		2	2							1	2	
house wren	L5	generalist mid-level nester																																					
indigo bunting	L4	forest-edge mid-level nester									1																												
killdeer	L5	generalist low-level nester								2									2										1										
least flycatcher	L3	forest-edge upper-level nester																																					
mallard	L5	wetland low-level nester																																					
mourning dove	L5	generalist mid-level nester																	6																	1			
northern cardinal	L5	generalist mid-level nester					1									1			1	1						1	1	1	1						1	1	1			
northern flicker	L4	generalist upper-level nester																																					
northern mockingbird	L5	generalist mid-level nester																										1											
orchard oriole	L5	generalist upper-level nester																																					
red-breasted nuthatch	L4	forest upper-level nester																																					
red-eyed vireo	L4	forest mid-level nester																	1																				
red-tailed hawk	L5	generalist upper-level nester																																					
red-winged blackbird	L5	generalist mid-level nester					1			2						1			4							1		1	1						3	2	4	4		
rock pigeon	L+	generalist mid-level nester																																					
rose-breasted grosbeak	L4	forest-edge mid-level nester																																					
savannah sparrow	L4	meadow low-level nester					1			2						1			1																				
song sparrow	L5	generalist low-level nester					1			2									1	1						2	3	4	3						2	3	3	3		
warbling vireo	L5	generalist upper-level nester																																			1	1	1
wild turkey	L3	forest-edge low-level nester																																					
willow flycatcher	L4	meadow mid-level nester																																				1	
yellow warbler	L5	generalist mid-level nester																									1									2	1	2	1

Species	L-Rank	Guild	Section 6.2									Section 6.4									Section 2.2									Section 3.2	Section 3.3
			Station 13									Station 14									Station 15									Station 16	Station 17
			2016	2017	2018	2019	2020	2021	2022	2023	2024	2016	2017	2018	2019	2020	2021	2022	2023	2024	2016	2017	2018	2019	2020	2021	2022	2023	2024	2024	2024
American crow	L5	generalist upper-level nester																													
American goldfinch	L5	generalist mid-level nester						2																							
American kestrel	L4	generalist upper-level nester																													
American redstart	L3	forest-edge mid-level nester																													
American robin	L5	generalist mid-level nester						1	1								2			5						2	2	2	5	2
Baltimore oriole	L5	generalist upper-level nester																1													
black-capped chickadee	L5	generalist mid-level nester																													
blue jay	L5	generalist upper-level nester																											2		
blue-gray gnatcatcher	L4	forest upper-level nester																													
brown-headed cowbird	L5	special case																													
Canada goose	L5	wetland low-level nester																												2	
cedar waxwing	L5	generalist mid-level nester							2																						
chipping sparrow	L5	generalist mid-level nester							1																						
common grackle	L5	generalist mid-level nester																													
Coopers hawk	L4	forest upper-level nester																													
downy woodpecker	L5	forest-edge mid-level nester																													
eastern kingbird	L4	meadow upper-level nester							1																					1	
eastern meadowlark	L3	meadow low-level nester																													
European starling	L+	generalist mid-level nester																1		4								7			1
field sparrow	L4	meadow low-level nester																													
gray catbird	L4	generalist mid-level nester						1	1																						
great crested flycatcher	L4	forest upper-level nester																													
hairy woodpecker	L4	forest upper-level nester																													
house finch	L+	generalist mid-level nester							1																					1	1	2		1
house sparrow	L+	generalist mid-level nester																															4
house wren	L5	generalist mid-level nester																													
indigo bunting	L4	forest-edge mid-level nester																													
killdeer	L5	generalist low-level nester																		5										3	5
least flycatcher	L3	forest-edge upper-level nester																													
mallard	L5	wetland low-level nester																													
mourning dove	L5	generalist mid-level nester																		1									1		
northern cardinal	L5	generalist mid-level nester						2	2								3	1		1								1		1	
northern flicker	L4	generalist upper-level nester																													
northern mockingbird	L5	generalist mid-level nester																		1											
orchard oriole	L5	generalist upper-level nester																													
red-breasted nuthatch	L4	forest upper-level nester																										1			
red-eyed vireo	L4	forest mid-level nester							1																						
red-tailed hawk	L5	generalist upper-level nester															1														
red-winged blackbird	L5	generalist mid-level nester							1								2	1		4								3	5	7	2	2
rock pigeon	L+	generalist mid-level nester																													16
rose-breasted grosbeak	L4	forest-edge mid-level nester																													
savannah sparrow	L4	meadow low-level nester						1	2									3										2			
song sparrow	L5	generalist low-level nester						1	2								2	3		1								5	2	3		
warbling vireo	L5	generalist upper-level nester															1														
wild turkey	L3	forest-edge low-level nester																1													
willow flycatcher	L4	meadow mid-level nester															1	1													
yellow warbler	L5	generalist mid-level nester							1								3	1		1											

Appendix 2. Butterfly occurrence in The Meadoway 2016, 2018-2024.

Common name	Scientific name	S-rank	Section 1								Section 2								Section 3	Section 4.1								Section 4.2								Host plant
			2016	2018	2019	2020	2021	2022	2023	2024	2016	2018	2019	2020	2021	2022	2023	2024	2024	2016	2018	2019	2020	2021	2022	2023	2024	2016	2018	2019	2020	2021	2022	2023	2024	
Acadian Hairstreak*	*Satyrium acadica*	S4							2																											Various willow species including black willow (*Salix nigra*) and silk willow (*Salix sericea*)
American Lady	*Vanessa virginiensis*	S5														1		1									2				1					Sunflower family, pearly everlasting, plantain-leaved pussy toes, wormwood, ironweed, burdock
Azure species*	*Celastrina* spp.	n/a																1			1								1							
Black Swallowtail*	*Papilio polyxenes*	S5			2	2	4	12	8	6			3		7	11	5	16	14	3	5	3	1	1			2	22	19	7	7	2	4	1	9	Carrot family… parsley, dill, celery,Queen Anne's lace
Blue species*	Lycaenidae family	n/a					15	3	1	1					1	3	10	1												2		2	4	1	1	
Cabbage White*	*Pieris rapae*	SNA			8	13	148	151	54	47			22		75	82	35	9	35	55	90	24	12	36	11	11	8	21	51	36	12	72	36	49	7	Mustards… cabbage, cauliflower and broccoli
Clouded Sulphur*	Blue species*B2:C26	S5			2	16	105	107	36	27			12		37	30	20	8	51	5	5	1	7	14	3	6		32	52	17	33	46	19	13	5	Legumes… cultivated crops
Common Buckeye	*Junonia coenia*	SNR (G5)																																		Uncommon breeding migrant
Common Ringlet*	*Coenonympha tullia*	S5			1		2	4	2											2	1			1	1			1	3	7	17	10	18	1		Kentucky bluegrass
Common Wood-Nymph*	*Cercyonis pegala*	S5							1									1	1					1				1	1		1	4	1			Grasses (Poaceae)
Crescent species*	*Phyciodes* spp.	n/a																1								2										
Delaware Skipper*	*Anatrytone logan*	S4								1									1																	Big bluestem and old switch panicgrass
Dun Skipper*	*Euphyes vestris*	S5																					1				1									Sedges: chufa flatsedge, sun sedge
Duskywing species*								1																												
Eastern Comma*	*Polygonia comma*	S5																				1														Elm and nettle families: American elm, hops, nettle, false nettle, wood nettle
Eastern Tailed Blue*	*Cupido comyntas*	S5				2	13		1	3					8	8	1			4		1			6			6	4	8	5	20	1	1	6	Clovers and legumes
Eastern Tiger Swallowtail*	*Pterourus glaucus*	S5																	1									1	1			1		1		Trees… hop tree, cherries and ashes
European Common Blue*	*Polymmatus icarus*	SNA					32	87	83	197					3	54	62	205	453					2	1	10	15					4	25	14	96	Alfalfa, clover, crown vetch (Burghardt et al. 2001), bird's-foot trefoil (many other legumes black medick)
European Skipper*	*Thymelicus lineola*	SNA					6	6	11	1						2	1	1											1	1						Grasses (Poaceae) prefers common timothy
Giant Swallowtail*	*Papilio cresphontes*	S4																																		Common prickly ash and common hop tree
Grass Skipper species*	Hesperiinae family	n/a					2			1							1	1				1											2			
Great-spangled Fritillary*	*Speyeria cybele*	S5					1			1					1		1											1								Violets
Hobomok Skipper*	*Lon hobomok*	S5						1																												Various grasses including panic grasses (*Panicum*) and blue grasses
Lady species	*Vanessa* spp.	n/a																												1						
Least Skipper*	*Ancyloxypha numitor*	S5					2	8	1	3																										Grasses (Poaceae)
Little Wood-Satyr*	*Megisto cymela*	S5					1																		1		1									Grasses (Poaceae)… Kentucky bluegrass orchard grass
Little Yellow	*Pyrisitia lisa*	SNA																																		A variety of legumes (Fabaceae)
Monarch	*Danaus plexippus*	S2N,S4B			29	13	50	38	25	49			32		34	20	15	28	25		6	37	11	16	9	1	7	7	217	195	46	86	59	22	54	Milkweeds
Mourning Cloak*	*Nymphalis antiopa*	S5																														2		1		Trees… willows, elms, cottonwoods and hackberries
Northern Broken-Dash*	*Wallengrenia egeremet*	S5								1																										Panic grasses: deertongue
Northern Crescent*	*Phyciodes cocyta*	S5							1											1	2															Asters
Orange Sulphur	*Colias eurytheme*	S5			1	4	20	23	1	8					4	8		2	7	2	1				2		3	3	1	3	3	7	3		3	Legumes… clovers and alfalfas
Painted Lady	*Vanessa cardui*	S5			2								3		1															7						Broad: most often thistles, hollyhock, mallow, various legumes, knapweed, burdock
Pearl Crescent*	*Phyciodes tharos*	S4							1	1														1			1				1				1	Smooth-leaved true asters
Peck's Skipper*	*Polites peckius*	S5					1		6								1		1			1	1					2	1	3	1	1	1	1		Kentucky bluegrass and little bluestem
Question Mark	*Polygonia interrogationis*	S5								1									1																	American elm, red elm, hackberry, Japanese hop, nettles, false nettle
Red Admiral	*Vanessa atalanta*	S5			2		2		14	16			1					14	4			13					14	1	1	15	1	2		4	10	Nettles
Silver-spotted Skipper*	*Epargyreus clarus*	S4					3	3	1											2			1		1	2	2	1								Legumes… showy tick-trefoil, Am. hog peanut and black locust
Silvery Blue*	*Glaucopsyche lygdamus*	S5					1	1	4						2	1												1		2						Legumes… tufted vetch, white sweet clover and alphlfa
Spring Azure*	*Celastrina lucia*	S5																																		Cherrys, blueberrys and early blooming viburnums
Summer Azure*	*Celastrina neglecta*	S5							1																							1				Dogwoods, New Jersey tea, meadowsweets and viburnums
Swallowtail species*																																		1		
Tawny-edged Skipper*	*Polites themistocles*	S5																																		Panicgrasses and bluegrasses
Viceroy*	*Limenitis archippus*	N5																			1											3				Willow and poplar
White Admiral*	*Limenitis arthemis*	S5																													1					Trees and shrubs… wild cherry, aspen, poplar, cottonwood, oaks, hawthorn, birch, willows, basswood
Wild Indigo Duskywing*	*Erynnis baptisiae*	S4							2	2										1	1				2			1		1		1				Purple crown-vetch

Appendix 2. (cont'd)

Common name	Scientific name	S-rank	Section 4.3								Section 4.4								Section 5					Section 6				Section 7								Host plant
			2016	2018	2019	2020	2021	2022	2023	2024	2016	2018	2019	2020	2021	2022	2023	2024	2020	2021	2022	2023	2024	2021	2022	2023	2024	2016	2018	2019	2020	2021	2022	2023	2024	
Acadian Hairstreak*	*Satyrium acadica*	S4																																		Various willow species including black willow (*Salix nigra*) and silk willow (*Salix sericea*)
American Lady	*Vanessa virginiensis*	S5						1		1			1					1														1		1	Sunflower family, pearly everlasting, plantain-leaved pussy toes, wormwood, ironweed, burdock
Azure species*	*Celastrina* spp.	n/a																														0			
Black Swallowtail*	*Papilio polyxenes*	S5	26	17	3	4	1	1		1	25	20	8	3	1	4	4	1	5			4	11	1	2			3	11	3	3	8	3	1	6	Carrot family… parsley, dill, celery and Queen Anne's lace
Blue species*	Lycaenidae family	n/a			21		3	3	2	1			2		1	6	3					1	2							5	1	3	2	3		
Cabbage White*	*Pieris rapae*	SNA	26	56	40	15	34	17	48	12	53	86	38	2	44	46	93	16	20			89	8	15	28		40	61	327	28	36	77	95	113	29	Mustards… cabbage, cauliflower and broccoli
Clouded Sulphur*	*Colias philodice*	S5	35	37	17	40	38	29	15	12	37	62	25	18	30	11	27	14	80			33	21	31	23		23	24	105	58	57	32	45	41	21	Legumes… cultivated crops
Common Buckeye	*Junonia coenia*	SNR (G5)														1												1					0			Uncommon breeding migrant
Common Ringlet*	*Coenonympha tullia*	S5		1		1	3	3	2	1				3	11	18	3		15					8	49			20	66		4	7	14	13	7	Kentucky bluegrass
Common Wood-Nymph*	*Cercyonis pegala*	S5			1	1	2	2	3	4									1										1			3		1		Grasses (Poaceae)
Crescent species*	*Phyciodes* spp.	n/a	1																									2	8						2	
Delaware Skipper*	*Anatrytone logan*	S4	2				2			1																									2	Big bluestem and old switch panicgrass
Dun Skipper*	*Euphyes vestris*	S5			3			1																						2						Sedges: chufa flatsedge, sun sedge
Duskywing species*																																				
Eastern Comma*	*Polygonia comma*	S5																																		Elm and nettle families: American elm, hops, nettle, false nettle, wood nettle
Eastern Tailed Blue*	*Cupido comyntas*	S5	7		40	52	58	20	8	8	2	1	6	5	23	2	3	7	2			2	7	3	2			13	10			8		2	1	Clovers and legumes
Eastern Tiger Swallowtail*	*Pterourus glaucus*	S5								1	1			1																			1	1	Trees… hop tree, cherries and ashes
European Common Blue*	*Polymmatus icarus*	SNA					6	29	17	45					7	61	119	92	1			148	363	2	59		16					42	38	47	53	Alfalfa, clover, crown vetch (Burghardt et al. 2001), bird's-foot trefoil (many other legumes e.g. black medick)
European Skipper*	*Thymelicus lineola*	SNA			5	1			1					1	5		3																		Grasses (Poaceae) prefers common timothy
Giant Swallowtail*	*Papilio cresphontes*	S4																											1						Common prickly ash and common hop tree
Grass Skipper species*	Hesperiinae family	n/a											1		4	1			1						1								2		
Great-spangled Fritillary*	*Speyeria cybele*	S5																																		Violets
Hobomok Skipper*	*Lon hobomok*	S5																																1		Various grasses including panic grasses (*Panicum*) and blue grasses
Lady species	*Vanessa* spp.	n/a			1																															
Least Skipper*	*Ancyloxypha numitor*	S5																																		Grasses (Poaceae)
Little Wood-Satyr*	*Megisto cymela*	S5																				1			1											Grasses (Poaceae)… Kentucky bluegrass and orchard grass
Little Yellow	*Pyrisitia lisa*	SNA																																	2	A variety of legumes (Fabaceae)
Monarch	*Danaus plexippus*	S2N,S4B	3	46	280	49	68	39	14	26	5	28	79	11	44	43	13	23	12			40	24	20	10		2	4	38	227	7	46	11	11	11	Milkweeds
Mourning Cloak*	*Nymphalis antiopa*	S5			1					1	1						1												1			3				Trees… willows, elms, cottonwoods and hackberries
Northern Broken-Dash*	*Wallengrenia egeremet*	S5			1																												1		1	Panic grasses: deertongue
Northern Crescent*	*Phyciodes cocyta*	S5																1											2							Asters
Orange Sulphur	*Colias eurytheme*	S5	2	4	2	3	3	4		3	7	22	2		5	21		4	3				11	2	15		4	9	21	2	3	2	22	6	8	Legumes… clovers and alfalfas
Painted Lady	*Vanessa cardui*	S5			1								4									1													Broad: most often thistles, hollyhock, mallow, various legumes, knapweed, burdock
Pearl Crescent*	*Phyciodes tharos*	S4					1								2										1							13	1			Smooth-leaved true asters
Peck's Skipper*	*Polites peckius*	S5			7	1	2		2				2		1	1	2	1	1									1	2							Kentucky bluegrass and little bluestem
Question Mark	*Polygonia interrogationis*	S5											1						1																	American elm, red elm, hackberry, Japanese hop, nettles, false nettle
Red Admiral	*Vanessa atalanta*	S5	2		16		1	1		10	1		11				1	8					25							5			1		9	Nettles
Silver-spotted Skipper*	*Epargyreus clarus*	S4																	2										1		1	1				Legumes… showy tick-trefoil, Am. hog peanut and black locust
Silvery Blue*	*Glaucopsyche lygdamus*	S5	6		10	12	5				1		1	8	2													16	5	1	2			1		Legumes… tufted vetch, white sweet clover and alphlfa
Spring Azure*	*Celastrina lucia*	S5			1																															Cherrys, blueberrys and early blooming viburnums
Summer Azure*	*Celastrina neglecta*	S5																															1			Dogwoods, New Jersey tea, meadowsweets and viburnums
Swallowtail species*																																				
Tawny-edged Skipper*	*Polites themistocles*	S5						1		1							1	2	4				4		4			3	7							Panicgrasses and bluegrasses
Viceroy*	*Limenitis archippus*	N5																						1								2	5		1	Willow and poplar
White Admiral*	*Limenitis arthemis*	S5																					1													Trees and shrubs… wild cherry, aspen, poplar, cottonwood, oaks, hawthorn, birch, willows, basswood
Wild Indigo Duskywing*	*Erynnis baptisiae*	S4				1	1			1								2	2			2	1	5	16		4				3		1	1	Purple crown-vetch

Appendix 2. (cont'd)

S2N (non-breeding)-Imperiled-imperiled nationally because of rarity due to very restricted range, very few population (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation nationally
S3B (breeding)-Vulnerable-vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation
S4-Apparently secure-uncommon but not rare; some cause for long-term concern due to declines or other factors
S5-Secure-common, widespread, and abundant in Ontario
N5-Secure-common, widespread, and abundant in the nation
SNR-Unranked-provincial conservation status not yet assessed (G5-globally secure)
SNA-Not applicable-a conservation status rank is not applicable because the species is not a suitable target for conservation activities
*resident species

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