



The Meadoway:

Vegetation, Bird and Butterfly Monitoring

Update Report

2016, 2018, 2019

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Table of Contents

1	Int	troduc	ction	.2
2	M	ethod	ology	.4
	2.1	Vege	tation plots	.4
	2.2	Bird	stations	.5
	2.3	Butte	erfly transects	.6
3	Re	sults .		.7
	3.1	Vege	tation plots	10
	3.2	1.1	Vegetation plots A-F – seed mix list 1	11
	3.2	1.2	Vegetation plots M and N – seed mix list 1	13
	3.2	1.3	Vegetation plot O – seed mix list 1	16
	3.2	1.4	Vegetation plots G-L – seed mix list 2	17
	3.2	1.5	All vegetation plots combined	20
	3.2	1.6	Vegetation plots P-W – not planted; turfgrass2	22
	3.2	1.7	Vegetation plot X – unrestored, exotic forb meadow2	24
	3.2	1.8	Invasive species management	24
	3.2	Bird	surveys	24
	3.3	Butte	erfly surveys	26
4	Su	mmar	ry	31
5	Re	feren	ces	35
6	Ap	pendi	ix	36

1 Introduction

The Meadoway project involves the revitalization of a 16-km linear hydro corridor, formerly known as the Gatineau Hydro Corridor (Figures 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 the Rouge National Urban Park becoming one of the largest greenspaces in Canada (Sharma 2018).

Restoration and maintenance activities have included seeding portions of the corridor with flora species native to meadows, mowing and invasive species management. Restoration began in 2012 with the section between 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 such as the west end of The Meadoway between Eglinton Avenue East and Kennedy Road. These turfgrass areas started undergoing restoration (spraying, tilling, seeding cover crops) in the summer of 2019. Mowing and herbicide application has occurred intermittently in different sections although became a more prominent focus in 2018.

Monitoring activities began in 2016 to document changes in species composition related to the vegetation, breeding birds and butterfly presence. The monitoring has also occurred in 2018 and 2019. This report is an update to the 2018 monitoring report with a focus on seeding success, species composition and abundance along with a comparison of turfgrass plots to restored plots. The effectiveness of invasive species management is also assessed in this report and can be used to guide future management decisions.



Figure 1. The Meadoway



Figure 2. Geographic location of The Meadoway related to the Toronto and Region Conservation Authority (TRCA) jurisdiction

2 Methodology

2.1 Vegetation plots

The methodology for monitoring meadow ecosystems used by the 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).



Figure 3. Vegetation plot set-up at The Meadoway

Each meadow plot consisted of one 20 x 20 m (400 m²) main plot, five 2 x 2 m (4 m²) shrub and sapling regeneration sub-plots and five 1 x 1 m (1 m²) 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 \geq 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.

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 1 x 1 m 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.

Species lists were created for the plot as a whole using data combined from the 20 x 20, all 2 x 2s and all 1x 1s. For a detailed description of vegetation monitoring methodology please see the Bob Hunter Meadow Management Monitoring Protocol (TRCA 2016).

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.

2.2 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. In the 2018 report, all bird species were included in the analysis; however, this report only contains species assumed to be breeding at the site.

Bird data were also interpreted using TRCA's local rank (L-rank) system for fauna. Fauna L-ranks are based on scores for six criteria including local occurrence, population trends, habitat dependence, area sensitivity, patch isolation sensitivity and sensitivity to development. For example, species ranked L1 would have: a limited local occurrence, declining population trends, habitat specialist and area sensitive requirements, restricted mobility and a sensitivity to development. Species ranked L5 would have: a widespread local occurrence, increasing population trends,

habitat generalist and non-area sensitive requirements, no sensitivity to patch isolation and a tolerance to development. Again, 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.



Figure 4. Biologist conducting bird monitoring

2.3 Butterfly transects

Butterflies were surveyed in 2016, 2018 and 2019 by slowly walking a specified path through the meadow and identifying/counting butterfly species observed (Figure 5). In 2016 and 2018, five sections were surveyed with transects situated on the paved trail that runs the length of the corridor. In 2019 two new sections (at the west end of the corridor) were added and the transects were moved slightly to run beneath the northmost hydro wires for the entire length of the corridor. In 2019, Hydro One established a works yard in a portion of section 7 making comparisons across the three years difficult. Start and end times were recorded and were generally consistent among years. 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 species and migratory species. Surveys were conducted between 09:00 and 16:00 and only in good weather conditions (>20°C, no rain, light winds).



Figure 5. Common ringlet (Coenonympha tullia)

3 Results

Twenty-four vegetation plots were set-up between 2016 and 2019 (Table 1, Figure 6). Vegetation plots A-O were set-up in 2016 and monitored in 2016, 2018 and 2019. Plots P-U were set-up in 2018 and were monitored in 2018 and 2019. Plots Q and R were moved in 2019 (by request of Hydro One) and re-named V and W (respectively). The new location of these plots still represents the general conditions within that section; however, changes in plant species composition at these stations were not compared between years. Bird monitoring was completed in 2016, 2018 and 2019 in study area sections 4 and 7, and only in 2018 and 2019 in study area sections 1 and 2. Butterfly monitoring was completed in study area sections 4 and 7 in 2016, 2018 and 2019, and was expanded to sections 1 and 2 in 2019.

Location	Seed mix	Vegetation plot letter	Vegetation plot years	Bird station #	Bird survey years	Butterfly survey years
Section 1.1	n/a	Х	2019	-	-	-
Section 1.2	Turfgrass	Р	2018/2019	-	-	-
Section 1.3	Turfgrass	Q, V	Q 2018, V 2019	-	-	-
Section 1.4	Turfgrass	R, W	R 2018, W 2019	6	2018/2019	2019
Section 2	Turfgrass	S, T, U	2018/2019	7	2018/2019	2019
Section 4.1	Mix 2	G, H, I	2016/2018/2019	1	2016/2018/2019	2016/2018/2019
Section 4.2	Mix 1	А, В, С	2016/2018/2019	2	2016/2018/2019	2016/2018/2019
Section 4.3	Mix 1	D, E, F	2016/2018/2019	3	2016/2018/2019	2016/2018/2019
Section 4.4	Mix 2	J, K, L	2016/2018/2019	4	2016/2018/2019	2016/2018/2019
Section 7	Mix 1	M, N, O	2016/2018/2019	5	2016/2018/2019	2016/2018/2019



Figure 6. Vegetation plot, bird and butterfly survey locations at The Meadoway in 2016, 2018 and 2019

3.1 Vegetation plots

Flora results describe species occurrence related to the type of seed mix planted (identified as seed mix 1 and seed mix 2, Table 2), year surveyed, location in The Meadoway and between seeded plots and turfgrass plots (unrestored at time of sampling in 2019). As such, the results section has been split into sub-sections which assist in synthesizing these descriptions. An additional section has been added to this 2019 report update related to examining the effectiveness of invasive species management of creeping thistle (*Cirsium arvense*) and dog-strangling vine (*Cynanchum rossicum*) using the vegetation plot data.

Species name	Common name	L-rank	Seed mix 1	Seed mix 2
Lobelia cardinalis	cardinal flower	L1	х	х
Schizachyrium scoparium	little bluestem	L2	х	х
Sorghastrum nutans	Indian grass	L2	х	х
Heliopsis helianthoides	ox-eye	L2	х	х
Andropogon gerardii	big bluestem	L3	х	х
Panicum virgatum	switch grass	L3	х	х
Gentiana andrewsii	bottle gentian round-headed bush-	L3	х	x
Lespedeza capitata	clover	L3	х	х
Lobelia siphilitica	great blue lobelia	L3	х	х
Penstemon digitalis	foxglove beard-tongue	L3	х	х
Penstemon hirsutus	hairy beard-tongue	L3	х	х
Pycnanthemum virginianum	Virginia mountain-mint	L3	х	
Elymus canadensis	Canada wild rye	L4	х	х
Rudbeckia hirta	black-eyed Susan	L4	х	х
Elymus virginicus var.				
virginicus	Virginia wild rye	L5	х	
Desmodium canadense	showy tick-trefoil	L5	Х	х
Monarda fistulosa	wild bergamot common evening-	L5	х	x
Oenothera biennis	primrose	L5	Х	х
Silphium perfoliatum	cup-plant	L5	х	х
Verbena hastata	blue vervain	L5	х	
Asclepias sullivantii	smooth milkweed	LX	х	х
Asclepias tuberosa	butterfly milkweed	LX	х	х
Helianthus giganteus	tall sunflower	LX	х	х
Solidago rigida ssp. rigida	stiff goldenrod	LX	х	
Allium cernuum	nodding wild onion	L*	х	х
Coreopsis lanceolata	lance-leaved coreopsis	L*	х	х
Coreopsis tripteris	tall tickseed	L*	х	х
Echinacea pallida	pale purple coneflower	L*	х	х
Ratibida pinnata	grey-headed coneflower	L*	х	х
Vernonia missurica	Missouri ironweed	L*	х	
Veronicastrum virginicum	Culver's root	L*	х	

Table 2. Flora species specified in seed mix 1 and 2

3.1.1 Vegetation plots A-F – seed mix list 1

Plots A-F contained a total of 158 species including 64 (40%) native species, 90 (57%) species not native to southern Ontario and 4 species that were previously deemed to have been extirpated from the Toronto Region (Appendix 1, Figure 7). The area where vegetation plots A-F were established was seeded with species in seed mix 1. These plots contained 24 of the 31 species (77%) specified in seed mix 1 (Figure 7, Table 3).





There was variation in when different species from the seed mix were found in the plots (Table 3). In addition to this temporal variation, seven species found were also identified by botanists as seeded, although were not shown on the seed mix list: wild senna (*Senna hebecarpa*), tall ironweed (*Vernonia gigantea*), Riddell's goldenrod (*Solidago riddellii*), smaller evening-primrose (*Oenothera parviflora*), large-flowered tickseed (*Coreopsis grandiflora*), swamp rose-mallow (*Hibiscus moscheutos*) and swamp milkweed (*Asclepias incarnata ssp. incarnata*) (Figure 8). It was clear that these were species introduced into the seed mix because they are prairie plants that are not native to the TRCA jurisdiction but are associated with other prairie plants that were specified in the seed mix. They are highly conservative species that are unlikely to volunteer into a disturbed hydro corridor as adventive introductions. In general, their native range extends into parts of southwestern Ontario.

Fifteen species occurred at a high frequency, being found in all plots (A-F) each year, including cup-plant (*Silphium perfoliatum*; Figure 8), while 30 species were rare, being found in only 1 plot over all years. Species frequently observed or rarely observed included a mix of native species and non-native species. One non-native, invasive species, that was found in all plots (A-F) in all years was dog-strangling vine. Although widespread, this species is being actively managed in The Meadoway due to its ability to form dense colonies smothering other vegetation (DiTommaso et al. 2005).

Scientific name	Common name	L-Rank	2016	2018	2019
Lobelia cardinalis	cardinal flower	L1			
Schizachyrium scoparium	little bluestem	L2		х	
Sorghastrum nutans	Indian grass	L2	х	х	х
Heliopsis helianthoides	ox-eye	L2	х	х	х
Gentiana andrewsii	bottle gentian	L2			
Penstemon digitalis	foxglove beard-tongue	L3			х
Lobelia siphilitica	great blue lobelia	L3		х	х
Lespedeza capitata	round-headed bush-clover	L3	х	х	х
Panicum virgatum	switch grass	L3	х	х	х
Andropogon gerardii	big bluestem	L3	х	х	х
Pycnanthemum virginianum	Virginia mountain-mint	L3	х	х	х
Penstemon hirsutus	hairy beard-tongue	L3			
Elymus canadensis	Canada wild rye	L4	х		х
Rudbeckia hirta	black-eyed Susan	L4	х	х	х
Verbena hastata	blue vervain	L5		х	
Oenothera biennis	common evening-primrose	L5	х	х	х
Desmodium canadense	showy tick-trefoil	L5	х	х	х
Monarda fistulosa	wild bergamot	L5	х	х	х
Silphium perfoliatum	cup-plant	L5	х	х	х
Elymus virginicus var. virginicus	Virginia wild rye	L5			
Asclepias sullivantii	smooth milkweed	LX	х	х	х
Asclepias tuberosa	butterfly milkweed	LX	х	х	х
Solidago rigida ssp. rigida	stiff goldenrod	LX	х	х	х
Helianthus giganteus	tall sunflower	LX	х	х	х
Vernonia missurica	Missouri ironweed	L*		х	х
Coreopsis lanceolata	lance-leaved coreopsis	L*	х		х
Coreopsis tripteris	tall tickseed	L*	х	х	х
Ratibida pinnata	grey-headed coneflower	L*	х	х	х
Veronicastrum virginicum	Culver's root	L*			
Allium cernuum	nodding wild onion	L*			
Echinacea pallida	pale purple coneflower	L*			

Table 3. Seeded species and those occurring in vegetation monitoring plots A-F



Figure 8. Swamp milkweed (Asclepias incarnata ssp. incarnata) (left) and cup-plant (Silphium perfoliatum) (right)

3.1.2 Vegetation plots M and N – seed mix list 1

In the 2018 report, vegetation plots M, N and O were summarized together due to their close proximity and similar management. In this 2019 update report, plots M and N were summarized together while plot O was summarized independently. This separation was due to the variability in success of the seed mix noted in the 2018 report, variability in soil substrate (more sand in M and N) and due to variable ongoing management in this section of The Meadoway.

Plots M and N contained a total of 166 species including 71 (43%) native species, 94 (57%) species not native to southern Ontario and 1 species that was previously deemed to have been extirpated from the Toronto Region (Appendix 1, Figure 10). The area where vegetation plots M and N were established was seeded with species in seed mix 1. These plots contained 15 of the 31 species (48%) specified in seed mix 1 (Figure 10, Table 4). Plots M and N are very unique for The Meadoway containing 5 species of native *Carex* spp. (sedges) and 6 species of native aster which are naturally occurring and have limited occurrence in The Meadoway. Plot N was particularly unique containing several uncommon species such as sky-blue aster (*Symphyotrichum oolentangiense*) and hairy aster (*Symphyotrichum pilosum var. pilosum*). Other naturally occurring noteworthy species in plot N include plantain-leaved pussytoes (*Antennaria parlinii ssp. fallax*), blue-eyed grass (*Sisyrinchium montanum*; Figure 11), poverty oat grass (*Danthonia spicata*) and downy serviceberry (*Amelanchier arborea*), red cedar (*Juniperus virginiana*) and grey goldenrod (*Solidago nemoralis ssp. nemoralis*). These species are either uncommon or locally ranked as sensitive species in urban areas.



Figure 10. Flora species composition in plots M and N

Of the 15 seeded species that germinated at the site, only wild bergamot (*Monarda fistulosa*) was found in all 3 years (2016, 2018, 2019; Figure 11). Wild bergamot may be also be a naturally occurring species at this site due to its early appearance in 2016. All other seeded species that occurred in the plots were only found in 2018 and/or 2019. Large-flowered tickseed was not specified in the seed mix list but was in the plots and was identified by botanists as being sourced from the seed mix.

Table 4. Seeded species and those occurring in vegetation monitoring plots M and N

Scientific name	Common name	L-Rank	2016	2018	2019
Lobelia cardinalis	cardinal flower	L1			
Schizachyrium scoparium	little bluestem	L2		х	х
Sorghastrum nutans	Indian grass	L2		х	х
Heliopsis helianthoides	ox-eye	L2		х	х
Gentiana andrewsii	bottle gentian	L2			
Penstemon digitalis	foxglove beard-tongue	L3			
Lobelia siphilitica	great blue lobelia	L3			
Lespedeza capitata	round-headed bush-clover	L3			
Panicum virgatum	switch grass	L3		х	х
Andropogon gerardii	big bluestem	L3		х	х
Pycnanthemum virginianum	Virginia mountain-mint	L3			
Penstemon hirsutus	hairy beard-tongue	L3			х
Elymus canadensis	Canada wild rye	L4			
Rudbeckia hirta	black-eyed Susan	L4		х	х
Verbena hastata	blue vervain	L5			
Oenothera biennis	common evening-primrose	L5		х	х
Desmodium canadense	showy tick-trefoil	L5			
Monarda fistulosa	wild bergamot	L5	х	х	х
Silphium perfoliatum	cup-plant	L5			
Elymus virginicus var. virginicus	Virginia wild rye	L5		х	х
Asclepias sullivantii	smooth milkweed	LX			
Asclepias tuberosa	butterfly milkweed	LX			
Solidago rigida ssp. rigida	stiff goldenrod	LX			
Helianthus giganteus	tall sunflower	LX		х	х
Vernonia missurica	Missouri ironweed	L*			х
Coreopsis lanceolata	lance-leaved coreopsis	L*			х
Coreopsis tripteris	tall tickseed	L*			
Ratibida pinnata	grey-headed coneflower	L*		х	х
Veronicastrum virginicum	Culver's root	L*			
Allium cernuum	nodding wild onion	L*			
Echinacea pallida	pale purple coneflower	L*			х



Figure 11. Blue-eyed grass (Sisyrinchium montanum) (left) and wild bergamot (Monarda fistulosa) (right)

3.1.3 Vegetation plot O – seed mix list 1

Plot O contained a total of 84 species including 28 (33%) native species, 55 (66%) species not native to southern Ontario and 1 species that was previously deemed to have been extirpated from the Toronto Region (Appendix 1, Figure 12). The area where vegetation plot O was established was seeded with species in seed mix 1 but was largely unsuccessful in 2016/2018. Plot O contained 12 of the 31 species (39%) specified in seed mix 1 (Figure 12, Table 5).



Figure 12. Flora species composition in plot O

Of the 12 species seeded at this site, none were found in 2016, 11 were found in 2018 and 6 were found in 2019. Only six seeded species were found in both 2018 and 2019: lance-leaved coreopsis (*Coreopsis lanceolata*), ox-eye (*Heliopsis helianthoides*), black-eyed Susan (*Rudbeckia hirta*), common evening primrose (*Oenothera biennis*) and tall sunflower (*Helianthus giganteus*). Showy tick-trefoil (*Desmodium canadense*) was seeded in the seed mix but not found until 2019.

Scientific name	Common name	L-Rank	2016	2018	2019
Lobelia cardinalis	cardinal flower	L1			
Schizachyrium scoparium	little bluestem	L2			
Sorghastrum nutans	Indian grass	L2		х	
Heliopsis helianthoides	ox-eye	L2		х	х
Gentiana andrewsii	bottle gentian	L2			
Penstemon digitalis	foxglove beard-tongue	L3			
Lobelia siphilitica	great blue lobelia	L3			
Lespedeza capitata	round-headed bush-clover	L3			
Panicum virgatum	switch grass	L3		х	
Andropogon gerardii	big bluestem	L3		х	
Pycnanthemum virginianum	Virginia mountain-mint	L3			
Penstemon hirsutus	hairy beard-tongue	L3			
Elymus canadensis	Canada wild rye	L4			
Rudbeckia hirta	black-eyed Susan	L4		х	х
Verbena hastata	blue vervain	L5			
Oenothera biennis	common evening-primrose	L5		х	х
Desmodium canadense	showy tick-trefoil	L5			х
Monarda fistulosa	wild bergamot	L5		х	
Silphium perfoliatum	cup-plant	L5			
Elymus virginicus var. virginicus	Virginia wild rye	L5		х	
Asclepias sullivantii	smooth milkweed	LX			
Asclepias tuberosa	butterfly milkweed	LX			
Solidago rigida ssp. rigida	stiff goldenrod	LX			
Helianthus giganteus	tall sunflower	LX		х	х
Vernonia missurica	Missouri ironweed	L*			
Coreopsis lanceolata	lance-leaved coreopsis	L*		х	х
Coreopsis tripteris	tall tickseed	L*			
Ratibida pinnata	grey-headed coneflower	L*		х	
Veronicastrum virginicum	Culver's root	L*			
Allium cernuum	nodding wild onion	L*			
Echinacea pallida	pale purple coneflower	L*			

Table 5. Seeded species and those occurring in vegetation monitoring plot O

3.1.4 Vegetation plots G-L – seed mix list 2

Plots G-L contained a total of 162 species including 60 (37%) native species, 101 (62%) species not native to southern Ontario and 1 species that was previously deemed to have been extirpated from the Toronto Region (Appendix 1, Figure 13). The area where vegetation plots G-L were established was seeded with species in seed mix 2 (Table 2). These plots together contained 14 of the 25 species (56%) specified in seed mix 2 (Figure 13, Table 6). There were also 3 species found in the plots that botanists knew were seeded but were not specified in seed mix 2: orange coneflower (*Rudbeckia fulgida*), wild senna and large-flowered tickseed. Oats were found only in plot K in 2019 and were likely a product of cover crop seeding at the site.





Two species that were seeded were not found in 2016 but were observed in 2018 and 2019 only in plot L: Canada wild rye and cup-plant. Alternatively, two species that were seeded were found in 2016 and not in 2018 or 2019: tall tickseed (*Coreopsis tripteris*) and lance-leaved coreopsis. Virginia mountain-mint (*Pycnanthemum virginianum*) was a seeded species but not specified in seed mix 2 and was only found in plot H in 2019.

Thirteen species occurred at a high frequency, being found in all plots (G-L) each year, including Indian grass (*Sorghastrum nutans*), a perennial grass species seeded into the site and representative of tallgrass prairies of southern Ontario (Figure 14; Packard and Mutel 1997). There were 33 species that were only found in 1 plot over all 3 years including 13 native species and 20 non-native species. Hairy aster was a notable species found in plot I in 2019. This species may have been seeded or may have colonized the site naturally. Based on TRCA's scoring and ranking, this species is rare, has a declining population trend, is sensitive to development and is highly dependent on specific habitat types.



Figure 14. Indian grass (Sorghastrum nutans)

Scientific name	Common name	L-Rank	2016	2018	2019
Lobelia cardinalis	cardinal flower	L1			
Schizachyrium scoparium	little bluestem	L2	х	х	х
Sorghastrum nutans	Indian grass	L2	х	х	х
Heliopsis helianthoides	ox-eye	L2	х	х	х
Gentiana andrewsii	bottle gentian	L2			
Penstemon digitalis	foxglove beard-tongue	L3			
Lobelia siphilitica	great blue lobelia	L3			
Lespedeza capitata	round-headed bush-clover	L3			
Panicum virgatum	switch grass	L3	х	х	х
Andropogon gerardii	big bluestem	L3	х	х	х
Penstemon hirsutus	hairy beard-tongue	L3			
Elymus canadensis	Canada wild rye	L4		х	х
Rudbeckia hirta	black-eyed Susan	L4	х	х	х
Oenothera biennis	common evening-primrose	L5	х	х	х
Desmodium canadense	showy tick-trefoil	L5	х	х	х
Monarda fistulosa	wild bergamot	L5	х	х	х
Silphium perfoliatum	cup-plant	L5		х	х
Asclepias sullivantii	smooth milkweed	LX			
Asclepias tuberosa	butterfly milkweed	LX			
Helianthus giganteus	tall sunflower	LX	х	х	х
Coreopsis lanceolata	lance-leaved coreopsis	L*	х		
Coreopsis tripteris	tall tickseed	L*	х		
Ratibida pinnata	grey-headed coneflower	L*			
Allium cernuum	nodding wild onion	L*			
Echinacea pallida	pale purple coneflower	L*			

Table 6. Seeded species and those occurring in vegetation monitoring plots G-L

3.1.5 All vegetation plots combined

Overall, the vegetation plots contained 265 species including 113 (42%) native species, 148 (56%) species not native to southern Ontario and 4 species that were previously deemed to have been extirpated from the Toronto Region (Appendix 1, Figure 15). Of the 31 species seeded, 27 (87%) were found in the vegetation plots (Figure 15, Table 7). There were also eight species found in the plots that botanists knew were seeded but were not specified in the seed mix list: tall ironweed, Riddell's goldenrod, wild senna, swamp milkweed, large-flowered tickseed, orange coneflower, swamp rose-mallow and smaller evening-primrose. Oats were also found seeded in plot K in 2019 (likely planted as a cover crop). As of 2019, The Meadoway supports 33 species of regional conservation concern (ranked L1-L3) and urban (ranked L4) with 18 of these species introduced through restoration plantings at the site and 15 naturally occurring. Of these species, four planted species are considered to be locally extirpated (ranked LX) from the jurisdiction as no known natural records have been found with the TRCA jurisdiction since the 1920s: smooth milkweed (*Asclepias sullivantii*), butterfly milkweed (*Asclepias tuberosa*), stiff goldenrod (*Solidago rigida ssp. rigida*) and tall sunflower.



Figure 15. Flora species composition in all plots

Scientific name	Common name	L-Rank	2016	2018	2019
Lobelia cardinalis	cardinal flower	L1			
Schizachyrium scoparium	little bluestem	L2	х	х	х
Sorghastrum nutans	Indian grass	L2	х	х	х
Heliopsis helianthoides	ox-eye	L2	х	х	х
Gentiana andrewsii	bottle gentian	L2			
Penstemon digitalis	foxglove beard-tongue	L3			х
Lobelia siphilitica	great blue lobelia	L3		х	х
Lespedeza capitata	round-headed bush-clover	L3	х	х	х
Panicum virgatum	switch grass	L3	х	х	х
Andropogon gerardii	big bluestem	L3	х	х	х
Pycnanthemum virginianum	Virginia mountain-mint	L3	х	х	х
Penstemon hirsutus	hairy beard-tongue	L3			х
Elymus canadensis	Canada wild rye	L4	х	х	х
Rudbeckia hirta	black-eyed Susan	L4	х	х	х
Verbena hastata	blue vervain	L5		х	
Oenothera biennis	common evening-primrose	L5	х	х	х
Desmodium canadense	showy tick-trefoil	L5	х	х	х
Monarda fistulosa	wild bergamot	L5	х	х	х
Silphium perfoliatum	cup-plant	L5	х	х	х
Elymus virginicus var. virginicus	Virginia wild rye	L5	х	х	х
Asclepias sullivantii	smooth milkweed	LX	х	х	х
Asclepias tuberosa	butterfly milkweed	LX	х	х	х
Solidago rigida ssp. rigida	stiff goldenrod	LX	х	х	х
Helianthus giganteus	tall sunflower	LX	х	х	х
Vernonia missurica	Missouri ironweed	L*		х	х
Coreopsis lanceolata	lance-leaved coreopsis	L*	х	х	х
Coreopsis tripteris	tall tickseed	L*	х	х	х
Ratibida pinnata	grey-headed coneflower	L*	х	х	х
Veronicastrum virginicum	Culver's root	L*			
Allium cernuum	nodding wild onion	L*			
Echinacea pallida	pale purple coneflower	L*			х

Table 7. Seeded species and those occurring in vegetation monitoring plots

3.1.6 Vegetation plots P-W – not planted; turfgrass

Plots P-W contained a total of 78 species including 28 (36%) native species and 50 (64%) species not native to southern Ontario (Appendix 1, Figure 16). These plots were in section 1 and 2 of The Meadoway that have been maintained as turfgrass consisting of primarily meadow fescue (*Schedonorus pratensis*), red fescue (*Festuca rubra* ssp. *rubra*) and Kentucky blue grass (*Poa pratensis* ssp. *pratensis*), all of which are non-native species (Figure 17). These sections of The Meadoway were sprayed, tilled and had a cover crop applied in the summer of 2019 but only after spring vegetation sampling occurred. Summer vegetation sampling was not feasible due to the ongoing

management activities. As such, the data for these plots still represent pre-management conditions and the results of 2019 management will be apparent when the plot data are collected in 2020. Common wild strawberry (*Fragaria virginiana* ssp. *virginiana*) was the most frequently encountered native species in the plots followed by tall goldenrod (*Solidago altissima*), riverbank grape (*Vitis riparia*), choke cherry (*Prunus virginiana* var. *virginiana*) and heal-all (*Prunella vulgaris* ssp. *lanceolate*).



Figure 16. Flora species composition in plots P-W



Figure 17. Photo at plot U (a turfgrass plot; September 2018)

3.1.7 Vegetation plot X – unrestored, exotic forb meadow

Plot X was added in 2019 at the request of the restoration team. This plot was only visited by the terrestrial monitoring team in the spring due to active management (spraying, plowing, planting oats) occurring when visited again in the summer. During the spring visit, this plot contained a total of 30 species including 10 (33%) native species and 20 (67%) species not native to southern Ontario (Figure 18). All sub-plots were dominated by non-native species. Sub-plots 1 and 2 were dominated by meadow fescue, sub-plot 3 was dominated by Kentucky blue grass and sub-plots 4 and 5 were dominated by dog-strangling vine.





3.1.8 Invasive species management

Significant efforts have been made since 2018 to map and control invasive species such as creeping thistle and dogstrangling vine. Biologists conducting vegetation plot sampling made note of the incredible success of invasive species management at The Meadoway including wicking of dog-strangling vine and mowing of creeping thistle. This analysis examined changes in maximum absolute cover of dog-strangling vine and creeping thistle within each subplot only at plots A to O (sections 4 and 7 of The Meadoway) because they were monitored each year (2016, 2018, 2019) and were targeted for invasive species management.

There was an increase in the number of subplots with dog-strangling vine between 2016 and 2018 (30 to 50 subplots). Due to this increase in occurrence, comparisons in the percent cover of dog-strangling vine were only done between 2018 and 2019. This also aligns better with the active management of invasive species that began more formally in 2018. Dog-strangling vine percent cover decreased at 19 of 50 subplots (38%) between 2018 and 2019 while it remained the same at 20 subplots (40%) and increased at 11 subplots (22%). Dog-strangling vine was completely eradicated from 9 subplots by 2019; however, was observed for the first time in 5 subplots in 2019.

Between 2016 and 2018 there was an increase in the number of subplots with creeping thistle (24 subplots in 2016 to 49 subplots in 2018). Due to this increase in occurrence, comparisons in the percent cover of creeping thistle were only done between 2018 and 2019. Creeping thistle percent cover decreased at 30 of 49 subplots (61%) between 2018 and 2019 while it remained the same at 7 subplots (14%) and increased at 12 subplots (25%). Creeping thistle was completely eradicated from 11 subplots; however, it was observed for the first time in 4 subplots in 2019.

3.2 Bird surveys

Twenty-two bird species were detected during 2016, 2018 and 2019 surveys (Appendix 2). These included one species of conservation concern in the Toronto Region (ranked L3): eastern meadowlark (*Sturnella magna*; Figure

19). Eastern meadowlark is a meadow-dependent species that nests on the ground in grassland habitats and is a species of conservation concern also due to declining population trends and sensitivity to disturbance. Eastern meadowlark is also listed as threatened in the province of Ontario under the Endangered Species Act (Endangered Species Act 2007). There were two other meadow-dependent species detected during surveys including savannah sparrow (*Passerculus sandwichensis*) and eastern kingbird (*Tyrannus tyrannus*). Red-winged blackbirds (*Agelaius phoeniceus*) and song sparrows (*Melospiza melodia*) were the most frequently occurring and most abundant species detected during surveys.



Figure 19. Eastern meadowlark (Sturnella magna)

There was variation in species composition and abundance among stations. Fewer bird species and individuals were detected in the turfgrass sites compared to all other sites (Table 8); however, similar numbers of sensitive species and meadow-dependent species were detected at the turfgrass sites and the restored sites. There was some variation in species richness (number of species) and abundance among the restored sites although differences were minimal and variable among years.

# u	#	speci	es	ab	undan	ice	# L1-	·L3 sp	ecies	# L1-	-L4 sp	ecies	de	eadov pende specie	ent	lev	idow l el nes specie	ter
Station	2016	2018	2019	2016	2018	2019	2016	2018	2019	2016	2018	2019	2016	2018	2019	2016	2018	2019
1	7	9	10	10	19	21	0	1	0	0	2	3	0	1	0	0	1	0
2	6	8	10	18	17	19	0	1	0	0	1	2	0	1	1	0	1	0
3	9	6	8	24	12	15	1	0	0	1	0	0	1	0	0	1	0	0
4	6	4	4	13	16	11	0	0	0	1	1	0	1	1	0	1	0	0
5	7	6	5	17	12	11	0	0	0	0	2	0	0	1	0	0	0	0
6*	na	2	3	na	2	4	na	0	0	na	1	1	na	1	1	na	1	1
7*	na	3	3	na	4	4	na	1	0	na	2	1	na	2	1	na	2	1

Table 8. Summary of bird survey results at stations 1-7 at The Meadoway

*Turfgrass sites

3.3 Butterfly surveys

Thirty-five butterfly species were observed during 2016, 2018 and 2019 surveys (Figure 20, Appendix 3). Of these 35 species, the giant swallowtail (*Papilio cresphontes*), Delaware skipper (*Anatrytone logan*), silver-spotted skipper (*Epargyreus clarus*) 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 butterflies (*Danaus plexippus*) were also found using The Meadoway in very high numbers. For example, 280 monarchs were counted using section 4.3 (between Bellamy Road North and Markham Road) in 2019. Butterfly species richness and abundance appeared to be lower in the turfgrass sites compared to the restored areas (Figures 21-24).



Figure 20. Eastern Tailed Blue (Cupido comyntas) and Peck's Skipper (Polites peckius)



Figure 21. Total butterfly abundance per year at The Meadoway in section 4.1 (top) and section 4.2 (bottom). Note that there is a scale-break to facilitate viewing less abundant species at the same time as more abundant species.



Figure 22. Total butterfly abundance per year at The Meadoway in section 4.3 (top) and section 4.4 (bottom). Note that there is a scale-break to facilitate viewing less abundant species at the same time as more abundant species.



Figure 23. Total butterfly abundance per year at The Meadoway in section 7. Note that there is a scale-break to facilitate viewing less abundant species at the same time as more abundant species.



Figure 24. Total butterfly abundance per year at The Meadoway in section 1 (top) and section 2 (bottom). Sections 1 and 2 were monitored for butterflies for the first time in 2019.

4 Summary

Meadow monitoring during 2016, 2018 and 2019 generally indicated that The Meadoway continues to support a plant community consisting of a mix of native and non-native flora species, provides habitat used by meadow birds and foraging opportunities for butterflies. A wide range of species were found during monitoring including federally, provincially and locally-ranked species-at-risk or species of conservation concern. In addition to these sensitive species, The Meadoway continues to be occupied by numerous invasive flora species although recent management initiatives have been successful at reducing their extent.

Flora composition in the vegetation plots was variable based on location and management activities. In general, there was a high percent composition of non-native species in the plots. This recognition in 2018 led to the implementation of more intensive invasive species management. The results of these efforts were apparent on site and in the flora data collected in 2019 with many plots showing a decrease in the amount of dog-strangling vine and creeping thistle.

Several native flora species that had been seeded, were found in the plots for the first time in 2019 including pale purple coneflower, fox-glove beard-tongue and hairy beard tongue. The late appearance of these species suggests that several years of monitoring may be needed to assess the effectiveness of the seed mix. Throughout the entire Meadoway with all plots combined, the seed mix appears to be successful aside from four species that have yet to be found: bottle gentian (*Gentiana andrewsii*), cardinal flower (*Lobelia cardinalis*), nodding wild onion (*Allium cernuum*) and Culver's root (*Veronicastrum virginicum*). An analysis of percent cover of these species may further highlight the success of the seeding and provide insight into the cover of native versus non-native species. Plot N continues to be a unique plot containing many native species including several sensitive species such as hairy aster (Figure 26) and plantain-leaved pussytoes.



Figure 26. Hairy aster (Symphyotrichum pilosum var. pilosum)

The bird community at The Meadoway continues to consist of a mix of generalists, meadow and forest-edge species. Meadow-dependent bird species using the site include savannah sparrow (Figure 27) and eastern meadowlark. Savannah sparrows continued to use the site in 2019 while eastern meadowlark were last found in 2018. Both of these species nest on the ground and as such are especially susceptible to disturbance in managed landscapes. Mowing should continue to occur only outside of the breeding season which occurs between late April and early August (Peck and James 1987, Cadman et al. 2007). The turfgrass stations in sections 1 and 2 continue to have fewer bird species and individuals while stations 1 and 2 in sections 4.1 and 4.2 had the greatest number of bird species and individuals.



Figure 27. Savannah sparrow (Passerculus sandwichensis)

Butterfly monitoring detected species characteristic of meadows in more urbanized areas of southern Ontario. Species that were especially abundant included cabbage white (*Pieris rapae*) and monarch (Figure 28). Cabbage white (a non-native species) continues to be the most abundant species. The greatest number of monarchs (280) was observed in section 4.3 in 2019. In 2018, the majority of monarchs were observed using section 4.2 feeding almost exclusively on red clover (*Trifolium pratense*), a non-native species. In 2019, the majority of monarchs were again in section 4.3 and during the fall visit they were nectaring and roosting on tall sunflower. This report has identified that both resident and migrant butterfly species continue to use The Meadoway in high numbers and that the restored areas tend to have higher numbers. Although the number of migrating butterflies using The Meadoway for nectaring is impressive, perhaps more relevant to the restoration project is the change in occurrence of local resident species that are using the new availability of food-plant species. Going forward, this suite of species (e.g. eastern tailed blue, common ringlet, various skipper species) will present an excellent indication of the quality of meadow habitat being provided. Nevertheless, the provision of a well-linked nectaring corridor for all species is an exciting development in the Toronto urban landscape.



Figure 28. Monarch (Danaus plexippus)

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6 Appendix

Appendix 1. Flora species found in vegetation monitoring plots at The Meadoway in 2016, 2018 and 2019

			1				2016				1				203	18										2019	•					Orio	ginally	Not
Species name	Species code	Common name	L-Rank	AB	CD				LN	1 N O	ABO	DE	FG	ΗΙ			INC	PQ	RS	τU	ABC	DE	F	ЗH				I O P	ST	υv	w :		cified	specified
Heliopsis helianthoides	helheli	ox-eye	L2	x x	x x	x x x	x x	< x			x x x	(x)	(x x	x x	x x	x	x x				< x x	x x	(x):	k x	x x x	(х×	x					x	
Schizachyrium scoparium	schscop	little bluestem	L2				>	(X			x	х	x	x		x							:	ĸ	x x x	(xx						х	
Sorghastrum nutans	sornuta	Indian grass	L2	xx	хx	x x x	x x	< x x	x		x)	(x)	(x x	хx	хx	хx	х×				< x	xx	(x)	ĸx	x x x	x	xx						х	
Symphyotrichum pilosum var. pilosum	astpipi	hairy aster	L2														х				< .				x		хх	:						
Andropogon gerardii	andgera	big bluestem	L3	x	х	хх	xx	< x x	x		x x x	(x)	< x x	хx	хх	х	xx				< x x	xx	(x)	ĸх	x x x	x	xx						х	
Antennaria parlinii ssp. fallax	antpafa	plantain-leaved pussytoes	L3																								×	:						
Celastrus scandens	celscan	American bittersweet	L3																								х							
Lespedeza capitata	lescapi	round-headed bush-clover	L3		хх	хх)	(x)	< x									xx	(x										х	
Lobelia siphilitica	lobsiph	great blue lobelia	L3										х										х										х	
Oenothera parviflora	oenparv	smaller evening-primrose	L3		x	хх						х	x																					х
Panicum virgatum	panvirg	switch grass	L3	хx	х	x x x	x x	x x			x)	(x)	(x x	x x	хx	хx	xx				< X	xx	(x)	ĸх	x x x	x	хx	:					х	
Penstemon digitalis	pendigi	foxglove beard-tongue	L3																				x										х	
Penstemon hirsutus	penhirs	hairy beard-tongue	L3																								хx	:					х	
Pycnanthemum virginianum	pycvirg	Virginia mountain-mint	L3	xx	хx	хx					x x x	(x)	(X								< x x	xx	(x	x									х	
Acer saccharinum	acesaci	silver maple	L4		х			х)	(x	x						x	х			x									
Acer x freemanii	acexfre	hybrid swamp maple	L4				>	< x							x							х			x x	x	T							
Amelanchier arborea	amearbo	downy serviceberry	L4							LT				LT			IT					LΤ				IT	×			x				
Asclepias incarnata ssp. incarnata	ascinca	swamp milkweed	L4								x										<													х
Carex pellita	carpell	woolly sedge	L4						x							x																		
Carya cordiformis	carcord	bitternut hickory	L4																								х							
Danthonia spicata	danspic	poverty oat grass	L4							х																	×	:						
Dichanthelium acuminatum ssp. acuminatum	panacum	hairy panic grass	L4							х							x										×	:						
Elymus canadensis	elycana	Canada wild rye	L4	x	x	x										х					< .					х							х	
Juniperus virginiana	junvirg	red cedar	L4							х																	×							
Rosa blanda	rosblan	smooth wild rose	L4						x																		х							
Rudbeckia hirta	rudhirt	black-eyed Susan	L4	x	хх	x x x	x x	< x x	x		х	х)	(x x	x x	хх	хx	x x				< x x	xx	(x)	x x	x x x	x	xx	x					х	
Sisyrinchium montanum	sismont	blue-eyed grass	L4														x										×	I I						
Solidago juncea	soljunc	early goldenrod	L4							х																	×	:						
Symphyotrichum oolentangiense	astoole	sky-blue aster	L4							х																	×	:		x	:			
Acalypha rhomboidea	acavirg	three-seeded mercury	L5								х																							
Acer saccharum ssp. saccharum	acesasa	sugar maple	L5																					ĸ										
Achillea borealis var. borealis	achmila	woolly yarrow	L5							х							x										xx	:				x		
Ambrosia artemisiifolia	ambarte	common ragweed	L5		x	x x x	x x	x x	x		x x	x>	(x x	хx	x	хx	х×				< x	xx	(x)	ĸх	x x x	x	xx	x						
Antennaria howellii ssp. howellii	anthoho	Howell's pussytoes	L5							х																	×	I I						
Apocynum androsaemifolium	apoandr	spreading dogbane	L5						x																									
Apocynum cannabinum var. cannabinum	apocaca	hemp dogbane	L5									х										х												
Asclepias syriaca	ascsyri	common milkweed	L5	хx	хх	x x x		< x x	xx	x	x x x	(x)	(x x	x x	хх	хx	×	x	х		< x x	xx	(x)	x x	x x x	x	х	х						
Bidens frondosa	bidfron	common beggar's-ticks	L5														x						x							x	1			
Carex bebbii	carbebb	Bebb's sedge	L5																								х							
Carex granularis	cargran	meadow sedge	L5							х																	×	:						
Carex stipata	carstip	awl-fruited sedge	L5																								х							
Chenopodiastrum simplex	chesimp	maple-leaved goosefoot	L5													x	x																	
Clinopodium vulgare	clivulg	wild basil	L5										x																					
Cornus alternifolia	coralte	alternate-leaved dogwood	L5													х										Π	Τ							
Cornus stolonifera	corstol	red osier dogwood	L5							х	x					х	xx				< x x		Π				хх	:		x				
Desmodium canadense	descana	showy tick-trefoil	L5	x	x x	хх×		<			x)	(x)	(x x	хx							< x	xx	(X	х	x x	1	Τ	х					х	
Echinocystis lobata	echloba	wild cucumber	L5						П															\Box	x	\square	Τ							
Elymus virginicus var. virginicus	elyvirg	Virginia wild rye	L5				\Box	x	х							х	xx	:							хx	x	×	:					х	
Epilobium ciliatum ssp. ciliatum	epicici	sticky willow-herb	L5			хх			x			x >	(x	x		х	x				< x	x	x	ĸ	x x	x	х							
Equisetum arvense	equarve	field horsetail	L5								t t t								x	x									x	T		x		
Erigeron annuus	eriannu	daisy fleabane	L5	x	хx	x		x		x	x >	(x	хx	хx	x x	х	x				< x x	x	x	ĸх	x x x	x	xx	:		x				
Erigeron canadensis	concana	horse-weed	L5		x	x x x	x x	< x x	x		x x	x	хx	x x	x	x	x x				< x x	x	x	x x	x x x	x	xx	x					$\neg \uparrow$	
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	1	1	1					2016				1					20:	18											20	19							Driginall	lv	Not
Species name	Species code	Common name	L-Rank	AI	B C	DE			JK	LN	/ N C	A	3 C C	E	FG	нI				ΟР	QR	ST	UA	в	сD	EF	G	H I.			NO	P	sт	υV	/w		pecified	·	pecified
Erigeron philadelphicus var. philadelphicus	eriphil	Philadelphia fleabane	L5													x	x				x						x	x x :	(x)	×	x		+	×				<u> </u>	
Euthamia graminifolia	eutgram	grass-leaved goldenrod	L5		х			x x	x	x			x		хx	x		хx	x					,	x	x	x	x	x >	x x	x		\square	1				-	
Fragaria vesca ssp. americana	fravesc	woodland strawberry	L5									x							x			×	x		x			x	>	x	x	x,	x					-	
Fragaria virginiana ssp. glauca	fravigl	blue-leaved wild strawberry	L5)	< 1																\top		-	\square		-				
Fragaria virginiana ssp. virginiana	fravivi	common wild strawberry	L5	x		хх	x				x	x)	< x :	x	x				х		хx	хx		x	хx		x	>	×		x,	x x	хx	: x				
Fraxinus americana	fraamer	white ash	L5)	< 1											x)	x		,	x		\square				
Fraxinus pennsylvanica	frapenn	red ash	L5			х				x							x	хx															\square						
Galium aparine	galapar	cleavers	L5									>	(,	x			x					\square	×	:				
Galium asprellum	galaspr	rough bedstraw	L5													хx											x						\square						
Geum canadense	geucana	white avens	L5)	< 1	x	x									х	x	x	x					\square					_	
Hackelia virginiana	hacvirg	Virginia stickseed	L5																								x						\square						
Juglans nigra	jugnigr	black walnut	L5)	< 1				x	x			x								x	хx					\square		-				
Juncus tenuis	juntenu	path rush	L5													x																	\square			х			
Monarda fistulosa	monfist	wild bergamot	L5	x	ĸх	хx	x x	x x	x x	x	x	x >	(x)	< x :	x x	xx	хx	хx	x	x			x	x);	x x	x x	x	x x :	(x)	x x	x	T	\square	1			х	1	
Oenothera biennis	oenbien	common evening-primrose	L5			хx	x x	x x	x x	x)	()	< x :	x x	хx	хx	хx	x	x			x	Ħ	x	x x	x	x x :	(x)	x x	хх	tt	\square	i T	+		х	+	
Oxalis dillenii	oxadill	deflexed yellow wood-sorrel	L5			хx	x		x x	x		x >	()		x	хx	x	хx	x	x		H,	x	x .	хx	x	x	x x x	(x)	x x	хx	tt	+	i T	+			+	
Oxalis stricta	oxastri	common yellow wood-sorrel	L5				x	x x	11			x >	(x)	(x	x	x	xx		Ħ		x	ΗŤ	x	Ħ	x	x	$\uparrow \uparrow$	Ť	15	x	x	Ħ	+	i T	+			+	
Panicum capillare	pancapi	panic grass	L5				t f	x	x	x		x >			x	xx	xx	x	x	x			ΤĒ	Ħ	x				1	x	хx	tt	+	1				+	
Parthenocissus vitacea	parinse	thicket creeper	L5					ΤĒ		,	(T	TŤ		x	1						\square		\uparrow	Ť	хx	x		1Ť	\top	ΗË	++	+	×	1			+	
Persicaria lapathifolia	pollapa	pale smartweed	L5															x												×	x		\pm	1	+			-	
Populus deltoides	popdelt	cottonwood	L5			хx		1 x	x					x	×	x	x									xx		x		+-	Η.	++	\pm	1	+ +				
Populus tremuloides	poptrem	trembling aspen	L5					††^	1 Î							Â														×		++	+	+				+	
Prunella vulgaris ssp. lanceolata	pruvula	heal-all (native)	L5													x x							x				x	x x		Ê	\vdash	++	+	x x	+			+	
Prunus serotina	prusero	black cherry	L5												++	x				-			Ĥ		-		Ĥ	î		-	\vdash	++	Ĥ	Ĥ	+			+	
Prunus virginiana var. virginiana	pruvirg	choke cherry	L5			x x	x		×		x			<i>.</i>	×	<u>^</u>	×	×	×	x					×	x x	x		×	-	x	×	×	rt-	×				
Rhus typhina	rhutyph	staghorn sumach	L5			x	xx	x x	x	x				< x :	xx	xx	x	x x	x	x		H x			x	xx	x	x x	x x	x x	x		+++	T ×	<u>i</u>			+	
Rubus idaeus ssp. strigosus	rubidae	wild red raspberry	L5					11	11	<u> </u>										-											x	++	++	Ē	++			+	
Rubus occidentalis	rubocci	wild black raspberry	L5												++	×												×		-	~	++	++	1	+			-	
Sambucus canadensis	samcana	common elderberry	L5													^		x										<u> </u>		×		++	\pm	1				-	
Silphium perfoliatum	silperf	cup-plant	L5	x	x x	хx	x					x	(x)	< x :	×			x					×	x	x x	xx			١,	x		++	+	1			х	+	
Solanum ptychanthum	solptyc	American black nightshade	L5											· · · ·				x	×	x			1		-					· ×	×	++	++	+	++			+	
Solidago altissima	solalti	tall goldenrod	L5	x	x x	x x	x x	x x	x x	x x	(x	x x	(x)	· ·	x x	x x	x x	x x	x	x x	x		×	x :	x x	x x	x	x x	(x)	x x	x	×	+ +		(x	×			
Solidago canadensis var. canadensis	solcana	Canada goldenrod	L5	x	x	x			1 A	x		<u> </u>	x	x	x	x		x			~		x x	x	x x	xx		XXX		x	~		+	1	Ê	~		+	
Solidago gigantea	solgiga	late goldenrod	L5											-									1		-					×		++	+ +	1	+	×		+	
Solidago nemoralis ssp. nemoralis	solnemo	grey goldenrod	L5								x				++				×											<u> </u>	x	++	+ +	1	+	<u>^</u>		+	
Symphyotrichum cordifolium	astcord	heart-leaved aster	L5								x								Ê	x								×		-	x	×	+	rt-	+				
Symphyotrichum ericoides var. ericoides	asteric	heath aster	L5		x l	\vdash	\square	×	$^{++}$	Η,	< x	$^{++}$,		+			×	x	xx	x	\square		$\uparrow \uparrow$	×	×				×	x	+	+	×	1	x		+	
Symphyotrichum lanceolatum var. lanceolatum	astlanc	panicled aster	L5	x	x x	x	x	x x	x x	x	x	1,			x x	×	х×	x x	x	xx				x,	x x	xx	x	x x		xx	x	++	++	ŕŤ	++	x		+	
Symphyotrichum lateriflorum var. lateriflorum	astlalt	calico aster	L5			Ĥ	ŕ†	†î fî	1î Îî	Ê		ΤŤ	<u> </u>	-		Ê						\square		ŕť	1	Ê			<u> </u>	<u>-</u>	Ĥ	++	++		1			+	-
Symphyotrichum novae-angliae	astnova	New England aster	L5	x	ĸ	\vdash	\vdash		++					++		-	\square	×	x	x x	\vdash		x	x	+	x		++	++	×	x	x	+	Ť	+	x		+	
Toxicodendron radicans var. rydbergii	rhurary	poison ivy (shrub form)	L5		+	\vdash	\vdash		$^{++}$	Η,	< x	ΤŤ		++				- x	X			\square	ΗÊ	Ê	+	H^		++	++	T _x	1x	Ħ	+	+	++			+	
Ulmus americana	ulmamer	white elm	L5			\vdash	++	++		ť							H	Ť	Ê	+		++	++	+	+	H	x	++	++	f	۴t	++	++	+	++	+		+	
Verbena hastata	verhast	blue vervain	L5	++	+	\vdash	\vdash	++	+	\vdash	++	++	Ħť	` - ,	xĤ	+	\vdash	+	+		\vdash	+		++	+	\vdash	Ĥ	++	++	+	\vdash	++	+	+	+	+	x	+	
Viola sororia var. sororia	viosoro	common blue violet	L5					++					++	+ť	x						H	\square		+	+		x	++	++	+	H	++	+	+	++	\vdash		+	
Vitis riparia	vitripa	riverbank grape	L5	x		x v	x l	++	++	x .		×	- y .		x Û		x	x -	y	x v	x v	++	Η.	<u>+</u> +,	× -	x -	ŷ	x v .		*	x -	++	+	╷┼╴	+	x		+	
Carex tenera var. tenera	cartete	straw sedge	LU	L I		Ĥ	Ĥ	++		ŕť	`	Ê	1^Ľ			+^	Ê	^			<u>Ê</u>	++	††^	ť	<u> </u>	Ĥ			<u> </u>	Ťŗ	ŕŕ	++	++	ŕŤ	++			+	
Asclepias sullivantii	ascsull	smooth milkweed	LX	x		- v	++		++	H		1x	×	×	+		\vdash	+	++			++		H,	-	x -	+	++	++	+	\vdash	++	++	+	++	\vdash	x	+	
Asclepias suinvantii Asclepias tuberosa	asctube	butterfly milkweed	LX	x		x v	x		++	\vdash		x	Î,	< x :	<u>_</u>		H		++			++	† I≎	t,	x y	Î.			++	+	\vdash	++	+	+	++	\vdash	x	+	
Helianthus giganteus	helgiga	tall sunflower	LX	Ŷ,	· •	Ŷ	Ĵ.	1 v v	v .		++	x,	Ĵ.			v v		v -		, H		++	H.	Ĵ,		<u>î</u>		v v .	(x)	, -		++	+	+	++	\vdash	x	+	
Solidago rigida ssp. rigida	solrigi	stiff goldenrod	LX				1. Î	+^+^	11^	Ĥ		_	_			^ ^	<u>^</u>	^ ^				++	⊢L [*]	Ĥ,	ì î			-	` ^ '	÷	ĤĤ	++	+	+	+	\vdash	x	+	
Acer negundo	acenegu	Manitoba maple	1*	Ŷ	-	Ŷv	Ŷ	1 <u>,</u>	.			1, ľ	` ^ [< x .	$\frac{1}{\sqrt{2}}$	~		v -		· ·	\vdash		⊢ L^	⊢ľ'	<u></u>	1.		<u>, </u>	- L	, ,		↓ .			. , 	v		+	
Coreopsis lanceolata	corlanc	lance-leaved coreopsis	L *	L_	-	XX	Ê.		⊢ Ê	\vdash			++	11	+	-	\vdash	^ ^			\vdash	 ^ ^	+ ^	+	+^	Ĥ.	<u> </u>	<u>^ ^ </u>	+	+-	t.	<u>+</u> ++'	ìĤ	Ĥ	Ĥ	-	x	+	
	conanc	pance-leaved coreopsis	1 ^L .		X	XX	×	XX	X											*						L X					T X X	\perp		\square			X		

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Species name	Species code	Common name	L-Rank	AB	CDE			JK	LM	NO	AB	CD	EF	G H I			N C	PQ	R	STL	A	s C	DE	FG	ΗI			NO	ΡS	τU	vw		pecified	specified
Coreopsis tripteris	cortrip	tall tickseed	L*	x	x x	x		хx			x x	хх	хx								x x	x	x x	х									x	
Echinacea pallida	echpall	pale purple coneflower	L*																									х					х	
Gleditsia triacanthos	gletria	honey locust	L*										х											х							х			
Hibiscus moscheutos	hibmosc	swamp rose-mallow	L*		х	x							хх										х	х										х
Polygonum achoreum	polacho	striate knotweed	L*													x	x																	
Ratibida pinnata	ratpinn	grey-headed coneflower	L*	x x :	ххх	x					x	хх	хх			x	x x				xx	x	x x	х			x	х					х	
Rudbeckia fulgida	rudfulg	orange coneflower	L*					x																										х
Senna hebecarpa	cashebe	wild senna	L*				\square							x x									х	х	хх		х							х
Solidago riddellii		Riddell's goldenrod	L*		×	x							хх																					х
Vernonia gigantea	vergiga	tall ironweed	L*																					х										х
Vernonia missurica	vermiss	Missouri ironweed	L*										хх										х	х				х					х	
Veronica peregrina ssp. peregrina	verpere	purslane speedwell	L*														x																	
Veronica serpyllifolia ssp. serpyllifolia	verserp	thyme-leaved speedwell	L*											x x		x		x					x	х	х		х							
Abutilon theophrasti	abutheo	velvet-leaf	L+				x							x																				
Acer platanoides	aceplat	Norway maple	L+									х							x >	<						х								
Acer tataricum ssp. ginnala	aceginn	Amur maple	L+									х							TŤ				x x	x	хх									
Agrostis gigantea	agrgiga	redtop	L+		x	x	ГŤ						хх	x x				\square	x >	(x)		$\uparrow \uparrow$	x	хx	хx		хx	х						
Ailanthus altissima	ailalti	tree-of-heaven	L+				\square	x						x	x		x	\square	Ħ		$\uparrow\uparrow$	\square				x								
Alliaria petiolata	allpeti	garlic mustard	L+													x								x	x						x			
Amaranthus albus	amaalbu	tumbleweed	L+													x	x											x						
Amaranthus blitoides	amablit	prostrate pigweed	L+																									x						
Amaranthus retroflexus	amaretr	red-root pigweed	L+				x				x	x		x		x	хx											x						
Arabidopsis thaliana	arathal	mouse-ear cress	L+				Ηt									x	хx																	
Arctium minus	arcmimi	common burdock	L+										x	x		x								хx	x		x				x			
Arenaria serpyllifolia	areserp	thyme-leaved sandwort	L+											x		x	x								x		x	x						
Artemisia biennis	artbien	biennial wormwood	L+													x																		1
Artemisia vulgaris	artvulg	common mugwort	L+			x	H						x											x		x								
Asparagus officinalis	aspoffi	asparagus	L+							x							x										x							
Avena sativa	avesati	oats	L+																							x							x	
Barbarea vulgaris	barvulg	winter cress	L+				H									x	x										x							
Bromus commutatus	brocomm	upright chess	L+				\square																		x									1
Bromus inermis	broinin	smooth brome grass	L+				l x	xx	хх		x	хх	x		x x	хx					x	x	x			хx	x							
Bromus japonicus	brojapo	Japanese chess	L+								x			x			x									x	x	x						
Bromus tectorum	brotect	downy chess	L+					x																										
Camelina microcarpa	cammicr	small-seeded false flax	L+													x											x							
Campanula rapunculoides	camrapu	creeping bellflower	L+						x							x											x							
Capsella bursa-pastoris	capburs	shepherd's purse	L+				\square									x	x x		$\uparrow\uparrow$			††		+				x						
Cardamine hirsuta	carhirs	hairy bitter cress	L+	+++	++		H							++		11	x x	++	Ħ			+		+		\square		t tř		+				
Carex spicata	carspic	spiked sedge	L+				H						x				ΤÊ	\square	x	x x		+	x	+	H	H	x	x		x				
Catalpa speciosa	catspec	northern catalpa	L+		×		H						x						$\uparrow\uparrow$			$\uparrow \uparrow$		+						Ť				
Centaurea stoebe ssp. micranthos	cenmacu	spotted knapweed	L+		T		\square			x						x	x		$\uparrow\uparrow$			††		+			x	x		+				
Cerastium fontanum	cerfont	mouse-ear chickweed	L+	x	xx	x x	l x	xx	x		xx	xx	xx	x x x	xx	xx	x x	x x	x)	(x)	x >		x x	x x	х×	хx	x	x	xx	xx	x x			
Chaenorhinum minus ssp. minus	chaminu	dwarf snapdragon	L+	<u> </u>		††^	Ħ	ΪĤ				-		<u> </u>			xx	\parallel	ΪÍ	††ŕ	ΤŤ	††	Ť			H ⁿ	1	†††		1	<u>i l</u> ^			
Chenopodium album	chealbu	lamb's quarters	L+	x			x	xx	x		хx	x	x	x x	xx	хx	x x		$\uparrow\uparrow$		x >	x	x	хx	x	x	x	x						
Chenopodium glaucum	cheglau	oak-leaved goosefoot	L+				H.									x											-							
Cichorium intybus	cicinty	chicory	L+	+++	++		\vdash			×				++		ĦÊ		H v	++	++	++	+		+	\vdash	H				x	x	x		
Cirsium arvense	cirarve	creeping thistle	L+	xx	x x ×	xx	x x	xx	хx		xx	хx	xx	x x x	xx	x x	x x	1x Î	x,	(x	x,		xx	xx	х×	xx	xx	x x	xx	x	xx	x		
Cirsium vulgare	cirvulg	bull thistle	L+	x	1.1	$\left\ \right\ ^{n}$	Π,	x	x		xx	x x	x	xxx		x x	XX		fť	x	x /	x	x	x x	x	XX	x x	x		x	x î	11		
Convolvulus arvensis	conarve	field bindweed	L+	xx	++	x	ΗÊ	x x	×		x x		x	x	x	X		x x	++		x x			x	xx	x x	×	H -	x	+	H-			
Coreopsis grandiflora	corgran	large-flowered tickseed	L+		++	<u>f</u>	\vdash		+^		x			xxv	l x Î	1 x	×	†î l^	++	++	1×1	++	+	v	xy	HĤ	Ŷ	x		+				x
Crataegus monogyna	cramono	English hawthorn	L+	+++	++		\vdash				-				<u>î</u>	H^	Ê	++	++	×	1^H	+		+^	L L	$\left \right $	+^	Ê	x	+	x			
Crepis tectorum	cretect	narrow-leaved hawk's beard	L+	+++	++		\vdash						++	++		+	v -	++	++	+î -	++	+		+		$\left \right $	+ v		Ĥ	-	Ĥ			
crepis tectorum	LIELELL	nanow-leaved nawk 3 beald	1-+											11	1.1	<u></u>	^		11	11	1				<u> </u>		1 ^					1 1		

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Species name	Species code	Common name	L-Rank	AB	CD			IIК	ιм	NO	ABC	DE	FG	ні			NO	PO	RS	τШ	AB	сD	FF	GН				NO	PS	ти	v	wx	specified	specified
Cynanchum rossicum	cynross	dog-strangling vine	L+		xx				x x	x x	xxx	xx	x x	xx	xxx			x x		x x	x x	xx		x x		xx		x x					specifica	speemed
Dactylis glomerata	dacglom	orchard grass	L+	x x		x		x x	x	x	x x	x x	x	xx	x x x			x	хx	x	x x	хx	x	x	x	хx			xx	x	x	x		
Daucus carota	daucaro	Queen Anne's lace	L+	x x	xx	xxx	(x)		x	xx	x x x	xx	xx	xx	x x x	(x	x x	xx	xx	x	xx	xx	xx	xx	xx	xx	x	xx	xx	x	x	xx		
Digitaria ischaemum	digisch	smooth crab grass	L+					x					x	xx															+					
Digitaria sanguinalis	digsang	hairy crab grass	L+				,	(x		x		x												x	+		Ħ			
Dipsacus fullonum	dipfull	teasel	L+											x											x				+					
Echium vulgare	echvulg	viper's bugloss	L+					x			x					x	хx				x				хx		x	x	+		x			
Elymus repens	elyrepe	quack grass	L+	x x	хx	xxx	(x)	(x x	x		x x x	хx	хx	x	x x >	<	x		x	x	x x	хx	хx	хx	хx	хх	x	x	x			x		
Epilobium parviflorum	epiparv	small-flowered willow-herb	L+								x																		+					
Eragrostis minor	eramino	little love grass	L+					(x											x	\square					
Erysimum cheiranthoides	erychei	wormseed mustard	L+					x						x		x	x										х		\square		Ħ			
Erysimum hieraciifolium	eryhier	hawkweed-leaved mustard	L+									x												х			х	x	\square		Ħ			
Euonymus europaeus	euoeuro	European spindle-tree	L+							х	x				,	<						x												
Euonymus fortunei	euofort	wintercreeper euonymus	L+															x											\square					
Fallopia convolvulus	polconv	black bindweed	L+								x					x					x				x		x	x	\square	T	\square			
Festuca rubra ssp. rubra	fesrubr	red fescue	L+	x	хx	хx)	(x x	x	х	x x x	хx		х	x x	x		хx	хх	x	x	хx	x	x	хx	хх		\top	xx	x	x	x x		
Festuca trachyphylla	festrac	hard fescue	L+									x															Π	++	+		Ħ			
Galium mollugo	galmoll	white bedstraw	L+																x										x	x				
Geum urbanum	geuurba	urban avens	L+										x	х	x							x	хx	хx	x	х			\top		x			
Hesperis matronalis	hesmatr	dame's rocket	L+																					x					\square					
Hypericum perforatum	hypperf	common St. John's-wort	L+			xxx	(x			х		хx	хx	хх	x	x	хх	хх				x	хх	хх	хх		х	x	x			x		
Lactuca serriola	lacserr	prickly lettuce	L+					x								x	x				x x		x				х		\square					
Lamium amplexicaule	lamampl	henbit	L+														х																	
Leonurus cardiaca ssp. cardiaca	leocard	motherwort	L+												хх										x									
Lepidium campestre	lepcamp	field pepper-grass	L+	x							хх				x	x					хx						х		\square					
Leucanthemum vulgare	chrleuc	ox-eye daisy	L+				>	(х	x		x	xx			x							хx	x		х	x			х	x		
Linaria vulgaris	linvulg	butter-and-eggs	L+	x x	хx	xxx	< x >	x x	х		x x x	хx	хх	хх	x x >	< x	х	хх	хх	х	хх	хх	хх	хх	хх	хх	х	x	хx	х		х		
Lolium arundinaceum	fesarun	tall fescue	L+																			хх			x		х		\square					
Lolium pratense	fesprat	meadow fescue	L+	x x	хx	хx	>	(x	х	х	x x x	хx	x	x	x x >	<		хх	хх	хх	x		хх	х		хх			xx	хх	х	x x		
Lonicera morrowii	lonmorr	Morrow's honeysuckle	L+						х															х				x	Π					
Lonicera tatarica	lontata	Tartarian honeysuckle	L+							х																								
Lonicera x bella	lonxbel	shrub honeysuckle	L+							х																								
Lotus corniculatus	lotcorn	bird's foot trefoil	L+	х				x			хх	х			хх						x x				х	х			Π			х		
Lysimachia arvensis	anaarve	scarlet pimpernel	L+													х	x											x						
Lysimachia punctata	lyspunc	spotted loosestrife	L+									х											x											
Lythrum salicaria	lytsali	purple loosestrife	L+																										\square			х		
Malus baccata	malbacc	Siberian crab-apple	L+									x											x											
Malus pumila	malpumi	apple	L+		х	х				х		х	x					x	хх	х		х	x	х			х		хх					
Malus sieboldii	pyrsieb	Toringo crab-apple	L+						х)	<																		
Malva neglecta	malnegl	common mallow	L+										ЦT				x											х						
Medicago lupulina	medlupu	black medick	L+	хх		х	xx	(x x	x	х	x x	x	x	хх	x x >	< x	хх	хх	хх	хх	хх	x		хx	хх	хх	х	хх	x	хх	х	х		
Medicago sativa ssp. sativa	medsasa	alfalfa	L+	хх			>	(X			хх			х	хх						хх				хх	х								
Melilotus albus	melalba	white sweet clover	L+	х	x			х		х	x			x	x	x	x x				x			x			х	x				x		
Melilotus officinalis	meloffi	yellow sweet clover	L+									\square	μT								х						х				\Box			
Morus alba	moralba	white mulberry	L+	хх	хx	xx	< x >	x x	х		x x x	хх	хх	хх	хх	< x	хх	х			хx	хх	хх	хх	хх	хх	х	х			\square			
Nepeta cataria	nepcata	catnip	L+													x											х		\square					
Phleum pratense	phlprat	timothy grass	L+	х	x	хx			x		x x		х		хх	I		хх	хх	хx	х		хх		х	х		\square	x	хх		x		
Phragmites australis ssp. australis	phraust	common reed	L+						x				ШT			х											х							
Physalis alkekengi	phyalke	Chinese lantern	L+			х						x											х											
Pilosella caespitosa	hiecaes	yellow hawkweed	L+							х		x			x >							х				х		x		L				
Plantago lanceolata	plalanc	English plantain	L+	х	x	xx	< x >	(X	x	хх	x	x	хх	хx	x	< T	x x	х			x	х	хх	xx	x	хх		x	x		x	x		
Plantago major	plamajo	common plantain	L+					x	x		хx	x	x	х	x >	< T	x	хх		хx	x	х		х	х	хх		x	x	хx		x		

							2	2016	5								20	18											2	019							Origir	nally	No	t
Species name	Species code	Common name	L-Rank	AE	B C	DE				KLI	MN	O A	ΑB	CD	EFG	Н			N	ΟP	QR	ST	UA	в	C D	ΕF	G١	11			ΛN	O P	S 1	ΓU	V	w x			speci	
Poa compressa	poacomp	flat-stemmed blue grass	L+	х				:	хх		х			х	х	x	хx	x	х				×	:)	ĸх	х		х					хx				
Poa pratensis ssp. pratensis	poaprat	Kentucky blue grass	L+	x	(х		x x	хх	x x	хx	(x	x x	ххх	x	x x x	хx		x x	хx	xx	xx	x	x x	хх	x	ĸх	хх	хx	(x	x>	< x	х	xx				
Polygonum aviculare	polavic	prostrate knotweed	L+														ĸ																							
Portulaca oleracea	poroler	purslane	L+					:	х							2	ĸ															х								
Potentilla argentea	potarge	silvery cinquefoil	L+			х	x	x :	х					х	x	x	ĸ								х		x)	ĸх		x	۲ ۱									
Potentilla recta	potrect	sulphur cinquefoil	L+	х		хх				x	х	×	(X	х	х	x	к х х	x	х	х		>	×		хх		x)	ĸх	хх	x	(X	х								
Pyrus communis	pyrcomm	pear	L+					Π													x									x										
Ranunculus acris	ranacri	tall buttercup	L+					П						x		Π				х	хх	xx	x		х							x	x >	< x		хx				
Rhamnus cathartica	rhacath	common buckthorn	L+	х		x	х		x	хх	хх	x x	(x x x		x x x	хx	x	хх	хх	xx	:			x		х	х	хх	(X	x	x >	< x	х	x				
Robinia pseudoacacia	robpseu	black locust	L+				x								x	х			х												х									
Rosa multiflora	rosmult	multiflora rose	L+					П			x	×	(x	х							×				x)	ĸ												
Rumex acetosella	rumacet	sheep sorrel	L+					П			х					х			П					П)	ĸ												
Rumex crispus	rumcris	curly dock	L+	х					x	хх		×	(x	х			x x	хx		x	х		×	x :	хx		x)	ĸ	хх	хx	(х								
Rumex obtusifolius	rumobtu	bitter dock	L+					ГŤ				×	(x	x	Π																			-		
Securigera varia	corvari	crown vetch	L+	х								×	(×																	
Sedum acre	sedacre	mossy stonecrop	L+						x								ĸ		Π					T				x												
Senecio vulgaris	senvulg	common groundsel	L+		$\uparrow\uparrow$			ΠŤ										x	Ħ					$\uparrow\uparrow$																
Setaria faberi	setfabe	giant foxtail	L+			x			x x	x				x	x	x			Ħ					$\uparrow\uparrow$	x	x)	ĸ				х						-		
Setaria italica	setital	foxtail millet	L+					Ħ						x	x	x	x x		Ħ					Ħ																
Setaria pumila ssp. pumila	setglau	yellow foxtail	L+	x)	(хx	x	Ħ	x	хx		×	(x	хx	x x x	x	x x x	хx	x	x	x		×	x	хх	x	x)	ĸ	хх	x	x	х						_		
Setaria viridis	setviri	green foxtail	L+)	(x	x :	x					x		x	x											x	х			х								
Silene latifolia	silprat	evening lychnis	L+)	(Ħ					х		x			x		x	x			x		x				x	(х								
Silene vulgaris	silvulg	bladder campion	L+					Ħ				×	(x	x	x	x										x	(x									
Sisymbrium altissimum	sisalti	tumble mustard	L+					Ħ										x	x											x	(
Solanum dulcamara	soldulc	bittersweet nightshade	L+			x		Ħ										x		x						хx				хx	(х								
Sonchus arvensis ssp. arvensis	sonarar	glandular perennial sow-thistle	L+														x x	x												x	(X									-
Sonchus asper	sonaspe	spiny sow-thistle	L+					Ħ					х	x			x	x																						
Sonchus oleraceus	sonoler	annual sow-thistle	L+					Ħ		x				x		Ħ	x x			x				x														_		
Stellaria graminea	stegram	grass-leaved chickweed	L+			x	x	Ħ							xx	x	x		x	x		x x				хx														
Stellaria media	stemedi	common chickweed	L+				x	Ħ																																
Tanacetum vulgare	tanvulg	tansy	L+					Ħ			x								x	x											x							-		
Taraxacum erythrospermum	tareryt	red-seeded dandelion	L+					Ħ								Ħ		x			x									x	(-		
Taraxacum officinale	taroffi	dandelion	L+	x)	(x	хx	хx	x	xx	xx	хx	x x	(x	хx	xxx	x	x x x	хx	x	хx	хx	x x	xx	x	хx	хx	x >	x x	хx	x x	(x	хx	x >	< x	x	xx				
Thlaspi arvense	thlarve	penny-cress	L+					Ħ					x			Ħ		x	x	x								x	x	×										
Tragopogon dubius	tradubi	lemon-yellow goat's beard	L+	H	x			Ħ		++			x	x		Ħ	x x	t Lî	T I			tt		1x	x	H		1	×	Ħ			tt		Ħ			-+		
Tragopogon pratensis	traprat	meadow goat's beard	L+	Ħ			\vdash	+	x	xx	x	x	1		x	Ħ	xx	x		x x	xx	x x		x	x	x	\vdash		x x	x		x	x,		x	x		-+		
Trifolium hybridum	trihybr	alsike clover	 L+		$^{++}$			Ħ		x	1	l x		x	x	Ħ		хx	x	x	H.	x	x	Ħ	x	x			x	хx	(x		x		H			-		
Trifolium pratense	triprat	red clover	 L+	x ,	(x	хx	х×	x	xx	xx	x	x x	(x	xx	xxx	x	x x x	x x	x	x x	х×	x x	xx	x	x x	xx	x >	x x	xx	x x		х×	x,	< x	x	x x		-+		
Trifolium repens	trirepe	white clover	L+		1		H^	†††			T.	11	11			ti li	x	x		x	x	1,	x	††	x	H Â	<u> </u>	<	1	×	(ΤŤ		t"	- <u> </u> ^		-+		_
Ulmus glabra	ulmglab	Scotch elm	_ L+		+			Ħ			1					Ħ		ΠŤ	Ħ		x	ΤŤ		$\uparrow \uparrow$	Ť		Π						Ħ		H			-		
Ulmus pumila	ulmpumi	Siberian elm	 L+	x	x	x	x	x			+	++			x x	Ħ			Ħ		T T	$^{++}$			x	хx		x	x				tt		H			-		
Verbascum thapsus	verthap	common mullein	_ L+	H	++	xx	×	t t	xx	xx			x	x	×	x	x x x	x x	x	x		tt	×	x	x x	t f	x >	x x	xx	x x			tt		Ħ			-+		
Veronica arvensis	verarve	corn speedwell	L+	H	+		Ħ	Ħ				++	1	x	x	x	x	x	x	x		Ħ	$+1^{\circ}$	†††	x	H	x	x x	1	×	(x	Ħ		x			-+		_
Veronica officinalis	veroffi	common speedwell	L+	Ħ	+		×	1x1		++					x	<u>f</u>		H^	<u> </u>			Ħ		Ħ	x	Ħ	t f			Ħ			Ħ		1 T			\rightarrow		_
Viburnum opulus ssp. opulus	vibopul	European highbush cranberry	L+	H	+		Ħ	††	++	++	+	++				Ħ		x	Ħ			$^{++}$		++	<u> </u>	Ħ	t t			H			Ħ					\rightarrow		-
Vicia cracca	viccrac	cow vetch	L+	x	(x	x	x	t _x t	×	xx	x x	x x	(x	x	x x	x	x x	xx	x.	xx	×	x x	xx	1x	x	xx	,		хx	x x	(x	х×	x,	(x	x	x x		\rightarrow		_
Vicia sativa var. angustifolia	vicsati	common vetch	L+	Ľ,				††				1^1^			x	Ê	- x	Î x	Ê		ΗŶ	fΪ	<u>f</u> f f	<u>T</u>		<u> </u>	H	+	X		. ^		ŕľ		Ê		<u> </u>			-
Vicia tetrasperma	victetr	slender vetch	L+	\vdash	+		\vdash	++	++	++	+	++	×	- x	xx	+	1x v	x v	t t	x		++	+		x x	1 v l	++	+	xx	x î	÷		H		+		<u> </u>	\rightarrow		-
Agrostis stolonifera	agrstol	creeping bent grass	L+?	\vdash	++	v		++	++	++	+	++			^ ^	+	+î lî	Ĥ	††		\vdash	++	+ l^	11	^ ^	Ĥ	++	+	^ ^	Ĥ	+		H		+		<u> </u>	\rightarrow		-
Allium schoenoprasum var. sibiricum	allscsi	wild chives	L+r L+?	\vdash	+	×	^	++	++	++	+	++	+			++		\square	+	+		++	++	++			\vdash	+		\vdash	+		++		+		<u> </u>	\rightarrow		
Amum schoenoprasam var. sibiricam	alisesi	wild criffes	LTI															11								×											I			

Spacing name	Enocios codo	Common name	L-Rank				2	2016										2018	3												2	019							Origina	illy	Not
Species name	species code	Common name	L-NdIIK	ΑB	C	DE	FG	ΗI	ΙI	ΚL	MN	104	A B (D	F	GΗ	ΙJ	ΚL	M	NO	Р	QR	S 1	ΓU	А	ВC	D	ΕF	GΗ	11	JΚ	LN	ИN	0	ΡS	ΤU	V	wх	specifie	ed	specified
Atriplex patula	atrpatu	halberd-leaved orache	L+?						:	x x																															
Chenopodium pratericola	chenprat	meadow goosefoot	L+?	x																																					
Euphorbia glyptosperma	chaglyp	ridge-seeded spurge	L+?					x									х																								
Euphorbia maculata	chamacu	spotted spurge	L+?					x	:							хх				х																					
Phalaris arundinacea	phaarun	reed canary grass	L+?								х		3	(х													:	x								
Potentilla norvegica	potnorv	rough cinquefoil	L+?						х					х	х	хх	хх		х	x					х			х	x>	x	хх	:	x								
Prunella vulgaris	pruvulg	heal-all	L+?				х	хx									х)	x						х						х					

Allium cernuum	allcern	nodding wild onion	L+
Gentiana andrewsii	genandr	bottle gentian	L3
Lobelia cardinalis	lobcard	cardinal flower	L1
Veronicastrum virginicum	vervirg	Culver's root	L+

Legend
L1-L3: species of regional conservation concern
L4: species of conservation concern in urban area
L5: species not of conservation concern at this time
L*: native to southern Ontario but no known natural records in TRCA jurisdiction
LX: species is extirpated from TRCA
L+: introduced species, not native to TRCA
L+?: species is probably introduced

Common nomo	Notting guild	L-rank	S	tation	1	St	tation	2	St	tation	3	S	tation	4	St	tation	5	S	tation	6	S	tation	17
Common name	Nesting guild	L-I dilk	2016	2018	2019	2016	2018	2019	2016	2018	2019	2016	2018	2019	2016	2018	2019	2016	2018	2019	2016	2018	2019
eastern meadowlark	meadow low-level nester	L3		1			1		2									-			-	1	
eastern kingbird	meadow upper-level nester	L4						1					1			1		-			-		
gray catbird	generalist mid-level nester	L4		1	2			1										-			-		
great crested flycatcher	forest upper-level nester	L4			1													-			-		
hairy woodpecker	forest upper-level nester	L4			1													-			-		
northern flicker	generalist upper-level nester	L4														1		-			-		
savannah sparrow	meadow low-level nester	L4										1						-	1	2	-	2	2
American goldfinch	generalist mid-level nester	L5	2	2	1	2	1			1		3	2		1			-			-		
American robin	generalist mid-level nester	L5		1	1	1	1	3	3		1	2		1	1	3		-	1	1	-	1	1
Baltimore oriole	generalist upper-level nester	L5	1	1			1	1			1							-			-		
blue jay	generalist upper-level nester	L5							1									-			-		
brown-headed cowbird	special case	L5	1														3	-			-		
common grackle	generalist mid-level nester	L5				1		1	1	1	2							-			-		
downy woodpecker	forest-edge mid-level nester	L5							1		1							-			-		
mallard	wetland low-level nester	L5			2													-			-		
mourning dove	generalist mid-level nester	L5				1	1	2	1	1	1	2			1	1	1	-			-		
northern cardinal	generalist mid-level nester	L5	1	1	2				1		1			1	1			-		1	-		
northern mockingbird	generalist mid-level nester	L5								1								-			-		
red-winged blackbird	generalist mid-level nester	L5	3	7	7	9	10	4	11	6	6	3	12	7	6		1	-			-		1
song sparrow	generalist low-level nester	L5	1	4	3	4	1	3	3	2	2	2	1	2	4	2	4	-			-		
warbling vireo	generalist upper-level nester	L5						1										-			-		
yellow warbler	generalist mid-level nester	L5	1	1	1		1	2							3	4	2	-			-		

Appendix 2. Bird species detected and abundance during bird monitoring at The Meadoway in 2016, 2018 and 2019

Legend

L1-L3: species of regional conservation concern

L4: species of conservation concern in urban areas

L5: species not of conservation concern at this time

Appendix 3. Butterfly species detected during monitoring at The Meadoway in 2016, 2018 and 2019 (S-rank definitions from Nature Serve 2018)

Common name	Scientific name	S-rank	Se	ection	1	Se	ction 2	2	Sec	tion 4	.1	Sec	tion 4	.2	Sec	tion 4	1.3	Sect	tion 4.	4	Se	ction	7	Host plant
Common name	Scientific fiame	3-Idlik	2016	2018	2019	2016	2018	2019	2016	2018	2019	2016	2018	2019	2016	2018	2019	2016	2018	2019	2016	2018	2019	Host plant
American Lady	Vanessa virginiensis	S5																		1				Sunflower family, pearly everlasting, plantain-leaved pussy toes, wormwood, ironweed, burdock
Azure species*	Celastrina spp.	n/a								1			1											
Black Swallowtail*	Papilio polyxenes	S5			2			3	3	5	3	22	19	7	26	17	3	25	20	8	3	11	3	Carrot family parsley, dill, celery and Queen Anne's lace
Blue species	Lycaenidae family	n/a												2			21			2			5	
Cabbage White	Pieris rapae	SNA			8			22	55	90	24	21	51	36	26	56	40	53	86	38	61	327	28	Mustards cabbage, cauliflower and broccoli
Clouded Sulphur	Colias philodice	S5			2			12	5	5	1	32	52	17	35	37	17	37	62	25	24	105	58	Legumes cultivated crops
Common Buckeye	Junonia coenia	SNR (G5)	_																		1			Uncommon breeding migrant
Common Ringlet*	Coenonympha tullia	S5			1				2	1		1	З	7		1					20	66		Kentucky bluegrass
Common Wood-Nymph	Cercyonis pegala	S5										1	1				1					1		Grasses (Poaceae)
Crescent species*	Phyciodes spp.	n/a													1						2	8		
Delaware Skipper*	Anatrytone logan	S4													2									Big bluestem and old switch panicgrass
Dun Skipper*	Euphyes vestris	S5															3						2	Sedges: chufa flatsedge, sun sedge
Eastern Comma*	Polygonia comma	S5									1													Elm and nettle families: American elm, hops, nettle, false nettle, wood nettle
Eastern Tailed Blue*	Cupido comyntas	S5							4		1	6	4	8	7		40	2	1	6	13	10		Clovers and legumes
Eastern Tiger Swallowtail	Pterourus glaucus	S5										1	1					1						Trees hop tree, cherries and ashes
European Skipper*	Thymelicus lineola	SNA											1	1			5							Grasses but prefers common timothy
Giant Swallowtail	Papilio cresphontes	S4																				1		Common prickly ash and common hop tree
Grass Skipper spp.	Hesperiinae family	n/a									1									1				
Great-spangled Fritillary	Speyeria cybele	S5										1												Violets
Lady species	Vanessa spp.	n/a												1			1							
Monarch	Danaus plexippus	S2N,S4B			29			32		6	37	7	217	195	3	46	280	5	28	79	4	38	227	Milkweeds
Mourning Cloak*	Nymphalis antiopa	S5															1	1				1		Trees willows, elms, cottonwoods and hackberries
Northern Broken-Dash*	Wallengrenia egeremet	S5															1							Panic grasses: deertongue
Northern Crescent*	Phyciodes cocyta	S5							1	2												2		Asters
Orange Sulphur	Colias eurytheme	S5			1				2	1		3	1	3	2	4	2	7	22	2	9	21	2	Legumes clovers and alfalfas
Painted Lady	Vanessa cardui	S5			2			3						7			1			4				Broad: most often thistles, hollyhock, mallow, various legumes
Peck's Skipper*	Polites peckius	S5									1	2	1	3			7			2	1	2		Kentucky bluegrass and little bluestem
Question Mark	Polygonia interrogation	S5																		1				American elm, red elm, hackberry, Japanese hop, nettles, false nettle
Red Admiral	Vanessa atalanta	S5			2			1			13	1	1	15	2		16	1		11			5	Nettles
Silver-spotted Skipper*	Epargyreus clarus	S4							2			1										1		Legumes showy tick-trefoil, Am. hog peanut and black locust
Silvery Blue*	Glaucopsyche lygdamus	S5										1		2	6		10	1		1	16	5		Legumes tufted vetch, white sweet clover and alphlfa
Spring Azure*	Celastrina lucia	S5															1							Cherrys, blueberrys and early blooming viburnums
Tawny-edged Skipper*	Polites themistocles	S5																			3	7		Panicgrasses and bluegrasses
Viceroy*	Limenitis archippus	N5								1														Willow and poplar
Wild Indigo Duskywing*	Erynnis baptisiae	S4							1	1		1		1										Purple crown-vetch

Legend

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 provice due to a restructed 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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