

(Updated with recommendations for Monarch Butterfly) Meadow Restoration Seed Mix Calculator

for Southern Ontario Ecozones

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Canadian Wildlife Federation in partnership with Carolinian Canada

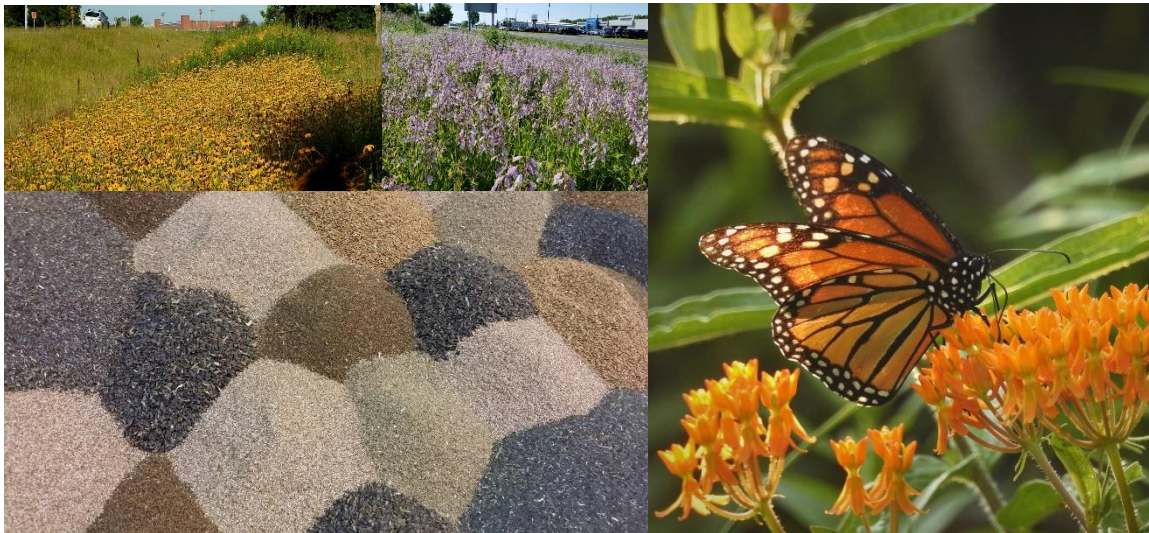


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1.0 Background

Native plants are the foundation of diverse ecosystems, having evolved in local communities of fungi, insects and other animals. They are food and shelter, directly or indirectly. They help clean the water, build soil fertility, and moderate climate. Restoring habitat with native plants is crucial to conserve pollinators and other beneficial animals. This process starts with choosing the right native plant species for local conditions. This can be difficult given the diversity of grasses and wildflower in southern Ontario, and the diversity of revegetation challenges. Here we provide a database of suggested species, mixes, and rates that can be used to create habitat within rights-of-way, and other open landscapes.

We hope this will be a helpful tool for those undertaking direct-seeded habitat projects, such as creating pollinator habitat within the working landscape or within conservation lands. This calculator was created to help specify and request appropriate local seed mixes for use in restoration. The calculator provides seeding rates based on target species proportions, and total seeding density, rather than seed weight, but will calculate the mix recipe that includes both seed number and seed weight. The calculator also estimates a cost per kg based on average price points across different suppliers and years but does not reflect the actual cost of any mix at this time. Do not provide seed cost estimates for clients or funding proposals without first contacting a seed supplier. The calculator estimates are only meant to help with coarse-level project budgeting.

This calculator assumes basic knowledge of Excel functionality, including sorting, and removing rows if the user desires altering the species lists, for example. It requires 2 areas of input by the user and will not calculate total kgs based on your total project area, which is a simple multiplication step at the end. We have also assumed that the user will have some knowledge of site conditions, and corresponding target or reference communities of native plants.

About the Author

Stefan Weber is a restoration biologist with experience designing, implementing, and evaluating broadscale seed-based restoration in Southern Ontario. His doctoral work included evaluation of roadside meadow seeding methods, changes in wild bee communities following restoration, and measuring the effect of local adaptation on restoration success. Stefan has also worked with the St. Williams Nursery, the Toronto Botanical Garden, The Ontario Agricultural College Herbarium, and Carolinian Canada.

1.1 Suggested Mixes by Eco-district (First Edition)

Mixes are recommended for six different groups of eco-districts in southern Ontario, spanning two ecozones. These regions are based on MOECP mapping (Figure 1; Crins et al, 2009). The suggested species can be found growing in open grassland and meadow habitats, including alvars, savannahs, dunes, wetland edges and glades.

In some cases, we've recommended species with limited or sporadic ranges within a group of eco-districts to both increase diversity across the landscape and streamline the planning aspects of revegetation with native plants. However, to avoid introducing species well beyond their native range, we've identified eco-districts where certain species are not likely to be found in the wild (NF in Eco-district mixes).

Plant Diversity

The recommended mixes are based around species with high Reliability Rankings because these are the species most likely to be available and establish well in a broad range of settings. See section 1.2 for ranking details. These base recommendations are meant to be a starting point for building your mix. We encourage you to modify the recommended mixes to meet your plant diversity targets and recommended that you do include additional species diversity where possible. For species with Reliability Rankings of 1 or 2, you should check with potential seed suppliers before you these species in your planting specifications.

The species pool we considered came from Southern Ontario Vascular Plant Species Lists (Bradley, 2013). Recommendations in the southwest regions are informed by *Vascular Plants of the Carolinian Zone* (Oldham 2017). Recommendations in other regions are based on the floras of Lanark and Ottawa regions (Brunton 2005, White 2016) , as well as personal observations of prairie remnants in the Rice Lake Plains, Ganaraska region and the greater Oak Ridges Moraine. These suggested mixes can be copied into the Custom Proportion column and tailored from there. To remove unused species, you must manually sort in Excel, with descending values; then, remove entire rows.

CAUTION: Before you make any changes to the calculator, save an unedited backup file in case of emergency. Be sure to select all cells in the calculator when re-sorting rows, otherwise the species data and user input may be decoupled, and the calculator will be inaccurate. When you sort rows, make sure to double check that the values in Total Kilograms/Hectare (Column P) are identical to each other, and equal the sum of individual Kilograms/Hectare (end of Column O, highlighted in orange). See the Troubleshooting section below for more information.

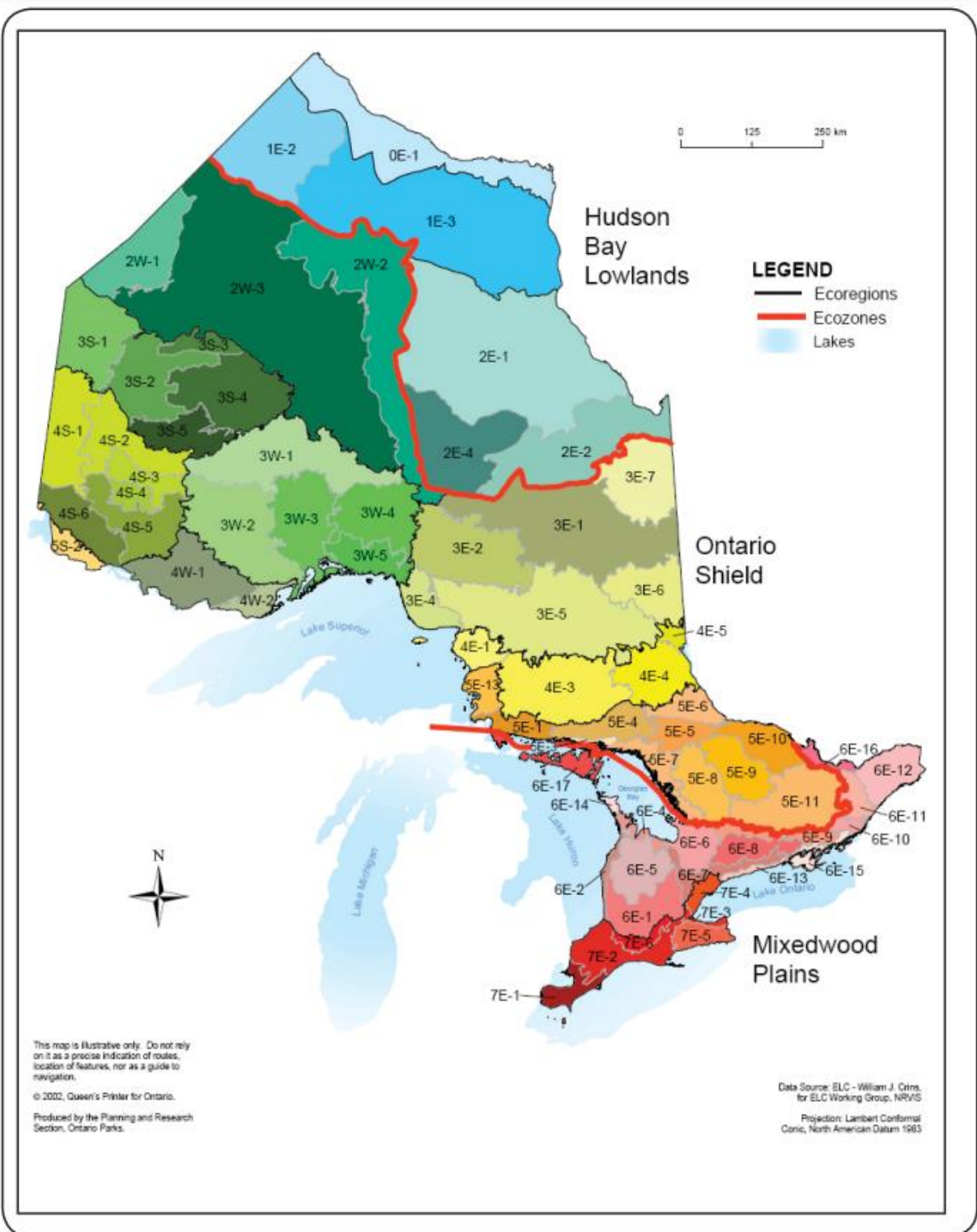


Figure 1: Ontario Eco-districts (Crins et al, 2009)

1.2 Substitutions & Additions

When requesting seed mixes with high floristic diversity, we advise that you also offer acceptable substitutions, particularly for species that are uncommon or difficult to produce.

Simple Substitutions

We've offered two substitutions for each species as a place to start. They are similar in growing conditions, and either size, bloom time, seed type or plant type. Simple substitutions are also one Reliability Rank higher (for 2-4), so they may be more readily available. See below for more details on choosing your own substitutions.

Reliability Rank

We use the term Reliability Rank to indicate which species are most easily farmed as bulk seed, and seem most readily available within the local industry. High ranks (4) indicate species that are usually available in large quantities in most years, and with adequate notice; these tend also to be the species that establish most reliability. Many high rank species do not require cold-moist stratification, for example, and otherwise germinate quickly. A low Reliability Rank indicate species that are difficult to produce, and also tend to be more conservative in their habitat needs, and/or requested less frequently. It's easiest to offer substitutions from a higher Reliability Rank, because they're more likely to be available.

Plant and Seed Type

We've also tried to categorize our plants into several functional groups, called Plant Types, that indicate their growth habit and suitable habitat. Similarly, we've categorized each species by a Seed Type, which differentiates seeds by size, shape and texture. The best substitutions will share both Plant and Seed Type. Plant type will be more important to matching habitat requirements, and potentially appearance or ecological function. Seed type helps match species with a similar price point and mass, affecting final rates.

The best substitutions will use a combination of methods. Remember to cross reference your substitutions with the Ecozone lists to make sure all species are present in the region. We've included 126 species in this list but recognize there may be others to consider. Please let us know if we should include other species.

1.3 Native Seed Suppliers

Please refer to the following resources for up-to-date lists of native plant and seed suppliers. Some suppliers provide local source-identified native seed and will provide region of origin for each species on request if necessary. Some seed suppliers carry native species that have been imported from the United States, either from known wild sources, or cultivars. Other suppliers provide local source-identified seed by special request only, so we suggest reaching out to seed-growers and suppliers a full year or more before the seed mix is intended to be sown.

For projects that are adjacent to conservation land, sensitive habitat, or are part of a broader grassland conservation scope, we highly recommend using known, wild-origin (source identified) seed only. Importing known wild-origin seed from Michigan or New York state may be appropriate for projects in the Carolinian Zone. Policies for local seed use in restoration vary across jurisdictions in southern Ontario, so it's best to check with your local conservation authorities before you commit to a seed mix.

Native Plant and Seed Suppliers in Ontario

- cwf-fcf.org/en/explore/gardening-for-wildlife/plants/buy/native-plant-suppliers/native-plant-suppliers/on/
- caroliniancanada.ca/itz/guides/sources

Regional Native Seed Networks

Some local groups may be able to supply small amounts of seed for conservation projects. Contact the Ontario Plant Restoration Alliance for more information: www.opra.ca

1.5 Monarch Rank

Though all flowering plants support pollinators and other beneficial insects, it may be desirable to create a seed mix intended to benefit a focus group of insects, At-Risk butterflies for example. To aid in this work, we've devised a "Monarch Rank" for grassland forbs that may be available in a bulk seed format, locally. Plant species with a high rank are either a larval host (Milkweed), or possible nectar source. Species that are ranked 4 bloom within the migration period (in this region), and have flowers accessible to large butterflies. These species typically have a "landing pad", and many are members of the Sunflower family (Asteraceae). Species ranked 3 have either ideal flower shapes for Monarch to access nectar but bloom outside of their migration period; or bloom in the migration period, with larger, tubular shaped flowers that could be accessed by a Monarch, though a distinct "landing pad" isn't present, or they form small patches in woodlands. Species with a rank of 2 do provide nectar, and may benefit Monarch in some instances, but either bloom early, or have bi-lateral, "lipped" flowers, which are typically accessible to bees only. Species with a rank of 1 are mostly graminoids, and while they do provide cover and structure in meadow habitats, they are not a nectar source for Monarchs.

2.0 Calculator Instructions

There are only two steps to using the basic calculator function. First, you'll need to choose a seeding rate, then you'll need to choose your mix of species, or the individual rates for each species. Before you begin you will need to know the location and growing conditions of your site, as well as the preferred seeding method, and any other objectives that would increase or decrease the density of your target species.

User your input, the calculator then runs off of an existing dataset of species and their attributes, like seed size and growing conditions. This will provide output in terms of mix proportions, individual species weights and a rough price estimate. See below for detailed instructions.

2.1 User Input

Step 1.

Choose a total seeding rate (seeds/m; 'RATE'-highlighted red). Ensure that this rate is copied into all cells for all species in your list. 500 seeds/m is the maximum recommended rate, typically reserved for Hydro-seeding methods, or erosion prone slopes. 100 seeds/m is the minimum recommended rate for small-scale, hand broadcast applications in ideally prepared soil. Adjust your rate based on the efficiency of the chosen handling method. Mechanical seeding methods are more practical for large areas but tend to use seed less efficiently.

Proposed Seeding Rate by Method

- Broadcast- Hand or Mechanical: 150-250 seeds/m
- Seed Drill: 250-350 seeds/m
- Hydroseed or Terraseed: 400-500 seeds/m
- Slopes over 1:3 : 500-600seeds/m

Seeding Method Considerations

- Mechanical seeders typically have bins for different sized seeds, that flow a different rate, so keep coarse and fine seed separate, otherwise they will spread unevenly
- Aster, Goldenrod, Lobelia and other very fine seeds need to be surface sown, and may be planted too deep with the drilling method; we recommend a second phase of hand seeding these species if possible.

- Hyrdo-seeding tends to use seed less efficiently, but its more practical for large area,s narrow corridors and slopes; for this reason we recommend using a higher seeding rate, also install in two phases, the first only seed, the second is a layer of tackifier. Avoid mixing seed in a paper-based slurry in this method
- To bulk up seed mixes for slopes, include annual agronomic grass species like White Millet.

Step 2.

Choose your species individual rates by adjusting their relative proportions in the custom proportion column (% , 'CUST PROP'- highlighted in yellow). This is the proportion of total seeds, presented as a percentage of total number of seeds in the mix.

Please Note, he extent to which these proportions are reflected in the restored community will be a function of both predictable outcomes of density and competition between species, as well as unpredictable impacts from weather, herbivory or other disturbances.

2.2 Existing Dataset

- **Species and Scientific Name**

Plant species common names in English, and scientific names as scientific names (species list included in appendix). Species were chosen from Southern Ontario Vasular Plant Species List Some scientific names may have been updated to reflect current taxonomic understanding.

For clarity, many nurseries prefer to receive species request in scientific names

- **Plant Type**

Most species in the dataset are considered Forbs, another name for wildflowers. Forbs are herbaceous, and though some can grow very large, they do not produce woody stems. Grasses, Sedges and Rushes are all considered graminoids, and while herbaceous, do not have showy wildflowers. Grasses have stem joints, Sedges have three sided stems, and Rushes have round, jointless stems. A few shrub species are listed that commonly grow on roadsides and produce a lot of seed. These are woody plants that can grow over 2m tall, and can spread vegetatively as well (eg. Dogwoods)

- **Habitat Type**

- Wet/Lowland- Moist soil, without standing water; ditches, stream or pond edge, wet meadow, seepy slopes, low drainage areas, low, heavy soil, moist clay.
- Dry Prairie/Alvar- Very dry upland sites with sand(resembles a prairie), or gravel or rock/pavement (resembles an alvar); mineral soils along slopes, road edges, green rooves, permeable pavement.
- Mesic Meadow- Medium soil moisture with even soil texture (loam); rich fertile soil on level ground, associated with cultural fields (eg hay or pasture), and forest glades and edges.
- Mesic Tallgrass Prairie- Restricted to the southern most regions, mesic prairies support a greater diversity of tallgrass plant species through richer, slightly wetter soils than dry prairies.

- **Seed Type**

Each seed is adapted in a different way to disperse, and it is sometimes useful to consider their size and shape. For example, seeds of very different sizes or shapes do not mix evenly and will flow through machinery at different rates. Seeds of different sizes and shapes may need to be planted at different depths in order to germinate optimally. Fluffy seeds are simply those where the pappus and chaff are difficult to separate from the seed, and therefore the restoration product might contain a large proportion of extrafloral parts, making it difficult to mix and spread evenly with other species. Another example would be grass seeds that often come with all or part of their awns still intact, this can cause issues with flow in mechanical applications and will not mix evenly with fine wildflower seeds. Furthermore, the difference in size between Blue Lobelia and Green Coneflower seeds is several orders of magnitude, so the smaller seed settles to the bottom of the mix very easily and will flow out of equipment fast than the larger seed, and therefore be applied to a smaller area.

- **Seeds/Gram**

This is a straightforward indication of the size of the seed, and in some ways a reflection of the density/thickness of the seed coat. Typically, wildflowers will have very small, fine seeds, but rushes and some grasses can also have very small, fine seeds, and therefore a high number of seeds per gram. For consistency, we've used seed weights derived from Prairie Moon Nursery in Minnesota (<https://www.prairiemoon.com/>). Seed weight is known to vary by region, year, and age of stand/crop. These are representative values, and seed mass may vary slightly from what is reported here. In future, we would like to cross-reference all weights with additional references and observations.

- **Seeds/Kilogram**

This is another simple extension of the seed/gram column just to serve as a handy reference for project managers switching back and forth from thinking about kg/ha to seed size and total seeding rate (seeds/metre).

- **Estimated Price/Kilogram (individual species)**

These estimates do not reflect the prices offered by any business or supplier at this time and are based solely on numerous seed mixes quotes from different suppliers (including US suppliers) over the past ten years. This is to help with project planning alone and should not be used to provide quotes for clients or grant applications. Contact your local native seed supplier, a list is provided at the end of this manual.

2.3 Calculator Output

- **Seeds/Metre**

The number of individual seeds per metre, listed for every species

- **Kilograms/Metre**

Seed weight(kg) times the number of individual seeds per metre, for each species

- **Kilograms/Hectare**

Seed weight(kg) for 10,000m² for each species

- **Total Kilograms/Hectare**

Sum of seed weight(kg) per hectare, this should be the same for all species, see Troubleshooting if you encounter a calculation error.

- **Grams/Kilogram (Mix Ratio)**

Individual species weights per kilogram of the specified custom mix; a 'recipe' for suppliers who typically provide seed by weight rather than by number.

- **Price Estimate/Hectare**

A rough price-point for gauging the cost of direct-seeded restoration options and contrasting species with different sized seeds or life history traits as substitutions.

*Seed prices vary between suppliers, anticipate differences in the estimate that the calculator provides and the estimate that the seed supplier will provide.

- **Price Estimate/Kilogram**

A rough price-point for gauging the cost of direct-seeded restoration options and contrasting species with different sized seeds or life history traits as substitutions.

*Seed prices vary between suppliers, anticipate differences in the estimate that the calculator provides and the estimate that the seed supplier will provide.

3.0 Troubleshooting

1. It is easy to make sorting errors in excel. Please make sure you select all columns within the rows you are resorting. We do not recommend restoring or removing any columns at this time.
2. Adding or removing rows can sometimes cause errors in the calculation. This does not happen when sorting, just adding or deleting rows. So, if you want to add a species, or remove species from the list, make sure to double check that the values in Total Kilograms/Hectare (Column P) are identical to each other, and equal the sum of individual Kilograms/Hectare (end of Column O, highlighted in orange). If they are not the same, change all values in Column P to say "a"; next, highlight this row, and using the Find/Replace function, replace all cells with "a" to "=O120" (or the last cell of Column O, representing the sum of that column, which is O122 in the full dataset, Calculator Version 3.0).

4.0 References Cited

Bradley, David J. (2013) Southern Ontario Vascular Plant Species List 3rd Edition. Southern Science & Information Section Ontario Ministry of Natural Resources Peterborough, Queen's Printer for Ontario

Brunton, D. F. (2005). Flora of Ottawa Brunton. Urban Natural Areas Environmental Evaluation Study: Final Report. Environmental Management Division, City of Ottawa. M. E. P. a. B. C. Services. Ottawa: 119.

Crins, William J., Paul A. Gray, Peter W.C. Uhlig, and Monique C. Wester. 2009. The Ecosystems of Ontario, Part I: Ecozones and Ecoregions. Ontario Ministry of Natural Resources, Peterborough Ontario, Inventory, Monitoring and Assessment, SIB TER IMA TR- 01, 71pp.

Oldham, M. (2017). List of the Vascular Plants of Ontario's Carolinian Zone Peterborough, ON, Carolinian Canada and Ontario Ministry of Natural Resources and Forestry: 132.

White, D. J. (2016). Plants of Lanark County. <http://www.lanarkflora.com/plantlist.html>.

Appendix 1- Species List: Native Grassland & Meadow Plants for Direct Seeding in Southern Ontario

Species	Scientific Name	Plant Type	Habitat Type
White Yarrow	<i>Achillea millefolium var occidentalis</i>	Forb	Mesic/Meadow
Purple/Anise Hyssop	<i>Agastache foeniculum</i>	Forb	Dry/Prairie-Alvar
Yellow Hyssop	<i>Agastache nepetoides</i>	Forb	Dry/Prairie-Alvar
Nodding Onion	<i>Allium cernuum</i>	Forb	Dry/Prairie-Alvar
Leadplant	<i>Amorpha canescens</i>	Forb	Mesic/Tallgrass Prairie
Big Blue Stem	<i>Andropogon gerardii</i>	Grass	Dry/Prairie-Alvar
Canada Anemone	<i>Anemone canadensis</i>	Forb	Wet/Lowland
Thimbleweed	<i>Anemone virginiana</i>	Forb	Dry/Prairie-Alvar
Wild Columbine	<i>Aquilegia canadensis</i>	Forb	Dry/Prairie-Alvar
Swamp Milkweed	<i>Asclepias incarnata</i>	Forb	Wet/Lowland
Sullivant's Milkweed	<i>Asclepias sullivantii</i>	Forb	Mesic/Tallgrass Prairie
Common Milkweed	<i>Asclepias syriaca</i>	Forb	Mesic/Meadow
Butterflyweed	<i>Asclepias tuberosa</i>	Forb	Dry/Prairie-Alvar
Whorled Milkweed	<i>Asclepias verticillata</i>	Forb	Dry/Prairie-Alvar
Canada Milkvetch	<i>Astragalus canadensis</i>	Forb	Dry/Prairie-Alvar
Wild Indigo	<i>Baptisia tinctoria</i>	Forb	Mesic/Meadow
Side Oats	<i>Bouteloua curtipendula</i>	Grass	Dry/Prairie-Alvar
Fringed Brome	<i>Bromus ciliatus</i>	Grass	Mesic/Meadow
Kalms Brome	<i>Bromus kalmii</i>	Grass	Dry/Prairie-Alvar
Gold Fruited Sedge	<i>Carex aurea</i>	Sedge	Wet/Lowland
Bebbs Sedge	<i>Carex bebbii</i>	Sedge	Wet/Lowland
Fringed Sedge	<i>Carex crinita</i>	Forb	Wet/Lowland
Grain Sedge	<i>Carex granularis</i>	Sedge	Wet/Lowland
Porcupine Sedge	<i>Carex hystericena</i>	Sedge	Wet/Lowland
Hops Sedge	<i>Carex lupulina</i>	Sedge	Wet/Lowland
Fox Sedge	<i>Carex vulpinoidea</i>	Sedge	Wet/Lowland
New Jersey Tea	<i>Ceanothus americanus</i>	Shrub	Dry/Prairie-Alvar
Turtle Head	<i>Chelone glabra</i>	Forb	Wet/Lowland
Field Thistle	<i>Cirsium discolor</i>	Forb	Mesic/Meadow
Swamp Thistle	<i>Cirsium muticum</i>	Forb	Wet/Lowland
Lance Leaved Coreopsis	<i>Coreopsis lanceolata</i>	Forb	Dry/Prairie-Alvar
Tall Coreopsis	<i>Coreopsis tripteris</i>	Forb	Mesic/Tallgrass Prairie
Grey Dogwood	<i>Cornus racemosa</i>	Shrub	Mesic/Meadow
Red Opiser Dogwood	<i>Cornus sericea</i>	Shrub	Wet/Lowland
Poverty-Oat-Grass	<i>Danthonia spicata</i>	Grass	Mesic/Meadow
Showy Tick-trefoil	<i>Desmodium canadense</i>	Forb	Mesic/Meadow

Panicled Tick Trefoil	<i>Desmodium paniculatum</i>	Forb	Dry/Prairie-Alvar
Flat Topped Aster	<i>Doellingeria umbellata</i>	Forb	Wet/Lowland
Tall Cinquefoil	<i>Drymocallis arguta</i>	Forb	Dry/Prairie-Alvar
Pale Purple Coneflower	<i>Echinacea pallida</i>	Forb	Mesic/Tallgrass Prairie
Canada Rye	<i>Elymus canadensis</i>	Grass	Dry/Prairie-Alvar
Bottle Brush Rye	<i>Elymus hystrix</i>	Grass	Mesic/Meadow
Riverbank Rye	<i>Elymus riparius</i>	Grass	Mesic/Meadow
Slender Wheat	<i>Elymus trachycaulis</i>	Grass	Dry/Prairie-Alvar
Silky Rye	<i>Elymus villosus</i>	Grass	Mesic/Meadow
Virginia Rye	<i>Elymus virginicus</i>	Grass	Mesic/Meadow
Weigand's Rye	<i>Elymus weigandii</i>	Forb	Mesic/Meadow
Joe Pye Weed	<i>Euotrichum maculatum</i>	Forb	Wet/Lowland
Boneset	<i>Eupatorium perfoliatum</i>	Forb	Mesic/Meadow
Grass Leaved Goldentop	<i>Euthamia graminifolia</i>	Forb	Mesic/Meadow
Bottle Gentian	<i>Gentiana andrewsii</i>	Forb	Wet/Lowland
Reed Manna Grass	<i>Glyceria grandis</i>	Grass	Wet/Lowland
Fowl Mana Grass	<i>Glyceria striata</i>	Grass	Wet/Lowland
Sneezeweed	<i>Helenium autumnale</i>	Forb	Wet/Lowland
Woodland Sunflower	<i>Helianthus divaricatus</i>	Forb	Dry/Prairie-Alvar
Giant Sunflower	<i>Helianthus gigantea</i>	Forb	Mesic/Tallgrass Prairie
Pale Leaved Sunflower	<i>Helianthus strumosus</i>	Forb	Dry/Prairie-Alvar
Sweet Oxeye	<i>Heliopsis helianthoides</i>	Forb	Mesic/Meadow
Swamp Rose Mallow	<i>Hibiscus moscheutos</i>	Forb	Wet/Lowland
Great St Johns Wort	<i>Hypericum ascyron</i>	Forb	Wet/Lowland
Spotted Jewelweed	<i>Impatiens capensis</i>	Forb	Wet/Lowland
Blue Flag	<i>Iris versicolor</i>	Forb	Wet/Lowland
Southern Blue Flag	<i>Iris virginiana</i>	Forb	Wet/Lowland
Stoft Stemmed Rush	<i>Juncus effuses</i>	Rush	Wet/Lowland
Rice Cutgrass	<i>Leersia oryzoides</i>	Grass	Wet/Lowland
Bushclover	<i>Lespedeza capitata</i>	Forb	Dry/Prairie-Alvar
Round Leaved Bushclover	<i>Lespedeza hirta</i>	Forb	Dry/Prairie-Alvar
Dwarf Blazing Star	<i>Liatris cylindracea</i>	Forb	Dry/Prairie-Alvar
Rough Blazing Star	<i>Liatris aspera</i>	Forb	Mesic/Tallgrass Prairie
Dense Blazing Star	<i>Liatris spicata</i>	Forb	Mesic/Tallgrass Prairie
Cardinal Flower	<i>Lobelia cardinalis</i>	Forb	Wet/Lowland
Blue Lobelia	<i>Lobelia siphilitica</i>	Forb	Wet/Lowland
Blue Lupine	<i>Lupinus perrenis</i>	Forb	Dry/Prairie-Alvar
Monkey Flower	<i>Mimulus ringens</i>	Forb	Wet/Lowland
Scarlet Bee Balm	<i>Monarda didyma</i>	Forb	Dry/Prairie-Alvar
Wild Bergamot	<i>Monarda fistulosa</i>	Forb	Mesic/Meadow
Spotted Bee Balm	<i>Monarda punctata</i>	Forb	Mesic/Meadow
Evening Primrose	<i>Oenothera biennis</i>	Forb	Mesic/Meadow

Gaura Primrose	<i>Oenothera gaura</i>	Forb	Mesic/Meadow
Switchgrass	<i>Panicum virgatum</i>	Grass	Dry/Prairie-Alvar
Smooth Beardtongue	<i>Penstemon digitalis</i>	Forb	Mesic/Meadow
Hairy Pink Beardtongue	<i>Penstemon hirsutus</i>	Forb	Dry/Prairie-Alvar
Obedient Plant	<i>Phytostegia americana</i>	Forb	Mesic/Meadow
Marsh Bluegrass	<i>Poa palustris</i>	Grass	Wet/Lowland
Canada Plum	<i>Prunus nigra</i>	Shrub	Mesic/Meadow
American Plum	<i>Prunus americana</i>	Shrub	Mesic/Meadow
Virginia Mountain Mint	<i>Pycnanthemum virginiana</i>	Forb	Mesic/Meadow
Grey Coneflower	<i>Ratibida pinnata</i>	Forb	Mesic/Tallgrass Prairie
Brown Eyed Susan	<i>Rudbeckia hirta</i>	Forb	Mesic/Meadow
Green Coneflower	<i>Rudbeckia laciniata</i>	Forb	Mesic/Meadow
Little Blue Stem	<i>Schizachyrium scoparium</i>	Grass	Dry/Prairie-Alvar
Dark Fruited Rush	<i>Scirpus atrovirens</i>	Rush	Wet/Lowland
Woolgrass	<i>Scirpus cyperinus</i>	Rush	Wet/Lowland
Senna	<i>Senna hebecarpa</i>	Forb	Mesic/Tallgrass Prairie
Compass Plant	<i>Silphium laciniatum</i>	Forb	Mesic/Tallgrass Prairie
Cup Plant	<i>Silphium perfoliatum</i>	Forb	Mesic/Tallgrass Prairie
Prairie Dock	<i>Silphium terebinthinaceum</i>	Forb	Mesic/Tallgrass Prairie
Canada Goldenrod	<i>Solidago canadensis</i>	Forb	Mesic/Meadow
Early Goldendrod	<i>Solidago juncea</i>	Forb	Dry/Prairie-Alvar
Grey Goldenrod	<i>Solidago nemoralis</i>	Forb	Dry/Prairie-Alvar
Upland White Goldenrod	<i>Solidago ptarmicoides</i>	Forb	Dry/Prairie-Alvar
Rough Goldenrod	<i>Solidago rugosa</i>	Forb	Wet/Lowland
Savannah Grass	<i>Sorghastrum nutans</i>	Grass	Dry/Prairie-Alvar
Prairie Cord Grass	<i>Spartina pectinata</i>	Grass	Wet/Lowland
Sand Dropseed	<i>Sporobolus cryptandrus</i>	Grass	Dry/Prairie-Alvar
Prairie Dropseed	<i>Sporobolus heterolepis</i>	Grass	Dry/Prairie-Alvar
Panicled/Lance Aster	<i>Symphiotrichum lanceolatum</i>	Forb	Mesic/Meadow
Swamp Aster	<i>Symphiotrichum puniceus</i>	Forb	Wet/Lowland
Heath Aster	<i>Symphyotrichum ericoides</i>	Forb	Dry/Prairie-Alvar
Smooth Aster	<i>Symphyotrichum laeve</i>	Forb	Dry/Prairie-Alvar
New England Aster	<i>Symphyotrichum novae-angliae</i>	Forb	Mesic/Meadow
Sky Blue Aster	<i>Symphyotrichum oolentangiense</i>	Forb	Dry/Prairie-Alvar
Arrow Aster	<i>Symphyotrichum urophyllum</i>	Forb	Dry/Prairie-Alvar
Tall Meadow Rue	<i>Thalictrum pubescens</i>	Forb	Mesic/Meadow
Cattail	<i>Typha latifolia</i>	Forb	Wet/Lowland
Blue Vervain	<i>Verbena hastata</i>	Forb	Wet/Lowland
Slender Vervain	<i>Verbena simplex</i>	Forb	Dry/Prairie-Alvar
Hoary Vervain	<i>Verbena stricta</i>	Forb	Dry/Prairie-Alvar
White Vervain	<i>Verbena urticifolia</i>	Forb	Mesic/Meadow

Ironweed	<i>Vernonia missourica</i>	Forb	Mesic/Tallgrass Prairie
Culvers Root	<i>Veronicastrum virginicum</i>	Forb	Mesic/Tallgrass Prairie
Golden Alexanders	<i>Zizia aurea</i>	Forb	Wet/Lowland