Seed Mix Guideline

Appropriate seed mixes should be specified to stabilize and restore disturbed soils. Sod is not acceptable within Reforestation, Restoration, or Naturalization Planting Areas, including (but not limited to) Vegetation Protection Zones (VPZ's or mVPZ's), Minimum Areas of Influence (MAI), and along trails in natural areas. Annual cover/nurse crops shall be included with all permanent native seed mixtures to establish quick vegetative cover, prevent erosion and maintain soil moisture, and minimize the establishment of opportunistic weeds and invasive species.

The following are recommended for selection of seed mixes:

a) Seed mixes must consist of only native species that are suitable to the local soil (including texture, fertility, pH, and organic matter content), moisture regime, and light conditions. Species should be compatible and complementary to the existing adjacent natural vegetation communities. Proposed percentages for each species in the mix should be provided.

b) Consideration should be given to the land-use adjacent to the area to be restored. For example, if the proposed seed mix is going to be implemented along a trail or sidewalk that is subject to winter maintenance with salt, salt-tolerant species should be incorporated in the seed mix. Similarly, if the proposed seed mix will be implemented in a ditch, along a road or in other heavily impacted area, the resilience ("toughness") of the seed mix may be an important consideration in determining the seed mix composition.

c) In addition to the native seed mix, a nurse crop shall be added to every seeding application – to aid in the quick stabilization, and establishment of erosion and weed control.

d) Temporary mix shall be used when temporary erosion control is needed. For example, to stabilize temporary stockpiles, temporary construction ditches, or when a portion of the site needs to be stabilized between phases of construction which occur over multiple growing seasons.

e) Local source native seed is preferred. Otherwise purchasing native seed as close to the same seed zone as the site is preferred.

f) Cultivars, nativars, and invasive species are not acceptable in proposed seed mixes or as proposed nurse/cover crops. Exotic species are not acceptable in permanent seed mixes.

a. Recommended Methods

Terraseeding
A calibrated mixture of seed and composted soil (or other growing media) that is applied onto bare soil surfaces with a blower truck. The mixture also is recommended to incorporate any additives to improve vegetation growth, such as mycorrhizal fungi inoculant. A minimum 50mm depth is required regardless of grades.

Hydroseeding
A slurry containing seed, mulch, water and often a tackifier, stored in a tank and sprayed onto the soil surface using a hose. The mixture also is recommended to incorporate any additives to improve vegetation growth, such as mycorrhizal fungi. If no tackifier was included, the use of additional erosion protection (e.g. rolled erosion control products or straw or other mulch layer) until soil is established is required.

b. Timing

i. Consideration of the timing of various seeding types is necessary to ensure successful germination and establishment of ground cover. Seeding shall be completed at the most appropriate time of year for each

seeding type. Ensure proposed timing of seeding works is clearly indicated and noted on submitted plans. Table 1, below, outlines the appropriate widows to plant various seeding types based on best practices.

a. For turf/temporary mixes: April 15th to October 15th, avoiding peak summer months. Late spring (April to mid-June) is ideal seeding time during drier conditions.
b. For native/wildflower mixes: Fall (September to November) is best for mixes which require a cold dormancy/stratification period unless cold stratified seed is supplied, in which case spring application may apply

Table 1: Optimal and Suboptimal Seeding Periods

	March	April	May	June	July	August	September	October	November
Seeding		Nurse Crop							
	Dormant Native Grass Seeds								
	Dormant Wildflower Seeds								
		Temporary Seed Mixes							

Optimal time for planting | Sub-optimal time for planting | Optimal time for planting **cold stratified seeds only**

ii. Seeding should not be executed during drought conditions (i.e. typical season occurs mid-June through mid-August), unless adequate irrigation can be supplied. Caution should be exercised when proposing seeding during periods when risk of freezing is high soon after germination.

iii. Works occurring during the late fall and winter months (November 1st to March 30th) should specify interim soil stabilization measures to secure the site during the spring freshet. Additional seeding might be required in the following growing season.

iv. All disturbed areas should be seeded as soon as possible following the completion of works in each area. Erosion controls must remain in place until seeding has sufficiently stabilized the site (80% cover).

v. If germination is not anticipated during the same growing season when seeding was carried out, additional erosion control measures (e.g. rolled erosion control products) are required to provide interim stabilization until vegetation is visible. If rolled erosion control products are being proposed, they should be made of 100% natural fibers (no polypropylene layer/matting). Photodegradable products are not permitted.

vi. Avoid non-woven plastic mesh products as these can present a serious hazard to wildlife which may become fatally entangled in it.

vii. When preparing a landscape plan for seeding works each plan should:
   a. Indicate a contingency plan for if works cannot be completed immediately after construction.
   b. Include notes on required monitoring and maintenance should works be completed during sub-optimal periods.

c. Application Rate

Native seed mixes should be applied at a rate of 22 - 25 kg/ha (21-23 lbs/acre) or at a rate of 250g/90 sq. m. (1/2lb/1000 sq. ft) for smaller areas.

Temporary seed mixes should be applied at a rate of 100 kg/ha (90 lbs/acre).

d. Recommended Seed Mixes

1. Early Succession Wet Meadow Mix

Apply to SWM Pond between NWL & five-year storm event, Greenway Corridor/ Channel creek bank and pocket wetland

Botanical Name	Common Name	% of Mix
Carex bebbii	Bebb's Sedge	5%
Carex stipata	Stalk-grain Sedge	4%
Carex vulpinoidea	Fox Sedge	25%
Elymus virginicus	Virginia Wild Rye	25%
Glyceria grandis	Tall Mannagrass	2%
Juncus effusus	Soft Rush	5%
Juncus tenuis	Path Rush	3%
Lobelia siphilitica	Great Blue Lobelia	1%
Monarda fistulosa	Wild Bergamot	1%
Poa palustris	Fowl Bluegrass	25%
Solidago canadensis	Canada Goldenrod	2%
Symphyotrichum novae-angliae (formerly *Aster novae-angliae*)	New England Aster	1%
Symphyotrichum puniceum (formerly *Aster puniceus*)	Purple-stemmed Aster	1%
		100%

2. Seasonally Flooded (Semi Moist) Mix

Apply to SWM Pond above five-year storm event, Greenway Corridor/ Channel floodplain

Botanical Name	Common Name	% of Mix
Carex vulpinoidea	Fox Sedge	30%
Elymus virginicus	Virginia Wild Rye	30%
Glyceria striata	Fowl Manna Grass	2%
Juncus tenuis	Path Rush	8%
Poa palustris	Fowl Bluegrass	30%
		100%

3. Upland Native Meadow Mix

Greenway corridor/ channel slope and buffer, Woodland/ Valleyland buffer and Restoration Areas

Botanical Name	Common Name	% of Mix
Anemone canadensis	Canada Anemone	1%
Asclepias syriaca	Common Milkweed	2%
Carex granularis	Meadow/Open Field Sedge	15%
Clematis virginiana	Virgins Bower	1%
Elymus riparius	Riverbank Wild Rye	40%
Euthamia graminifolia	Grass-leaved Goldenrod	1%
Monarda fistulosa	Wild Bergamot	1%
Oenethera biennis	Evening Primrose	25%
Rudbeckia hirta	Black-eyed Susan	10%
Solidago canadensis	Canada Goldenrod	2%
Symphyotrichum novae-angliae (formerly *Aster novae-angliae*)	New England Aster	1%
Symphyotrichum cordifolium (formerly *Aster cordifolius*)	Blue Wood (Heart-leaved Aster)	1%
		100%

4. Temporary Mix

To be used to stabilize short term exposed or disturbed soils such as interim condition stormwater management facilities, ditch lines, swales, and fill/soil piles, park base requirement

Botanical Name	Common Name	% of Mix
Agrostis stolonifera	Creeping Bent Grass	25%
Avena sativa	Annual Oats	25%
Carex granularis	Meadow/Open Field Sedge	5%
Elymus canadensis	Canada Wild Rye	25%
Schizachyrium scoparuim	Little Bluestem	20%
		100%

e. Cover Crop

A cover crop should be utilized for all permanent seed mixes. The cover crop will act as a nurse crop, provide short term erosion control and weed control.

Application Rate

The cover crop should be applied at rate of 22kg/ha (20lbs/acre).

Acceptable Species

The appropriate time of sowing nurse crop depends on the species and its hardiness to frost.
Confirmation of the appropriate nurse crops should be provided once the timing of works has been determined.

Botanical Name	Common Name	Hardiness
Avena sativa	Common Oats	Winter Kill
Agrostis stolonifera	Creeping Bent Grass	Winter Hardy
Cosmos bipinnatus	Cosmos*	Winter Kill
Elymus canadensis	Canada Wild Rye	Winter Hardy
Elymus virginicus	Virginia Wild Rye	Winter Hardy
Fagopyrum esculentum	Buckwheat	Winter Kill
Festuca rubra	Red Fescue	
Hordeum vulgare	Barley	Winter Kill
Panicum miliaceum	White Millet	
Secale cereale	Rye	Winter Hardy

Note* Can be used as a wildflower nurse crop for planting in public areas and supports pollinator species.

Unacceptable Species

Annual Rye (*Lolium multiflorum*) should not be used as a nurse crop. Recent research indicates that Annual Rye can inhibit the growth of other species thereby hindering the establishment of native vegetation. It can also be confused with and potentially hybridize with Perennial Rye *(Lolium perenne*).

f. Additional Considerations

Seed/Sod Mat/Soil Salvage

Prior to construction, collect any suitable native seeds, sod mats or soil present. When development projects will take several years to complete, harvest and store local seed for post-construction rehabilitation. Depending on the extent of

disturbance, the seeds harvested from these areas will likely be suitable for the conditions of the area once works are complete. Exercise care when stratifying the seeds to maintain viability during the storage period.

Where sod mats are salvaged, care must be taken to select mats that are clear of extensive invasive/exotic species growth.

Edge Plantings

Include thorny species, such as raspberries, blackberries and hawthorns, in the perimeter vegetation screen of natural area plantings to help deter encroachment and trampling by people, pets and certain types of wildlife.

Establishing Long-term Native Cover

When creating a seed mix, consider including seeds that will germinate immediately the following growing season (nurse crop) and in three to five years. Keep in mind that some native seeds are hard to grow and may not bloom within the two-year warranty and monitoring period. For example, *Impatiens spp*. seeds undergo a double dormancy and may not grow until two to three years after seeding.

Peat Moss

Avoid using peat moss as it is a non-renewable resource. Its harvest damages the wetlands it is removed from, making its use unsustainable. Where organic content of soil needs to be amended, alternatives can include coir mulch, compost, fine-textured wood mulch or leaf mulch.

Mycorrhizal Fungi

The application of mycorrhizal fungi in permanent seed mixes is highly encouraged to promote healthy soils and establishment of ground cover. Mycorrhizal fungi have a symbiotic relationship with plants and can enhance the amount of water and nutrients plant roots are able to absorb, while contributing to soil structure. Several mycorrhizae products and commercially available and should be selected based on suitability to the seeding application method and type. Direct seed inoculation is recommended immediately prior to seeding application. Refer to manufacturer's specifications for inoculation recommendations.