

SECTION 4

MEADOWS AND GRASSLANDS

4.1 SITE CHARACTERISTICS AND TYPICAL PLANT ASSOCIATIONS

A meadow is a naturally vegetated, abandoned agricultural field or other open area with relatively fertile soil and less than 50% woody ground cover or 25% tree crown cover.

Three broad types of meadows can be distinguished, depending on the successional stage or the amount of woody vegetation present:

- ♦ grasslands;
- ♦ brushy grassland or scrubland;
- ♦ shrubland.



Grasslands

Grasslands are meadows in the early stage of succession. They are typically covered with old stumps, matted grasses, rock piles, a variety of seed-bearing herbs and grasses.

If woody vegetation is not controlled, in about 10 to 25 years the grassland will develop into the next successional stage.



Brushy grassland or scrubland

A meadow in an intermediate stage of succession (i.e., 15-30% woody ground cover, less than 25% crown cover of trees) is sometimes called brushy grassland or scrubland.



Brushy grassland typically includes a variety of shrubs, matted vegetation, herbs, tangles of grapevines and creepers, and raspberry clumps.

If woody vegetation is not controlled, in about 10 to 25 years the brushy grassland will develop into shrubland.

Shrubland

A meadow in a late stage of succession (sometimes called shrubland) has 30-50% woody plant coverage with shrubs being dominant, and tree crown coverage less than 25%.



These types of meadows include a variety of shrubs of different heights, entwined with vines, overgrown raspberry canes, interspersed with a variety of herbs and grasses, and much matted vegetation.

Plant associations for the different types of meadows vary, but typically include various proportions of plants

that may be woody, grass-like or herbaceous; native (indigenous to the area) or introduced (opportunistic plants usually indigenous to Europe, Asia or distant parts of North America).

Some typical meadow species are listed in the following table.

MEDIUM HEIGHT GRASSES (mostly introduced)	HERBS (both native and introduced)	SCATTERED WOODY PLANTS (both native and introduced)
smooth brome (I)	goldenrod (N)	hawthorns (N, I)
timothy (I)	teasel (I)	buckthorns (I)
orchard grass (I)	asters (N)	poplars (N)
redtop (I)	dandelion (I) milkweeds (N)	dogwoods (N)
reed canary grass (N) (in moist areas)	clovers (I)	raspberries (N, I)
Kentucky bluegrass (I)	plantains (I)	elms (N)
		apple (I)

Plant composition in a meadow is variable, with fertile soil on level ground often alternating with patches of sandy or stony soil on dry hillsides. These are colonized by species such as Canada bluegrass, staghorn sumac, hawkweeds, grey goldenrod and heath aster, and wet pockets sustaining sedges, rushes and grasses.



A hedgerow "invading" an old field.

The species present will depend mostly on how long the field has been left undisturbed, but other factors include:

- what the field was used for before (e.g., fields used for crops may have tile drains and residuals of herbicides and pesticides, hayfields have a high cover of grasses);
- what the surrounding vegetation is like;
- soil characteristics and surface water patterns.

Caution

Seek expert opinion if:

- *prairie or other rare plant communities have been identified on the site;*
- *the site contains any of the prairie/savannah indicators listed in the Appendix;*
- *the site is sandy, with little woody vegetation and no history of disturbance;*
- *the site is on thin soil over bedrock, with little history of disturbance.*

4.2 DESIGN CONSIDERATIONS

Before you start

Review the constraints and biophysical conditions of the site:

- what is the current vegetation cover?
- is it too dense for meadow species to become established?
- what are the soil characteristics, depth, moisture levels, and fertility levels?
- are there noxious weeds that may be a concern?
- is the site located in an urban area or in a more natural or rural setting?
- what will the public perception of a meadow be?
- is there a need for public education?

Restoration goals can be flexible because meadow communities are variable and change over time. Often, the objective for creating meadow is to attract wildlife. The species of wildlife will depend on stage of succession, size of meadow, surrounding vegetation, the presence of other habitat elements like nest sites, concealment cover, etc.

Meadows often contain numerous wildflowers. While introduced species frequently form a large component, native species usually hold their own. Eradication of introduced species will likely be both unnecessary and undesirable.

Meadows are among the easiest communities to establish, and a natural succession process may be the only requirement. Plants are widely available from commercial nurseries or from other meadow sites.

POTENTIAL DIFFICULTIES	POTENTIAL SOLUTION
<ul style="list-style-type: none"> Public acceptance can be difficult to achieve in some urbanized surroundings. 	<ul style="list-style-type: none"> Increase public acceptance by signage, interpretation, planting colourful species; adding elements to create interest such as benches, well-marked paths. Create well-defined edges; border with shrubs, mow borders.
<ul style="list-style-type: none"> Bird and larger mammal use is low if grassland is small (less than 20 ha); however, even small grasslands can create additional habitat for insects and small mammals. They can be used as foraging areas by insect- and mammal-eating birds. 	<ul style="list-style-type: none"> Increase wildlife use by planting or retaining trees or shrubs on the periphery or in discrete groups, so as not to change the "grassland" character. Add habitat elements such as ponds, rock piles, logs, sand piles.
<ul style="list-style-type: none"> If the grassland is to be retained, woody species must be removed. 	<ul style="list-style-type: none"> Selective removal of undesired species
<ul style="list-style-type: none"> Some species are highly invasive (e.g., buckthorns) and will quickly change the character of the grassland if not controlled. 	<ul style="list-style-type: none"> Selective removal of undesired species
<ul style="list-style-type: none"> A number of species come under the 1974 Weed Control Act. Some can cause injury to people (e.g., poison ivy), some are responsible for hay fever (e.g., ragweed), and some can cause crop diseases (e.g., common barberry). In the great majority of urban and rural situations, however, most of these weed species should be seen as an important part of the grassland community, attracting birds, insects, and butterflies. 	<ul style="list-style-type: none"> Selective removal of undesired species

Trade-offs

- There will be trade-offs, depending on which stage of succession is present. As succession proceeds, some wildlife species will leave and others will appear.
- If a certain stage of succession is to be retained, meadow vegetation must be managed (i.e., removal of woody vegetation by mowing, burning, etc.).

Wildlife Species Found in Grasslands and Shrublands

Different types of meadows provide opportunities for different wildlife species. Before beginning a restoration project, evaluate which species may benefit.

Cultivated hayfields or pastures have little concealment cover such as matted stems of previous years' growth, variety of seed-bearing plants, old stumps, and scattered woody vegetation. A greater density of matted vegetation will attract a greater variety of wildlife. Two or three years after a field is abandoned, there is generally enough concealing cover to attract voles and ground-nesting birds.

Heavily matted vegetation in brushy grasslands attracts many wildlife species. More nest sites are offered by shrubs and small trees, clumps of raspberries, grapevines and shrubs.



Shrubland wildlife is attracted not only to taller bushes, but also to the greater shelter and litter associated with woody cover. The diversity of concealing vegetation is most important, e.g., raspberry patches; tangles and thickets where grapevines or creepers entwine shrubs and grasses; matted herbs and grasses that can provide tunnels for

mice; decaying logs and rock piles which provide habitat for reptiles and amphibians.

Potential Wildlife Species in Different Types of Meadows in the Greater Toronto Bioregion

SPECIES	GRASSLANDS	BRUSHY GRASSLAND	SHRUBLAND
<i>BIRDS</i>			
Canada Goose	x		
Mallard	x		
Blue-Winged Teal	x		
* Northern Harrier	x	x	
Common Snipe	x	x	
* Upland Sandpiper	x		
Morning Dove		x	x
* Short-Eared Owl	x		
Willow Flycatcher		x	x
Eastern Kingbird		x	x
Blue Jay			x
House Wren			x

American Robin		x	x
Gray Catbird		x	x
Brown Thrasher		x	x
Cedar Waxwing		x	x
Golden-Winged Warbler		x	
Blue-Winged Warbler		x	x
Yellow Warbler		x	x
Chestnut-Sided Warbler		x	x
Northern Cardinal			x
Indigo Bunting			x
Field Sparrow		x	x
Savannah Sparrow	x		
Grasshopper Sparrow	x		
Song Sparrow		x	x
Bobolink	x		
Red-Winged Blackbird	x	x	
Eastern Meadowlark	x		
American Goldfinch		x	x
MAMMALS			
Short-Tailed Shrew	x	x	
Eastern Cottontail		x	x
Eastern Chipmunk			x
Woodchuck	x	x	x
Deer Mouse	x	x	x
Meadow Vole	x	x	
Meadow Jumping Mouse	x		
Coyote	x	x	x
Red Fox	x	x	x
White-Tailed Deer	x	x	x

* Species that require extensive (>20 ha) habitat

4.3 RESTORATION OPTIONS AND TECHNIQUES

Existing meadows

A wide variety of species can be planted in existing meadows in order to achieve the appropriate stage of grassland, to enhance public acceptance or to attract wildlife. The following table shows some considerations when planting a meadow.

CAVEATS

- Even though introduced species are common in meadows, it may be best when planting to stick to natives to avoid the risk of introducing highly invasive plants. Introduced species will, nonetheless, soon colonize the area.
- Obtain plants from nearby sources. Species should be common and easily obtainable, and there may be no need to buy from nurseries.

COMMUNITY INVOLVEMENT

- Plant transfers are popular.
- Species that add colour and interest (without adding woody material) are most successfully established if dug from donor sources (areas to be developed) or other fields and roadsides; small holes will soon revegetate. These "plugs" can be planted directly into fields. They need very little maintenance after they have been watered.
- Seeds can be collected from nearby sources in fall, planted in a cold frame over winter (or cold treated for 6 weeks in a refrigerator), sown in pots, germinated, grown into hardy specimens that can then be planted. The community can be involved in growing plugs.

Reality Check

Is eliminating introduced species a realistic restoration objective?

Eradication of introduced species is not necessary or desirable in meadow restoration, because:

- introduced plants are an integral and persistent part of most old fields. They contribute to wildlife habitat and survive in balance with other vegetation;
- old fields often become increasingly dominated by native plants; the time frame required may be longer than is usually tolerated, but public attitudes are changing in this respect;
- introduced plants are well adapted to colonizing disturbed or open soil; many efforts to eradicate them only result in an influx of new ones.

If some introduced species are found to jeopardize the presence of desired wildlife or vegetation, their eradication should be considered (e.g., buckthorns can invade fields quickly; they eliminate old field vegetation, are considered unattractive, have marginal value as wildlife habitat, and are long lived).

Woody plant species to add colour, interest, attraction to wildlife:

- willow (*Salix sp.*)
- dogwood (*Cornus sp.*)

- Canada plum and pin cherry (*Prunus nigra* and *P. pensylvanica*)
 - raspberry (*Rubus sp.*)
 - hawthorn (*Crataegus sp.*)
 - Eastern white cedar (*Thuja occidentalis*)
 - poplar, aspen and cottonwood (*Populus sp.*)
 - nannyberry (*Viburnum lentago*)
 - Virginia creeper (*Parthenocissus sp.*)
 - wild grape (*Vitis sp.*)
 - ninebark (*Physocarpus opulifolius*)
- if planted in groves or clumps, grassland character can be retained. Woody vegetation must be controlled if this is the objective. Succession can be advanced by planting shrubs in a scattered pattern. Avoid planting in geometric rows;
 - if small enough, these plants can be dug from donor sites or fruits collected and sown in pots after appropriate treatment (refer to *Growing native woody plants from seed* by Henry Kock, the University of Guelph Arboretum);
 - native herb and grass species should be used in grasslands where the objective is to maintain the existing stage of succession. (See Appendix IV and V for list of native and introduced meadow species.)

Starting a meadow from scratch

Natural regeneration

Any area of bare soil will quite quickly become vegetated with pioneering species, usually a combination of old field herbs and grasses and tree species such as poplar, cedar, etc. Some areas, such as lawns sodded with commercial fescues and fertilized, and recently cultivated agricultural fields may take much longer to evolve into an old field (particularly if there is no seed source from adjoining areas). They will be dominated by aggressive species for most of that time.

Picture of a corn field or playing field.



If time is not a constraint, naturalization may be allowed to take its course.

Soil preparation and planting in fertile soil

Land occupied by crops or lawn can be:

- tilled every two weeks in spring to discourage the growth of introduced grasses or agricultural weeds;
- covered with black plastic or other mulch, which kills the existing vegetation.

Consider variations in the contours of a site that naturally form micro-habitats, with growing conditions suited to a wide variety of plants (i.e., wet depressions and drier hillsides).

Seeding

There are several methods for obtaining seed. The most accurate to ensure the widest variety of viable seed is to gather it ripe from individual plants by hand at the appropriate time of year. However, this method is costly, time consuming and requires expert knowledge. Seed can also be collected in the fall from an appropriate source with a combine, or from smaller fields with a seed stripper harvester, which is less damaging to the soil.

Seeds can be prepared (husked) before planting, but good results can also be obtained with unprepared seed. Sow the seed randomly over the site to "match" the greatest variety of species to the greatest variety of micro-habitats. Doing so before winter ensures they receive adequate cold treatment. Growth should be monitored, but objectives for this type of restoration should be somewhat flexible to take into account the length of time needed for a meadow to become established.

Meadow strips

"Sod" strips from an existing meadow can also be used to revegetate a site, creating natural results. Drawbacks to this methods include:

- the damage caused to the donor meadow (unless it is about to be converted to another use);

- ♦ the higher probability of a mismatch of sod species and the underlying soil.

However, the result is usually very close to a naturally vegetated meadow.

Sod can be obtained from appropriate donor sites with a sod peeler or sod hoe, which can strip large blocks that can then be transported on pallets to the site.

Topsoil application

Many old field seeds stay viable in the ground for decades. Topsoil spread over prepared soil can also be a seed source for a natural community. This method may be biased toward some introduced species, which have been found to have the longest viability.

By mixing in topsoil or fertilizing, soils of degraded habitat can be reconditioned. alternatively, species suited to impoverished soils may be planted, including those common in old fields or those characteristic of tall-grass prairies. (See Appendix VI for typical species found in meadows and tall-grass prairies.)

Natural succession

Natural succession, or the naturalization of maintained meadow, is being allowed to proceed in many parks and along roads throughout the city. Often, naturalization proves that fascinating, pleasing and diverse plant and animal communities can colonize areas on their own with no interference (as has occurred, for



example, in Tommy Thompson Park). Wildflowers have also been planted in many small sites throughout Metro Toronto. They are raised by a grower from seed collected by Metro Parks personnel and plugs are delivered for planting in the fall.

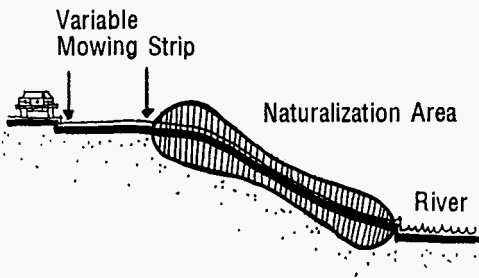
4.4 MANAGEMENT

Techniques for managing meadows mainly involve removing woody vegetation, depending on the successional stage required. In old fields—characteristically a mixture of introduced and native species—control of introduced species is seldom necessary.

A number of other management issues must be considered, however, particularly in urban parklands, parkways, and highway landscapes.

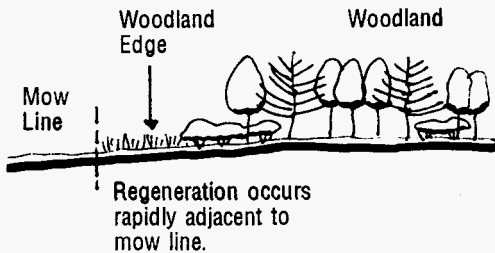
Urban mowing regimes

In urban areas, highly manicured parkland is coming under increasing public criticism as a sterile environment in which differences in sites are ignored, and where only a few exotic bird species thrive. It is also becoming increasingly costly to maintain, and is often hazardous to maintenance operators. The following problems frequently encountered in the field require practical solutions. They involve a variety of approaches to designing and managing turf and meadows to create visual interest, as well as habitat diversity.



Steep slopes

Mowing slopes of a 25% grade or more is a hazard to the operator and produces a poor turf due to slippage and erosion. Mowing should be discontinued and the slope planted with self-sustaining shrubs adapted to site conditions.

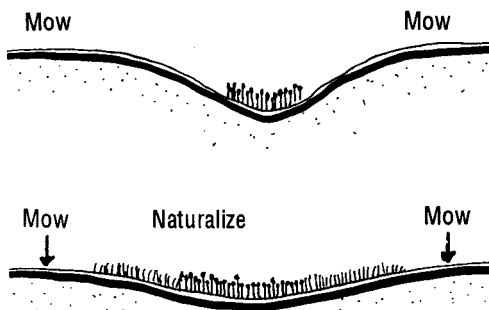


Significant natural areas

Mowing near natural areas can damage their ecological diversity and habitat. A buffer of 5 m to 10 m should be left unmown and allowed to naturalize.

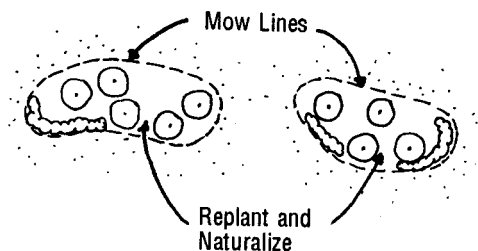
Wet areas of turf

Where turf areas are subject to spring floods and frequent rains, they are difficult to mow and produce poor turf. Alternatives include naturalization, replanting to woodland, or the development of small, possibly isolated, wetland communities.



Widely spaced trees in turf

The frequent incidence of trees maintained as individuals, disconnected from others, involves considerable handwork by small mowers. Such areas can be filled in with other plant materials to create bosques and wildlife habitat, with a new mowing line around them.



Dense tree groupings

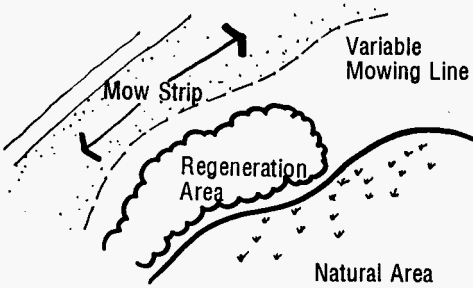
Turf under dense tree canopies is always difficult to keep in good condition. Mowing under trees should be discontinued to permit a natural groundcover and understorey to develop, either through naturalization or with restoration procedures. Where treed areas are used for picnicking or passive recreation, a new mowing regime that creates areas of maintained turf within a meadow environment can be introduced to accommodate both recreational activities and woodland re-establishment.



Edges

Landscape appears neglected where the edges between one kind and another have not been adequately considered, particularly between manicured and rough turf or meadow. Edges should be laid out in sweeping lines, as an obviously designed edge looks purposeful. Well laid out and carefully considered, it

creates an attractive landscape of contrasting elements, with the meadow habitat enhancing the mown turf.



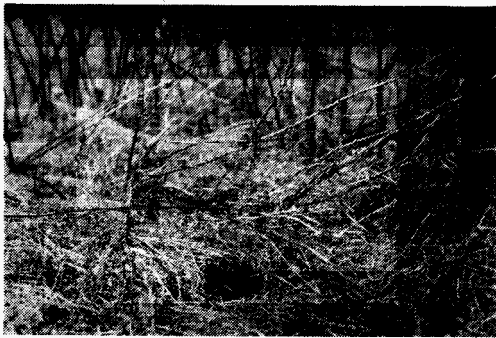
Safety and litter

Mowing along road edges to maintain quality turf minimizes chance fires and facilitates litter pick-up. A variable mowing line of 3 m to 5 m should be maintained, depending on the class of road and site conditions.

Rodents

Naturalized turf encourages the immigration of small rodents in the initial stage of succession. Where natural areas are adjacent to residential property, this may be perceived as a problem. While rodents cause more problems to young trees and shrubs than to people, they are often considered a

pest near habitation. They are controlled most effectively near residential areas by maintaining a mown strip close to fence lines.



Songbirds

Grasslands and shrublands are important habitats for birds (see table in Subsection 4.2). Where occasional cutting of these lands is required, it should be done as late in the fall as possible, after migratory birds have flown. Cutting before late fall interferes with seed sources and the birds' essential food supply prior to migration.



4.5 MONITORING

Monitoring requirements in naturalized areas are, by definition, minimal; the main objective of restoration by naturalization is usually to increase plant and animal habitat and decrease costs, and both are almost certain to happen. If the restoration objective is to retain a meadow at a certain stage of succession, then monitoring of woody growth will be required. If certain species of plants or animals are desired, monitoring should reflect this type of objective.

Selected References

Restoration and Management Notes: a journal published twice yearly by the University of Wisconsin - Madison Arboretum. Some of the most up-to-date methods can be found in this journal.

Curtis, J.T. 1959. *The Vegetation of Wisconsin: an ordination of plant communities*. The University of Wisconsin Press, Madison, Wisconsin. The classic text on the structure and composition of prairies.

Courtenay, Booth, and James H. Zimmerman. 1972. *Wildflowers and Weeds*. Van Nostrand Reinhold Company, New York.

Also, please see the list of prairie references in Hough Stansbury Woodland Naylor Dance Limited and Gore & Storrie Limited, 1994. *Ecological Restoration Opportunities for the Lake Ontario Greenway*, Waterfront Regeneration Trust.