

Resources

Diboll, Neil, "Creating Native Prairie Ecosystems as the New American Lawn," *Proceedings of the International Conference on Urban Horticulture, ACTA Horticulture No. 643 (January 2004)*, p. 57-70. Even though this article focuses on the Midwestern United States, it provides excellent charts and practical advice on site selection, preparation, and management.

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**BUSHKILL STREAM
CONSERVANCY**

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Managing Meadows in Southeastern Pennsylvania



**BUSHKILL STREAM
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The information in this brochure is based on the experience of the Bushkill Stream Conservancy and conversations with Art Gover, Penn State Vegetation Management, Department of Horticulture, Pennsylvania State University; Ernst Conservation Seeds; Rebecca Kennedy, Lehigh County Conservation District; and Jim Thorne, Natural Lands Trust.

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Closeup of sideoats grama, Bouteloua curtipendula
Stevie O. Daniels

Meadow with little bluestem, Schizachyrium scoparium
Stevie O. Daniels

Ghosted image this page:

Fox Sedge, Carex vulpinoidea

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Introduction

Establishing meadows of native grasses requires proper site preparation, selection of suitable species, and at least monthly management during the growing season in the first three years with scheduled monitoring over time to prevent the invasion of woody plants and unwanted weedy species. This brochure brings together information particularly suited for the southeastern area of Pennsylvania and is focused on methods for installations on large sites (1/2 acre or larger).

Every site is unique and requires knowledge of the soil, the plant species chosen, and the plant species that may show up. For a successful project, hire experts to plant and manage (at least the first three years) the site or make sure you have someone in your organization with the knowledge and the time to direct the personnel who will be performing maintenance.

Indiangrass, Sorghastrum nutans
Stevie O. Daniels



Management of the site will depend on how it was established. Proper preparation of the soil and selection of appropriate species will affect the type of management situations that may arise during the first three to five years of establishment. Those early years require the most intense labor and expense to ensure that the desired plants become established and that unwanted plants are removed or controlled.

If the site is on public land, then members of your group or organization should meet with local municipal officials to discuss the project and ensure that the municipality is willing to perform the necessary mowing and herbicide applications that will be needed in the first few years and an annual mowing in the fourth and future years. It is also important to find out if the necessary equipment is available. For instance, having a mower that can be set to cut no lower than four to six inches is essential. Also, be aware that the application of herbicides on public property can only be done by a certified pesticide applicator. In Pennsylvania, only employees of a government agency or private company that manages landscapes (or farms) is allowed to obtain a license.



For helpful advice on using signs to explain the meadow process, see the Bushkill Stream Conservancy's "Establishing Streamside Buffer Areas in Your Community Park" at <http://bushkill.org/projects.html>.

Selecting and Preparing the Site

Meadows require full sun. Evaluate the soil to determine if it is sand, loam, clay, rocky, etc. Is it dry, medium, or wet? Is it well-drained or does water sit on the surface after a rain? What plants are currently growing on the site? Are there plants or nearby landscapes that will be a source of wind-blown weed seeds?

Eliminate all weeds and competing vegetation before planting. Some methods that can be used include: removing sod with a sod-cutter (on sites without perennial weeds), smothering with clear or black plastic (small areas), repeated soil tillage (takes a full growing season), and herbicide treatment with glyphosate [one brand name is Roundup] (depending on existing plants this could work with one treatment or it may take up to two years).

Plan to use straw mulch or an erosion control blanket to hold soil and seeds in place if the site is sloped or has other factors that would require it.

The meadow at Lions Park, Forks Township, Pa., following bed preparation and seeding.
Bushkill Stream Conservancy



Choosing Plant Species

Opinions differ about whether the initial planting should include both native grass seed species and broadleaf or wildflower species. This brochure takes the perspective that beginning with grass-only is the best approach. Once the grasses are well established, wildflowers can be added by seed or as plants. You may choose to add them along the edges most visible to the public. Also, some native wildflowers may appear on their own from seed already present in the soil. When the site is no longer mowed, the plants can mature and bloom. Select a seed mix that matches the soil and growing conditions. The chart below features suggested grasses.

Right: Little bluestem, *Schizachyrium scoparium*
Stevie O. Daniels



A Selected List of Grasses for Meadows

Common Name/Scientific Name	Moisture	Height	Cool Season	Warm Season
big bluestem (<i>Andropogon gerardi</i>)	dry to medium	4-6 ft		X
little bluestem (<i>Schizachyrium scoparium</i>)	dry	2-3 ft		X
sideoats grama (<i>Bouteloua curtipendula</i>)	dry to medium	1-2 ft		X
broomsedge (<i>Andropogon virginicus</i>)	dry	2 ft		X
Indiangrass (<i>Sorghastrum nutans</i>)	dry to medium	4-3 ft		X
switchgrass (<i>Panicum virgatum</i>)	medium to wet	4 ft		X
Canada wild rye (<i>Elymus canadensis</i>)	medium to wet	2 ft	X	
Elliott's beardgrass (<i>Andropogon gyrans</i>)	medium	2-3 ft		X
purpletop (<i>Tridens flavus</i>)	medium	2-3 ft		X
prairie dropseed (<i>Sporobolus heterolepis</i>)	medium	2-3 ft		X
blue joint grass (<i>Calamagrostis canadensis</i>)	wet*	2-4 ft	X	
awl sedge (<i>Carex stipata</i>)	wet	1.5-3 ft		
fox sedge (<i>Carex vulpinoidea</i>)	wet	3 ft		
tussock sedge (<i>Carex stricta</i>)	wet	2 ft		
soft rush (<i>Juncus effusus</i>)	wet	4 ft		

*sedges and rushes, which are grass-like plants, are better suited for wet meadows

Plant in late May when soil has warmed up. Use a no-till drill seeder pulled behind a tractor. This seeder cuts rows or furrows and drops in the seed. This method limits soil disturbance which would cause weed seeds to germinate, retains the protective surface thatch layer preventing erosion, and provides excellent seed-to-soil contact important to native grass germination.



No-till drill seeder
Beaver Valley Supply and Kasco Manufacturing

Newlins Mill, Palmer Township, Pa. Grass seedlings begin to appear in newly planted meadow (below).

Bushkill Stream Conservancy



Management after Planting

First Year

Mow several times to control annual weeds. The first mowing should be before the weeds reach a height of 8-12 inches. Set the mower to a height of 4-6 inches (just above the developing plants) and use a flail type (if possible) since it chops clippings into small pieces that will not suffocate young developing plants. If a rotary or sickle mower is used, remove any resulting large clumps of plant material from the site.

During the growing season, remove large weeds by cutting them off at ground level. Do not pull them out since that will likely pull out desirable plants at the same time and leave disturbed ground, which may cause other weed seeds to germinate.

Mow often enough to prevent weeds from getting any taller than 8 inches or developing flower and seed heads (this may be about once a month depending on how much rainfall the area receives). The final mowing of the entire area should NOT be done until early spring of the next year, and it should be a low cutting. Rake off the cuttings.

The meadow (above) at Lions Park in Forks Township, Pa. in its second year with Virginia wild rye (Elymus virginicus) as the dominant grass.

Bushkill Stream Conservancy

A well-established meadow on Long Island, N.Y., that includes little bluestem (Schizachyrium scoparium), hairgrass (Deschampsia caespitosa), and Maryland aster (Chrysopsis mariana).

Jim Grimes



Second Year

If crabgrass was a noticeable problem in the first year but was not treated, then plan to apply a pre-emergent herbicide in mid- to late-March after the initial mowing for the season.

Monitor the site at least monthly to check for unwanted plants. Spot-treat perennial weeds that continue to be a problem, such as Canada thistle, ragweed, and Johnson's grass with a contact broadleaf herbicide. See chart of the weeds that are likely to appear and can be the most problematic in out-competing native grasses.

NOTE: Poison ivy (*Toxicodendron radicans*), wild grape (*Vitis riparia*), and Virginia creeper (*Parthenocissus quinquefolia*) are native plants but will take over a meadow.

Late fall scene (below) in meadow at Delhaas Woods, Bristol Township, Pa., features little bluestem and bushy bluestem.

Stevie O. Daniels



The meadow at Gwynedd Wildlife Preserve, Ambler, Pa., features big bluestem, little bluestem, and Indian grass as well as native wildflowers such as New York ironweed, purple coneflower, and swamp milkweed.

Natural Lands Trust/Bill Moses

A second mowing may be needed during the growing season in the second year. Base this decision on an evaluation of the level of invasion from biennial weeds, such as burdock, wild parsnip, bull thistle, curly dock, and Queen Anne's lace. To control these species, they must not be allowed to flower and set seed. Mow areas of the site with large populations of these plants to a height of about 10 inches when they are in full bloom (usually mid to late June). This will kill or set them back severely. Since the desirable plants will seldom be taller than 10 inches at this time, they will only be minimally damaged.

If feasible, consider using a weed trimmer on the clumps rather than bringing in a tractor and mower since grassland birds nest from early May to mid-July. If you absolutely must mow, then leave some parts of the meadow unmown. And mow from the inside moving outward which will allow adult and fledgling birds a way to escape to adjacent fields or areas; starting at the perimeter and moving inwards may trap the birds.

If broadleaf weeds become so thick that they are shading the grasses, a last resort is to apply a broadleaf herbicide that does not harm grasses. See chart on pages 12 and 13.

Top Sixteen Weeds



Bull Thistle
Cirsium vulgare

Tenaglia, D. - www.missouriplants.com



Crabgrass
Digitaria spp.

Meade, J., Rutgers NJAES Coop. Ext.



Ragweed
Ambrosia trifida

Meade, J., Rutgers NJAES Coop. Ext.



Burdock
Arctium lappa

Creative Commons - Chernilevsky, G.



Canada Thistle
Cirsium arvense

Tenaglia, D. - www.missouriplants.com



Johnson's Grass
Sorghum halepense

Swearingen, J. USDI National Park Service



Wild Parsnip
Pastinaca sativa

Creative Commons - Manske, M.



Curly Dock
Rumex crispus

USDA - Mohlenbrook, R. H



Horseweed
Conza canadensis

USDA - Bodner, Ted



Bur Cucumber
Sicyos angulatus

Daniels, Stevie O.



Field Bindweed
Convolvulus arvensis

USDA - Akexander, P.J.



Garlic Mustard
Alliaria petiolata

Creative Commons - Atkin, Tony



Queen Anne's Lace
Daucus carota

Creative Commons - Sibley, Christopher



Multiflora Rose
Rosa multiflora

Creative Commons



Jimsonweed
Datura stramonium

USDA - Justice, William



Honeysuckle
Lonicera tartarica, L. morrowii

Creative Commons - Roletschek, R.



The meadow at ChesLen Preserve, Coatesville, Pa., (above) features broomsedge, little bluestem, and Indiangrass.
Natural Lands Trust/David Steckel

Third Year and Beyond

Burn or mow the meadow in mid-spring every year. If mowing, mow down to ground level and remove the clippings. This procedure prevents invasion by trees and shrubs and controls undesirable cool-season grasses and weeds by damaging the new growth.

A prescribed burn is recommended for maintaining meadows in the East for a number of reasons including setting back undesirable cool-season weeds, removing plant litter from the previous season and exposing soil surface to the warmth of the sun, recycling nutrients to the soil, and preventing invasion of woody plants. Meadow experts at Prairie Nursery in Wisconsin suggest leaving a portion of the area unburned or unmown to preserve over-wintering butterfly, moth, and invertebrate pupae and eggs that would be destroyed by the burn. Their studies also show that different plant species become dominant in the areas left unburned or unmown, which increases diversity of the overall site.

Many conservancy, wildlife, or forestry organizations have staff trained to conduct prescribed burns and in some locations members of the local fire department are also qualified. A good source in eastern Pennsylvania is The Natural Lands Trust. Be sure to inform area homeowners about the burn and use it as another opportunity to educate the public about native meadows and their importance to wildlife, biodiversity, water protection, etc.

Monitor the meadow throughout the season to watch for perennial weeds or woody plant seedlings that need to be removed or be individually treated with a contact herbicide.

The brand names listed in the chart below are suggestions, not recommendations. Herbicides are available in identical formulation from multiple manufacturers. This information is based on the Penn State publication, “Suggested Herbicide Mixtures for Roadside Vegetation Management,” Roadside Research Project, Department of Horticulture, College of Agricultural Sciences, Penn State University, Factsheet 8, by Art Gover, Jon Johnson, and Larry Kuhns, 2007.

Always read the container label and carefully follow all precautions and safety recommendations given. Store all chemicals in the original labeled containers in a locked cabinet or shed. If in doubt about whether the product is appropriate for the plant you are trying to control, do not use. Consult your local Pennsylvania extension agent for further information.

Herbicides for Managing Weeds in Meadows

Brand Name	Chemical	Type	Target	Application Time
Aquacap or Pendulum 3.3E	pendimethalin	pre-emergent	crabgrass, other annual weeds	late Feb./early March
Aquaneat, Rodeo, or Aquamaster	glyphosate	post-emergent	any unwanted weeds	growing season
Garlon 3A	triclopyr	post-emergent	herbaceous broadleaf plants, minimal injury to grasses	growing season