

Native Herbaceous Plantings

Establishment, Maintenance and Management for Wildlife Habitat and Pollinators

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Conservation Fact Sheet

INTRODUCTION

Native grasses and wildflowers, including forbs and legumes, perform key roles in natural ecosystems. They stabilize soils, reduce soil erosion, increase soil organic matter, and provide nesting habitat, protective cover, and foraging habitat for birds, small mammals, and insects (including pollinators). They attract many beneficial insects, including those that pollinate crops, and those that control insect pests. The insects that they attract are an important component of the food chain in natural systems. Without these native plants, the natural and man-altered systems that provide food and fiber cannot achieve their full potential.

This fact sheet is intended to assist conservation planners, farmers, landowners, and others involved in habitat restoration with establishment and management of native herbaceous plantings in Maryland. The fact sheet provides information on seeding mix selection, establishment methods, weed control during establishment, and maintenance and management of the established stand.

SELECTING A MIX

All of the mixes described here will provide wildlife, soil conservation, and water quality benefits. The selection of a mix is typically based upon the purpose of the planting and the site conditions.

Soil moisture characteristics are an important consideration for selection of any planting – some plants are better adapted to dry sites while others are found more frequently in wet sites. Many native plants can tolerate a wide range of soil moisture conditions, but plants better suited to a site will be healthier, and have better survivability and regeneration.

Some of the mixes described in this document are named for their soil moisture adaptability (e.g., *Mix for Dry Sites*), while others include species options based on soil moisture (e.g., Mix 3 provides the option of Canada wildrye for drier sites, and Virginia wildrye for wetter sites). Mixes developed for mesic sites (i.e., sites with a moderate amount of moisture) typically contain the most adaptable species for a broad range of soil moisture



Figure 1. Butterflyweed (a.k.a. butterfly milkweed, *Asclepias tuberosa*) in full bloom. Butterflyweed is well-adapted to dry sites and will readily re-seed. *Photo by S. Strano.*

regimes. So unless a planting location is predominantly dry or wet, a mix adapted to mesic sites is the best choice.

Soil conservation and water quality considerations may be a secondary or primary objective for a native herbaceous planting.

Native grasses are excellent for providing nesting and cover habitat, stabilizing soils, improving water quality, and increasing soil organic matter. Forbs provide cover habitat and water quality benefits, but they are especially important for foraging habitat quality. Forbs and legumes provide food resources for wildlife and insects in the forms of seeds, leaf matter, pollen, and nectar. The insects attracted by forbs and legumes are especially important food resources for many types of wildlife.

Habitat quality is often enhanced by a diverse mixture of plants, especially so in herbaceous habitats. A diverse planting provides more food resources for more species, and maintains a supply of food resources throughout the season. Diverse vegetation also creates structural variability, which provides different types of habitat to meet wildlife needs for escape cover, nesting, foraging, raising young, and winter cover.

Program Participation – If you are enrolled in a program that provides financial assistance for establishment and/or management of native herbaceous plantings, specific restrictions and requirements may apply. Refer to the program guidance provided in addition to this fact sheet.



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Native grasses, when mowed or burned, will often tend to become the dominant vegetation in an herbaceous planting, especially when they are a large proportion of the seed mix. A mix dominated by grasses will tend to provide lower habitat quality because of the lack of forbs and legumes.

Grasses tend to produce more biomass than forbs, and more of the biomass is concentrated near the ground. Large quantities of biomass near the ground surface create less than ideal conditions for most species of small wildlife, which find it easier and more efficient to traverse bare soil and forage beneath a canopy of vegetative cover (Healy 1985).

Some cultivars of native tall-prairie grasses such as big bluestem (*Andropogon gerardii*) and switchgrass (*Panicum virgatum*) tend to be aggressive when planted in the Mid-Atlantic region, where soil fertility and moisture availability are relatively high. As they become more dominant, they will produce large amounts of biomass and deter growth of other species.

The long-term vegetative diversity of a planting will be greatly determined by the selected grass species and *the proportions of grasses, forbs, and legumes in a seed mix.* Generally the proportion of native grass <u>seed</u> in a native grass and forb mix should be no more than 75 percent, based on the number of seeds per pound. A mix with this proportion of grass or greater would likely only be necessary where the potential for soil erosion is very high, or where the specific purpose requires a grass-dominated stand. In plantings where the primary concern is wildlife habitat or pollinators, a mix with only 10 to 25 percent grasses by seed is recommended.

The *cost of seed* is another consideration in a mix selection. Forbs generally have much higher seed costs than grasses. A mix with a larger proportion of forbs than grasses will typically cost more than a mix with a larger proportion of grasses.

Maryland Native Grass and Wildflower Mixes

These mixes were developed with consideration of species benefits, adaptability, diversity, persistence, and cost. The mixes contain a large assortment of species that support pollinators and beneficial insects, and provide flowering throughout most of the growing season.

Stock wildflower mixes may be less expensive on per weight basis, but will not provide all the benefits of a Maryland native mix, and may require a much higher seeding rate. Also, because wildflower seed size and density tend to vary significantly by species and family, it is difficult to recommend mixes simply by weight without knowing which species are in a mix.

Consequently, the seeding rates developed for Maryland-specific mixtures adjust for these factors to achieve the desired grass-to-forb ratios. Mixes 15 - 17 (in Table 2.2 of the *Maryland Conservation Planting Guide*) are designed to establish high-diversity herbaceous stands of Maryland native grasses and wildflowers for optimum wildlife and pollinator habitat.

The composition of these mixes was selected to provide a target diversity-to-cost ratio, while planting approximately 30 seeds per square foot. These mixes are approximately 10 or 15 percent grasses and 85 or 90 percent wildflowers, depending on the mix.

The grasses are generally 3 feet in height or shorter, and tend to be less competitive than non-native grasses and tall-statured native grasses. This makes them more compatible with native wildflowers. All of the grasses tend to have a bunch-type growth form and are suitable for sites with low fertility.

The wildflower components of Mixes 15 - 17 are species that occur throughout Maryland. They support pollinators, other beneficial insects, and early successional wildlife; provide flowering throughout most of the growing season (as a mix); and are commercially available.

Mix 8d is a native, stand-alone, wildflower-only mix designed to be interseeded into an existing native grass stand to enhance the stand for pollinators and other wildlife.

For optimum wildlife and pollinator habitat, select an appropriate mix, based on site conditions, from the following options:

Mix 15 – High Diversity Native Grass/Forb Mix for Dry Sites. This mix is appropriate for excessivelydrained to well-drained soils. It contains Canada wildrye, little bluestem, and purpletop, plus 16 species of wildflowers (including five legumes).

Mix 16 – High Diversity Native Grass/Forb Mix for Mesic Sites. This mix is appropriate for a broad range of soil moisture conditions from well-drained to somewhat poorly drained soils. It contains broomsedge, purpletop, and Virginia wildrye, plus 16 species of wildflowers (including four legumes).

Mix 17 – High Diversity Native Grass/Forb Mix for Wet Sites. This mix is appropriate for somewhat poorly to very poorly drained soils. Most of the species in the mix occur in wetlands, but should not be planted in areas with sustained inundation of more than a few inches. This mix contains fox sedge, redtop panicgrass, and Virginia wildrye, plus 15 species of wildflowers (including one legume).

Mix 8d – High Diversity Native Wildflower and Legume Mix for Interseeding. This mix can be used for interseeding into existing grass stands on dry and mesic sites to enhance forb diversity for pollinators and other wildlife. It contains 19 species of wildflowers (including four legumes) that germinate and establish relatively quickly.

Additional Mixes for Water Quality and Wildlife

The following Maryland native mixes (refer to Table 2.2 of the *Maryland Conservation Planting Guide*) can provide water quality and/or wildlife benefits, but do <u>not</u> meet the NRCS requirements for pollinator mixes because of the low proportion of wildflowers to grasses.

Mixes 1 and 2 – Tall Native Mixes for Dry or Mesic Sites. These mixes contain options for seeding predominantly tall-statured warm season grasses such as big bluestem, coastal panicgrass, Florida paspalum, indiangrass, and switchgrass. These mixes are generally not recommended for wildlife because the tallstatured grasses tend to dominate the stand, severely limiting plant diversity and creating excessive biomass. They can be especially problematic on sites with good soil moisture. The addition of partridge pea or Mix 8a is optional, but forbs may not persist except on very dry sites.

Mixes 3, 4, 5 – Short Native Warm and Cool Season Mixes. These mixes contain options for a combination of warm and cool season grasses, most of which are short-statured, plus native wildflowers. The grasses in these mixes tend to be less aggressive than the grasses in Mixes 1 and 2, which makes them more compatible with diverse plantings of grasses and wildflowers. These mixes are generally recommended for wildlife habitat where pollinators are not the primary concern.

Mix 3 is suitable for dry to mesic sites. Little bluestem, purpletop, and Canada wildrye are the grasses that are typically planted. Other options include broomsedge, splitbeard bluestem, purple lovegrass, and Virginia wildrye. Add partridge pea or one of the wildflower-only mixes (Mix 8a or 8b) to complete the grass/forb mix.

Mix 4 is suitable for mesic sites. Broomsedge, little bluestem, and Virginia wildrye are the grasses that are typically planted. Other options include splitbeard bluestem, purple lovegrass, purpletop, Florida paspalum, river oats, riverbank wildrye, and slender woodoats. Add partridge pea or one of the wildflower-only mixes (Mix 8a or 8b) to complete the grass/forb mix.

Mix 5 is suitable for wet sites. Redtop panicgrass and Virginia wildrye are the grasses that are typically planted, along with fox sedge. Other options include bushy broomsedge, beaked panicgrass, Florida paspalum, river oats, riverbank wildrye, slender woodoats, hop sedge, lurid sedge, fowl mannagrass, and rattlesnakegrass. Add a wildflower-only mix (Mix 8c) to complete the grass/forb mix.

Mixes 8a, 8b, 8c – Native Wildflower-Only Mixes. These mixes contain only native wildflowers and legumes (i.e., no grasses). They are typically only used as companion mixes to increase plant diversity and wildlife food resources for selected grass mixes, as indicated in Table 2.2 of the *Maryland Conservation Planting Guide*.

Mixes 8a and 8b are designed for dry to mesic sites, and vary in species diversity from relatively low (Mix 8a, minimum 5 species) to medium (Mix 8b, minimum 10 species). **Mix 8c** (minimum 5 species) is designed for wet sites.

Mix 11 - Tall Native Cool Season Mix for Shady Mesic to Wet Sites. This mix includes riverbank wildrye, Virginia wildrye, and river oats or slender woodoats. The species in this mix are adapted to streambanks, floodplains, and small openings in moist to wet woods. Add Mix 8c to provide a grass-forb mix for wildlife habitat.

Mix 14 – Short Native Cool Season Mix for Wet Sites. This mix of grasses (fowl meadowgrass, Virginia wildrye, and red fescue) is appropriate for sites that do not pond water for prolonged periods. For an all-native grass/forb mix, add partridge pea to provide wildlife benefits. Clovers may be used in place of partridge pea to meet specific objectives.

Seed Availability and Substitutions

Commercial availability of native grass and wildflower seed is highly variable, and costs will fluctuate for many species based on annual production. When species are not available or cost of seed for a specific species is very high (i.e., more than \$300/lb), substitute species may be used. Select substitute species based on occurrence, adaptation, bloom period, and flower color.

Substitute species may need to be incorporated into mixes at different rates on a pound per acre basis, because seed size and density often vary significantly, even within the same plant family or genus. The *Mary-land Conservation Planting Guide* provides tools for selecting substitute species.

Tables 2.3 and 2.4 in the *Planting Guide* provide substitute species for native grasses and wildflowers, respectively. Both tables provide species-specific substitution rates in pounds per acre (lbs/ac) of pure live seed (PLS) at which the substitute species should be incorporated into the mix.

The substitute rates are calibrated for the individual species based on seeds per pound and grass to forb ratios. For wildflower-dominant mixes (i.e., mixes 15, 16, 17 and 8d), use the *Forb Mix* substitute rates. For grass-dominant mixes, use the *Grass Mix* substitute rates.

ESTABLISHMENT

Native perennial grasses and wildflowers require different establishment and management methods than introduced cool-season grasses (e.g., tall fescue, orchardgrass). The majority of wildflowers in the Maryland native mixes are perennial species, and as with native perennial grasses, much of the initial growth is focused on root establishment. Unlike annual wildflowers, perennials may take a year or more to establish roots and basal leaves before flowering. Some wildflowers may take up to 4 years to become fully established.

Because of the relatively long establishment period, it is important to reduce competition and prevent shading by annual weeds in the first two growing seasons. Perennial and annual grasses should be controlled prior to planting by herbicide treatment or conventional tillage methods. A clean, weed-free seedbed will provide the best chance of success. Where weeds are a problem, a cover crop may be used to control weed growth prior to planting.

Native grass and wildflower mixes may be seeded with a broadcast or drop seeder or planted with a native seed drill. Unlike standard grass seed drills, native seed drills and some drop seeders have special mechanisms to accommodate hairy and fluffy seeds, as well as seeds of different sizes. When using a broadcast seeder or conventional drop seeder, a bulking agent/carrier such as cat litter, pelletized lime, sand or sawdust will need to be added to the seed mix to ensure good coverage. Bulking agents are typically added at a ratio of 1:1 to 5:1 bulking agent to seed weight.

A broadcast seeding will need to be packed down to ensure good seed-to-soil contact. This is typically accomplished with a cultipacker or roller. With either seeding method, it is important to keep the seeds close to the surface, usually within ¼ inch. Many of the wildflower and native grass seeds are relatively small, and may not germinate if seeded too deeply.

Native wildflowers can also be interseeded into an existing native grass dominated planting to enhance vegetative diversity. Interseeding of wildflowers usually must be preceded by prescribed burning and/or disking of the grasses to ensure adequate seed to soil contact. See the subsection on *Interseeding Native Forbs and Legumes* under *Management* in the latter portion of this document.

Weed Control During Establishment

Planting Year

In the first growing season after seed germination, it is very important to ensure that the seedlings do not get shaded out by weeds. Weeds are typically controlled by mowing, and in some cases by herbicide treatment.



Figure 2. Wildflower seedlings can be difficult to distinguish from annual weeds. Among the many seedlings in this photo are ragweed (an annual weed), and tick-trefoil, bee balm, and black-eyed susan, three of the seeded wildflowers. *Photo by S. Strano.*

Mow the planting as needed during the summer months to control weeds and keep them from flowering. Mow at a height of 8 to 10 inches, or just above wildflower seedling height, but at a height that will clip off flower buds on the existing weeds. Do not let weeds get taller than 18 inches, at which point they may shade out the wildflower seedlings. Do not hesitate to mow because some of the plants are flowering. Typically, most plants flowering in the first growing season are annuals or biennials (e.g., partridge pea, black-eved susan), which make up a small portion of the mix. Even with mowing, these species will usually flower again. It is far more important to ensure the perennial wildflowers receive enough sunlight and water to support their growth. Nesting season restrictions on mowing typically do not apply during the establishment period.

Herbicides can be used to control weeds where application can be targeted in a way that does not kill the seeded wildflowers. Herbicide application may be useful for treating dense clumps of weeds, or where weeds are significantly taller than the wildflowers. Herbicides can be applied in a targeted manner with a backpack sprayer or a wick-bar applicator. Most wildflowers are susceptible to broadleaf control herbicides, so they should not be used in a wildflower planting. Be sure to read and follow herbicide label instructions. Contact your local weed control specialist for more information on herbicide application.

Second and Third Year After Planting

By the second growing season, the wildflowers should be fairly well established. If unwanted grasses or weeds comprise more than 25 percent of the stand, either treat with an appropriate herbicide or mow the area as necessary to prevent them from going to seed. Annual weeds become less of a problem as perennial plants establish and discourage germination.

PLANTING

- Prepare a clean, weed-free seedbed.
- Kill existing turf if planting in pasture or grass area.
- Good seed-to-soil contact is important, but don't seed too deeply.

WEED CONTROL DURING ESTABLISHMENT

- 1st growing season Mow the planting periodically to a height of 8-10 inches when vegetation reaches 18 inches, and before annual plants go to seed.
- 2nd growing season In spring, if annual grasses (e.g., foxtail, crabgrass) comprise more than 25 percent of the stand, mow the planting to 8-10 inches before they go to seed.

MAINTENANCE

Wildflower plantings require periodic maintenance to control noxious and invasive weeds, and prevent succession of woody vegetation. Control of noxious weeds (specifically, johnsongrass, shattercane, bull thistle, Canada thistle, musk thistle, and plumeless thistle) is required by Maryland state law.

Weed Control

Control noxious weeds and other invasive plants by spot treatment, using mechanical methods or approved herbicides. If it becomes necessary to control noxious weeds during the nesting season, contact your local weed control specialist for recommendations.

Control of Woody Growth

Methods to control woody growth in wildflower plantings include mowing (i.e., bush-hogging), targeted herbicide treatment, and prescribed burning. Mowing is the most common method because of access to equipment. Herbicide treatment is a common and effective method of controlling brush, but care must be taken not to kill the wildflowers. Prescribed burning is probably the best method for controlling woody vegetation in a wildflower planting, but is not always a viable alternative because of issues with permits and availability of trained fire crew.

Mowing

Mow as needed, but preferably on a 2 to 3 year rotation, mowing only 1/3 to 1/2 of the planting each year. The remaining unmowed areas will provide year-round wildlife food and cover. Do <u>not</u> mow for cosmetic purposes.

through August 15. For pollinator plantings, mowing should be deferred until later in the season -- December through March -- to make pollinator resources available during fall.
However, mowing in late summer or early fall, prior to leaves turning color, is the most effective time to control-

leaves turning color, is the most effective time to controlling woody growth because it limits the amount of carbohydrate reserves that can be translocated to the roots. When objectives or program requirements limit mowing to the dormant season, woody vegetation can be controlled by spot treatment with herbicides.

Generally, mowing should not occur during the primary nesting season (PNS), which occurs from April 15

Spot mowing during the PNS can be used to control weeds or provide resources for targeted species. During this time, mowing should be limited to specific areas, and should not exceed more than 1/3 of the stand. If the area is enrolled in a financial assistance program, mowing and management during the PNS may not be allowed.

To the extent possible, mow in a manner that will provide escape routes for wildlife at the time of mowing, such as mowing from the inside out, or mowing from the field side toward the woods edge.



Figure 3. Edge-to-edge (left) or inside-to-outside (below) mowing patterns provide escape routes for wildlife.

Targeted Herbicide Application

Herbicide treatment is a common and effective method for controlling woody vegetation. However, because wildflowers are susceptible to most herbicides that control broadleaf plants, the use of herbicides in wildflower plantings should only be used in a targeted method that limits wildflower exposure to the herbicide.

Methods vary depending on the type, size, and age of the target species, and the size of the treatment area. This fact sheet provides some general recommendations on the use of herbicides for woody vegetation control. For more specific information, contact your local University of Maryland Extension office or county weed control specialist.

Small areas of woody vegetation can be treated using basal bark, foliar spray, or cut-surface treatment meth-

ods in which the herbicide is applied with portable sprayers and hand tools.

Large areas of woody vegetation will likely require foliar application of a systemic herbicide using a wick bar applicator. Systemic herbicides (e.g., 2,4-D) are absorbed by the plant and translocated to the roots. Woody vegetation may need to be mowed and allowed to re-grow to enable effective application of herbicide to foliar surfaces.

Application of systemic herbicides in late summer or early fall, prior to leaf drop, is typically more effective because the herbicide will be translocated to the roots. Check the pesticide label to determine the types of plants that are controlled or damaged by the herbicide. Always read and follow the pesticide label when applying herbicides.

MANAGEMENT

The primary management objective of a native wildflower planting is to maintain the wildflower component of the stand. After establishment, the main threats to wildflowers in the stand are competition from perennial grasses and encroachment of woody vegetation. Prescribed burning, strip disking, strip herbicide application, and interseeding native forbs and legumes may be used alone or in combination to control perennial grasses and woody vegetation, and maintain the wildflower component of the planting.



Figure 4. A monarch butterfly emerges from its chrysalis. Monarch caterpillars feed on milkweed (*Asclepias* spp.), but will often find a nearby plant on which to metamorphose. *Photo by S. Strano.*

The best time to implement management activities on wildflower stands is in early fall, when wildflower germination and development is encouraged, and control of perennial warm-season grasses and woody vegetation is most effective.

Generally, management practices should be conducted outside of the PNS to provide sufficient time for birds and ground-nesting wildlife to fledge. In some cases however, specific management activities may be conducted during the PNS to provide resources for targeted species. During this time, mowing should be limited to specific areas, and should not exceed more than 1/3 of the stand. If the stand is enrolled in a financial assistance program, management during the PNS may not be allowed.

Management activities are conducted on an as-needed basis to achieve desired objectives. Management activities on perennial wildflower stands are implemented less frequently than on annual wildflower stands. Management on perennial stands is usually not conducted until at least 5 years after planting, while annual wildflower stands are usually disked on a 2 to 3-year rotation.

Prescribed Burning

Prescribed burning is the most effective management technique for removing accumulated plant litter and controlling woody plants. Prescribed burning will also enhance wildflower and warm-season grass re-growth by exposing seed to sunlight and releasing nutrients that are bound up in plant litter.

The best time to conduct prescribed burning on wildflower stands is early fall. Burning at this time is most effective for controlling woody vegetation. Winter burns may encourage wildflowers, but are less effective at controlling woody vegetation. Spring burns favor warmseason grasses and harm wildflowers. Do not burn during the primary nesting season (April 15 - August 15).

Conduct prescribed burning on a 3 to 5 year rotation, or as needed to control woody growth. Burn only 1/3 to 1/2 of the wildflower stand at a time to maintain food and cover for wildlife.

Prescribed burning requires the use of firebreaks that are usually 12 to 15 feet wide. Existing strips of coolseason grasses or disked strips of bare ground can be used as firebreaks.

Prescribed burning can facilitate disking, which can be used to promote the germination of wildflower seeds. However, disking can also promote the germination of weed seeds. If wildflowers do not return in the numbers expected after burning, try lightly disking 30-foot strips to promote germination.

Prescribed burning requires a permit and may not be allowed in some areas. Contact your local office of the Maryland Department of Natural Resources, Forest Service, or NRCS Service Center for current information concerning permits and assistance for this practice.

Strip Disking

Strip disking can be used to increase the vegetative diversity in a stand. <u>However, disking should only be</u> conducted in wildflower stands when the need exists.

Disking is not necessarily needed in a diverse stand of wildflowers with a minor component of perennial grasses. Many wildflowers used in mixes are perennial, and some may not fully develop for three to four years after seeding. Disking during the development period may destroy seedlings. If perennial wildflowers were planted, wait at least 5 years before disking.

If a stand does become dominated by perennial grasses, disking may be used to simultaneously reduce the amount of perennial grass cover and promote wildflower germination. The appropriate intensity and timing for disking will depend on the purpose of the planting and the stand characteristics. Disking should only be used if it will not result in excessive erosion or adversely impact water quality, and will not destroy the planting.

Minimum Set-backs

For water quality purposes, avoid disking within 20 feet of a watercourse, water body, or wetland, or within 15 feet of intensively used areas (e.g., barnyards, conventionally tilled land).

Disking Intensity

Before disking, mow the area that will be disked. Fall mowing can facilitate spring disking by providing time for breakdown of leaf matter.

The required disking intensity will vary depending on the stand condition. For stands where perennial grasses are not dense, a single pass with a light finish disk may be sufficient to set back grasses and encourage wildflower germination.

Thick stands of perennial warm-season grasses will require heavier, more intensive disking to open up the stand. In thick stands, multiple passes with a tandem disk, or a single pass with a heavy offset disk may be required to thin the grasses. A heavy offset disk will slice and turn the soil and bury residue, which may be needed to reduce the overall cover of grasses. After use of a heavy offset disk or when the soil has been turned over, the soil surface should be smoothed with a cultipacker, harrow, or other finishing implement.

Spacing and Timing

Disk in strips on 1/3 to 1/2 of each field as necessary to maintain vegetative diversity. Disk on the contour in an alternating pattern of disked and undisked strips. Do <u>not</u> disk perennial wildflowers in the first 5 years after planting. Annual wildflowers may be disked more often, usually on a 2 to 3 year rotation.

The best time to disk to promote wildflower germination is in late summer to early fall (September 1 to October 15). Late summer/early fall disking may also be more effective for reducing the density of warm-season grasses, because at this time they are sending reserves into their roots. If fall disking is not possible, disking can be conducted in late winter to early spring (preferably in March), although this is likely to encourage the growth of annual grasses (e.g., foxtail). Do <u>not</u> disk during the PNS.

After disking, monitor the site for weeds and apply control methods if necessary.

Use the following additional guidance for disking on highly erodible land with an Erodibility Index (EI) \geq 16:

- Disk in strips <u>no wider than 30 feet</u>. Undisked strips should be twice the width of disked strips. Disking intensity should be light enough to maintain at least 30% residue cover in the disked strips. Do not disk parts of the field where excessive erosion is likely to occur.
- On highly erodible land <u>with an El > 30</u>, only disk in the upper half of the slope, and adjust the disking intensity to attain at least 60% residue cover.

Strip Herbicide Treatment

On grass and wildflower stands that have become dominated by grasses, herbicide treatment may be used to restored the wildflower component of the stand. Native wildflower seeds may reside in the soil for many years without germinating if they are completely shaded out by grasses and other vegetation. Thinning of the existing grass stand can provide the light needed to prompt germination of existing seeds.



Figure 5. A dense stand of native grasses was sprayed in strips with glyphosate. The openings created by the herbicide treatment prompted the germination and growth of wildflower seeds that were waiting for a disturbance. *Photo by S. Strano.*

The purpose of chemical suppression spraying is not to completely eradicate the grasses, but to reduce their vigor and abundance to encourage wildflower diversity. The goal of the herbicide application should be to suppress approximately 50% of the perennial grasses within the treatment area.

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Spraying should be done in strips or blocks, and applied to only 1/3 (preferred) to 1/2 of the field in any one year. Target areas where grasses dominate to minimize damage to desirable forbs and legumes.

To be effective, herbicides must be applied when the grasses to be suppressed are actively growing. The best time to apply strip herbicide treatment on stands containing warm-season grasses is in late summer and early fall, when wildflower germination and development is encouraged, and control of perennial warm-season grasses is most effective.

Check the pesticide label to determine the types of plants that are controlled by the herbicide, and follow the pesticide label when applying herbicides. Consult with your local University of Maryland Extension office or county weed control specialist for specific herbicide recommendations for your site.

Interseeding Native Forbs and Legumes

The native wildflower component of a stand of herbaceous vegetation tends to naturally decline with age, and the stand tends to become dominated by perennial grasses. Wildflowers may be interseeded into existing herbaceous vegetation to maintain plant diversity and provide food for wildlife.

Select a seed mix with wildflowers that germinate and establish relatively quickly. Mix 8d – the *High Diversity Native Wildflower and Legume Mix for Interseeding* – has a higher proportion of fast growing annual and perennial wildflowers than the other Maryland wildflower mixes, and is recommended for this purpose.

Spring is the best time for interseeding this mix because it contains a significant proportion of annual wildflowers. A late fall dormant seeding can also be used, and will provide better timing with fall disking, which encourages germination of forbs and legumes that exist in the seedbank. Use appropriate planting dates based on your plant hardiness zone.

Site Preparation

If the grass stand is thick or contains more than ¼-inch of litter (thatch), lightly disk or harrow the stand prior to seeding. For very dense and vigorous grass stands, targeted herbicide application can be used to kill some of the grasses and create space for wildflower development (see the previous section on strip herbicide treatment). It is important to ensure that the stand contains space for wildflowers to establish. When disking or harrowing is needed, use a minimum set-back of at least 20 feet from a watercourse, water body, or wetland.

Planting Methods

Wildflowers may be interseeded by broadcast or no-till drill methods. For either method, the grass needs to be cut short prior to seeding. For broadcast seeding, mix the wildflower seed with a bulking agent/carrier such as pelletized lime, sawdust or cat litter so the seed will be more evenly dispersed. Broadcast the seed. Then go over it with a cultipacker, drag, or harrow to enhance seed-to-soil contact. When seeding with a no-till drill, set the drill to place seed about ¼-inch into the soil. Avoid placing the seed too deeply into the soil as this can inhibit germination.

DEFINITIONS

Mesic – In ecology, a type of habitat with a well-balanced moisture supply.

Primary nesting season (PNS) – The portion of the year when ground-nesting birds and small mammals are breeding, nesting, and rearing young. In Maryland the PNS runs from April 15th through August 15th.

Xeric – In ecology, a habitat with low moisture conditions that inhibits plant growth, reduces overall biomass production, and increases potential for drought stress. Forested xeric habitats are typically less dominated by trees and contain more grasses and forbs than mesic forests.

REFERENCES

Healy, WM. 1985. *Turkey Poult Feeding Activity, Invertebrate Abundance, and Vegetation Structure*. The Journal of Wildlife Management, Vol. 49, No. 2 (Apr., 1985), pp. 466-472.



Figure 6. A tiger swallowtail feeding on swamp milkweed (*Asclepias incarnata*). *Photo by S. Strano.*

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Scientific Name	Common Name	% by Weight	% by Seed		Grass/ Forb	Legume	Flowering Period and Flower Color										
				Duration			м	Α	м	J	J	А	s	ο	N		
Asclepias syriaca	Common Milkweed	11.2%	4.0%	Perennial	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~												
Asclepias tuberosa	Butterfly Milkweed	16.8%	6.0%	Perennial	-												
Baptisia tinctoria	Yellow False Indigo	2.6%	4.0%	Perennial													
Chamaecrista fasciculata	Partridge Pea	6.0%	2.0%	Annual													
Desmodium paniculatum	Panicled Tick-Trefoil	6.8%	7.0%	Perennial	-												
Elymus canadensis	Canada Wildrye	8.6%	5.0%	Perennial	Υ												
Heliopsis helianthoides	Smooth Oxeye	11.8%	7.0%	Perennial	<u></u>												
Lespedeza capitata	Round-head Bush-Clover	7.9%	7.0%	Perennial	-												
Monarda punctata	Spotted Bee-balm	1.1%	8.0%	Perennial	<u>4</u>												
Penstemon digitalis	Tall White Beard-Tongue	3.4%	7.0%	Perennial	<u>4</u>												
Pycnanthemum tenuifolium	Narrow-leaf Mountain Mint	0.3%	7.0%	Perennial	-												
Rudbeckia hirta	Black-eyed Susan	0.6%	5.0%	Biennial	<u>4</u>												
Schizachyrium scoparium	Little Bluestem	6.8%	5.0%	Perennial	Υ												
Senna marilandica	Maryland Senna	9.6%	1.0%	Perennial	- 49												
Solidago nemoralis	Gray Goldenrod	1.2%	6.0%	Perennial	(P)												
Symphyotrichum laeve var. laeve	Smooth Blue Aster	1.0%	5.0%	Perennial	(A)												
Symphyotrichum pilosum	White Oldfield Aster	2.0%	7.0%	Perennial	(A)												
Tradescantia virginiana	Virginia Spiderwort	0.2%	2.0%	Perennial	۲												
Tridens flavus	Purpletop	2.1%	5.0%	Perennial	Υ												

Mix 15 Notes: Use all species listed. <u>Substitutions</u>: Use Tables 2.3 and 2.4 (Forb Mix column) to select substitute species for grasses and wildflowers, respectively. To the extent possible, select substitute species based on occurrence, adaptation, and bloom period. Recommended substitute grass species are *Andropogon virginicus* (Broomsedge), *Dicanthelium clandestinum* (Deertongue), and *Sorghastrum nutans* (Indiangrass).

* Seeding rates are subject to change when substitute species are used, or when species are removed from the mix.

I6. High Diversity Native Grass/Forb Mix for Mesic Sites This mix has a predominant wildflower component for optimum wildlife and pollinator habitat.																
Scientific Name	Common Name	% by Weight	% by Seed	Duration	Grass/ Forb	Legume	Flowering Period and Flower Cold									
				Duration			м	Α	М	J	J	Α	s	0	Ν	
Andropogon virginicus	Broomsedge	0.7%	3.0%	Perennial	Υ											
Asclepias syriaca	Common Milkweed	17.0%	6.0%	Perennial	-											
Chamaecrista fasciculata	Partridge Pea	6.0%	2.0%	Annual	-											
Coreopsis lanceolata	Lanceleaf Tickseed	6.3%	7.0%	Perennial	-											
Desmodium canadense	Showy Tick Trefoil	19.1%	7.0%	Perennial	-											
Doellingeria umbellata var. umbellata	Flat-topped White Aster	0.7%	3.0%	Perennial	(P)											
Elymus virginicus	Virginia Wildrye	5.9%	3.0%	Perennial	Υ											
Eutrochium purpureum	Sweet-scented Joe-Pyeweed	1.8%	6.0%	Perennial	-											
Helenium flexuosum	Purple Sneezeweed	0.7%	7.0%	Perennial	-											
Heliopsis helianthoides	Smooth Oxeye	11.9%	7.0%	Perennial	-											
Lespedeza capitata	Round-head Bush-Clover	8.0%	7.0%	Perennial	-											
Monarda fistulosa	Wild Bergamot	1.1%	7.0%	Perennial	-											
Penstemon digitalis	Tall White Beard-Tongue	3.5%	7.0%	Perennial	(P)											
Rudbeckia triloba	Brown-eyed Susan	2.2%	6.0%	Perennial												
Senna hebecarpa	American Senna	9.7%	1.0%	Perennial	-											
Solidago nemoralis	Gray Goldenrod	1.2%	6.0%	Perennial	(P)											
Symphyotrichum oblongifolium	Aromatic Aster	2.0%	7.0%	Perennial	(P)											
Tradescantia virginiana	Virginia Spiderwort	0.5%	4.0%	Perennial	(P)											
Tridens flavus	Purpletop	1.7%	4.0%	Perennial	Υ											
	Seeds per Square Foot:	30	Grasse	es by Seed:	10%											
Pound	s of Pure Live Seed (PLS) per Acre:	6.5*	Fort	os by Seed:	90%											

Mix 16 Notes: Use all species listed. <u>Substitutions</u>: Use Tables 2.3 and 2.4 (Forb Mix column) to select substitute species for grasses and wildflowers, respectively. To the extent possible, select substitute species based on occurrence, adaptation, and bloom period. Recommended substitute grass species are *Eragrostis spectabilis* (Purple Lovegrass) and *Tridens flavus* (Purpletop). *Schizachyrium scoparium* (Little Bluestem) may be used as a substitute on mesic sites that are well-drained.

* Seeding rates are subject to change when substitute species are used, or when species are removed from the mix.

Scientific Name	Common Name	% by Weight	% by Seed	Duration	Grass/ Forb	Legume	Flowering Period and Flower Color										
							М	Α	м	J	J	Α	s	0	Ν		
Asclepias incarnata	Swamp Milkweed	22.2%	5.0%	Perennial	(B)												
Bidens cernua	Nodding Bur Marigold	7.2%	3.0%	Annual	(B)												
Bidens frondosa	Beggar Ticks	7.8%	2.0%	Annual	(A)												
Carex vulpinoidea	Fox Sedge	1.0%	4.0%	Perennial	Υ												
Doellingeria umbellata var. umbellata	Flat-topped White Aster	2.7%	7.0%	Perennial	(B)												
Elymus virginicus	Virginia Wildrye	15.5%	5.0%	Perennial	Υ												
Eupatorium perfoliatum	Boneset	0.8%	7.0%	Perennial	(A)												
Eutrochium fistulosum	Joe-Pye Weed	1.1%	7.0%	Perennial	(B)												
Helenium autumnale	Yellow Sneezeweed	1.7%	8.0%	Perennial	-69-												
Panicum rigidulum	Redtop Panicgrass	2.3%	6.0%	Perennial	Υ												
Pycnanthemum tenuifolium	Narrow-leaf Mountain Mint	0.6%	8.0%	Perennial	(A)												
Senna hebecarpa	American Senna	15.1%	1.0%	Perennial	(A)												
Symphyotrichum lateriflorum var. lateriflorum	Calico Aster	2.5%	6.0%	Perennial	Ŷ												
Symphyotrichum novae-angliae	New England Aster	2.0%	7.0%	Perennial	Ŷ												
Thalictrum pubescens	Tall Meadow Rue	8.0%	5.0%	Perennial	(A)												
Tradescantia virginiana	Virginia Spiderwort	0.9%	5.0%	Perennial	\$ }												
Verbena hastata	Blue (Swamp) Vervain	1.4%	7.0%	Biennial	\$ }												
Vernonia noveboracensis	New York Ironweed	7.2%	7.0%	Perennial	(A)												
Pounds	30	Grass	ses/Sedges b	y Seed:	15%												

Mix 17 Notes: Use all species listed. <u>Substitutions</u>: Use Tables 2.3 and 2.4 (Forb Mix column) to select substitute species for grasses and wildflowers, respectively. To the extent possible, select substitute species based on occurrence, adaptation, and bloom period. Recommended substitute grass species are *Chasmanthium laxum* (Slender Woodoats), *Elymus riparius* (Riverbank Wildrye), *Panicum anceps* (Beaked Panicgrass), and *Glyceria striata* (Fowl Mannagrass). Recommended substitute sedge species are *Carex lupulina* (Hop Sedge) and *Carex lurida* (Lurid Sedge). On drier sites, substitute *Chasmanthium latifolium* (River Oats), *Chasmanthium laxum* (*Slender Woodoats*), or *Elymus riparius* (Riverbank Wildrye) for *Carex vulpinoidea* (Fox Sedge).

* Seeding rates are subject to change when substitute species are used, or when species are removed from the mix.

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