



# COMPARING WARM-SEASON AND COOL-SEASON GRASSES FOR EROSION CONTROL, WATER QUALITY, AND WILDLIFE HABITAT

*Conservation Practice Fact Sheet*

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## INTRODUCTION

The terms "warm-season grasses" and "cool-season grasses" are broad categories that include a diverse collection of individual grass species. Each species has its own specific growth habits, environmental tolerances, and management requirements. The ability of a particular species, or group of species, to provide desired benefits can vary tremendously, based on site conditions and seasonal variations in temperature and precipitation. While it is possible to provide some general guidelines about warm-season and cool-season grass plantings, please be aware that exceptions can almost always be found when comparing one planting to another.

Warm-season grasses are plants that grow mostly from June through early September. They are well adapted to hot, dry weather, and will stay green in July and August, unlike the cool-season grasses that grow best in the spring and fall when soil and air temperatures are cooler.

This fact sheet explains some of the advantages and disadvantages associated with warm-season and cool-season grasses that are recommended for erosion control, water quality protection, and wildlife habitat improvement in Maryland.

## PROVIDING EROSION CONTROL AND WATER QUALITY PROTECTION

Cool-season grasses have a short-term advantage over warm-season grasses for protecting the soil from erosion and for filtering sediment and other particulates out of surface water. Cool-season species usually produce dense stands in only a year or two, as compared to three or more years for warm-season grasses. As a result, cool-season grasses usually provide erosion control and sediment trapping benefits much sooner after planting than warm-season grasses. After a few years, however, warm-season grasses will also provide these benefits as the stands mature and become denser.

Once established, warm-season grasses usually have the advantage for nutrient uptake. Many species of warm-season grasses (especially tall species such as switchgrass, coastal panicgrass, big bluestem, indiangrass, and eastern gamagrass) produce abundant top growth in addition to having root systems that are



*The bunched growth habit and stiff stems of little bluestem, a native warm season grass, provide good wildlife habitat.*

much more extensive than those of cool-season grasses. The above and below-ground biomass produced during the summer months by warm-season grasses can immobilize large quantities of excess soil nutrients.

Cool-season grasses usually produce less biomass overall, but do have the advantage of growing earlier in the spring and later in the fall, thus providing nutrient uptake benefits when warm-season grasses are dormant.

## IMPROVING WILDLIFE HABITAT

Many species of wildlife prefer native warm-season grasses for several reasons. Most native warm-season plantings are generally taller and clumpier, and maintain their species diversity longer than their cool-season grass counterparts.

### Habitat Structure

The bunched growth form of many native warm-season grasses provides the habitat structure important for nest-building by ground-nesting birds such as quail and pheasant. The openings between plant clumps provide an opportunity for these birds and other wildlife to move around and forage for food, while being protected by overhead cover. Although some cool-season grasses are also "bunch" grasses, they tend to spread out and fill in openings faster than most warm-season species.

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The stiff stems of native warm-season grasses are more likely to remain standing through the winter and into early spring, thus providing winter residents with protection from the weather and predators. The limp stems of most cool-season grasses tend to mat down much more quickly, resulting in poorer cover for wildlife as the stand matures.

### Biodiversity

In warm-season grass plantings, the openings between plants allow room for broadleaf forbs and legumes, which help support a diverse insect community and provide food (e.g., foliage, seeds, nectar, insects) for birds and other wildlife. Unlike most native warm-season species, most cool-season species can rapidly out-compete the broadleaf plants, thus reducing the diversity and habitat value of the planting. It is also not unusual for one species of cool-season grass to eventually dominate a mixed planting, resulting in a monoculture.

Recent studies have identified several other concerns associated with introduced (i.e., not native) cool-season grasses, especially if they are planted in strips adjacent to agricultural fields:

- When the diversity of a cool-season planting declines, so does insect diversity. This usually means that there are fewer beneficial insects (pollinators and predators), higher population levels of plant pests (such as aphids, mites, grasshoppers, and grubs), and an increased risk of pest outbreaks into nearby agricultural fields.
- Pests are more likely to disperse into adjacent fields when cool-season grasses are stressed during hot, dry weather. Mowing during this period can also encourage insects to disperse into adjacent areas.

Reduced plant and insect diversity may be related to endophyte infection of many cool-season grass species. Orchardgrass, timothy, and various fescues, ryegrasses, and bluegrasses have been reported to contain endophytes. Endophyte-infected grasses are usually more drought-tolerant, disease-resistant, and are less likely to be eaten by wildlife and insects. These characteristics greatly enhance the ability of cool-season grasses to compete in a planting. This is beneficial for the grasses, but is less desirable for wildlife habitat.

Although the growth habits and other characteristics of native warm-season grasses tend to favor their use for improving wildlife habitat, this doesn't mean that you should never plant cool-season grasses. A variety of habitat types is important if you want to benefit a wide range of wildlife species. For example, consider establishing and managing warm-season plantings in

some areas, and cool-seasons in others. Cool-season grasses do have one habitat advantage -- they can provide a better source of food (green foliage and insects) for wildlife in early spring because the plants "green up" much earlier in the growing season.



*A cool-season mix of orchardgrass, red fescue, red clover, and white clover can provide wildlife with a source of food in early spring while warm-season grasses are dormant.*

Regardless of whether you choose warm-season or cool-season grasses, make sure that each mix consists of a diverse combination of grasses including legumes and/or forbs, and plan to implement a maintenance regime that encourages plant diversity.

### USING NATIVE PLANTS

There has been an increasing emphasis lately on using native plant species. Why is this important?

We generally define plants as "native" if they occurred in Maryland before the period of European settlement. Early settlers from many continents brought plants with them from their home countries. Today, some of these imported plants are valuable agricultural crops. Unfortunately, many other exotic plants have become problem weed species in this country.

Native species can provide a practical and ecologically valuable choice for conservation plantings. The use of native plants is increasing as more people discover their many benefits:

- Native plants are often better adapted to local soil, rainfall, and temperature conditions than non-native (introduced) plants. Once established, native plants seldom need watering, fertilizer, or pesticides.
- Native plants can match the finest cultivated plants in beauty, while often surpassing introduced plants in resistance to drought, insects, and disease.

- Diverse, native plant communities provide excellent wildlife habitat. The seeds, fruits, and foliage of native plants are eaten by birds and mammals. The nectar of many flowering species is used by insects and hummingbirds.

Big bluestem, little bluestem, indiagrass, switchgrass, deertongue, coastal panicgrass, eastern gamagrass, broomsedge, side-oats grama, and purpletop are just a few of the warm-season grasses that are native to Maryland.



*Deertongue, a native warm-season grass, is adapted to a wide range of site conditions – from droughty to wet.*

Commonly used cool-season grasses such as orchardgrass, timothy, Kentucky bluegrass, and most fescues are introduced species. There are a few cool-season natives that are commercially available, however. These include red fescue, fowl meadowgrass, Canada wild rye, and Virginia wild rye.

Whether you choose warm-season or cool-season grasses, please keep in mind the added benefits of planting native species.

## ESTABLISHING GRASSES

Without a doubt, most cool-season grasses are easier to establish than warm-season grasses. Nevertheless, if you are willing to be patient, warm-season grasses are well worth your time and effort.

### Materials and Equipment Needed

Seeds of introduced cool-season grasses are usually more readily available and less expensive to purchase than native warm-season grasses. Depending on the species, some warm-season grasses may not be in stock at your local seed supplier and must be ordered.

Warm-season grasses are much more tolerant of poor soil conditions (i.e., low pH and/or low in nutrients) than most cool-season grasses, and therefore usually do not require addition of lime and fertilizer. With

little or no need for lime or fertilizer, the money saved on these materials should help offset the higher cost of purchasing warm-season grass seeds.

Most warm-season grasses have fluffy seeds that require the use of a specialized seed drill. This drill is outfitted with picker wheels in the seed box that stir the seed and push it down into the large diameter drop tubes. You can usually rent one of these drills locally or hire a contractor who has one.

Most cool-season grasses (and a few warm-season grasses) have small, relatively "clean" seeds that can be planted by using a conventional grass drill or culti-packer-type seeder. A grain drill may also be used if it can be properly calibrated to plant small seeds at the recommended rate. Eastern gamagrass has a large, clean seed that can be drilled with a corn planter.

### Seedling Growth and Weed Competition

Weeds provide good food and cover for wildlife, but can hinder the growth of seedling grasses by shading them and by competing for moisture and nutrients. An additional concern is that neighbors tend to complain when unmanaged weedy plantings are nearby.

Cool-season grasses germinate well and produce vigorous seedlings that can compete strongly against weeds. The seeds of warm-season grasses, on the other hand, may germinate over a period of several



*Cool-season planting of orchardgrass, red fescue, red clover, and white clover. Late spring, second growing season. This filter strip was planted during the previous fall and is now well-established.*

growing seasons. Warm-season grass seedlings usually spend one to two years producing roots but little top growth. As a result, these seedlings are less competitive against weeds during the establishment years. Because they establish slowly, warm-season grasses can be easily overwhelmed by weeds, especially on the better soils. Effective weed control, consisting of periodic mowing or the use of selective herbicides, is essential to establishing warm-season grasses in a

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reasonable amount of time. A nurse crop of small grain (especially oats) can also help to suppress weeds during the first growing season. If you are attentive to weed control, you can look forward to seeing a beautiful stand of warm-season grasses in about three years. Without good management, warm-season grass stands can still develop, but the time needed may be up to five years.

### Drought Tolerance

On dry, sandy sites, or during periods of prolonged drought, seedlings and established stands of warm-season grasses have the advantage of being very drought-tolerant. Warm-season grasses are well-adapted to growing on sites with low moisture-holding capacity (e.g., on sand hills or rocky slopes), although stand establishment may be relatively slow under harsh conditions. In comparison, most cool-season grasses are more likely to experience higher seedling mortality and thinning of established stands on dry sites and during drought periods, unless supplemental water is applied.

### MAINTAINING GRASSES

After they are established, grass plantings need occasional maintenance to rejuvenate them and to keep trees and shrubs from invading. Warm-season and cool-season grasses have somewhat different management needs.

Most warm-season grasses are long-lived and, once established, usually do not need replanting. Periodic management may consist of prescribed burning and/or light strip disking on a 3 to 4-year rotation. These techniques are used primarily to maintain high quality wildlife habitat by reducing stand density and rejuvenating the wildflower component of the planting. Prescribed burning can also be used to kill trees and shrubs that may have spread into the grass planting.

Most cool-season stands are maintained by mowing on a 2 to 3-year rotation to control woody growth. (Mowing is generally not used for warm-season grasses unless burning is not feasible.) If the cool-season grass mix includes legumes, they may need to



*Native warm-season grass planting of indiagrass, big bluestem, little bluestem, and wildflowers. Late summer, second growing season. Moderate amounts of ragweed are present, but the grasses are now tall enough to compete effectively. This planting was mowed earlier in the growing season to control weeds.*



*Another planting of native warm-season grasses (indiagrass, big bluestem, little bluestem) and wildflowers. Mid-summer, third growing season. A selective herbicide was applied during the first two years to reduce weed competition.*

be overseeded into the grasses every 3 to 4 years. As stands mature, the cool-season grasses may tend to thin out and need to be reseeded.

For both warm-season and cool-season stands, carefully managed haying or grazing and selective use of herbicides may also be appropriate management techniques.

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<b>Topic</b>	<b>Brief Summary of the Benefits and Drawbacks of Warm-Season vs. Cool-Season Grasses</b>	
	<i>Warm-Season Grasses</i>	<i>Cool-Season Grasses</i>
<b>Erosion Control and Water Quality</b>	Provide long-term benefits for erosion control and sediment trapping. Produce more overall biomass for nutrient uptake than cool-season grasses. Provide nutrient uptake during the summer when cool-seasons are dormant.	Provide short-term and long-term benefits for erosion control and sediment trapping. Provide nutrient uptake earlier in the spring and later in the fall than warm-season grasses.
<b>Wildlife Habitat</b>	Provide excellent nesting and feeding habitat. Bunch grasses provide openings for feeding, while maintaining overhead protection from predators. Stiff-stemmed grasses are more likely to remain standing for good winter protection. Plantings are more likely to remain diverse, supporting a balanced mix of plant species and insect populations.	Due to earlier "green-up," provide a better source of food (green foliage and insects) in early spring than warm-season grasses. Tend to mat down more quickly than most warm-season grasses as they age. This degrades the quality for nesting, feeding, and overhead protection. May harbor more agricultural insect pests in the summer, especially if plant diversity has declined.
<b>Establishment</b>	Usually need a specialized seed drill to plant these grasses. Seed may be more expensive and less readily available than cool-season grasses. Usually don't need much lime or any fertilizer. Tolerate poor soil conditions (i.e., nutrient-poor and/or low pH) better than cool-season grasses. Seeds are slow to germinate. Seedlings usually need 2 to 3 years to establish. Weed competition is often a problem during establishment, especially on the better soils. Seedlings and established stands are very drought-tolerant. Good for sites with low moisture-holding capacity (e.g., sand hills, rocky slopes).	Plant with a conventional grass drill or cultipacker-seeder. Can sometimes be planted with a grain drill. Relatively inexpensive, readily available seeds. Have higher nutrient requirements than warm-season grasses. Less tolerant of poor soil conditions. Seeds germinate fairly quickly. Seedlings are usually well-established 1 to 2 years after planting. Rapid seedling growth results in less weed competition during establishment. Higher seedling mortality and thinning of established stands on dry sites or during drought periods, unless supplemental water is applied.
<b>Maintenance</b>	Maintained by using prescribed burning or light strip disking on a 3 to 4-year rotation. Grasses are long-lived and usually do not need re-seeding. Can be hayed or grazed with careful management. Selective herbicides may be used for weed control.	Maintained by mowing on a 2 to 3-year rotation, and by overseeding with legumes every 3 to 4 yrs. As stands mature, grasses may thin out and need to be reseeded. Can be hayed or grazed with careful management. Selective herbicides may be used for weed control.
<b>Other Issues</b>	Most species grow very tall (5 to 8 feet), and depending on where they are planted, can "block the view." This may be a benefit or a drawback, depending on what is nearby.	Tend to be low-growing (3 feet tall or less).

***Land owners and managers please note: If you will be receiving cost-sharing for your project, be sure to check with your funding agency/organization for details concerning specific establishment and maintenance requirements. Some requirements may be more restrictive than those described in this fact sheet.***

***For more information about selecting, establishing, and maintaining warm-season and cool-season grasses, contact your local NRCS Field Service Center.***

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