



## PLANTING OF NATIVE GRASS SPECIES ON LANDFILL CAPS AND FORMERLY CONTAMINATED WASTE SITES IN THE MID ATLANTIC

Native warm season grasses provide extremely valuable habitat for ground-nesting birds and many mammals. They are very deep rooted, making for a long lasting, stress tolerant, low maintenance plant. The root biomass of native warm season grasses far exceeds that of the introduced cool season grasses. This characteristic provides increased organic matter in soils and more rapid infiltration rates. The bunch-type habit of these grasses provides space for the inclusion of native forbs, wildflowers, and legumes to further improve habitat quality.

In the past, most landfill caps and remediated waste sites have been vegetated with a monoculture of cool season non-native turf grasses (e.g., Tall Fescue or Kentucky 31). These non-native species may provide quick cover that can stabilize soils, but they require regular mowing and periodic fertilizing to maintain plant vigor. These species are also invasive and can out compete native plant species. These non-native species generally provide little food or cover for grassland birds or other wildlife, and it essentially wastes land that could be productive for wildlife. This is especially critical when breeding bird surveys note continuing declines in populations of many grassland birds (e.g., field sparrows, grasshopper sparrows, and Henslow's sparrow). There are alternative strategies that produce vegetative cover that can stabilize the soil and provide erosion control, provide habitat for a wide range of birds and other wildlife, and have lower maintenance costs than what is currently used. By striving for a diverse grassland community, habitat will be provided for several species of grassland birds with declining populations. Planting a seed mix with a both native warm and cool season grasses can achieve all of these objectives. Cool season grasses grow and flower in the early and cooler part of the summer. Warm season grasses grow in the later and warmer part of the summer. Warm season grasses are better adapted to poor soils and drier conditions, making them well suited for landfill and other caps systems, as well as most formerly contaminated waste sites.

While these cool and warm season grasses do require some mowing/haying to prevent woody species invasion and to maintain plant vigor, these grasses can often be managed on a three year mowing rotation. Conversely, species typically planted (e.g., Kentucky 31 fescue) requires mowing and fertilization at least twice a year. Thus the long-term mowing costs of these non-native species, as proposed for many cap systems, are six times the cost of mowing a native warm season grass community. Using 2003 estimates, it costs \$50/acre to mow a Resource Conservation and Recovery Act (RCRA) cap. Using Kentucky 31 as a cap seed mixture on a 30 acre landfill, and mowing twice a year for six years costs \$18,000. However, managing the same site planted in native grasses for six years costs \$3,000.

Establishing a community of native grasses does take more effort, planning, and care initially. Seeding must be done at appropriate times, and sometimes requires specialized equipment. It also takes two years to fully establish the warm season grass plants. But the long-term maintenance costs will pay off, and the difference in habitat value for wildlife species is substantial.

## Site Preparation

Warm season grasses are very adaptable, but grow particularly well on moderately well drained soils or better. Soil pH should be adjusted to achieve a pH of 5.5 or higher. Bring fertility up to medium levels for phosphorus and potassium, but **do not** apply nitrogen at or before planting time. Nitrogen will only stimulate weed competition.

## Seed Mix

The following seed mix is an example of what can be used for restoration. These species are available from commercial vendors, but orders should allow sufficient time for delivery. The seed mix can be adjusted to site specific and seasonal conditions, however the species are adapted to a wide variety of site conditions. All seeding rates are per acre of **pure live seed (PLS)**. The PLS should be specified when ordering.

	<u>Pounds/acre PLS</u>
Big Bluestem ( <i>Andropogon gerardi</i> )	4
Little Bluestem ( <i>Schizachyrium scoparium</i> )	6
Switchgrass ( <i>Panicum virgatum</i> )	2
Indiangrass ( <i>Sorghastrum nutans</i> )	6
Canada Wild Rye ( <i>Elymus canadensis</i> )	10
Partridge Pea ( <i>Chamaecrista fasciculata</i> )	2
Annual Rye Grass ( <i>Lolium multiflorum</i> )	25

The heavier seeding with annual rye grass provides immediate erosion control, as it will sprout and easily become established. The annual rye grass and the Canadian wild rye will also act as a nursery crop to protect the smaller seedlings of the other species until they can become established. Planting of a legume species (partridge pea) will improve soil conditioning and habitat quality. When the annual rye grass dies after one year, the other warm season grass species should be fairly well established, and will provide the longer term erosion control needed on these landfill caps or other cap systems. Wildflowers can also be planted with the mix to provide nectar source for birds, butterflies and other insects. The following wildflower species are widely distributed and adapted to similar conditions and should be added where additional plant diversity, wildlife value, and color is desired. All of the species listed are tall enough that they will be able to compete with native grasses for sunlight.

	<u>Pounds/acre PLS</u>
Black-eyed Susan ( <i>Rudbeckia hirta</i> )	1/2
Lanceleaf Coreopsis ( <i>Coreopsis lanceolata</i> )	1/2
Common Milkweed ( <i>Asclepias syriaca</i> )	1/2
Wild Bergamot ( <i>Monarda fistulosa</i> )	1/2

## **Application of Seed**

Seeding should generally be done in early spring (April or May). Planting can be done in the fall as the cool season grasses will sprout immediately, however, the warm season grasses will not sprout until the next spring. Heavier seeding rates of the warm season grasses may be needed to compensate for herbivory and mortality, if planted during the fall. Planting, regardless of the season, should not be done during periods of severe drought, high winds, excessive moisture, frozen grounds, or other conditions that preclude satisfactory results. Seeding can be accomplished using a Tyedrill or a Brillion drill seeder or a 3,000 gallon hydroseeder. If a Brillion drill seeder is chosen, seeds should be planted no deeper than 1/4 inch. After seeding with a drill, compact with a landroller, such as a cultipacker. With proper equipment, sowing seed and cultipacking in one operation is satisfactory. If a Hydroseeder/mulcher is used, it should have a minimum 3,000 gallon capacity with two paddle agitators, and one cutter agitator for complete shredding of mulch, capable of maintaining a homogeneous slurry. Recirculating type slurry agitation is not acceptable, as this type of agitation reduces seed viability.

## **Management of the Warm Season Grasses**

**First growing season:** The cool season grasses (e.g., Canada Wild Rye) will be the first plants to sprout. The warm season grasses (e.g., Bluestems, Switchgrass, and Indiangrass) take longer to sprout, and will primarily establish roots during this season. The area should be mowed two to three times, depending on rainfall, to reduce annual weed invasion and enable light to reach some of the small warm season grass seedlings. Mowing should be timed to prevent seed production by annual weeds. Blade height should be sufficient to crop annual weeds without damaging perennial seedlings (approximately 6-8 inches).

**Second growing season:** Mow once, depending on climate. Mow no lower than 10 inches, as mowing lower will significantly damage the crown of these grasses, cause mortality, or open site for invasion by less desirable species.

**During the third and subsequent growing seasons:** Mow one-third of the site once a year, and rotate so that each area of the site is mowed approximately once every three years. After mowing, the area should be "hayed" (i.e., collect debris) because the warm season grasses are very dense and mowed debris will kill new growth trying to germinate. Mowing should not be done during the nesting season (April 15 through July 30) to preclude killing ground-nesting birds and their eggs/young. Mow no lower than 10 inches, as mowing lower will significantly damage the crown of these grasses, cause mortality, or open site for invasion by less desirable species.

## **Monitoring Recommendations**

Quantitative monitoring of the grasses is generally not performed, however, approximately 80% of the site should be warm season grasses after 3 years. This could be a qualitative descriptive type of assessment. Please note that warm season grass species take several years to become established and substantial top growth may not occur until the third year. As long as weed species are mowed periodically in the first year, to provide sunlight to the small seedlings, these grass species are relatively easy to establish.

During the establishment period, the site should be managed for the control and elimination of non-native invasive plant species (e.g., fescue, Johnson grass, Japanese honeysuckle). Techniques employed for control of undesirable plant species can consist of physical removal and the spot or wick application of herbicides. Control of these invasive species should only be necessary during the establishment period.

During the establishment period, the site should be monitored for any significant erosion. Areas exhibiting erosion should be restored to pre-disturbance conditions as soon as possible and stabilized with standard erosion controls methodologies including, but not limited to: biodegradable matting, seeding with a native seed mix that includes annual rye grass, and depending on severity of erosion, silt fencing, or staked hay bales to reduce soil runoff. Jute matting is preferred as it is 100% biodegradable and is less harmful to wildlife.



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