Planting Guide

Switchgrass for Biofuel in Virginia

(Panicum virgatum)

GENERAL USE

Switchgrass is a native, perennial, warm season grass noted for its rapid growth in the mid to late summer when high temperatures retard the growth of cool season grasses. Switchgrass is used as a livestock forage, critical area cover, and wildlife food and cover, seeded in pure stands or mixtures. Its stiff-stemmed upright growth is rated excellent for upland bird nesting, brood rearing, and winter cover. Waterfowl prefer the more open growth habit of Indiangrass.

CHARACTERISTICS

Switchgrass produces a deep, extensive, fibrous root system and short rhizomes. It can be distinguished from other warm season grasses, even when they are young, by the white patch of hair at the point where the leaf attaches to the stem. The stem is round and usually has a reddish tint. When mature, it spreading, open seed head.

Growth begins in late April or early May, and increases rapidly with higher temperatures. It produces about seventy percent of its annual growth after July 1. If undisturbed, it attains a height of three to six feet, and has good stem strength. Mature, unharvested stems will remain standing well into the winter for increased protective cover for wildlife.

ADAPTABILITY

Switchgrass is winter hardy, and will grow throughout Virginia. It is adapted to all soil textures and moist, well-drained and poorly-drained soils. It is the most adapted warm season grass to flooded and very poorly drained conditions. Deep, well-drained soils are preferred for optimum production. Virginia is divided into three USDA plant hardiness zones, zones 6, 7, and 8. Zone 6 is the area west of Interstate 81 and is the coldest zone. Zone 7 occupies the majority of the state. Zone 8 is the area of Hampton Roads (Virginia Beach, Norfolk, Chesapeake) and the Eastern Shore.

‘Kanlow’ and ‘Alamo’ are both southern lowland type switchgrasses and are preferred for biofuel production because they produce the greatest amount of biomass, cellulose, and lignin. ‘Kanlow’, originally from southern Oklahoma, was released by the USDA, Natural Resources Conservation Service Manhattan, Kansas Plant Materials Center for wetter areas and applications requiring stiff stems. ‘Kanlow’ is adapted throughout the state. ‘Alamo’, originally from southern Texas and released from the Knox City, Texas Plant Materials Center is adapted to the eastern two-thirds of the state (plant hardiness zones 7 and 8). ‘Alamo’ has winter-killed in plant hardiness zone 6.

‘Cave-in-Rock’, originally from Illinois and released by the Elsberry, Missouri Plant Materials Center, is adapted to the western two-thirds of Virginia (plant hardiness zones 6 and 7). ‘Shawnee’ has recently been selected out of a population of ‘Cave-in-Rock’ for improved digestibility and was released by the Agricultural Research Service in Lincoln, Nebraska. It is also adapted to the western two-thirds of the state. ‘Cave-in-Rock’ and ‘Shawnee’ are the best cultivars for forage.

‘Shelter’, originally from West Virginia and released by the Big Flats, New York Plant Materials Center, is also adapted to the western two-thirds of Virginia and the best cultivar for wildlife cover. ‘Cave-in-Rock’, ‘Shawnee’, and ‘Shelter’ are not recommended for plant hardiness zone 8. The oldest adapted cultivar is ‘Blackwell’, originally from northern Oklahoma, and released by the Manhattan, Kansas Plant Materials Center. It has exceptional seedling vigor and tolerance to droughty, sterile soil conditions. ‘Carthage’, originally from Carthage, North Carolina and released by the cape may, new Jersey Plant Materials Center, is the newest cultivar and is adapted to moist, well-drained soils. ‘Blackwell’ and ‘Carthage’ are adapted throughout the state.

ESTABLISHMENT

Northern cultivars of switchgrass such as ‘Cave-in-Rock’, ‘Shawnee’, ‘Shelter’, ‘Blackwell’, ‘Kanlow’, and ‘Carthage’ require a cold, moist stratification before it will germinate at high temperatures. ‘Alamo’ does not have to be sown as early, but earlier seedings will survive summer droughts better.

Switchgrass seed should be drilled. Seedings in former crop fields require thorough preparation and packing before drilling. Prepared seedbeds must be smooth, firm surfaces free of competition. The seeding must be packed after drilling to insure good seed to soil contact. Seedings sown into fields that have been pastures or hayfields are best done without tillage to avoid exposing the seed of exotic forage species to ideal germination conditions. Good weed control of the live vegetation on the site is critical before drilling. Seedings sown into tilled pastures and hay fields will require thorough disking and weed control before drilling.

Seeding Dates - Northern Cultivars (Cave-in-Rock, Shawnee, Shelter, Blackwell, Kanlow, Carthage)

Before the date of last frost
Western Virginia - December 1 to April 15
Central Virginia – December 15 to April 1

Southern Cultivars (Alamo)

Eastern and Central Virginia - January 1 to May 1

Seeding Rate – 5-6 pounds of pure live seed per acre drilled in pure stands
Seeding Depth – 1/8-1/4 inch

The seedling vigor of switchgrass is poor, as it is for all perennial, native warm season grasses. Weed control is critical for stand survival. The only residual herbicides approved for use with perennial native warm season grasses are Plateau and Journey, but they are not recommended for use with switchgrass. All weed control must be done with contact herbicides or mowing. Most contact broadleaf herbicides are approved for use on warm season grasses. Annual grasses must be controlled by mowing over the top of the switchgrass to prevent the weeds from making seed. Annual broadleaf weeds that are not controlled by herbicides may also be controlled by mowing over the top of the switchgrass to prevent the weeds from making seed. Both annual and perennial cool season grasses may be controlled when the switchgrass is dormant with a contact herbicide such as Roundup.

The stand should be fertilized to raise the levels of phosphorus and potassium to moderate levels for corn (100 bushels per acre yield) before seeding. Nitrogen should not be applied until mid-summer once the stand is established and competing well with any weeds. Nitrogen rates the first year should be thirty to forty pounds per acre. The pH should be maintained between 6.0 and 6.5 for optimum yields. It will tolerate pH as low as 5.0 and maintain healthy stands for mine reclamation.

MANAGEMENT

Stands managed for biofuel should be fertilized annually with eighty to one hundred pounds of nitrogen per acre, split into two applications in June and August. Nutrient contributions from manure of grazing livestock should be accounted for. Moderate soil test levels of phosphorus and potassium should be maintained.

Biofuel yields are greatest and stands are the least impacted when the stand is cut once a year three to four weeks after the first frost in the fall. A stubble height of six inches should be left. Stands cut once a year will also not have a negative impact on ground-nesting birds in the stand.

Weed control may be accomplished best by maintaining plant vigor of the switchgrass. Broadleaf weeds may be controlled with contact herbicides applied during the growing season. Cool season grasses may be controlled with contact herbicides applied when the switchgrass is dormant.

Prepared by Robert Glennon, USDA, Natural Resources Conservation Service, Natural Resource Specialist, November 2006 2002.
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