USDA
United States Department of Agriculture

A Conservation Plant Released by The Natural Resources Conservation Service
Cape May Plant Materials Center, Cape May Court House, New Jersey

'CARTHAGE' switchgrass

Panicum virgatum L.

Figure 1: Carthage switchgrass is a cultivar released from the Cape May Plant Materials Center, Cape May Court House, NJ.

'Carthage' switchgrass (*Panicum virgatum* L.) is a cultivar released in 2006 by the Cape May Plant Materials Center (PMC), Cape May Court House, NJ.

Description
Carthage switchgrass is a native, perennial, warm-season bunchgrass that grows 4–5 feet tall. It has round stems and produces a many-branched, open, 6–18 inch indeterminate inflorescence. It spreads by seed or by short rhizomes up to 0.5 inches long. It produces an average of 134 stems/ft^2 with stems measuring 0.12 inches in diameter on average.

Carthage shows better than average spread, a higher forage nutrient value, and earlier spring recovery than current Midwest selections of switchgrass being used in the Northeast. Agricultural Research Service studies from Penn State show Carthage has very good yields of high-quality forage with excellent stand persistence. The most desirable traits of this cultivar are its good seedling vigor and outstanding leafiness. Because it matures late compared to other varieties of switchgrass, it complements cool-season forages for mid to late summer use.

Source
A single clone was collected vegetatively from an individual plant in 1957 near Carthage, North Carolina. The clone was vegetatively increased, and open pollinated in isolation. The collection site is located on the boundary of the Piedmont and Coastal Plain physiographic region. The dominant soils in this region are deep, sandy Quartzipsamments and Paleudults. Since its release, the origin of Carthage has come under scrutiny based on research examining the diversity of switchgrass varieties. Genetic analysis of 49 switchgrass accessions revealed that Carthage was not representative of local genotypes and was more closely related to accessions originating from the Midwest (Zhang et al., 2011). Researchers hypothesized that Carthage was transferred by the U.S. Army from its Midwest origins to North Carolina with the transfer of horses, mules, and prairie hay from Fort Robinson (western Nebraska) to Fort Bragg (approximately 12.4 miles from Carthage, NC) (Zhang et al., 2011).

Comparative trials of Carthage and other switchgrass varieties were conducted in PA, NY, and RI. Carthage was selected for high forage yield production, stand establishment persistence, and forage nutrient value.

Conservation Uses
Carthage switchgrass was released primarily for forage or hay production. It has produced greater yields in the Northeast and Mid-Atlantic than popular Midwestern varieties such as 'Cave-in-Rock' and 'Blackwell'. Studies conducted at the Cape May PMC (Cape May, NJ) showed the protein content of Carthage switchgrass ranged from 8–10%. Secondary potential uses include wildlife habitat, land restoration, conservation cover, buffers, and critical area planting.

Area of Adaptation and Use
Carthage switchgrass was developed for use in Mid-Atlantic states from North Carolina to northern Pennsylvania and New Jersey (USDA Hardiness Zones 6a–8b). These soils tend to be shallow and droughty. Carthage performed well in trials conducted as far north as New York and Rhode Island.

Establishment and Management for Conservation Plantings
Drill seed into a well-prepared conventional seedbed or no-till into a killed sod at a depth of 0.5 inches. If broadcast, lightly rake and cultipack the site to provide good seed to soil contact. It can be no-tilled into a cool-season crop and mixed with partridge pea for wildlife planting. Solid stands are established using 8–10 pounds of pure live seed per acre. In a mixed seeding with other warm-season grasses, the rate should be lowered to 4–6 pounds per acre. The optimum seeding time is mid-April to mid-June. If early cool-season weeds are a problem, suppress weed competition and plant towards the later end

of the seeding window. On sites where weeds are not a problem, an early spring seeding (April) is best. Fertilization can be used moderately as determined by a soil test, however, fertilization will also increase weed competition. Amendments may be applied prior to, during, or after seeding. Nitrogen should only be applied after green growth has begun in the second growing season. The soil pH should be adjusted to a range of 5.5–6.5. It grows best in sandy to loamy soils and does not perform as well in heavier soils.

Switchgrass seedlings are slow to establish relative to cool-season grasses such as fescue and ryegrass. Stands that appear poor the first year will most likely improve the second growing season. To control weeds mow to the height of 4–6 inches three to four times the first year after planting. Pre and post-emergent herbicides for broadleaf and grassy weeds may be applied, however do not apply post-emergent herbicide until switchgrass has developed at least four leaves.

Newly seeded areas should not be grazed the first year. Begin grazing in a rotational system when switchgrass plants are 18–24 inches tall. Graze no lower than 8–10 inches and allow the plant to recover to 24 inches before utilizing again.

Ecological Considerations
There are no known limitations or cautions for the use of Carthage switchgrass. Carthage can be negatively affected by insect and disease such as grasshoppers, flea beetles, and leaf/stem rust. Spot blotch can be especially problematic in New Jersey but Carthage has displayed better resistance than other common switchgrass varieties (Bonos, Helsel, & Hlubik, 2008).

Seed and Plant Production
Seed production fields may require two or more years before the stand becomes productive. The Carthage seed production field at the Cape May PMC produced an average of 10,050 lb/ac of biomass from 2009 to 2013. Carthage switchgrass seed produced at the Cape May PMC from 2000 to 2011 had an average germination rate of 51.4% based on the results from seven seed lab tests. Seed production yields averaged 70.8 lb/ac when harvested by combine and 11.5 lb/ac when harvested using a flail vac seed harvester. There are approximately 250,000 seeds per pound.

Availability
For conservation use: Carthage switchgrass is available from several Mid-Atlantic nurseries. Refer to the *New Jersey Plant Materials Center Conservation Plant Releases and Suppliers* brochure for sources. For more information on the availability, planting, and use, contact your local NRCS office or Soil and Water Conservation District.

For seed or plant increase: Seed production of Carthage switchgrass will be maintained by the USDA-NRCS Cape May PMC. Foundation seed is available to seed producers for increase and to other interested parties, as available. Seed increase is limited to two generations (Registered and Certified) beyond the Foundation seed class to maintain satisfactory genetic purity and identity. Carthage switchgrass requires a minimum isolation distance of 900, 300, or 165 feet from other cultivated varieties and wild populations of switchgrass to produce Foundation, Registered, or Certified seed classes respectively (AOSCA, 2016).

For More Information
Cape May Plant Materials Center, 1536 Route 9 North, Cape May Court House, NJ, 609-465-5901, https://www.nrcs.usda.gov/plant-materials/njpmc.

Citation
Release Brochure for Carthage switchgrass (*Panicum virgatum)*. 2024. USDA-Natural Resources Conservation Service, Cape May Plant Materials Center. Cape May Court House, NJ.

For additional information about this and other plants, please contact your local USDA Service Center, NRCS field office, or Conservation District <http://www.nrcs.usda.gov/>, and visit the PLANTS Web site <http://plants.usda.gov> or the Plant Materials Program Web site <http://www.plant-materials.nrcs.usda.gov>

References
AOSCA. 2016. Seed Certification Handbook. Association of Official Seed Certifying Agencies, Moline, IL.
Bonos, S., Z. Helsel, and W. Hlubik. 2008. Switchgrass production and use in New Jersey. Fact Sheet 1075. Rutgers New Jersey Agricultural Experiment Station Cooperative Extension, New Brunswick, NJ.
Zhang, Y, J.E. Zalapa, A.R. Jakubowski, D.L. Price, A. Acharya, Y. Wei, … M.D. Casler. 2011. Post-glacial evolution of *Panicum virgatum*: centers of diversity and gene pools revealed by SSR markers and cpDNA sequences. Genetica 139: 933-948.