UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
CAPE MAY COURT HOUSE, NEW JERSEY

and

RUTGERS UNIVERSITY
AGRICULTURAL EXPERIMENT STATION
NEW BRUNSWICK, NEW JERSEY

NOTICE OF RELEASE OF HIGH TIDE GERMPLASM SWITCHGRASS TESTED PLANT MATERIAL

The USDA-Natural Resources Conservation Service (NRCS), USDA-Agricultural Research Service (ARS) and the Rutgers University, Agricultural Experiment Station announce the naming and release of High Tide switchgrass *Panicum virgatum* L. High Tide germplasm switchgrass has been assigned the Accession number 9094764. This release will be referred to as High Tide germplasm and is released as a tested plant materials class of certified seed.

This alternative release procedure is justified because of grower demand for a Middle Atlantic ecotype of switchgrass that has application for tidal shoreline/streambank stabilization. Currently no switchgrass releases are commercially available in the Mid-Atlantic/Northeast for this application. Grower demand is relatively high for this selection as a local ecotype switchgrass.

Collection Site Information:
Accession # 9094764 was originally collected in September 2000 from a native stand of switchgrass growing in the upper margins of the intertidal zone along a tidal shoreline near Perryville, Maryland. The stand was discovered by David Wilson, Coordinator, Eastern Shore Maryland RC&D office. The location is the Veterans Hospital in Cecil County at 39 degrees, 32' N. latitude and 76 degrees 4' W. longitude (MLRA 149A, Northern Coastal Plain region). This monocultural stand was growing in tidal fresh water near the location where the Susquehanna River empties into the Chesapeake Bay. Plants growing in association were Canada rush (*Juncus canadensis*), American three square (*Schoenoplectus pungens*) and giant cordgrass (*Spartina cynosuroides*). Annual precipitation in the area is 40-47 inches. The freeze free period averages 220 days and the Plant Hardiness Zone is 7a.

Description:
Switchgrass is a native, erect, coarse, warm-season perennial bunchgrass. The foliage height of this germplasm averages 5-6 feet in height, the inflorescence length averages 18-inches (47 cm) and the open panicle often extends to a height of 6 to 7 feet (1.8-2.1 m). Tables 1 and 2 summarize data collected by Rutgers University on morphological characteristics of the High Tide germplasm in comparison to other releases/germplasm. The low incidence of spot blotch

disease and lodging in 2005 and 2006 (Table 1.) along with High Tide's low ash content make it a potentially good biofuel crop. (Table 2.)

Switchgrass has both sod and bunch-forming ecotypes. Bunch-forming ecotypes like 'Carthage' are generally encountered on uplands. In the Southeast, bunch-forming ecotypes have only short, vertically oriented rhizomes averaging 0.5 inch (1.4 cm) in length, while sod-forming ecotypes, like High Tide germplasm, have both short, vertically-oriented rhizomes and long horizontally-oriented rhizomes (2 to 4 times longer than vertical rhizomes) Switchgrass roots may reach depths of 8 feet (2.5 m) or more.

Table 1. Morphological and agronomic characteristics of switchgrass cultivars/germplasm grown in New Jersey in 2005 and 2006.

								Spot Blotch	
		Plant Height		Panicle length		Anthesis Date		Disease	Lodging
Population	Ecotype	2005	2006	2005	2006	2005	2006	2005	2006
		----------cm----------				----julian day----		---1-10 scale†---	
High Tide*		**117.4**	**174.8**	**46.2**	**48.7**	**236.5**	**197.4**	**9.4**	**7.9**
Timber*	Lowland‡	157.2	240.6	53.9	61.2	242.1	202.6	7.2	7.3
Kanlow	Lowland	159.5	232.4	52.9	57.2	243.3	210.1	9.2	6.9
Pathfinder	Upland	106.5	158.7	47.5	44.9	233.7	190.6	6.7	3.5
Carthage*	Upland	122.5	180.2	63.9	63.8	233.9	194.0	6.9	6.3
196	Unknown	109.4	154.3	45.9	47.2	234.1	192.3	7.5	5.2
Turkey	Unknown	110.0	158.4	45.1	41.9	230.4	185.7	8.4	3.3
Caddo	Upland	106.4	158.7	47.5	44.6	230.3	187.4	4.8	4.0
Contract*	Upland	99.0	157.3	43.1	44.8	231.3	184.4	8.8	6.2
Shelter	Upland	100.0	158.4	37.0	36.6	233.1	181.0	8.3	7.5
Shawnee	Upland	110.4	154.9	47.2	42.1	234.7	190.7	4.9	4.2
Sunburst	Upland	109.8	160.4	35.8	39.7	236.1	185.3	7.5	6.6
Blackwell	Upland	124.2	175.1	46.9	46.2	234.3	192.8	5.3	4.3
PAV12	Unknown	103.3	155.5	34.0	36.2	230.7	178.3	10.0	4.7
LSD		9.5	10.4	7.1	5.5	3.5	3.8	1.3	1.2

† Spot blotch disease and lodging were rated on a 1-10 scale, where 10= least disease or lodging.
* Northeast populations
‡ This population was not characterized but appears to exhibit very similar characteristics to the cultivar 'Kanlow' indicating that it appears to be a Lowland ecotype.

Table 2. Biomass, lignin, and chemical composition of stems of switchgrass cultivars/germplasm grown in New Jersey in 2006.

Population	Biomass	Lignin Content (ADL)	Cell-ulose Content (NDF)	Hemi-cellulose Content (ADF)	Ash Content	Cl Content
	-g/pl-	----------% dry weight ----------				
High Tide	**1012**	**9.29**	**41.79**	**26.68**	**0.38**	**0.25**
Timber	1292	9.41	38.12	32.38	1.34	0.15
Kanlow	1072	6.46	45.43	27.16	1.59	0.22
Pathfinder	958	5.15	44.40	26.37	2.45	0.23
Carthage	929	7.86	26.96	43.45	0.82	0.21
196	848	7.16	44.12	29.69	1.36	0.23
Turkey	848	8.03	44.05	29.07	1.70	0.21
Caddo	774	7.36	41.35	29.29	1.84	0.19
Contract	735	6.87	41.54	26.99	1.19	0.27
Shelter	721	4.85	38.59	16.47	1.31	0.31
Shawnee	710	6.37	43.00	31.05	1.92	0.20
Sunburst	392	5.67	41.19	30.60	1.73	0.40
LSD	405	1.6	NS	NS	0.6	0.12

Method of Breeding and Selection:
Seed was collected from hundreds of individual plants in Fall 2000 and Fall 2001. Seed was cleaned and stored until flats were sown in the greenhouse in the winter of 2000-2001. A seed increase production field was established Spring 2001 in a wetland pit with 2" plugs planted one foot apart within a row and on 42" row centers to accommodate our cultivation equipment. During the growing season the production field is flooded once a week to simulate natural conditions of the collection site. The production field was increased in Spring 2002 to it's present ¼ acre size. No breeding or selection from this stand was done. Seed is bulked and will be distributed as tested germplasm.

Ecological Considerations and Evaluation:
An Environmental Evaluation (attached) of this release was done as directed by policy. The resulting determination indicated that there are no limitations for it's use .

Primary Conservation Use:
This germplasm release is suited for streambank/shoreline stabilization in a freshwater environment as well as for herbaceous riparian buffer plantings. A few individuals from the population have exhibited some salt tolerance in a controlled salt acclimation environment at the Cape May Plant Materials Center.

This release has been proven an excellent performer in herbaceous riparian zone plantings. In a cooperative study with the USDA-ARS Pasture Lab, multiple warm season species/cultivars were evaluated on their adaptation to riparian zones. The entries (Table 3.) included High Tide germplasm switchgrass (HSG), 'Red River' prairie cordgrass, (*Spartina pectinata*) (PCG), 'Bonilla'(BBB), 'Niagara'(NBB), and 'Suther' (SBB) Big bluestem (*Andropogon gerardii*), 'Osage' (OIG) and 'Suther' (SIG) Indiangrass (*Sorghastrum nutans*), 'Shelter' (SSG) switchgrass, and NY tetraploid (EGG) eastern Gamagrass (*Tripsacum dactyloides*)

The High Tide germplasm exhibited exceptional survival, growth, and biomass production compared to other switchgrass entries as well as other species. (See Tables 3-7). These studies were conducted in four locations: Wye Research and Education Center (University of Maryland-Ag. Experiment Station) on the Eastern Shore of Maryland, Mattern Watershed site in south central PA, Lambs Creek in north central PA, and at the Big Flats Plant Materials Center in south central New York state. Each location was subject to high soil water tables and periodic flooding throughout the year. The study was designed to determine which species of native warm season grasses were best adapted to these soil/site conditions. Plants in the center of each row were evaluated for survival and vegetative vigor in the Spring of 2005 and 2006. The High Tide germplasm is designated as HSG in all the bar charts. Table 4 summarizes plant survival at the four locations in 2006. The only entry that had a higher average survival than High Tide germplasm across locations was 'Red River' (PCG) prairie cordgrass. Table 5 summarizes biomass yield, which averaged highest for High Tide and Tables 6 and 7 gives a relative ranking to all the entries. 'High Tide' switchgrass and 'Red River' prairie cordgrass were the two highest ranked species in the study. which also included:

Table 3. Species list for USDA-ARS/USDA-NRCS Riparian Zone Study.

Species	**Cultivar/Germplasm (Symbol)**
Switchgrass	**Shelter (SSG)** **High Tide germplasm (HSG)**
Prairie cordgrass	**Red River (PCG)**
Eastern Gamagrass	**NY tetraploid (EGG)**
Indiangrass	**Osage (OIG)** **Suther (SIG)**
Big Bluestem	**Suther (SBB)** **Niagara (NBB)** **Bonilla (BBB)**

Table 4. Percent Survival in 2006 of Warm Season Grasses across the Four Project Locations.

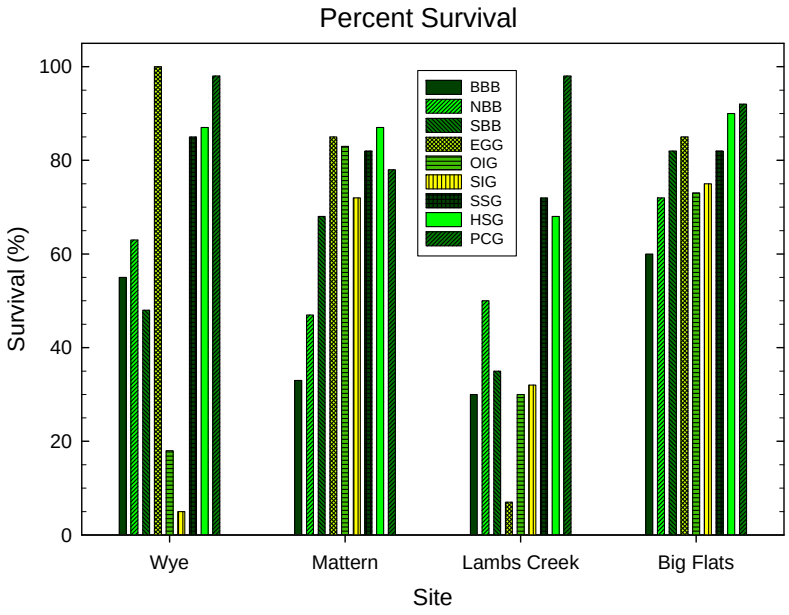

Table 5. Biomass Production in 2005 of Warm Season Grasses at the Four Project Locations.

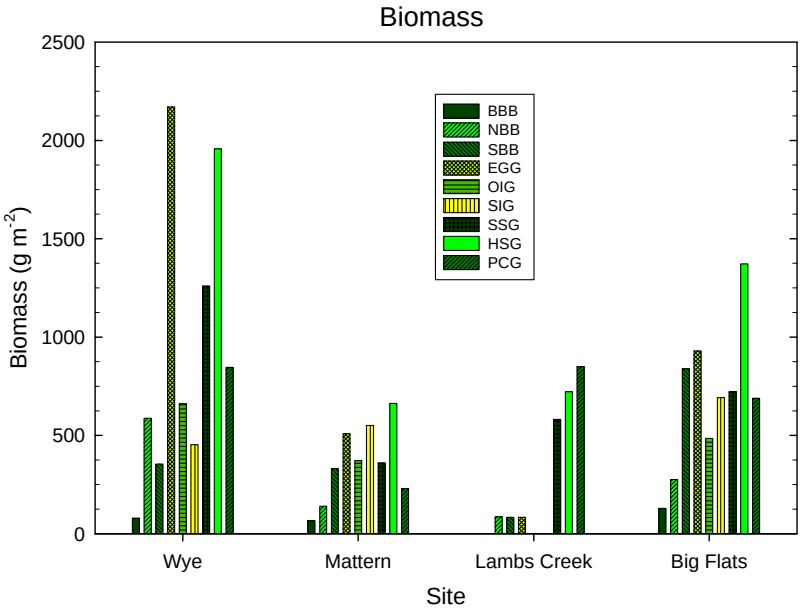

Table 6. Relative Rank of Warm Season Grasses for Survival, Height, and Biomass Production Across the Four Project Locations. (2005-2006)

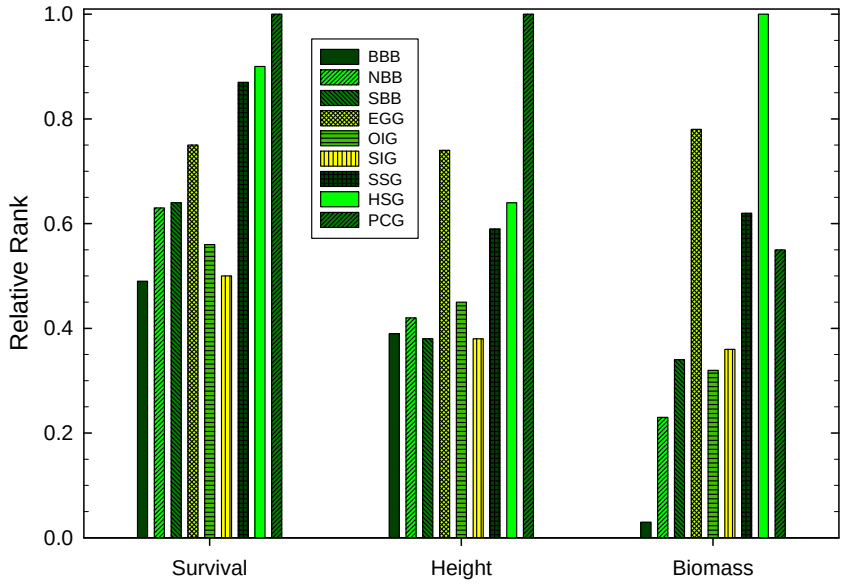

Table 7. Overall Relative Ranking of Species for Survival, Vigor, and Yield (2005-2006)

Cultivar	Survival (2006)	Vigor (2006)	Yield (2005)	Overall
	Relative ranking (1=best, 9=worst)			
Red River PC	1	1	4	2.0
High Tide SG	2	3	1	2.0
NY tetraploid EG	4	2	2	3.0
Shelter SG	3	4	3	3.3
Osage IG	7	5	7	6.3
Niagara BB	5.5	6	8	6.5
Suther BB	5.5	8.5	6	6.7
Suther IG	8	8.5	5	7.2
Bonilla BB	9	7	9	8.3

Secondary Conservation Use:

Due to the amount of biomass this germplasm produces as well as the low ash content (Table 2), it may have application as a biofuel crop. High Tide germplasm has been included in biofuel production projects in comparative studies with other switchgrass entries at Cornell University, Rutgers University, North Carolina State University, and University of Florida. Additional results will be forthcoming.

Area of Adaptation: This release is recommended for planting throughout the Mid-Atlantic and Northeast area of the Eastern U.S. from the Southern Tier of New York west to western Pennsylvania and south to southern and eastern shore Maryland and Virginia.

Availability of Plant Materials:

Original germplasm material may be obtained through the Cape May Plant Materials Center, 1536 Route 9 North, Cape May Courthouse, NJ 08210. Phone: (609) 465-5901 FAX: (609) 465-9284.

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Signatures for release of:

High Tide Germplasm switchgrass
***Panicum virgatum* L.**

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