DEVELOPMENT OF A MID-ATLANTIC COMPOSITE RELEASE OF BEAKED PANICGRASS – FINAL REPORT

Introduction

Beaked panicgrass (*Panicum anceps* Michx.) is primarily a clump-forming, warm-season, perennial grass with two subspecies. One is a lowland ecotype, *P. anceps* ssp. *rhizomatum* Hitch & Chase, and is found only in the Coastal Plain. The other, an upland ecotype, *P. anceps* ssp. *anceps* Michx, is evenly distributed throughout the range. Both subspecies are rhizomatous, but *P. anceps* ssp. *rhizomatum's* rhizomes are longer. Researchers at the Norman A. Berg National Plant Materials Center (NPMC) and Dr. Sara Tangren of Chesapeake Natives, Inc., studied 17 populations of beaked panicgrass from Maryland and Virginia (see Figure 5). The goal was to select a source-identified release useful for soil stabilization, grazing and re-vegetation of mined sites and other disturbed areas. Beaked panicgrass is common in the Piedmont and less so on the Coastal Plain, yet it is tolerant to a wide range of habitats including well-drained sandy to waterlogged sites.

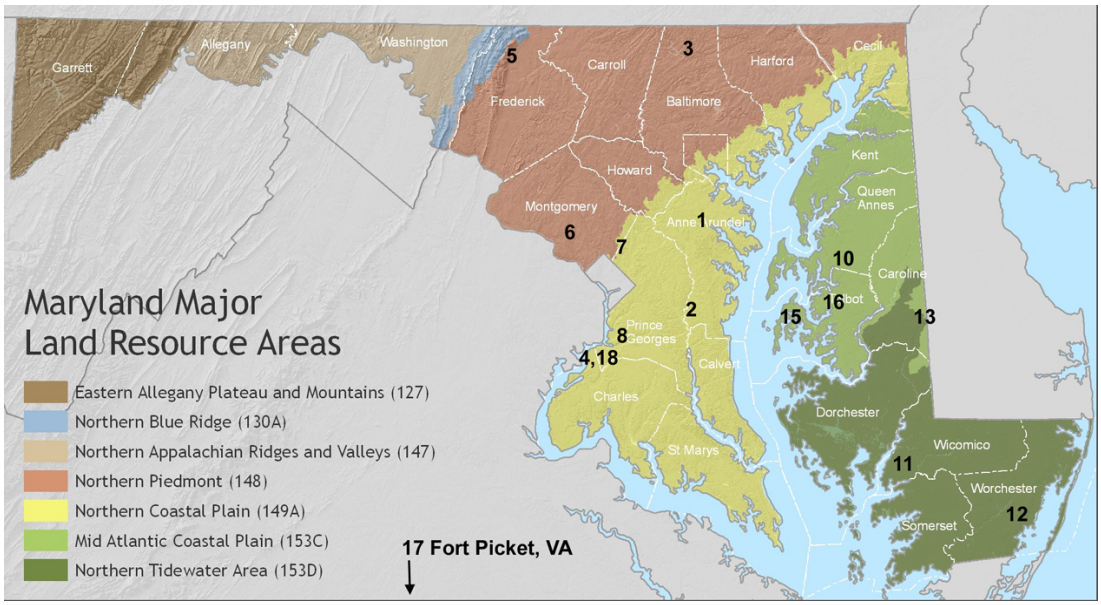

Figure 5: Parent population locations of beaked panicgrass indicated by NRCS propagation numbers. The map shows parent population by geologic province, with all but one accession originating in Maryland. Please note the population from Fort Picket, VA. Map courtesy Amanda Moore USDA, NRCS 2009.

Beaked panicgrass has tremendous potential for soil stabilization. In the 1940s, 1960s and 1980s various conservation organizations were experimenting with beaked panicgrass. This research involved meadow establishment, forage production on poor soils, surface mine stabilization, germination requirements (Kujawski, 2001) and developing a cultivar for soil stabilization purposes (Grabowski, 2004). Livestock and deer graze beaked panicgrass from early spring to late fall. Livestock grazing should be deferred through the summer to improve plant vigor and density. The plant produces prodigious amounts of seed that are a food source for terrestrial and water birds.

Experimental Design and Conduct

Multiple methods were used to locate wild populations of beaked panicgrass, including examining herbarium vouchers. Table 3 lists the propagation numbers, county and site location for the Maryland and Virginia parent populations.

Table 3: Collection data of parent beaked panicgrass populations, by county, site location and relative population size. Please note that it is common for herbaceous plant population abundance to be estimated visually in categories of one to 10, 10 to 100, 100 to 1000, etc.

Propagation #	County	Site Location	Approximate # plants in population
1	Anne Arundel	Piney Orchard Power Line	10,000
2	Anne Arundel	Sands Road Telephone Line	100
3	Baltimore	Parkton Verizon Power Line	50
4	Charles	Kabin on the Korner	10,000
5	Frederick	Auburn Road	10,000
6	Montgomery	Potomac Power Line	1,000
7	Prince George's	Sellman Road Power Line	1,000
8	Prince George's	Foust Road Telephone Line	1,000
9	Queen Anne's	Lands End Rd TL	25
10	St. Marys	Queens Landing Road	10,000
11	Wicomico	Rt 352 Telephone Line	10,000
12	Worcester	Rt 376 Telephone Line	5
13	Worcester	Rt 611 Telephone Line	100
14	Caroline	Sand Hill Road, Rt 404 and Noble Rd.	10,000

Seed Germination: There has been limited experimentation on the germination of beaked panicgrass populations. Tests performed in conjunction with Chesapeake Natives, Inc. demonstrated that beaked panicgrass seed germination responds well to cold moist stratification. Treatments for the 12 accessions propagated out of the 14 parent populations included origin of the seed (parent population) and cold stratification duration (30, 60, or 90 days). Seed was sown into 179 (98 and 144 cell) trays using a seed-sowing machine. Cold stratification was at 40°F and 50% humidity. As the length of stratification increased, so did the germination percentage. The highest germination percentage, approximately 50%, occurred after 90 days, and then the germination percentages level off (see Figure 6). Propagation requires 14 to 15 weeks from germination to finished plug.

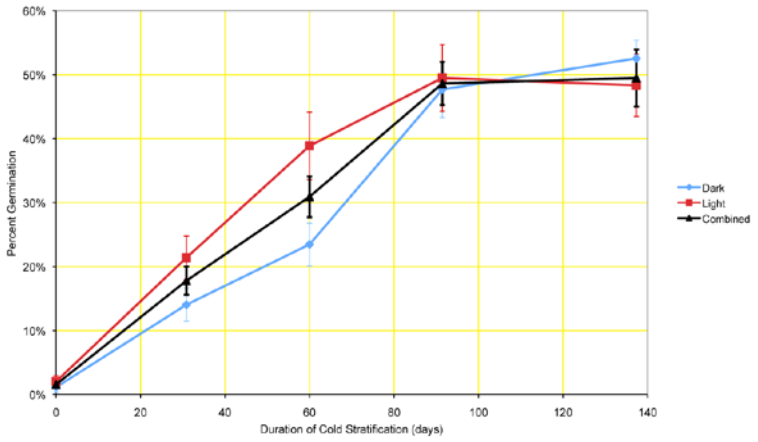

Figure 6. All treatments show increased germination percentages with cold stratification. The percent germination increases with the number of days in cold stratification, until 90 days when germination rates become stable regardless of treatment.

Parent Population Seed Germination Results: A significant source of variation in the germination experiments was due to the collection site (see Figure 7). Whether the differences are due to parent population's genetics, seed collection date or other factors cannot be determined, and needs further examination. Such a determination would require multiple collections from the same sites and multiple years.

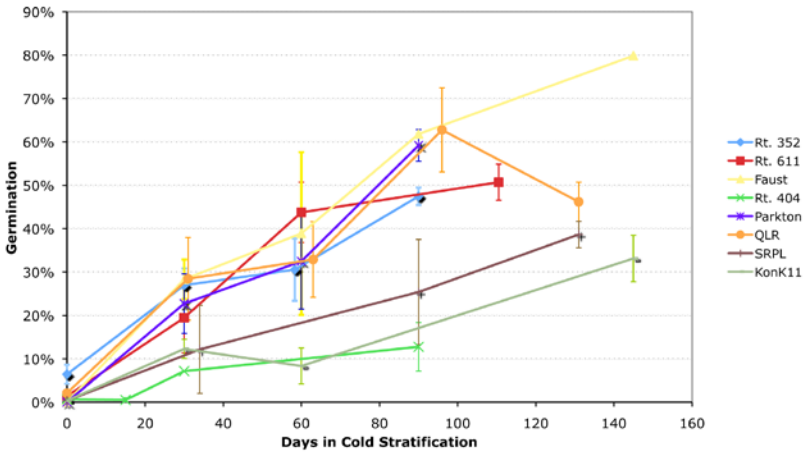

Figure 7. Germination in all eight lines increased with stratification time. The rate of the increase was affected by collection site.

P. anceps ssp. *rhizomatum:* The Rt. 404 collection site in Caroline County Maryland, (see Figure 1, and Propagation #14 of Table 1) had a significantly low germination percentage, approximately 12% after 90 days cold stratification (see Figure 7). A small amount of seed was collected from a large parent population, this seed produced only five plugs and it was not possible to advance it to the trials. Three distinguishing collection site features were noted:

1. Uniform sized plants and seed maturity date.
2. Large population (over 10,000 plants).
3. Small seed size

The habitat, location and seed size suggest that this population may be subspecies *rhizomatum*. Nine other populations were collected in the Maryland Coastal Plain region; all had good germination rates. If this population is subspecies *rhizomatum*, then the individual plants would be closely related and contain limited genetic diversity. Confirming this requires a second Rt. 404 site visit in order to observe the root structure of the population. This rhizomatous species could be superior to the clump forming species since it would most likely be highly successful in fully populating a site.

Evaluation Fields Establishment: Starting in mid-May 2008, the beaked panicgrass evaluation fields were established at three different geographic areas covered by this project:

1. Coastal plain east of the Chesapeake Bay – A farm in Talbot County.
2. Coastal plain west of the Chesapeake Bay – On the NPMC grounds located in Prince George's County.
3. Piedmont – A farm in Carroll County.

Field layout: Field layout and installation considerations included: the number of accessions for each species, the number of replicate blocks to be planted, plant vigor, size and the width of the small plot combine.

In May 2008, three replications of one year-old beaked panicgrass multipot-plugs (one inch in width by four inches in length) were planted in 14 rows with 10 plants in each row. Each plant was planted two feet apart with four feet between rows and with five foot borders. The field was irrigated during plant establishment for the first growing season only during dry periods using hoses and impact sprinklers when less than one inch of precipitation occurred during a week. Weed competition was limited by spring herbicide applications of surflan (active ingredient oryzalin, 3oz/gal) SedgeHammer™ (active ingredient halosulfuron .9 oz/gal) and three way amine (active ingredient 2, 4 D, dicamba, and mcpp .75 oz/gal). Mechanical cultivation also limited weed competition and achieved 100% groundcover in only two growing seasons (see Figure 8).

Beaked panicgrass (see Figures 8 and 9) consists primarily of low basal foliage until the culms begin to send up panicles in June. By July, the plants are approximately three feet tall, with the upper foot or so consisting primarily of panicles. The plants continue to produce new panicles into the fall. Based on ten, half gram samples it is estimated that beaked panicgrass seed contain an average of 4,640,260 seeds per pound. When planted in a no-till seed drill seed at a rate of approximately 20 seeds per square foot, each pound contains enough seeds to plant over five acres.

Figure 8. Rows of beaked panicgrass growing in a sandy loam, July 2009 at the NPMC.

Figure 9. A close up image of a two-year old beaked panicgrass clump clearly showing the characteristic growth ring which is just becoming apparent. Grass blades radiate outward from an empty circle.

Discussion and Results

Beaked panicgrass tolerates a wide range of habitats, from well-drained sandy soil to waterlogged sites. It prefers growing in 35 percent shade and tolerates full sun situations. This adaptability makes it a perfect candidate for various conservation uses including: wet or mesic soils meadow establishment, and forage production for cattle and horses on poor soils. Ground nesting birds benefit from beaked panicgrass seed and habitat. The short stature and clump forming growth compliment wildflowers which can attract a diversity of pollinators.

Due to small seed size and large volume of seed produced per plant, care should be taken when cleaning beaked panicgrass seed. The seed cleans relatively easily; the NPMC uses an Eclipse 324 three screen clipper, 25 percent air setting, and a 12 x 12 (.018 inch x .018 inch) wire screen to achieve 73 percent pure seed. The moderate germination percentages (50%), lengthy cold stratification period (90 days) and over one year establishment period should be considered in critical areas in which a quick cover is required. Autumn sowing of a nurse crop, such as annual rye, in combination with beaked panicgrass, should alleviate this challenge.

It is important to note that even though beaked panicgrass collection sites varied widely throughout Maryland and Virginia (see Figure 1); the physical appearance of the various populations was very similar (see Figure 8). Spring green up, flowering dates and seed set were all observed to occur at roughly the same time. These similarities were consistent at all three evaluation sites.

Project Termination: After consultation with partners from the conservation seed industry it was determined that commercial seed growers were meeting the conservation needs for beaked panicgrass seed. Ernst Conservation Seed, Inc. currently offers a Mid-Atlantic provenance, beaked panicgrass (Worchester County Maryland) and will receive seed from this project in order to bolster the genetic diversity of its product. Additional seed will be deposited in Agricultural Research Service, National Plant Germplasm System, for long-term preservation of this species. Plants will be donated (September 2012) to local government and non-profit watershed agencies (City of Hyattsville, Parks Department and the Anacostia Watershed Society).

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DEVELOPMENT OF A MID-ATLANTIC COMPOSITE RELEASE OF GRAY GOLDENROD - FINAL REPORT

Introduction

Gray goldenrod (*Solidago nemoralis* Aiton) is an herbaceous perennial plant that blooms in late summer and fall with potential value in a variety of conservation applications. Among its uses are wildlife habitat creation and providing hardy groundcover in harsh, sunny conditions in the Coastal Plain and Piedmont regions of the Mid-Atlantic. In 2009 researchers from the USDA Natural Resources Conservation Service's Norman A. Berg National Plant Materials Center (NPMC), in cooperation with Dr. Sara Tangren of Chesapeake Natives, Inc., implemented plans to develop a selected class, composite release of gray goldenrod.

After two successful years of establishment, mortality rates soared. Due to this high mortality, efforts to develop a composite release of gray goldenrod were abandoned. Gray goldenrod has the potential to be an important conservation plant if cultural practices can be developed to manage the short lived nature of the plant.

Experimental Design and Conduct

An assembly of 12 Maryland provenance gray goldenrod populations was compiled for the study. Figure 10 shows collected parent population locations by Major Land Resource Area.

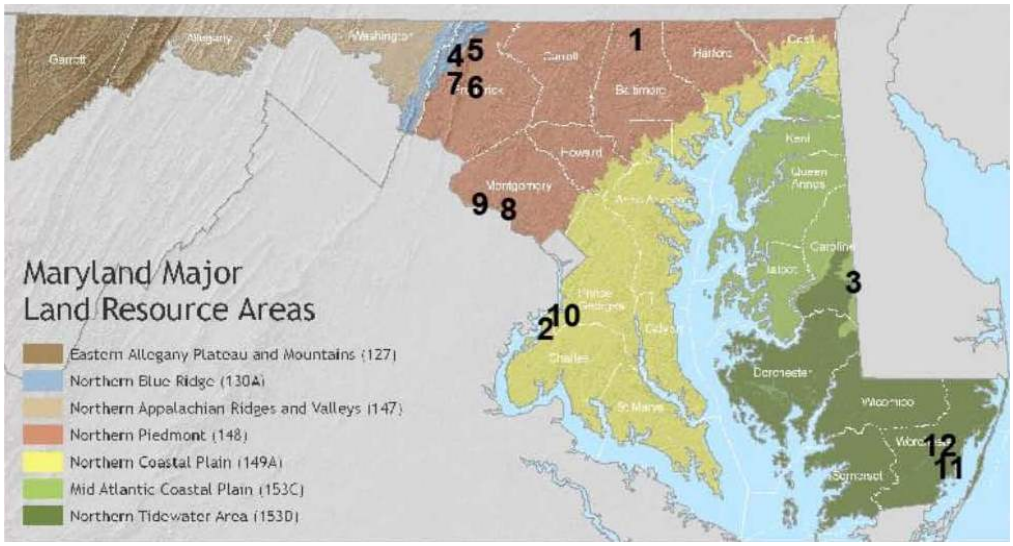

Figure 10: Parent population locations of gray goldenrod indicated by NRCS propagation numbers. The map shows parent population by major land resource area, with the greatest number of populations coming from the Northern Piedmont. Map courtesy of Amanda Moore USDA, NRCS 2009.

Although significant wild populations of gray goldenrod are rare, populations were collected from all three geographic areas covered by this project: Coastal Plain east of the Chesapeake Bay, Coastal Plain west of the Chesapeake Bay, and Piedmont (see Table 4).

Table 4: Gray goldenrod site collection data, by propagation and accession numbers.

Propagation #	Accession #	Maryland County	Town	Site Description
1	9106024	Prince George's	Accokeek	Beretta Telephone Line
2	9106025	Caroline	Denton	Sand Hill Road
3	9106026	Frederick	Thurmont	Rt 15 CFSP Entrance
4	9106027	Montgomery	Potomac	Potomac Power Line
5	9106028	Worcester	Berlin	Rt 376 Telephone Line
6	9106029	Worcester	Assateague	Rt 611 Telephone Line
7	9106030	Charles	Indian Head	Kabin on the Korner
8	9106031	Frederick	Harmon	Gambrill Pk Rd
9	9106032	Baltimore	Parkton	Parkton Verizon Power Line
10	9106033	Frederick	Thurmont	Catoctin Hollow & Mink Farm Rd
11	9106034	Montgomery	Poolesville	River Road
12	9106035	Frederick	Hansonville	Rt 15, 1/4 mi N of Cemetery Dr.

Seed Germination: In July, gray goldenrod reaches its maximum height of two to three feet. Seed ripens in the autumn and should be collected when the heads are brown and have become fluffy. Since germination percentages of fresh seed are low, 90 days of cold moist pretreatment is recommended. For this study, the seed were a pretreated with 90 days in a cold (40 degrees F) moist environment. The seedlings were grown in a greenhouse for approximately 10 weeks with greenhouse conditions maintained at approximately 70 degrees F.

Evaluation Field Establishment: In mid-May 2008, gray goldenrod evaluation fields were established in the three geographic areas covered by this project:

1. Coastal plain east of the Chesapeake Bay – Farm in Talbot County, MD,
2. Coastal plain west of the Chesapeake Bay – NPMC, Prince George's County, MD,
3. Piedmont – Farm in Carroll County, MD.

Field layout considerations included weed mat width, mower width (used to cut grass between the weed mats), number of accessions for each species, number of replicate blocks to be planted and small plot combine width (used to harvest the seed). A map of the ultimate field configuration can be seen in Figure 11. To suppress weed competition and make delineation among the 12 accessions easier, weed mat was laid using the model 1275FA mulch layer, Holland Transplanter Company (see Figure 12) pulled by standard farm tractor. Holes were burned in the weed mat with a modified electric charcoal starter. The modified electric charcoal starter was faster and provided more consistent holes than manually cutting "X"s for the plants. The electric charcoal starter was modified by bending the last four inches of the looped heating element perpendicular to its original design, creating a four inch long "U" shaped working surface, and securing the burner's handle to a four foot wooden tool handle (e.g., rake or broom). The electric charcoal starter modification and use are outside the tool's intended purpose; please exercise caution to avoid injury to staff or damage to equipment or infrastructure. The electric charcoal starter's heating element is extremely hot.

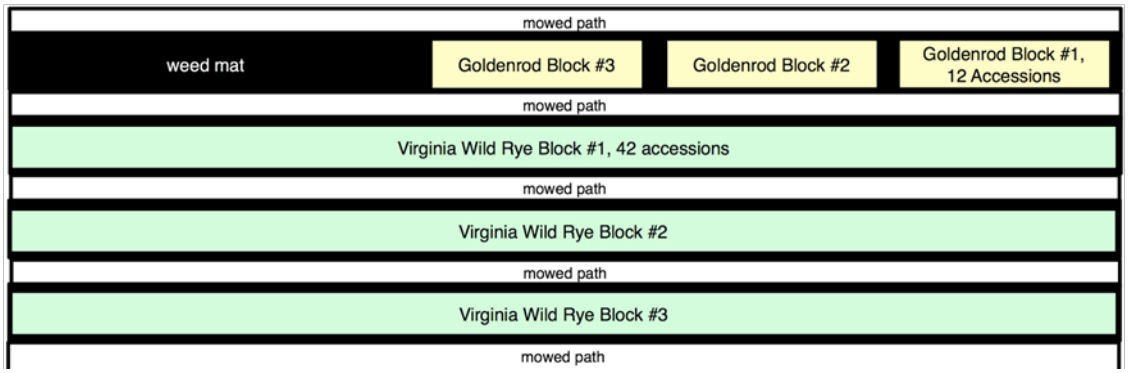

Figure 11: Farm field map. The yellow rectangles show the locations of the gray goldenrod replication blocks. Adjacent plantings of Virginia wildrye can be seen below the gray goldenrod blocks utilized for this study.

Figure 12: NPMC staff using the mulch layer attachment to lay weed mat in preparation for planting the breeder blocks. Completed, weed mat covered beds can be seen to the left of the tractor.

Once openings were burned in the weed mat, holes in the soil were made using a round dibble the approximate size of the plugs and the seedling plugs were planted and firmed into place. Accession numbers were painted onto the weed mat next to each accession plot using white permanent paint pens. In the weeks after planting, supplemental overhead irrigation was applied when rainfall totaled less than one inch per week.

The gray goldenrod field plots consist of a three foot by five foot rectangle of 15 plants. While most goldenrods are rhizomatous, gray goldenrod (eastern race) is one of the few exceptions (see Figure 13). Werner (1976) and Werner and Platt (1976), suggest that the lack of rhizomes relative to other goldenrod species is an adaptation to drier habitats, where an increase in vegetative growth would cause more demand for water than the soil could provide.

Figure 13: A gray goldenrod plant being dug from the field. Basal foliage rosette is green and full. The root mat is fibrous and large and lacks the long rhizomes indicative of other goldenrods.

Discussion and Results

Gray goldenrod quickly establishes, attracts native pollinators, grows vigorously, withstands xeric growing conditions and is attractive in flower and flowers profusely; it was not long lived in the conditions provided in this study. During the first two years the plants flowered profusely and thrived. However, by the third year approximately 75 percent of the plants were dead. This high mortality rate was observed at all three test sites in the same year. Conservation seed industry partners are familiar with gray goldenrod being short-lived and use a two-year seed production period. There was no observed correlation between the high mortality and any of the highly varied physical characteristics among the selected gray goldenrod accessions (see Figure 14). Gray goldenrod seedlings were observed establishing at the NPMC downwind from the parent plants where the species had not been previously established or observed. The study concluded before second generation seedling longevity could be determined.

Figure 14: This photograph shows gray goldenrod flowering period variation and plot design. Within the weed mat are three sets of five goldenrod plants arranged in rows. Each row has a painted label that indicates the accession. Note the considerable variation among the visible accessions. The accession at left (labeled R), has green flower buds while the accession in the center (labeled P) is a little past full bloom and starting to set some seed and the accession plot on the right (labeled O) is at peak bloom.

Solidago nemoralis ssp. *decemflora*: It is important to note that gray goldenrod has eastern and western races. Populations west of the Appalachians (*S. nemoralis* ssp. *decemflora*) are tetraploid whereas populations in the east (*S. nemoralis* ssp. *nemoralis*) are predominantly diploid. Considered the same species, the western race is adapted to grow in prairies and the eastern race is adapted to grow in fields and open wood (savannah) edges. The western variety is an aggressive tetraploid, strongly rhizomatous and widely regarded as an agricultural weed. The western variety's native range does not extend into Maryland, and care should be taken that the aggressive western variety is not used.

Project Termination: After considerable plant mortality in the study's third year, consultation with partners from the conservation seed industry and continuous project evaluation revealed the limited potential for a gray goldenrod release in the Mid-Atlantic, it was decided that limited demand did not warrant further work. Gray goldenrod's short lifespan severely limits its suitability as a conservation release. The costs in time and materials to produce plants with such a short lifespan are simply too great and should be carefully considered before release efforts are renewed.

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DEVELOPMENT OF MID-ATLANTIC COMPOSITE RELEASES OF VIRGINIA AND SOUTHEASTERN WILDRYES – FINAL REPORT

Introduction

Virginia wildrye (*Elymus virginicus*) and southeastern wildrye (*Elymus glabriflorus*) are native, perennial, cool-season bunchgrasses. They have a multitude of beneficial characteristics, including rapid and high germination rates (85%), long term seed viability, suitability for slope and critical area stabilization, tolerance of well-drained sandy to waterlogged sites and providing palatable and nutritious grazing. Researchers at the USDA Natural Resources Conservation Service's Norman A. Berg National Plant Materials Center (NPMC) and Dr. Sara Tangren of Chesapeake Natives, Inc., studied 39 populations of wildrye from Maryland, Delaware and West Virginia (see Figure 15.) The study's goal was to select composite releases useful for habitat restoration, wildlife and wetland plantings in the Coastal Plain and Piedmont regions of the Mid-Atlantic.

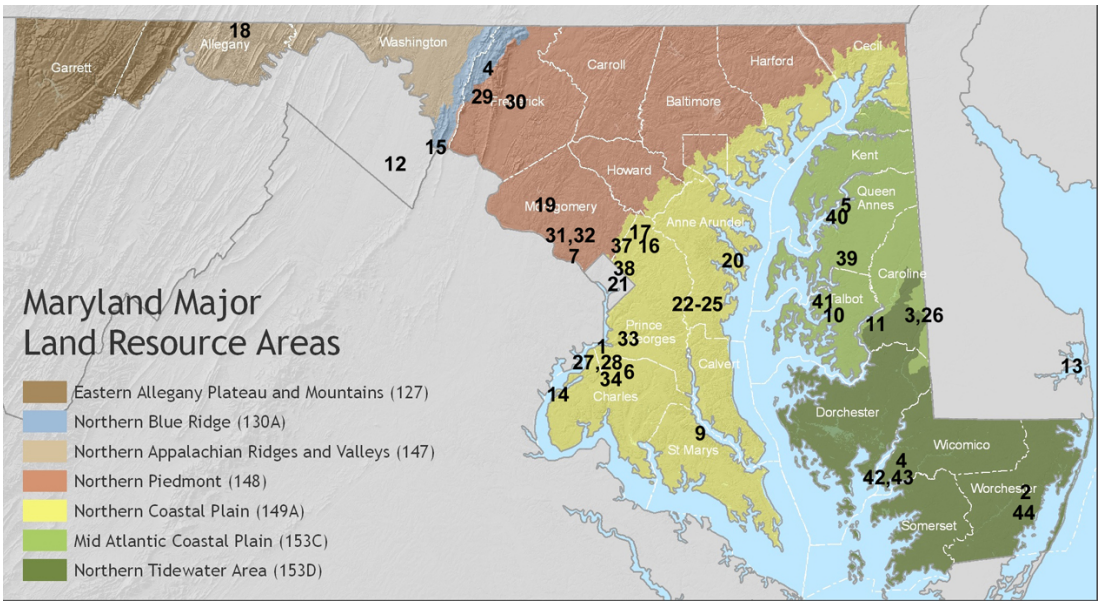

Figure 15. The NRCS propagation numbers added to a Major Land Resource Area map of Maryland to indicate the location of the wildrye parent populations. Map courtesy Amanda Moore USDA, NRCS 2009.

New developments in *Elymus* spp's taxonomy (Barkworth et al, *Flora of North America North of Mexico* 2006) have resulted in splitting Virginia wildrye (*E. virginicus*) into new taxa, including southeastern wildrye (*E. glabriflorus*) and early wildrye (*E. macgregorii*). Due to this re-classification, the 39 accessions were re-classified.

Complications experienced during this project:

- At the time of collection, the investigators were unaware of the multiple taxa involved,
- The natural distribution of the new taxa remains unknown with the data from this study being the most significant contribution to date,
- Accession replications were planted too closely with many accessions self sowing into one another during the three-year study,
- The original seed collection was not placed in long-term seed storage.

Experimental Design and Conduct

Multiple methods were used to locate native populations, including examining herbarium vouchers. Thirty-nine accessions were sampled for herbarium vouchers and the study was completed during the winter of 2010 – 2011. Table 5 provides a complete plant listing by genus, specific epithet, with county, site description and relative population size. Blanks occur either because no field note was made or it was not possible to estimate the quantity of wildrye plants since more than one type of wildrye was present.

The first test performed at the NPMC consisted of three replications: 15 plants of each of the 39 accessions randomly planted into weed mat for weed control.

In mid-May, researchers established wildrye evaluation fields at three sites (see Figure 15):

4. Coastal plain east of the Chesapeake Bay – A private farm in Talbot County,
5. Coastal plain west of the Chesapeake Bay – On the NPMC grounds in Prince George's County,
6. Piedmont – A farm in Carroll County.

Field layout considerations included weed mat width, mower width (used to cut grass between the weed mats), number of accessions for each species, number of replicate blocks to be planted and the small plot combine width (used to harvest the seed) (see Figure 16).

A weed mat effectively suppresses weed competition and makes it easier to delineate among the 39 accessions planted during the course of this release effort. Once the weed mat was in position, holes to accommodate the plants were burned in the mat with a modified electric charcoal starter.

Table 5: Wildrye species identification and collection locations. The species and varieties in red require further verification.

Propagation Number	Accession Number	Genus	Species	County	Site Description	Plants in population
1	9094225	*Elymus*	*glabriflorus*	Prince George's	Beretta Telephone Line	50
2	9094226	*Elymus*	*glabriflorus*	Worcester	under TL across rd from Oakley's Farm Mkt	100
3	9094227	*Elymus*	*glabriflorus*	Caroline		
4	9094228	*Elymus*	*glabriflorus*	Wicomico	Wicomico City	6
5	9094229	*Elymus*	*glabriflorus*	Queen Annes	Land's End Road	
6	9094230	*Elymus*	*glabriflorus*	Charles	Chapel Hill	100
7	9094231	*Elymus*	*glabriflorus*	Montgomery	Cabin John Power Line	10
8	9094232	*Elymus*	*macgregorii*	Montgomery	River Road	
9	9094233	*Elymus*	*glabriflorus*	St. Marys	Dos Santos Way	200
10	9094234	*Elymus*	*glabriflorus*	Talbot	behind guard rail on Rt 50 northbound	10
11	9094235	*Elymus*	*glabriflorus*	Caroline	Bethlehem Road	24
12	9078782	*Elymus*	*macgregorii*	Jefferson, WV	Charlestown, WVA Rte 51 Altona Swamp	
13	9080017	*Elymus*	*glabriflorus*	Sussex, DE	LA Bay S Canal Mouth N side	
14	9080167	*Elymus*	*virginicus*	Charles	Jct 224/225 Mattawoman Creek	
15	9085127	*Elymus*	*virginicus*	Washington	C&O Canal from Harper's Ferry RR bridge	
16	9085131	*Elymus*	*virginicus*	Prince George's	Lemon's Br Rd., Uhler Natural Area	
17	9085132	*Elymus*	*virginicus*	Prince George's	Patuxent Wildlife Research Center	
18	9085137	*Elymus*	*virginicus*	Allegany	Marley Branch S of Flintstone on Williams Rd.	
19	9085141	*Elymus*	*virginicus*	Montgomery	Between Seneca Creek and Tschiffely Rd.	
20	9085154	*Elymus*	*virginicus*	Anne Arundel	Bembe Beach Rd across from Port Annapolis Dr.	

21	9080003	*Elymus*	*virginicus*			
22	9094250	*Elymus*	*virginicus*	Anne Arundel	Patuxent River bank	5000
23	9094251	*Elymus*	*virginicus*	Anne Arundel	Patuxent River Road aka Harwood Road	31
24	9094252	*Elymus*	*glabriflorus*	Anne Arundel	Sands Road	1000
25	9094253	*Elymus*	*glabriflorus*	Anne Arundel	Sands Road	28
26	9094254	*Elymus*	*glabriflorus*	Caroline	stream along Sand Hill Rd	
27	9094255	*Elymus*	*glabriflorus*	Charles	Marshall Hall Road	200
28	9094256	*Elymus*	*glabriflorus*	Charles	Marshall Hall Road	100
29	9094257	*Elymus*	*virginicus*	Frederick	Gambrill Pk Rd	1000
30	9094258	*Elymus*	*virginicus*	Frederick	Old Frederick Rd	1000
31	9094259	*Elymus*	*glabriflorus*	Montgomery	Potomac Power Line	1000
32	9094260	*Elymus*	*glabriflorus*	Montgomery	Potomac Power Line	10
33	9106011	*Elymus*	*glabriflorus*	Prince George's	Ted's Towing & Auto Service, Rt. 210	24
37	9106015	*Elymus*	*glabriflorus*	Prince George's	Sellman Road Power Line,	
38	9106016	*Elymus*	*glabriflorus*	Prince George's	Anacostia River	
39	9106017	*Elymus*	*glabriflorus*	Queen Annes	Grange Hall Rd.	
40	9106018	*Elymus*	*glabriflorus*	Queen Annes	Spaniard Neck Rd	
41	9106019	*Elymus*	*virginicus*	Talbot	parking lot at dock, Skipton Landing Rd.	7
44	9106022	*Elymus*	*glabriflorus*	Worcester	railroad tracks east of Snow Hill	200

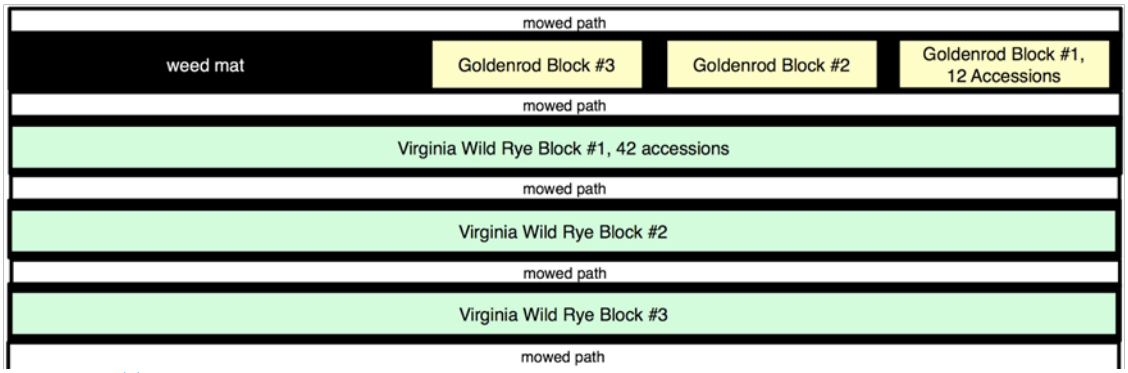

Figure 16. Farm field map. The green rows show the locations of the Virginia wildrye replication blocks. Adjacent plantings of gray goldenrod can be seen above the wildrye blocks utilized for this study.

Using the modified electric charcoal starter was faster than manually cutting "X"s with a utility knife. The electric charcoal starter was modified for this purpose by bending the last four inches of the looped heating element perpendicular to its original design, creating a four inch long "U" shaped working surface, and securing the burner's handle to a four foot wooden tool handle (e.g., rake or broom). The electric charcoal starter modification and use are outside the tool's intended purpose; please exercise caution to avoid injury to staff or damage to equipment or infrastructure. The electric charcoal starter's heating element is extremely hot.

Plants were placed in individual holes burned through the weed mat.

Figure 17. NPMC staff using the mulch layer attachment to place weed mat in preparation for planting the breeder blocks. Completed, weed mat covered beds can be seen to the left of the tractor.

Weed mat holes were dibbled and seedling plugs were firmed into place. Accession numbers were painted onto the weed mat next to each accession plot using permanent paint pens. In the weeks after planting, supplemental irrigation was applied as needed.

Virginia wildrye field plots consisted of a three foot by five foot rectangle of 15 plants (see Figure 18). Randomized complete block design was used for all accessions.

Figure 18. Rows of Southeastern wildrye in black plastic weed mat with painted accession labels visible in foreground.

Discussion and Results

Species Height and Observations: The six observed taxa had heights that varied greatly among the species, while remaining consistent within species. This height variability was consistent across the three planting sites.

1. Southeastern wildrye – the tallest of all species, ranges from 3.3 to 4.3 feet tall. It flowers two to four weeks later than Virginia wildrye (blooms mid June in Maryland).
2. Southeastern wildrye variety *australis* - ranges from 3.3 to 4.3 feet and is more glaucus.
3. Early wildrye – ranges from 2.7 to 4.3 feet tall. Is the earliest flowering, reaching antithesis a month before the others, and prefers moist, shaded conditions.

Several accessions fit neatly into the varieties described in *Flora of North America North of Mexico* (2006), whereas others did not. From the accessions that were completed, the following generalizations can be made:

1. Virginia wildrye - *Flora of North America North of Mexico* (2006) now includes four varieties of Virginia wildrye. Within this species two varieties were apparent:
   a. The variety v*irginicus* ranged from 1.8 to 2.8 feet tall.
   b. The variety *intermedius* ranged from 2.2 to 3.0 feet tall; it originated from the coastal plain west of the Chesapeake Bay. Both of these short varieties tended to be leafier than other accessions.

Species Frequency in Maryland:
Southeastern wildrye was the most common species of the collected accessions, representing 26 out of the 39 accessions, or 74 percent. Populations were found throughout Maryland, from Tidewater to Piedmont, but predominately in Coastal Plain soils (see Figure 15).

Virginia wildrye was found to be the second most common species, with 13 out of 39, or 33 percent. It was found growing west of the Chesapeake Bay in the Coastal Plain, Piedmont and Ridge and Valley soils.

Early Wildrye was the least common species of the collected accessions, representing only two out of 39, or 5 percent. Both populations were found on the Potomac River floodplain. It is important to note that early wildrye was not known to occur in Maryland or West Virginia prior to this release effort. Due to the new wildrye identification key in *Flora of North America North of Mexico* (2006), it may be possible to identify new populations, but further work is necessary.

There were no observations showing a connection between relative population size and relative prevalence in Maryland. This is illustrated by the only two accessions of early wildrye. Both accessions may be from the same population stretching all the way up the Potomac River from Washington DC into West Virginia, probably including hundreds of thousands of individuals.

While no wildrye was found growing in excessively well drained soils, it was found in moist to well drained locations. It was initially expected that the various wildrye species would all be found in similar site conditions (specifically in regards to soil moisture). However, this was not found to be the case.

Mid-Atlantic Wildrye Identification Key: A simplified, or laymen, Mid-Atlantic wildrye identification key should be developed for use by conservationists, hydrologists, seed producers and land managers in the Mid-Atlantic region. The groundwork for the production of such a key was covered as part of this project. This key would provide the following benefits:

- Allow for more efficient and accurate collections.
- Inventory additional populations.
- Map natural geographic distributions.
- Facilitate restoration planning and landscape design.

Project Successes:
- Local farmers can produce southeastern and Virginia wildrye seed.
- Wildrye seed easily harvests, cleans and germinates reliably and quickly.
- Southeastern wildrye's longevity in storage, quick germination and cool season growth should make it effective for slope stabilization.

Lessons Learned: The following steps are needed for production of a successful source identified release:
- Publish a layman's identification guide to the local wildrye taxa.

- Establish the geographic distribution of wildrye taxa by revisiting herbarium vouchers and working with local groups.
- Collect seeds of the various wildrye taxa and establish accession plots in separate fields.
- Provide adequate space between accession plots to minimize seed shattered from one plot do not establish in the next plot.
- Each wildrye species should be tested in critical areas, buffers, wetlands and landscapes for various conservation applications.

Project Termination: It was decided that the limited demand for a mid-Atlantic wildrye did not warrant further work. In order to preserve the genetic diversity resulting from this project, seed will be donated (September 2012) to Ernst Conservation Seed, Inc. and the USDA Agricultural Research Service's National Plant Germplasm System. Plants will be donated (September 2012) to local government and non-profit watershed agencies (City of Hyattsville, Parks Department and the Anacostia Watershed Society).

References

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Bureau of Land Management (Updated March 2012) Technical Protocol for the Collection, Study, and Conservation of Seeds from Native Plant Species for Seeds of Success. Version available at http://www.nps.gov/plants/sos/index.htm (accessed on 7/6/12).