United States Department of Agriculture
Natural Resources Conservation Service

2010 ANNUAL TECHNICAL REPORT

NORMAN A. BERG NATIONAL PLANT MATERIALS CENTER

Finding innovative vegetative solutions for emerging conservation challenges in Delaware, Maryland, Pennsylvania and Virginia for over 76 years.

Historic images from the Norman A. Berg National Plant Materials Center (from left to right) of men working in the fields (circa 1935), building the A-frame house (circa 1939) and greenhouse work (circa 1970s).

UNITED STATES DEPARTMENT OF AGRICULTURE

NATURAL RESOURCES CONSERVATION SERVICE

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PLANT MATERIALS CENTER HISTORY

The National Observational Nursery Project was established in Beltsville, Maryland in 1935 as a conservation plant nursery in the fledging Soil Conservation Service (SCS) Division of Nurseries. By 1939, a campus of buildings and greenhouses had been constructed by the Civilian Conservation Corps. In its early years, the nursery produced vast quantities of grass seed and trees to facilitate SCS efforts to restore farmland devastated by the Dust Bowl. Over subsequent years, the nursery's mission would evolve to address a great diversity of emerging resource concerns, from finding alternative oil and rubber crops to supporting the nation's war effort in Europe, collecting and distributing foreign plant materials, and developing native conservation plant releases.

Surviving SCS nursery closures in the early 1950s and becoming a testing ground for program restructuring that ultimately created the modern and versatile Plant Materials Program we know today, the National Plant Materials Center was born. In May 2009 the National Plant Materials Center was renamed the Norman A. Berg National Plant Materials Center (NPMC) to celebrate the life and career of the late Norman A. Berg, early SCS administrator and life-long conservationist. Mr. Berg's legacy has inspired generations of conservationists, having a positive and lasting impact on NRCS.

In addition to addressing Plant Materials Program focus areas of plant growth data for conservation planning tools and practice standards, energy conservation, pollinator conservation, air quality conservation, climate change and transition to organic, the NPMC has numerous ongoing research studies addressing region-specific conservation challenges. Current research activities include designing optimal forage for managed grazing systems, increasing diversity in NRCS conservation plantings to improve wildlife and pollinator habitat, designing optimal vegetated environmental buffers to control poultry house emissions and providing the most up to date conservation technical information to NRCS field staff and the general public.

Since 1939, the NPMC has had 12 Managers (see Table 1), including landscape restoration pioneer Franklin J. Crider and current National Program Leader John Englert.

Table 1: A comprehensive list of NPMC managers, and years served, from 1939 to present.

CENTER MANAGERS	DATES OF SERVICE
Franklin J. Crider	1939 - 1948
Wilmer W. Steiner	1948 - 1955
Robert B. Thornton	1955 - 1968
H. Wayne Everett	1969 - 1973
Gilbert Lovell	1973 - 1978
Michael McCrary	1978 - 1979
Stephen K. Salvo	1979 - 1983
James Briggs	1983 - 1989
J. Eric Scherer	1990 - 1991
J. Scott Peterson	1991 - 1994
John Englert	1995 - 2008
Jeremy West	2009 - present

SITE AND CLIMATE INFORMATION

The NPMC is located in Beltsville, Maryland (Latitude 39N 1' 1.9482" and Longitude 76W 51' 7.7574") approximately 18 miles northeast of USDA Headquarters, Washington DC. The NPMC is situated in the Northern Coastal Plain region of the North Atlantic Slope Diversified Farming Land Resource Area (MLRA) (see Figure 1), an area characterized by rapid urbanization and resultant development-related water quality degradation.

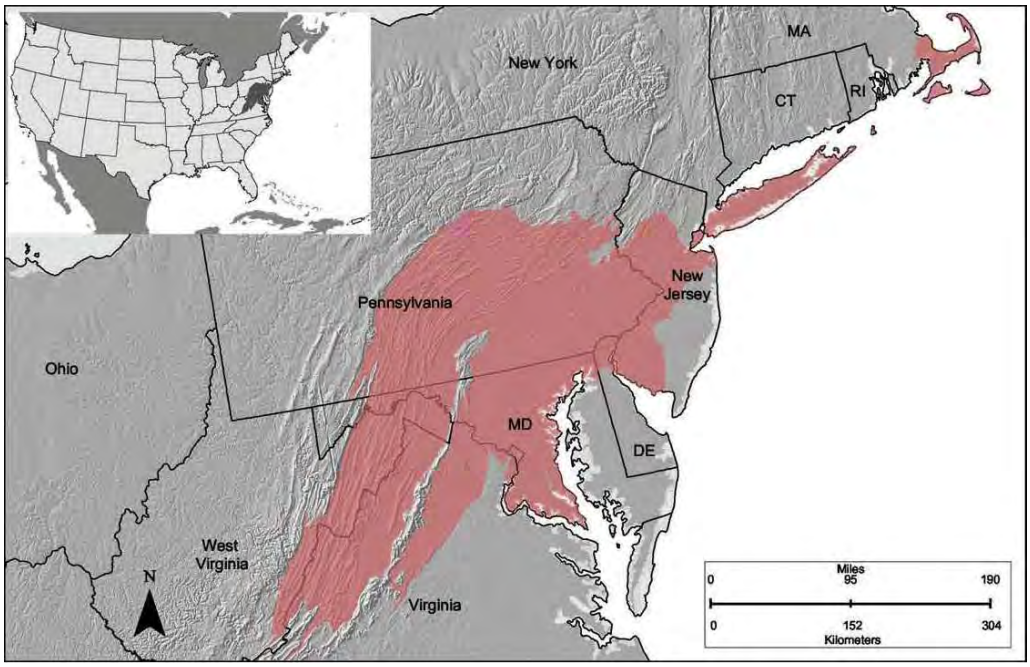

Figure 1: The North Atlantic Slope Diversified Farming Land Resource Area (red) covers approximately 40,865 square miles of nine mid-Atlantic states and the District of Columbia (MLRA Explorer Custom Report).

The 285 acre, NRCS-owned farm site is on the east campus of the Beltsville Agricultural Research Center, among approximately 7,000 acres of federal properties utilized by such entities as Agricultural Research Service, Secret Service and National Aeronautics and Space Administration. The principle use of the surrounding federal properties is agricultural research.

The NPMC's mean elevation is 147 feet above sea level. The property's most common soil map units are Russett-Christiana complex (30%) and Christiana- Downer complex (24%). Other soil map units include the Downer-Hamonton complex (8%), frequently flooded Zekiah and Issue soils (8%) and others (31%). Surface soil textures tend to be silt loam (34%) or fine sandy loam (30%) with some loamy sand (20%) or sandy loam (10 %). 41% of soils at the NPMC belong to Non-irrigated Land Capability Class 2 and are soils with moderate limitations for crop production. 22% of soils belong to Land Capability Class 3 and are soils with severe limitations for crop production. Less than 3% of the total acreage belongs to Land Capability Class 1 with few limitations. Over 63% of the NPMC is considered prime farmland, with 22% of this area considered farmland of state importance and 12% requiring irrigation to reach prime potential.

Based on climate data provided by the University of Maryland, Department of Atmospheric and Oceanic Science, precipitation (inclusive of snowfall) in Beltsville during 2010 is roughly equivalent to the average precipitation over the preceding 69 years (see Figure 2), occurring primarily as rain

during the spring, summer and fall. Snow fall tends to be negligible, but 2010 saw 36 inches during February with a 69-year site average of 5 inches for the same month. The average temperature during 2010 was only slightly higher than the preceding 69 years, with the greatest increases from March through October (see Figure 3) and the winter months slightly cooler than the average.

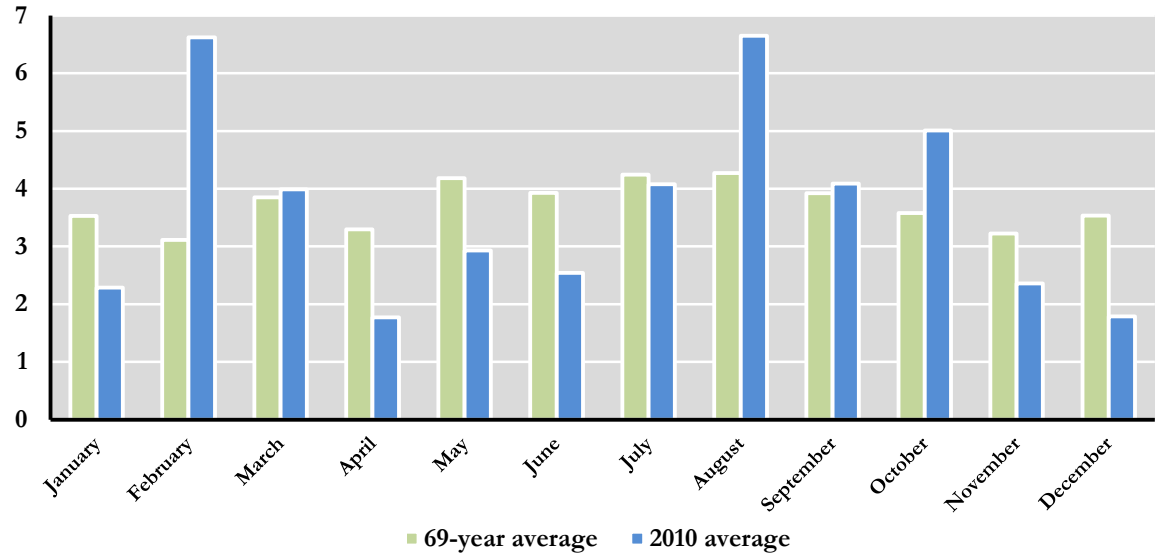

Figure 2: Beltsville weather data: average monthly precipitation (snow and rainfall) for 1941-2010 and 2010, in inches. Data provided by University of Maryland, Department of Atmospheric and Oceanic Science.

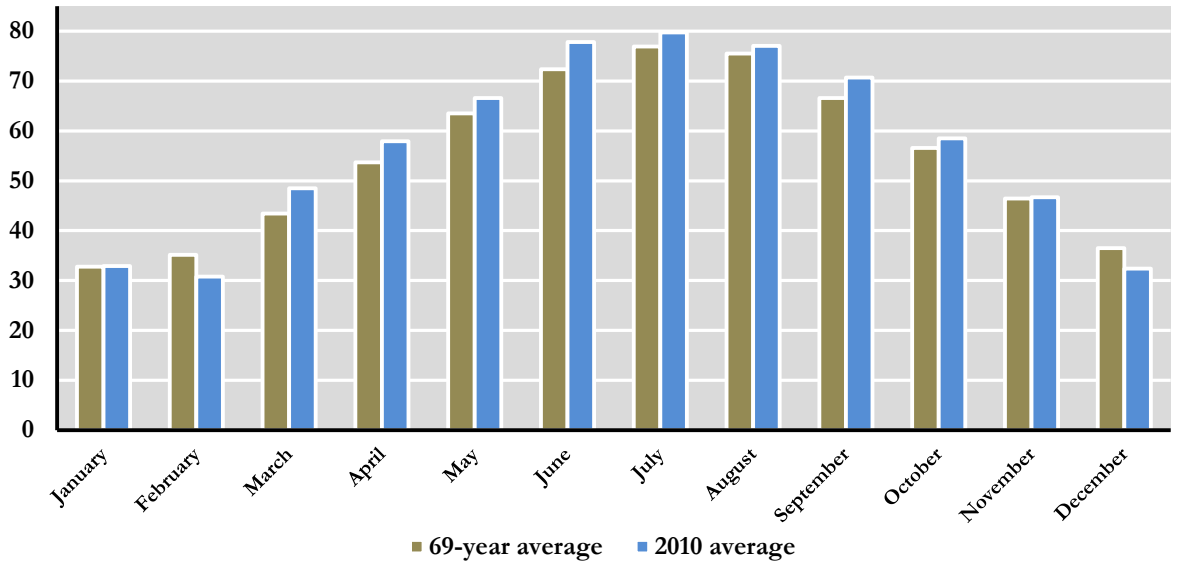

Figure 3: Beltsville weather data: average monthly temperatures for 1941-2010 and 2010, in degrees Fahrenheit. Data provided by University of Maryland, Department of Atmospheric and Oceanic Science.

SERVICE AREA

Unlike the other 26 Plant Materials Centers (PMC) in the Plant Materials Program, the NPMC does not have a defined Service Area, but rather sits within Cape May PMC's Service Area (see Figure 4) of Connecticut, Delaware, Maryland, Massachusetts, New Jersey, New York (Long Island), North Carolina, Rhode Island and Virginia. While NPMC does coordinate with Cape May PMC on addressing emerging conservation issues throughout the larger Cape May PMC Service Area the NPMC's area of greatest focus is the Chesapeake Bay, in particular the states of Delaware, Maryland, southern Pennsylvania and northern Virginia. The NPMC also plays an integral role supporting Plant Materials Program implementations nationwide, providing technical assistance to the National Program Leader benefitting all PMCs across the country.

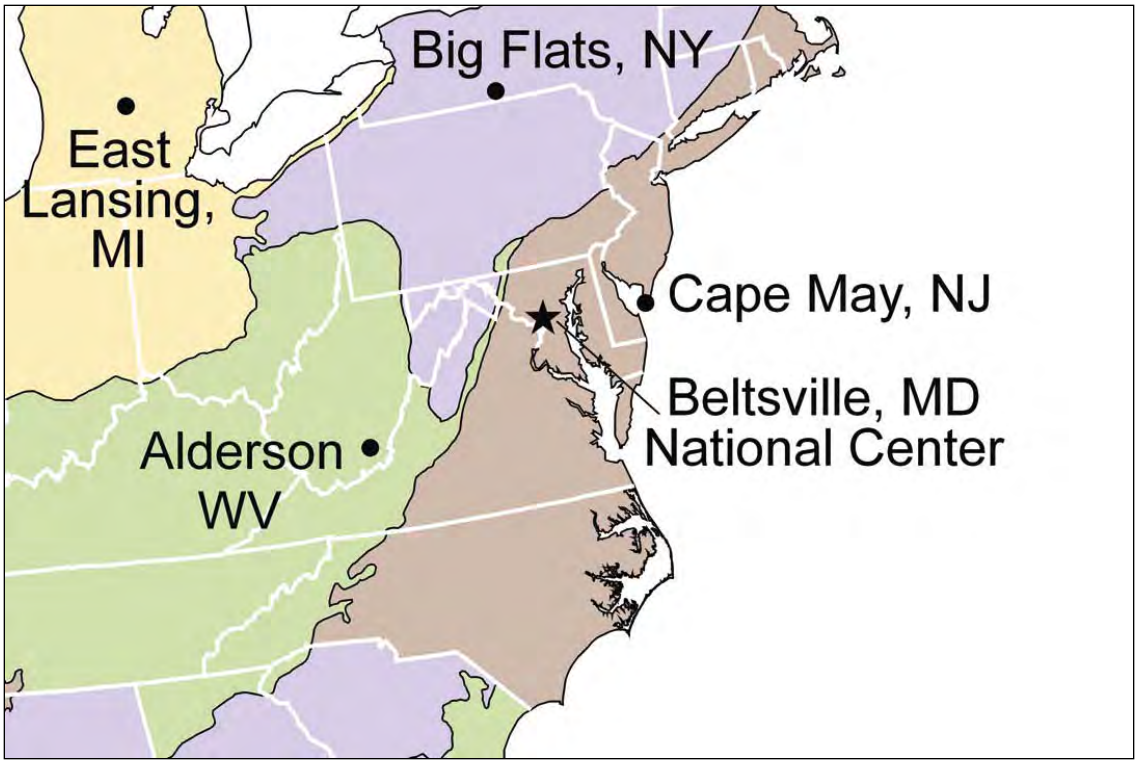

Figure 4: Location map showing the Cape May PMC six-state, Atlantic coast service area. The NPMC and adjacent PMCs in Michigan, New York, New Jersey and West Virginia are shown.

LONG RANGE PLAN

The NPMC does not presently have a Long Range Plan (LRP). An interim LRP, based on conservation priorities identified by PMC Manager Jeremy West, was utilized for Business Planning in 2010. A fully collaborative Long Range Plan based on conservation priorities identified by the Advisory and Technical Committees for the Cape May PMC Service Area is presently being developed and anticipated for implementation in FY 2012.

PMC Manager identified conservation priorities were grouped into five categories, including Growth and Development, Program Support, Technology Development, Technology Transfer and Facility Maintenance. The 2010 Goals and Objectives for each of these categories are represented below:

GROWTH AND DEVELOPMENT

GOAL I:
ENSURE THAT NPMC ACTIVITIES ARE RESPONSIVE TO EMERGING, REGION SPECIFIC CHALLENGES BY ENGAGING STAKEHOLDERS AND THE GENERAL PUBLIC IN PLANNING.

OBJECTIVE A:
Engage diverse stakeholder groups in the NPMC's Long Range Planning processes to better inform our investment of limited resources.

OBJECTIVE B:
Education the general public about NPMC, and agency, activities with on-site tours and experiential learning opportunities.

❖

GOAL II:
DIVERSITY OUR PARTNERSHIPS AND ACTIVITIES TO ENSURE THAT NPMC SKILLS AND RESOURCES CONTINUE TO GROW.

OBJECTIVE A:
Develop partnerships and projects which allow us to directly support efforts to restore the Chesapeake Bay.

OBJECTIVE B:
Develop agreements to share facility resources with partners to facilitate a cooperative approach to regional resource concerns.

❖

PROGRAM SUPPORT

GOAL III:
PROVIDE SUPPORT AND LEADERSHIP TO THE PLANT MATERIALS PROGRAM.

OBJECTIVE A:
Provide support to the National Plant Materials Leader and leadership to all Plant Materials Centers to assist with program implementation.

OBJECTIVE B:
Maintain the National POMS database, program archives and website and provide support as needed.

❖

TECHNOLOGY DEVELOPMENT

GOAL IV:
DEVELOP FIELD PLANTINGS TO EVALUATE RELEASES AND SUPPORT EMERGING CONSERVATION NEEDS.

OBJECTIVE A:
Continue evaluating NPMC releases and evaluate future release opportunities.

OBJECTIVE B:
Identify future field planting needs.

❖

GOAL V:
FACILITATE DATA COLLECTION AND ANALYSIS TO INFORM CONSERVATION TECHNOLOGY DEVELOPMENT.

OBJECTIVE A:
Maintain field evaluations, collect data, and develop study plans.

OBJECTIVE B:
Support State Resource Conservationists in evaluating and revising conservation practice standards.

❖

TECHNOLOGY TRANSFER

GOAL VI:
PREPARE DOCUMENTS THAT IMPROVE TECHNICAL CAPACITY AND PROMOTE THE CENTER.

OBJECTIVE A:
Prepare technical documents and distribute to improve field office and partner capacity to address broad ranging resource concerns.

OBJECTIVE B:
Prepare a variety of popular, progress documents and presentations to promote the Center's and Agency's conservation activities.

❖

GOAL VII:
PROVIDE TRAINING TO ENSURE PARTNERS ARE PREPARED TO ADDRESS A WIDE RANGE OF RESOURCE CONCERNS.

OBJECTIVE A:
Train Field Office staff on windbreaks, controlling invasives and plant identification to ensure that these skills are fully up to date.

OBJECTIVE B:
Prepare a variety of popular and progress documents to promote the Center's and Agency's conservation activities.

❖

FACILITY MAINTENANCE

GOAL VIII
MAINTAIN A SAFE AND PRODUCTIVE WORKING ENVIRONMENT.

OBJECTIVE A:
Maintain the NPMC's property to ensure the health and vigor of our natural communities and prepare fields to support diverse conservation needs.

OBJECTIVE B:
Ensure a safe and secure working environment for all staff and volunteers.

OBJECTIVE C:
Maintain all Center buildings and adjacent public areas.

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2010 TECHNOLOGY TRANSFER

PUBLICATIONS

Reports

- Utilizing Warm-Season Grasses to Mitigate Poultry Tunnel Fan Emissions on Delmarva Peninsula
- 2009 Great Smoky Mountains National Park – Annual Report
- Maryland 2009 Cool-Season Grass Forage Trial Report
- Maryland 2009 Warm-Season Grass Forage Trail Report
- Wheatgrass Biofuel Variety Trial 2007-2009

Plant Guides

- Claspingleaf Pondweed Plant Guide
- Florida Paspalum Plant Guide

Plant Fact Sheets

- Hairawn Muhly Plant Fact Sheet
- Hairy Small-Leaf Ticktrefoil Plant Fact Sheet
- Field Thistle Plant Fact Sheet
- Claspingleaf Pondweed Plant Fact Sheet
- Purple Bergamot Plant Fact Sheet
- Panicled Ticktrefoil Plant Fact Sheet
- Downy Rattlesnake Plantain Plant Fact Sheet

TRAINING SESSIONS

- Plant Propagation for Master Gardeners
- Delaware Ag Week, Hay and Pasture Day
- Southern MD Hay and Pasture Conference
- Tristate Hay and Pasture Conference

PRESENTATIONS/EXHIBITS

- First Family Garden Low Tunnels
- Delaware NRCS People's Garden
- Gardening for Pollinators Exhibit
- Vegetative Buffers for Poultry and Livestock Farms – Plant Materials for Vegetative Buffers
- National Boy Scouts of America Jamboree: NRCS Trail Pollinator Garden

2010 STUDIES

The NPMC staff plans and develops studies to address conservation challenges identified in the Long Range Plan. All active studies are listed in Table 2, with a corresponding study number and objective. Each study, and results generated in 2010, is explored in greater detail in subsequent pages and corresponding appendices.

Table 2: Study numbers, names and objectives for active 2010 studies at the NPMC.

ID Number: MDPMC-P-0801-BU
Name: Development of a Mid-Atlantic Composite Release of Beaked Panicgrass (*Panicum anceps* Michx.)
Objective: Develop a composite release of beaked panicgrass for soil erosion/sediment control.

ID Number: MDPMC-P-0802-BU
Name: Development of a Mid-Atlantic Composite Release of Gray Goldenrod (*Solidago nemoralis* Aiton)
Objective: Develop a composite release of gray goldenrod for soil erosion/sediment control.

ID Number: MDPMC-P-9801-BU
Name: Evaluation and Release of Indiangrass (*Sorghastrum nutans*) for the Mid-Atlantic U.S.
Objective: Develop a selected class composite release of indiangrass for wildlife plantings.

ID Number: MDPMC-P-9803-BU
Name: Development of a Mid-Atlantic Composite Release of *Elymus virginicus* Virginia Wildrye, *E. glabriflorus* Southeastern Wildrye.
Objective: Develop a conservation plant release for soil erosion/sedimentation control and wildlife.

ID Number: MDPMC-T-10-PA
Name: Adaptation Trial of Superior Warm-Season Grasses (gamma grass, big bluestem, indiangrass and switchgrass) Selected for Advanced Testing
Objective: Evaluate the area of adaptation for gamma grass, big bluestem, indiangrass and switchgrass.

ID Number: MDPMC-T-0501-PA
Name: Native Warm-Season Grass Forage Variety Trial
Objective: Provide producers with the latest information on variety performance in Maryland's growing conditions.

ID Number: MDPMC-T-0502-PA
Name: Cool-season grass forage variety trial
Objective: Provide producers with the latest information on variety performance in Maryland's growing conditions.

ID Number: MDPMC-T-0503-PA
Name: Bermudagrass forage variety trail
Objective: Provide producers with the latest information on production of commercially available Bermudagrass.

ID Number: MDPMC-T-0602-WI
Name: Plant species for use as vegetative environmental buffers (VEBs) to improve air quality and poultry production facilities
Objective: Develop VEBs to improve air quality at poultry production facilities.

ID Number: MDPMC-T-0803-WI
Name: Warm-Season Grass Management Trials
Objective: Determine optimal methods for renovating warm-season grass stands to increase diversity and provide improved wildlife habitat.

ID Number: MDPMC-T-0804-BU
Name: Effects of nitrogen fertility on the seed production of two native plant species: Southeastern wildrye (*Elymus glabriflorus*) and beaked panicgrass (*Panicum anceps*)
Objective: Maximize seed production while minimizing fertilization inputs.

ID Number: MDPMC-T-0804-WI
Name: Wildflower Persistence Study
Objective: Determine the persistence of Maryland native wildflowers in established warm-season grass stands.

ID Number: MDPMC-T-9604-RE
Name: NRCS-NPS Great Smoky Mountains Revegetation Project
Objective: Provide seed cleaning services to Great Smoky Mountain National Park to facilitate parkland revegetation efforts.

DEVELOPMENT OF A MID-ATLANTIC COMPOSITE RELEASE OF BEAKED PANICGRASS (*Panicum anceps* Michx.)

Study No: MDPMC-P-0801-BU

Study Leaders: Shawn Belt, Horticulturist, and Sara Tangren (Chesapeake Natives Inc.)

Objective: Make locally native beaked panicgrass seed more affordable and available for the Maryland State Highways Administration.

Introduction: An assembly of 17 different Maryland and one Virginia provenance (see Figure 5) beaked panicgrass (*Panicum anceps*) populations were compiled for the study (see Table 3). Two field trials were made. The first field trial is to establish a selected class release composed of Mid-Atlantic beaked panicgrass accessions. Each accession was mapped and evaluated for establishment, growth and seed production. The study's primary goal is to create a selected class release useful for wildlife and wetland/dry land restoration plantings in the coastal plain and piedmont regions of Mid-Atlantic States. Beaked panicgrass is common in the piedmont and less so on the coastal plain, it is tolerant to a wide range of habitats including sandy, well-drained to waterlogged sites. It is used for revegetating areas such as mine reclamation sites, logging sites, timber roads and other disturbed areas.

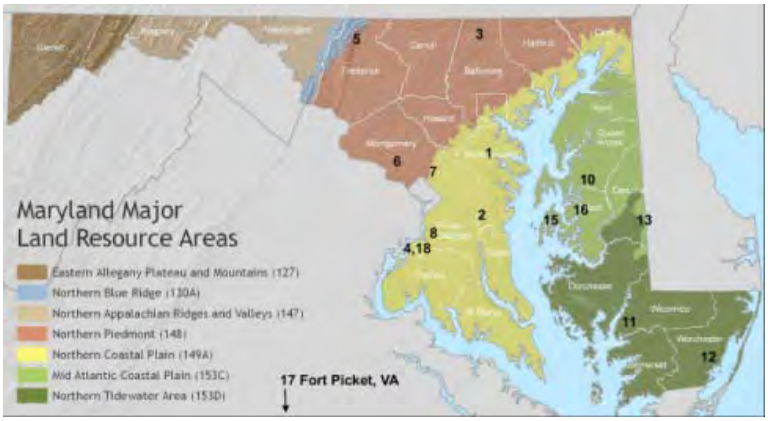

Figure 5: Parent Populations and Geologic Provinces. The NRCS propagation numbers have been added to a geologic map of Maryland to indicate the location of the Virginia wildrye parent populations.

Livestock and deer graze beaked panicgrass from early spring to late fall. To improve plant vigor and density, livestock grazing should be deferred through the summer. Beaked panicgrass produces prodigious amounts of seed that are a moderately valued food source for terrestrial and water birds.

Experimental Design: Completely Randomized Design

Status of Project: After internal review and evaluation of the need for a beaked panicgrass conservation plant release demonstrated limited need and ongoing commercial sector development of a selected class release, it was decided to discontinue release development efforts. In 2011 all collected data will be compiled into a final report for use by PMCs and partners and a Plant Guide will be developed and posted on PLANTS. All seed will be deposited within the National Plant Germplasm System so that the genetic variations of the seed collections are preserved long-term.

Table 3: Beaked panicgrass accessions utilized for the research study.

NRCS Accession Number	Maryland county	Site description	Number of plants in population	Number of plants collected	Town
9094236	Anne Arundel	Piney Orchard Power Line	10		Odenton
9094237	Anne Arundel	Sands Road Telephone Line	100	50	Lothian
9094238	Baltimore	Parkton Verizon Power Line	50	50	Parkton
9094239	Charles	Kabin on the Korner	-	50	Indian Head
9094240	Frederick	Auburn Road	Millions	50	Thurmont
9094241	Montgomery	Potomac Power Line	1,000	50	Potomac
9094242	Prince George's	Sellman Road Power Line	1,000	50	Beltsville
9094243	Prince George's	Foust Road Telephone Line	1,000	50	Accokeek
9094246	Wicomico	Rt. 352 Telephone Line	10,000	50	Salisbury
9094247	Worcester	Rt. 376 Telephone Line	12	12	Berlin
9094248	Caroline	Sand Hill Road, Rt. 404 and Noble Road	10,000	50	Denton
9078739	Prince George's	Patuxent Wildlife Research Center	-	-	
9078740	Talbot	St. Michael's	-	-	St. Michael's
9078763	Talbot	Centerville Rd.	-	-	Centerville
9080047	Charles	Ft. Picket Pine Rd., West Gate B47A	-	-	
9080170	Prince George's	Jct. MD 210/227 corner North of McDonald's	-	-	

DEVELOPMENT OF A MID-ATLANTIC COMPOSITE RELEASE OF GRAY GOLDENROD (*Solidago nemoralis*)

Study No: MDPMC-P-0802-BU

Study Leaders: Shawn Belt, Horticulturist, and Sara Tangren (Chesapeake Natives, Inc.)

Objective: Make a selected class release of gray goldenrod useful for restoration, wildlife and dry land plantings in the coastal plain and piedmont regions of Mid-Atlantic States.

Introduction: An assembly of 12 different Maryland provenance gray goldenrod (*Solidago nemoralis*) populations (see Figure 6) was compiled for the study. Note, no information on accessions and collection sites was provided by Chesapeake Natives, Inc., as with associated study MDPMC-P-0801-BU. Collections of wild populations were difficult to find, although we were able to collect 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. Two field trials were made. The first field test was to establish a selected class release composed of Mid-Atlantic gray goldenrod accessions. Each accession was mapped and evaluated for establishment, growth and seed production. Gray goldenrod used in a restoration context can be seen in Figure 7.

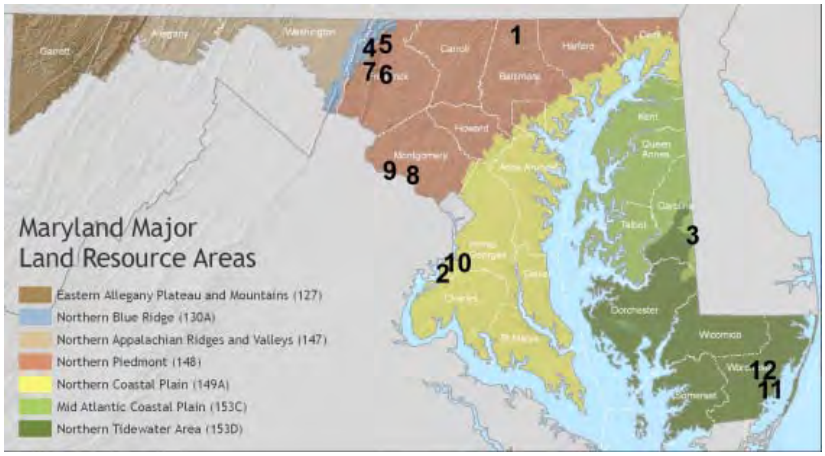

Figure 6: Parent Populations and Geologic Provinces. The NRCS propagation numbers have been added to a geologic map of Maryland to indicate the location of the gray goldenrod parent populations.

Gray goldenrod evaluation fields were established at three different physiographic region sites: Coastal Plain east of the Chesapeake Bay (Talbot County) at the Glen Plutschak Farm, Coastal Plain west of the Chesapeake Bay (Prince George County) at the National Plant Materials Center and Piedmont (Carroll County) at the Frank White farm. We will be able to examine the seed harvest weights for any interaction between the accession site and production site. The results will tell us whether there are gray goldenrod seed transfer zones within Maryland.

There are two distinct eastern and western gray goldenrod varieties in North America. The western variety is an aggressive tetraploid, strongly rhizomatous and widely regarded as an agricultural weed. The native range of the western variety does not extend into Maryland, but care should be taken that the aggressive western variety is not used.

Experimental Design: Completely Randomized Design.

Figure 7: This landscape photograph shows a roadside slope covered with goldenrod in bloom. Gray goldenrod seed germinated well on Rt. 118, Germantown, despite the drought of 2002.

Status of Project: The on-site gray goldenrod plantings, shortly after a highly successful establishment period, suffered severe mortality. Surviving specimens were insufficient to continue efforts to develop a conservation plant release. After internal review and evaluation of the need for a gray goldenrod conservation plant release demonstrated limited need, it was decided to discontinue release development efforts. A final report evaluating and diagnosing the planting's unusually high mortality for use by PMCs or partners interested in developing a regional gray goldenrod release, along with a Plant Guide, will be prepared.

EVALUATION AND RELEASE OF INDIANGRASS (*Sorghastrum nutans*) FOR THE MID-ATLANTIC U.S.

Study No: MDPMC-P-9801-BU

Study Leader: R. Jay Ugiansky, Resource Conservationist

Objective: Assemble a collection of indiangrass from the Mid-Atlantic region, select for short, upright growth, disease resistance and uniform seed maturity and release as a selected class composite for general conservation use.

Introduction: Currently available indiangrass (*Sorghastrum nutans*) varieties are not adapted to the mid-Atlantic or for use in wildlife plantings, but rather have been selected for high performance in critical area plantings or forage. These tall and highly competitive varieties tend to grow very dense and out-compete forbs, resulting in plantings with little wildlife value. Indiangrass is a perennial native warm-season (C4) tall bunch grass growing one to two meters tall in loose bunches from short, scaly rhizomes. Blooms occur in August with seed maturation in September.

Procedure: The initial evaluation block was planted at the University of Maryland, Keedysville farm in 1997 with all seed collected by Dr. Harry Swartz.

Indiangrass accessions and collection site:

- 9080079 (US 460, VA)
- 9080078 (Ft. Pickett, VA)
- 9080077 (Barclay, MD)
- 9080076 (Whiting RR, NJ)
- 9080075 (PG Co., MD)
- 9080073 (Lansdowne, VA)
- 9080074 (National Archives, MD)

Initially seed was to be harvested from the initial crossing block of seven accessions. However, this resulted in an extremely variable foundation field that was not suitable for release. The decision was made to select for short stature and stiff stems for wildlife use. This will be done over several generations of selection and crossing, using randomized crossing blocks prior to establishing a new foundation field.

Potential Products: Mid-Atlantic germplasm Indiangrass release.

Status of Project: In April/May 1999, 862 plants from seven accessions were transplanted to the NPMC and planted in a crossing block. In 2001, 14 individuals from each accession were dug and planted in a randomized crossing block. Seed was harvested from each accession in the crossing block in 2002. Two hundred plugs were grown from the seed harvested from each accession to establish a foundation field. The plugs were planted in a random pattern in rows three feet apart. Seed was harvested in 2004 and 2005 from this field and additional plants were started in 2004. Seed was difficult to harvest as plants exhibited widely varying growing heights and seed maturity. The amount of variation present at this stage precluded a release of this material without further selection.

Plants were selected from this field that exhibited a shorter height and similar maturity. In the spring of 2007, 23 plants were dug and divided. Plants were potted and grown for one month, outside under automatic overhead irrigation to allow for re-growth of roots prior to field planting. A total of 105 plants survived (between two and eight divisions of each clump), and were planted in a random crossing block and irrigated. All of the 105 survived and grew well, but few seed heads were produced and only a very small amount of seed was harvested in 2007. Seed harvested from selected plants in 2008 were planted in 2009 for further evaluation. Thousands of seedlings were germinated in 2009 and grown in deep plug trays (67). In 2010, plants were selected from plug trays that exhibited the desired phenotype of stiff stems and upright growth and transplanted to quart size containers. The selected plants will be planted in the field in 2011. Plants will be further evaluated in 2012. Due to the continued variability, several generations of selection are expected to be required to yield a relatively uniform release of a stiff stemmed, short-statured and uniformly blooming indiangrass. If variability continues to be a problem in future generations then this study will be terminated without a release.

DEVELOPMENT OF A MID-ATLANTIC COMPOSITE RELEASE OF *Elymus virginicus* VIRGINIA WILDRYE, *E. glabriflorus* SOUTHEASTERN WILDRYE

Study No: MDPMC-P-9803-BU

Study Leaders: Shawn Belt, Horticulturist, and Sara Tangren, Chesapeake

Objective: Assemble and evaluate for survival and overall performance a collection of wildrye (*Elymus virginicus*) from the Mid-Atlantic States and release as a composite selected class release for the Mid-Atlantic States for wildlife food/cover, restoration, slope stabilization and erosion control, and as a component of native grass forage mixes.

Introduction: An assembly of 44 different Maryland, Delaware and West Virginia collection populations are being studied (see Figure 8). Each accession will be evaluated for growth, seed production and plant vigor. The final goal of the study is to select a composite release useful for restoration, wildlife and wetland plantings in the coastal plain and piedmont regions of Mid-Atlantic States.

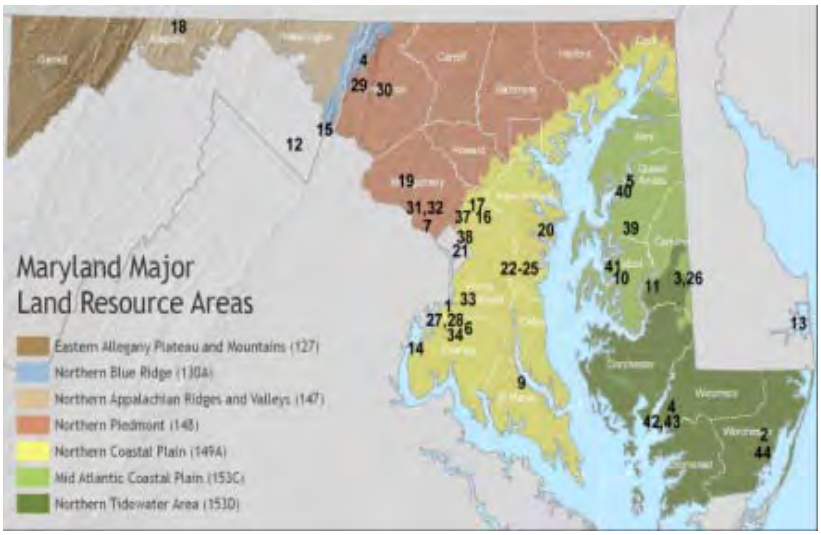

Figure 8: Parent Populations and Geologic Provinces. The NRCS propagation numbers have been added to a geologic map of Maryland to indicate the location of the Virginia Wildrye parent populations.

There has been a recent change in the nomenclature of *Elymus*. Brown and Brown (1984) lists three species of *Elymus* in Maryland: *E. virginicus, E. villosus, and E. canadensis*. Barkworth et al have developed a new *Elymus* identification key for the Flora of North America. This new key describes what were previously identified as three sub-species of *E. virginicus;* are now identified as different *Elymus* species. These new species are: *E. glabriflorus, E. halophilus and E. hirstiglumis*. Due to this re-classification the 41 different test accessions are being re-identified.

These new species are: *E. glabriflorus, E. halophilus* and *E. hirstiglumis*. Due to this re-classification the 41 different test accessions are being re-identified as to their classification. All accessions have been sampled for herbarium vouchers and the identification is currently taking place.

The first test performed at the National Plant Materials Center consists of three replications of 15 plants of each of the 44 accessions randomly planted into weed mat for weed control. Virginia wildrye evaluation fields were established at three different physiographic region sites: Tidewater (Talbot County) at the Glen Plutschak Farm, Coastal Plain (Prince George County) at the National Plant Materials Center and Tidewater (Carroll County) at the Frank White farm. We will be able to examine the seed harvest weights for any interaction between accession site and production site. This will tell us whether there are gray goldenrod seed transfer zones within Maryland.

Status of Project: Collection information for the 44 different accessions is listed in Table 4. After internal review and evaluation of the need for a Virginia wildrye conservation plant release demonstrated limited need and ongoing commercial sector development of a selected class release, it was decided to discontinue release development efforts. Additionally, effective data collection was complicated by the tremendous diversity of species and sub-species represented in the onsite plantings. An identification key would have been necessary for effective data collection, but such a key presently does not exist for Virginia wildrye. It was decided that the necessary level of staff and resource investment to develop an appropriate identification key did not align with a clearly defined need expressed by NRCS field staff. A final report summarizing this effort and addressing Virginia wildrye's unanticipated diversity for use by PMCs or partners interested in developing a regional Virginia wildrye release, along with a Plant Guide, will be prepared.

Table 4: Elymus complex plants utilized for the research study, listed by NRCS Accession Number with site description notes.

NRCS Accession Number	Site Description	Plants Growing in Association	Number of plants in population	Number of plants collected	Town
9094225	Beretta Telephone Line	purple lovegrass, gray goldenrod, Elliott's beardgrass, MD goldenaster	50	50	
9094226	under TL across rd from Oakley's Farm Mkt		100	50	Berlin
9094227	Sand Hill Road, hung pink flag on fem Am holly	---			---
9094228	Wicomico City	also Leucothoe, red chokeberry, bayberry	6	6	
9094229	Land's End Road	---			---
9094230	Chapel Hill		100		Waldorf
9094231	Cabin John Power Line		10	10	
9094232	River Road	Riverbank or Slender wild rye in same area as bottlebrush and asters		50	
9094233	Dos Santos Way		200	50	Mechanicsville
9094234	behind guard rail on Rt 50 northbound		10	10	
9094235	Bethlehem Road		24	24	Preston
9078782	Charlestown, WVA Rte 51 Altona Swamp				

9080017	LA Bay S Canal Mouth N side				
9080167	Jct 224/225 Mattawoman Creek	---			Pomonkey
9085127	C&O Canal from Harper's Ferry RR bridge				
9085131	Lemon's Br Rd., Uhler Natural Area	---			---
9085132	Patuxent Wildlife Research Center	---			---
9085137	Marley Branch S of Flintstone on Williams Rd.	---	---	---	Flintstone
9085141	Between Seneca Creek and Tschiffely Rd.	---			---
9085154	Bembe Beach Rd across from Port Annapolis Dr.	---		field only	---
9080003		---			Oxon Run
9094250	Patuxent River bank		5000	44	Lothian
9094251	Patuxent River Road aka Harwood Road	excellent area to collect Euonymus americanus	31	31	Lothian
9094252	Sands Road	Also here pasture rose, un id Viccia, L. frutescens	1000	70	Lothian
9094253	Sands Road	also strawberry here	28	28	Lothian
9094254	stream along Sand Hill Rd	cardinal flower			Denton
9094255	Marshall Hall Road	Eupatorium fistulosum, Elymus virginicus, Penstemon digitalis	200	50	Accokeek
9094256	Marshall Hall Road	white turtlehead	100	50	Accokeek
9094257	Gambrill Pk Rd	foxglove beardtongue	1000	50	
9094258	Old Frederick Rd		1000	20	
9094259	Potomac Power Line		1000		Potomac
9094260	Potomac Power Line	orange coneflower, pussytoes, wavy leaf aster, pasture rose	10	10	
9106011	Ted's Towing & Auto Service, Rt. 210	mistflower, switchgrass, tall fescue	24	24	Indianhead
9106015	Sellman Road Power Line, low area	swamp milkweed, Chasmanthium laxa, winterberry			Beltsville
9106016	Anacostia River	---			Hyattsville
9106017	Grange Hall Rd.	---			Starr
9106018	Spaniard Neck Rd	---			---
9106019	parking lot at dock, Skipton Landing Rd.		7	7	
9106020	Nanticoke Telephone Line		24	24	
9106021	Ragged Point Cove		12	12	
9106022	railroad tracks east of Snow Hill	L. capitata, L. frutescens or virginica, Gnaphalium, Md goldenaster, sp mint, blue curls	200	50	Snow Hill
9106023	Tower Rd		20	20	

ADAPTATION TRIAL OF SUPERIOR WARM-SEASON GRASSES (GAMMA GRASS, BIG BLUESTEM, INDIANGRASS AND SWITCHGRASS) SELECTED FOR ADVANCED TESTING

Study No: MDPMC-T-10-PA

Study Leader: Shawn Belt, Horticulturist

Objective: The purpose of this study is to provide a standard means by which superior plants will be evaluated for adaptation.

Introduction: Part of the release process for a superior plant material selected for release is to test the plant's area of adaptation. The Norman A. Berg National Plant Materials Center (NPMC) is often called upon by other PMCs and other entities for the purpose of testing superior plants that they have selected for release (see Table 5).

Procedure: The experimental design used for this study is a randomized complete block. The superior plants are established in 20 feet rows on one foot centers with 10 feet spacing (unless otherwise specified) between rows. Plantings were irrigated and weeded as needed during the initial growing season to aid establishment. Maintenance consists of mowing several times throughout the growing season to control weed competition. Factors for evaluation include survival, plant vigor (height and width), diseases (leaf spot and rust), drought and cold tolerance.

Potential Products: Information technology and cultivar release**.**

Status of Project: The following warm-season grass species are currently under test at the NPMC: Eastern gamagrass (*Tripsacum dactyloides*), big bluestem (*Andropogon gerardii*), indiangrass (*Sorghastrum nutans*), and switchgrass (*Panicum virgatum*). Eastern gamagrass, big bluestem, and indiangrass plugs were planted July 2008; switchgrass plugs were planted May 2009. Evaluations are ongoing and will be completed in 2011.

Table 5: Plants utilized for the research study, listed by species and release name and NRCS Accession Number with plant material source.

Species/ Release Name	NRCS Accession Number	Origin	Source of Plant Material
Eastern Gamagrass			
'Meadowcrest'	591483	Beltsville, MD	Big Flats PMC
'Pete'	421612	Kansas and Oklahoma	Manhattan PMC
'Highlander'	634941	Montgomery Co., TN	MS PMC
Big Bluestem			
'Suther Germplasm'	9082318	Cabarrus Co., NC	Cape May PMC
'Southlow Germplasm'	642398	Lower peninsula MI	Rose Lake PMC
'Niagara'	315656	Erie Co., NY	Big Flats PMC
	9093699	WV composite	Roundstone Seed Co.
'Bonanza'	341701	derived from 'Pawnee' - Pawnee Co., NE	Sharp Bros. Seed Co.
'Goldmine'	641702	derived from Kaw	Sharp Bros. Seed Co.
'Roundtree'	674216	Moorehead, IA	Sharp Bros. Seed Co.
'Bonilla'	315658	Bonilla, ND	Sharp Bros. Seed Co.
'Kaw'	421276	Manhattan KS	Manhattan PMC
'Earl'	408932	Riley Co., KS	Manhattan PMC
'OZ-70'	16052	Ozark Region	Elsberry PMC
(unreleased)	9046932	New Eng. composite	Big Flats PMC
(unreleased)	9094220	South MA	Cape May PMC
'Camp Dawson'	9093698	Kingwood, WV	WV PMC
Indiangrass			
'Prairie View'	642387	Central & Southern Indiana	Ernst Conservation Seed
'Suther Germplasm'	9081282	Cabarrus Co., NC	Ernst Conservation Seed
'Southlow Michigan'	642396	Lower peninsula MI	Ernst Conservation Seed
'Coastal'	9094765	CT, RI, &MA	Cape May PMC
'Nebraska-54'	9106307	Nebraska composite	Sharp Bros. Seed Co.
'Americus'	514673	AL & GA	Jimmy Carter PMC
'Rumsey'	315747	Jefferson Co., IL	Ernst Conservation Seed
(unreleased)	591811	NY	Big Flats PMC
(unreleased)	9046933	New England composite	Big Flats PMC
Switchgrass			
'Alamo'	422006	Frio River TX	Ernst Conservation Seed
'Blackwell'	421520	Blackwell, OK	Ernst Conservation Seed
'Carthage'	421138	Carthage, NC	Cape May PMC
'Cave In Rock'	469228	southern Illinois	Ernst Conservation Seed
'Dacotah'	537588	Breien, ND	Sharp Bros. Seed Co.
'EG 1101'		Blade Energy Co.	Blade Energy Co.
'EG 1102'		Blade Energy Co.	Blade Energy Co.
'Forestburg'	478001	Sanbourn Co., SD	Sharp Bros. Seed Co.
'High Tide Germplasm'	9094764	Perryville, MD	Cape May PMC
'Kanlow'	421521	Wetumah, OK	Sharp Bros. Seed Co.
'Pathfinder'	9106040	NE & KS	Sharp Bros. Seed Co.
'Shawnee'	591824	nursery cross	Ernst Conservation Seed
'Shelter'	430240	Pleasants Co., WV	Ernst Conservation Seed
'St Croix'	9106038	Mike Cassler (ARS)	Mike Cassler (ARS)
'Sunburst'	9106041	WI	Cape May PMC
'Timber'	9081259	NC	Cape May PMC
'Trail Blazer'	9106042	NE	Sharp Bros. Seed Co.

NATIVE WARM-SEASON GRASS FORAGE VARIETY TRIAL

Study No: MDPMC-T-0501-PA

Study Leader: R. Jay Ugiansky, Resource Conservationist

Objective: Determine the yield by harvest date and season total of warm-season grass varieties when grown in Maryland in a simulated rotational grazing system. Forage production information will help farmers to optimize production in a sustainable manner that will conserve natural resources and benefit their bottom line. Total yield and harvest date growth curve data will be used to refine the grazing models in the C-Graze software that is used in planning and optimizing managed grazing systems.

Introduction: Native warm-season grasses used in a rotational grazing system provide valuable summer forage when cool-season grasses are less productive. Native warm-season grasses are not only used for forage and pasture, but also for wildlife habitat, soil stabilization and biofuels. There are many cultivars, selected ecotypes and source identified native warm-season grasses available today, here referred to collectively as "varieties." With many varieties and a lack of comparative forage production information for Maryland, it can be difficult to decide which varieties will provide the best forage production. While some forage varieties have not been adequately tested in Maryland, other non-forage varieties may prove valuable for forage production. To better utilize these grasses, more forage productivity data is needed. This trial is being conducted jointly by Maryland NRCS and Maryland Cooperative Extension, with annual funding from Maryland Grazing Lands Conservation Initiative Coalition.

Procedure: The trial includes 36 varieties of eight different species (eastern gamagrass, switchgrass, big bluestem, indiangrass, little bluestem, coastal little bluestem, Florida paspalum, and coastal panicgrass). The trial was conducted on Galestown-Evesboro loamy sands, 0-8% slope, somewhat excessively drained (available water holding capacity in a 60-inch soil profile is 3.7 inches) at the NPMC located in Beltsville, Maryland. With the exception of eastern gamagrass, varieties were seeded in six-row plots with five-inch row spacing using a cone-seeder. Eastern gamagrass varieties were seeded in two, 30-inch rows per plot. All varieties were seeded June 16, 2005. Switchgrass, little bluestem and Florida paspalum were seeded at eight pounds PLS per acre and the other species were planted at 10 pounds, as shown in Table 6. The trial was planted in a randomized complete block design with four replications. Plot size is three feet by 20 feet with yield measurements taken from the entire plot area. Soil test (October 4, 2007) values were pH 5.5, P = 111 ppm (very high), and K = 85 ppm (medium). Pelletized dolomitic lime was applied at one ton per acre in early May 2008. Nitrogen was applied at a rate of 100 pounds per acre at the beginning each growing season except 2005. Irrigation was only applied during establishment (2005 and 2006) and was not applied in 2007, 2008 or 2009. The trial will continue for a minimum of four years (stands permitting) as a simulated grazing system.

Table 6: Forage yield in pounds per acre by species/variety and year.

Species/Variety	Stand 7/21/08	2007 Total	2008 Total	2009 Total	2010 Jul. 7	2010 Sep. 10	2010 Total	2008-2010 Average
		Forage Yield (pounds per acre)						
Eastern Gamagrass								
'Meadowcrest'	99	2,873	11,090	9,336	10,246	6,491	16,737	12,388
'Highlander'	91	3,442	12,120	10,582	8,070	5,939	14,009	12,237
'Pete'	89	2,377	9,861	10,311	8,558	5,875	14,433	11,535
'Verl'	86	2,864	11,015	8,957	7,100	5,657	12,757	10,910
Switchgrass								
'Carthage'	100	9,790	9,764	9,251	6,384	7,248	13,632	10,882
'Kanlow'	80	8,303	8,632	8,362	5,372	6,808	12,180	9,725
'Cave in Rock'	86	6,963	9,019	7,757	4,626	5,665	10,291	9,022
'Blackwell'	95	5,879	9,313	7,020	4,114	5,460	9,574	8,636
'Shawnee'	96	6,666	9,523	7,938	3,675	4,712	8,387	8,616
'Shelter'	87	3,608	7,796	8,153	4,016	4,875	8,891	8,280
Hightide Germplasm	68	3,293	5,428	4,195	1,855	3,159	5,014	4,879
Coastal Panicgrass								
'Atlantic'	79	9,934	8,849	8,477	4,507	6,799	11,306	9,544
Florida Paspalum								
MD unreleased 9078766	93	5,672	9,053	6,193	697	1,906	2,603	5,950
Big Bluestem								
Suther Germplasm	86	2,089	6,594	5,994	3,356	5,576	8,932	7,173
'Niagara'	95	1,149	6,899	7,029	3,923	3,608	7,531	7,153
'Rountree'	98	1,737	6,295	6,174	2,332	4,081	6,413	6,294
Southlow Michigan Germplasm	85	849	5,864	5,178	3,051	3,534	6,585	5,876
Indiangrass								
NY unreleased	94	1,995	7,083	6,477	3,727	4,068	7,795	7,118
'Osage'	93	4,503	7,108	5,158	2,876	5,042	7,918	6,728
'Americus'	91	4,525	7,065	5,540	2,114	4,688	6,802	6,469
Suther Germplasm	99	3,906	6,416	5,803	1,533	4,073	5,606	5,942
Southlow Michigan Germplasm	86	1,412	6,586	4,911	2,509	2,870	5,379	5,625
'NE-54'	96	2,386	5,955	5,646	1,700	2,345	4,045	5,215
MD unreleased	90	1,776	5,140	4,867	2,026	3,609	5,635	5,214
'Rumsey'	85	2,869	5,590	5,049	2,017	2,849	4,866	5,168
'Holt'	90	1,085	4,821	3,527	1,305	1,910	3,215	3,854
Little Bluestem								
'Aldous'	86	2,410	5,374	2,169	504	2,340	2,844	3,462
Southlow Michigan Germplasm	87	1,068	4,234	2,072	925	1,791	2,716	3,007
' Camper'	80	2,564	4,556	1,315	511	1,646	2,687	2,853
'Cimarron'	76	4,587	4,640	1,551	93	2,814	3,742	3,311
Coastal little blue	95	1,060	3,583	1,312	192	586	778	1,891
'Blaze'	83	1,268	3,562	916	142	1,932	3,059	2,512
Mean	89	3,591	7,151	5,851	3,252	4,061	7,386	6,796
LSD1/ (0.05)	15	1,705	2,033	2,321	1,735	1,445	4,025	3,149
% CV3/	12	34	20	28	38	25	41	36

1/ = least significant difference test at 5% level of probability; 2/ = coefficient of variation

The plots were not harvested until 2007 to allow grasses to fully establish. Cuttings were made using a Carter flail-type harvester and cut to a height of eight inches. Harvests were made three times each growing season on dates indicated in Table 6. Harvest material was weighed green in the field and samples were collected for dry matter determinations from two of the four replications.

Potential Products: Maryland grazing standards and recommendations. Growth curve data obtained from study will be used to refine the grazing models in the C-Graze computer program. Yearly summary reports and final report.

Status of Project: Yield data for 2007-2010, ranked by three year average, are located in Table 6. Three harvests per season were made each year except only two were made in 2010. Yields increased in 2010 despite fewer harvests and adverse hot-dry weather, indicating that two harvests may be better than three, but more data would be required before making this conclusion.

The eastern gamagrass varieties and 'Carthage' switchgrass continued to be among the highest yielding in 2010 over the three year average. 'Meadowcrest' gamagrass was the highest yielding of all varieties but not significantly greater yielding than the other gamagrass varieties and the highest yielding switchgrass varieties and 'Atlantic' coastal panicgrass. The gamagrass plots have continued to improve as the individual clumps grew larger and further filled the plot areas. Eastern gamagrass varieties began growth earlier and produced greater yields at the first harvest than other varieties. This early season growth was the major contributor to greater season total yield.

The Florida paspalum exhibited excellent stand establishment and yielded remarkably well in 2008 considering it is an unimproved collection. However, it did not yield as well in 2009 and continued to decline in 2010 indicating poor persistence.

Field-size evaluations of establishment, persistence and palatability of promising varieties/selections under actual rotational grazing management are planned for subsequent years. These studies will be conducted at the University of Maryland Wye Research and Education Center and at the ARS Beltsville Agricultural Research Center.

COOL-SEASON GRASS FORAGE VARIETY TRIAL

Study No: MDPMC-T-0502-PA

Study Leader: R. Jay Ugiansky, Resource Conservationist

Objective: Determine the yield by harvest date and season total of cool-season grass varieties when grown in Maryland in a simulated rotational grazing system. Forage production information will help farmers to optimize production in a sustainable manner that will conserve natural resources and benefit their bottom line. Total yield and harvest date growth curve data will be used to refine the grazing models in the C-Graz software that is used in planning and optimizing managed grazing systems.

Introduction: Maryland farmers can benefit from a greater knowledge of variety performance in Maryland growing conditions. This valuable information enables farmers to make more informed decisions for sustainably maximizing production.

An ongoing variety trial is being conducted by Maryland NRCS and University of Maryland to provide the latest information on the agronomic performance of publicly and privately developed cool-season grass varieties. Collected data will benefit the farmers in Maryland and surrounding states, seed industry, Maryland Cooperative Extension and NRCS.

The cool-season grass forage variety trial was seeded September 25, 2005 at the NPMC located Beltsville, Maryland. Seed dealers and distributors and grass breeders were invited to submit entries of released varieties or advanced breeding lines that they would like evaluated in Maryland.

The eighteen cool-season grass entries in this trial are varieties of tall fescue, orchardgrass, Alaska brome, pasture brome, festulolium and perennial ryegrass. Varieties and yields are reported in Tables 7-8. Yields are not reported for varieties that have not persisted.

Procedure: The trial was planted in a randomized complete block with four replications. Plot size is three feet by 20 feet with yield measurements taken from the entire plot area. Stand ratings were recorded to capture information for establishment and persistence. The trial will continue for a minimum of four years (stands permitting) as a simulated grazing system. Cuttings were made using a Carter flail-type harvester and cut to a height of three inches when the grasses achieved a target height of 10 – 12 inches. Establishment was severely limited by drought in the fall of 2005 and spring of 2006. The first significant rainfall after seeding did not occur until October 7 and 8, 2006. Supplemental irrigation was applied as needed to maintain good survival, but was not sufficient for optimal growth. Replication 1 was eliminated from the data analysis because of severe stand mortality of many of the entries due to variations in the soils that amplified the effects of the drought. Fertilizer applications of phosphorus and potash were applied only to meet soil test recommendations. Nitrogen was applied at a rate of 60 pounds of available nitrogen in April, after the first harvest and again in the fall. Cuttings were made for all plots when 10 – 12 inches of height was achieved by the tallest and faster growing varieties.

Potential Products: Maryland grazing standards and recommendations. Growth curve data obtained from study is will be used to refine the grazing models in the C-Graze computer program. Yearly summary reports and final report.

Table 7: 2007 to 2010 yield comparison of cool-season forage cultivars by season total at the NPMC.

Species/Variety	Marketer	Forage Yield (lbs./acre)				
		2007	2008	2009	2010	4 year Average
Tall Fescue						
Kora	DLF-Intl. Seeds	3,616	5,770	7,224	3,706	5,079
BAR FA BTR9	Barenbrug USA	3,350	6,135	5,801	4,087	4,843
BAR FA 6FRD	Barenbrug USA	3,413	5,837	6,321	3,788	4,840
Select	FFR Cooperative	3,383	5,902	6,161	3,751	4,799
BAR FA 9301A	Barenbrug USA	3,581	5,832	5,655	2,854	4,480
Max Q		3,307	5,574	4,835	3,833	4,387
KY-31	Public	3,447	4,315	5,125	2,968	3,964
Enhance	Allied Seed	3,373	4,434	4,721	2,696	3,805
Perennial ryegrass						
Remington	Barenbrug USA	2,516	3,027	2,799	536	2,220
Orchardgrass						
Benchmark plus	FFR Cooperative	1,911	2,545	2,464	561	1,870
Extend	Allied Seed	1,856	2,821	2,138	0	1,704
Mean		3,069	4,745	4,840	2,616	3,818
LSD[1/] (0.05)		NS[3/]	1,908	1,921	1,422	1,384
% CV[2/]		28	24	23	32	21

1/ = least significant difference test at 5% level of probability; 2/ = coefficient of variation; 3/ = not significant

Table 8: 2010 yield comparison of cool season forage cultivars by harvest date and season total at the NPMC.

Species/Variety	Marketer	2010 Forage Yield (lbs./acre)		
		28-Apr	15-Jun	Season Total
Tall Fescue				
BAR FA BTR9	Barenbrug USA	572	3,514	4,087
Max Q		774	3,058	3,833
BAR FA 6FRD	Barenbrug USA	881	2,907	3,788
Select	FFR Cooperative	839	2,911	3,751
Kora	DLF-Intl. Seeds	443	3,263	3,706
KY-31	Public	455	2,513	2,968
BAR FA 9301A	Barenbrug USA	723	2,130	2,854
Enhance	Allied Seed	424	2,271	2,696
Perennial ryegrass				
Remington	Barenbrug USA	80	456	536
Orchardgrass				
Benchmark plus	FFR Cooperative	161	400	561
Extend	Allied Seed	0	0	0
Mean		487	2,130	2,616
LSD[2/] (0.05)		461	1,192	1,422
% CV[3/]		56	33	31.91

1/ = not harvested; 2/ = least significant difference test at 5% level of probability; 3/ = coefficient of variation; 4/ = not significant

Status of Project: Summary of yields and stand scores are reported in Tables 7-8. Varieties are grouped according to species/type and are ranked according to the 4 year average yield. In the 2010 season, yields were on average lower than in 2008 or 2009. These lower yields may be due to both weather and fewer harvests in 2010. The tall fescue varieties consistently yielded significantly higher than varieties of other species. The tall fescue variety 'Kora' yielded the highest for the four year average, but not significantly higher than the lowest yielding tall fescue variety 'Enhance'. The tall fescue varieties also persisted well whereas many of the orchard grass, festulolium, perennial rye and brome grass varieties did not persist into the 2010 season. The data collection phase of this trial was concluded in 2010.

BERMUDAGRASS FORAGE VARIETY TRIAL

Study No: MDPMC-T-0503-PA

Study Leader: R. Jay Ugiansky, Resource Conservationist

Objective: Determine the yield by harvest date of seeded and sprigged Bermudagrass varieties when grown in Maryland in a simulated rotational grazing system. Forage production information will help farmers to optimize production in a sustainable manner that will conserve natural resources. Total yield and harvest date growth curve data will be used to refine the grazing models in the C-Graz software that is used in planning and optimizing managed grazing systems.

Introduction: High-use areas often become devoid of plant cover at agricultural operations with livestock. These areas not only produce negligible forage but also can be significant sources of sediment and nutrients through runoff and dust. While Bermudagrass has shown potential as plant cover and forage for high-use areas, there is a knowledge and experience deficit in the use of commercial varieties in Maryland. Having this knowledge would enable farmers to make more informed decisions maximizing production in a sustainable manner that will conserve natural resources and benefit their bottom line.

This variety trial was conducted by Maryland NRCS and University of Maryland Cooperative Extension to develop the latest information on agronomic performance of commercially available Bermudagrass varieties. Information gathered will be of mutual benefit to the farmers of Maryland and surrounding states, the Maryland Cooperative Extension and NRCS. Commercially available varieties of Bermudagrass (sprigged and seeded) will be included in the trial that have potential for superior hardiness, durability and/or forage production under high-use conditions in Maryland.

Common Bermudagrass, which has not been intentionally planted and is considered a weed, has been observed surviving under high-use conditions in Maryland where other forages and plant cover have been destroyed by livestock activity. There are a number of commercial varieties of Bermuda grass that have been selected for forage or turf and would be cold hardy in Maryland. However, there is currently little knowledge of how these commercial varieties of Bermudagrass will perform under high-use conditions in Maryland. Commercial varieties of Bermudagrass, and especially the seeded varieties, have largely not been used in Maryland for grazing and greater knowledge is needed for Bermudagrass to be recommended for grazing. Seeded varieties of Bermudagrass have previously been discouraged in Maryland due to the aggressive, weedy nature of common Bermudagrass. However, there is an increasing interest on the part of the turf grass industry in using Bermudagrass in Maryland.

Procedure: Seed and sprigs were purchased from commercial sources or obtained from a PMC. Varieties included in the trial are listed in Table 9. Seeded varieties were planted in three feet by 20 feet plots with a six row cone seeder with six inch row spacing at a rate of eight pounds PLS per acre. Sprigged varieties were established by hand spreading sprigs over freshly tilled plots, then lightly tilling sprigs into the soil and then firmly packing the soil with a Brillion seeder.

Fertilizer applications of phosphorous and potash was applied to meet soil test recommendations. Nitrogen was applied at a rate of 75 pounds per acre of available nitrogen when growth at start of spring growth.

Table 9: 2009 and 2010 yield comparisons Bermudagrass cultivars by harvest date and season total at the NPMC, Beltsville, Maryland.

	Forage Yield (lbs./acre)				
	2009	2010			2009-2010
Variety	Total	June 10	Oct. 13	Total	Average
Midland 99	**11,476**	2,523	7,073	**9,596**	**10,536**
Ozark	**11,571**	2,744	5,849	**8,593**	**10,082**
Tiffton 44	**9,364**	2,221	6,243	**8,463**	**8,913**
Sungrazer Plus	**9,285**	1,634	5,095	**6,729**	**8,007**
Riata	**8,644**	2,630	4,324	**6,954**	**7,799**
Quickstand	**7,327**	983	4,678	**5,661**	**6,494**
Tuffcote	**6,570**	763	4,935	**5,699**	**6,134**
Mean	**9,199**	1,907	5,535	**7,442**	**8,321**
LSD[1/] (0.05)	**NS[3/]**	739	NS	**2,056**	**2,349**
% CV[3/]	**21**	22	18	**16**	**16**

1/ = least significant difference test at 5% level of probability; 2/ = coefficient of variation; 3/ = not significant

Yield measurements were taken from the entire three feet by 20 feet plot area. Cuttings were made using a Carter flail-type harvester and cut to a height of eight inches when the grasses have reached the mid to late boot stage. Data on other traits such as persistence, tolerance to diseases and insects and rate of recovery will be collected as appropriate. The tests will be conducted for four years (stands permitting) as a simulated grazing system.

Potential Products: Maryland grazing standards and recommendations. Growth curve data obtained from study is will be used to refine the grazing models in the C-Graze computer program. Yearly summary reports and final report.

Status of Project: Summary of yields and stand scores are reported in Table 9. Varieties are grouped according to species/type and are ranked according to the two year average yield. For the 2009 and 2010 average yield data, 'Midland 99' and 'Ozark' yielded significantly higher than all other varieties except for 'Tiffton 44'. 'Quickstand' and 'Tuffcote' yielded significantly lower than 'Midland 99', 'Ozark' and Tiffton 44'. The two seeded varieties 'Sungrazer Plus' and 'Riata' yielded lower than the improved sprigged varieties but higher than the older sprigged selection 'Quickstand' and 'Tuffcote'. Yield comparisons in this trial may not translate well to actual yields in field conditions under heavy animal use. Qualities that may result in higher yields may result in lower persistence or tolerance to heavy animal use. Additional studies have been established and are ongoing at several cooperating horse farms to determine tolerance of available Bermudagrass varieties to the over-grazing and heavy wear of horse pasture heavy-use/sacrifice areas.

PLANT SPECIES FOR USE AS VEGETATIVE ENVIRONMENTAL BUFFERS (VEB) TO IMPROVE AIR QUALITY AROUND POULTRY PRODUCTION FACILITIES

Study No: MDPMC-T-0602-WI

Study Leader: Shawn Belt, Horticulturist, Martin Van der Grinten, Manager NY PMC

Objective: There are a limited number of plant species being used for VEBs which tolerate the harsh conditions adjacent to tunnel fans. This study is designed to test the survivability and growth of grasses, shrubs and trees for potential use inclusion in VEBs. Study results will show that the selected plants are able to tolerate the tunnel fan emissions and climatic conditions. Continuing studies will quantify the effectiveness of these various plant species for filtering dust, absorbing ammonia and ability to diminish odors.

Introduction: The Delmarva Peninsula is home to one of the country's highest concentrations of poultry farms. The 2007 National Agricultural Statistical Service placed poultry and egg production as the most valued commodity in Maryland and Delaware and the second most valued commodity in Pennsylvania. But, poultry houses generate dust, odor and ammonia that are expelled from the houses by ventilation systems.

Dust is linked to respiratory effects in poultry workers and can be a nuisance for neighbors/neighboring communities. Ammonia emitted from poultry houses has been linked to degradation of both air and water quality in the Chesapeake Bay. The number of birds produced on the Delmarva Peninsula in 2010 was 559,000,000. The National Air Emissions Study (NAEMS) in Kentucky showed that 31-35 grams of ammonia is emitted per bird, so approximately 17-20,000 metric tons of ammonia are emitted by the poultry industry in the Delmarva Peninsula alone.

Procedure: Establish poultry tunnel fan adjacent VEBs composed of a variety of grasses, shrubs and trees at various test farm sites in Maryland, Delaware and Pennsylvania and evaluate and document plant performance. Plant performance is defined as survival, vigor and growth (height and width).

Potential Products: Updated Maryland and Delaware NRCS FOTG standards and plant guides**.** Technology transfer achieved through informational presentations, progress reports, technical notes and posters at conferences. Public outreach achieved by regional farming newspaper articles.

Progress or Status: In 2010, seven different test farms were planted in Maryland, Delaware and Pennsylvania. At these seven sites a total of 443 plants were installed, consisting of 19 different species. Six test sites consist of broiler type poultry farms the seventh (and largest) site is a commercial egg laying farm. Table 10 specifies the test plants and the resulting growth. American elms were tested at the most sites in 2010. A total of 49 American elms were planted, only 3 trees died. A survival rate of over 93%, which is a very high survival rate especially given the below average rainfall for 2010 growing season.

Table 10: Seven VEB test sites in MD, DE and PA. Information identifying an individual farm obscured.

[redacted] Farm* - Biglersville, PA

Botanical Name	Common Name	Qty.	Distance from fans (ft)	Average height (cm)
Acer rubrum	Red Maple	8	34	100
Alnus serrulata 'Panbowl'	Alder	6	34	99.17
Celtis occidentalis	Hackberry	6	45	78
Juniperus virginiana	Eastern Red Cedar	8	45	64
Miscanthus x giganteus	Giant Miscanthus	30	30	170
Morella pennsylvanica	Bayberry	8	30	72.5
Panicum amarum 'Atlantic'	Coastal Switchgrass	24	30	115
Panicum virgatum 'Northwind'	Switchgrass	90	30	125
Panicum virgatum 'Thundercloud'	Switchgrass	30	30	150
Populus deltoides x nigra 'Spike'	Poplar	12	45	252.86
Quercus rubra	Red Oak	10	45	107
Robinia pseudoacacia	Black Locust	11	34	132
Salix alba x matsudana 'Austree'	Hybrid Willow	55	45	260
Salix purpurea 'Streamco'	Purpleoisier Willow	62	34	100
Thuja *occidentalis* 'Affinity'	Northern White Cedar	8	56	163.12
Thuja occidentalis	Northern White Cedar	8	56	55
Thuja standishii x plicata 'Green Giant'	Arborvitae	6	56	156.67
Ulmus americana 'Valley Forge'	American Elm	17	45	188

*all plants were irrigated and mulched

[redacted] Farm* - Grantville, PA

Botanical Name	Common Name	Qty.	Distance from fans (ft)	Average height (cm)
Ulmus americana 'New Harmony'	American Elm	1	37	81
Ulmus americana 'Valley Forge'*	American Elm	2	37	84

*****irrigation 67% plant survival

[redacted] Farm* – Denton, MD

Botanical Name	Common Name	Qty.	Distance from fans (ft)	Average height (cm)
Ulmus americana 'New Harmony'	American Elm	2	20	89
Ulmus americana 'Valley Forge'	American Elm	6	20	84

*****no irrigation 100% plant survival

[redacted] Farm* – Queen Anne's Co., MD

Botanical Name	Common Name	Qty.	Distance from fans (ft)	Average height (cm)
Ulmus americana 'New Harmony'	American Elm	3	30	165
Ulmus americana 'Valley Forge'	American Elm	8	30	164

* no irrigation, 90% plant survival

[redacted] Farm* – Centreville, MD

Botanical Name	Common Name	Qty.	Distance from fans (ft)	Average height (cm)
Ulmus americana 'New Harmony'	American Elm	2	40	246

*****no irrigation, 100% plant survival

[redacted] Farm* - Rhodesdale, MD

Botanical Name	Common Name	Qty.	Distance from fans (ft)	Average height (cm)
Ulmus americana 'New Harmony'	American Elm	2	30	94
Ulmus americana 'Valley Forge'	American Elm	4	30	88

*****irrigation, 100% plant survival

WARM-SEASON GRASS MANAGEMENT TRIALS

Study No: MDPMC-T-0803-WI

Study Leader: R. Jay Ugiansky, Resource Conservationist

Objective: Evaluate vegetative response to disturbance treatments on native warm-season grass (NWSG) stands for both excessively thick stands and stands of "normal" thickness. Evaluate effectiveness of over-seeding new, Maryland wildflower mixes based on timing, disturbance intensity and seeding rate treatments.

Introduction: Wildflowers are food for insect larvae and provide pollen and nectar to pollinators. A diverse mix of wildflowers with blooms throughout the growing season is especially valuable to pollinators while supporting populations of beneficial insects, such as those that prey on crop pests. Wildflowers in grass plantings provide a varied food source and structural complexity to support a diverse community of birds, mammals and insects.

Warm-season grasses can come to dominate conservation plantings, resulting in limited plant species diversity, lack of structural complexity and a compromised ability to support diverse wildlife. Maryland NRCS is working to increase the wildflower diversity in its conservation plantings and thereby increase the ability of these plantings to support greater wildlife diversity. This study will determine the optimal methods for renovating warm-season grass stands to increase diversity and improve wildlife habitat. The study is being conducted at the National Plant Materials Center in Beltsville, Maryland in cooperation with Maryland NRCS State Biologist Steve Strano.

Procedure: Two separate treatment areas, Area 1 (located at Locust Field, NPMC) and Area 2 (located at C2, NPMC), with different soils and existing plant compositions will be utilized for the study. Area 1 (dry) is on well-drained site with soil dominated by indiangrass and will receive "dry wildflower mix" treatments. Area 2 (mesic) is mesic site with soil dominated by warm-season grasses and will receive "mesic wildflower mix" treatments. All study plots will be evaluated for percent cover of existing vegetation and open ground before and after treatment application. The treatments for the two trials are identical except for species mix, used which is tailored to the trial site soil conditions.

Treatments:

A. Time of mowing/disking effects (T)
   - Late summer – mow and disk (September)
   - Late summer mow – fall (dormant) disk (November)
   - Fall (dormant) mow (November) – spring disk (March)
   - Late winter/early spring – mow and disk (March)

B. Intensity of disking effects/percent bare ground (D = Disk or C = Chisel plow)
   - 25 percent bare ground
   - 50 percent bare ground
   - 100 percent bare ground
   - No disk (control)

C. Overseeding
   - None - Control (x)
   - ½ pound PLS per acre rate (w)

- ½ pound PLS per acre rate with small grain nurse crop (oats at 20 pounds per acre) (g)
- 4 pounds PLS per acre rate (c)

Wildflower Mixes:

- Area 1: Indiangrass plot – Use Maryland native wildflower mix for dry sites
- Area 2: Warm-season grass plot – Use Maryland native wildflower mix for mesic sites

Response Evaluation:

The following responses will be evaluated for a period of three years:

A. Percent cover (based on cover classes)
   - Total
   - Desirable grasses
   - Desirable forbs
   - Weeds – any problematic species
   - Litter (based on what is visible)
   - Bare ground (based on what is visible)

B. Litter depth (based on depth classes, using most representative depth class for plot)

C. Vegetative composition (species)

At the end of the three-year evaluation, mowing and disking using the same timing treatments as above will be conducted to evaluate the response of the wildflowers without re-seeding.

Potential Products: New seeding recommendations for NRCS programs. Technical notes and fact sheets.

Status of Project: Pretreatment evaluations were conducted in fall 2007. And post treatment evaluations have been conducted in fall 2008, 2009 and 2010. Summary of 2010 data are shown in figures 9 to 12. As of 2010 the data indicates the following:

1) Disking is overall not extremely effective at reducing cover of well-established, tall-statured NWSGs.

2) Disking was shown to be somewhat effective at reducing cover of tall-statured NWSGs in the site with more well-drained soils (i.e. dry site) with predominately indiangrass as the primary NWSG. Plots at this site had indiangrass cover reduced whereas the switchgrass and big bluestem cover remained the same or increased, suggesting that indiangrass is more susceptible to damage by disking.

3) NWSGs disked in the fall had less cover than NWSGs disked in spring after 2 seasons, especially on the dry site. This suggests that NWSGs may be more susceptible to critical damage when disked in the fall, or alternatively, spring disking may have a positive effect on NWSGs. The difference in percent cover of NWSGs between fall and spring disk was more pronounced in the 100% bare ground disking treatment, but was apparent in the 25% and 50% disking treatments.

4) Larger scale evaluations should be conducted to determine the most effective and efficient methods for reducing the NWSG cover in established stands. In addition to disking, other methods of disturbance should be evaluated, including plowing and herbicide treatment.

5) The timing of disturbance to NWSGs should be evaluated further. Currently, the most common time for disking and burning NWSGs is in the early spring, because it is more convenient for managers, and it leaves wildlife cover standing through the winter. If fall disturbance is more effective, then current management practices will need to be re-evaluated.

6) Wildflower establishment was affected more by species than any other variable. Many wildflowers species were not found in any of the plots whereas a few were commonly found as shown in figures 11 and 12.

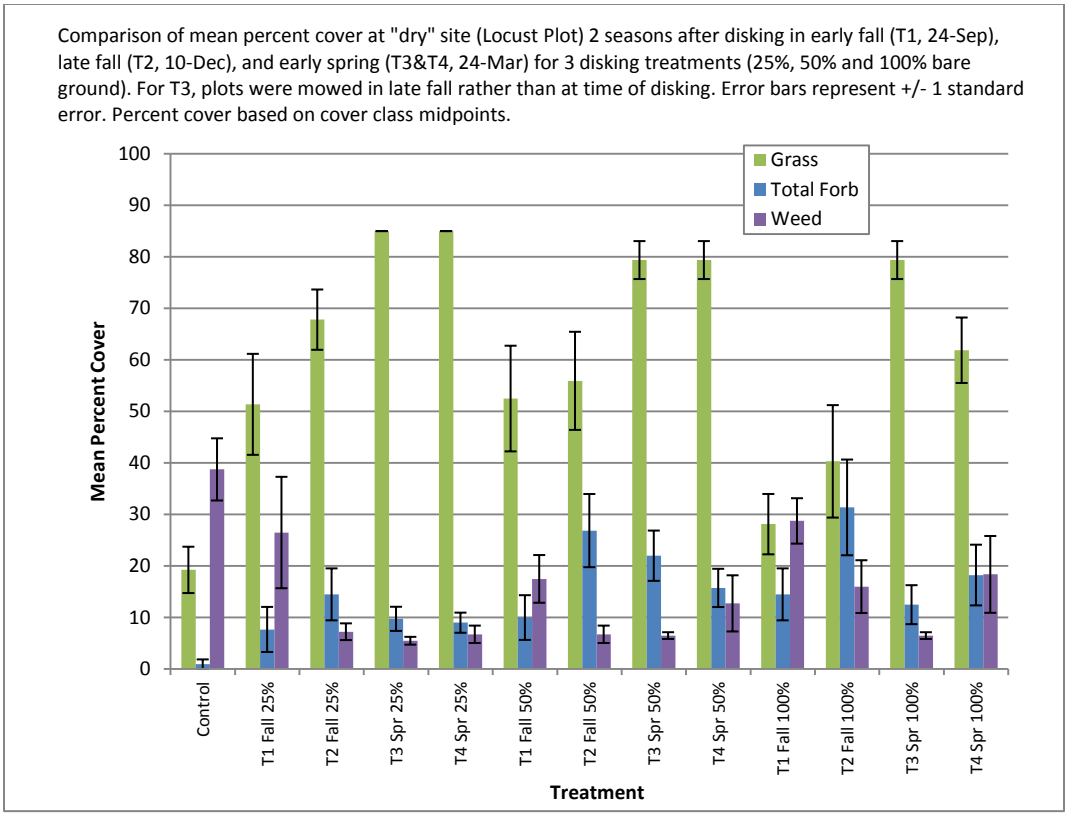

Figure 9: Comparison of mean percent cover for the xeric site, various disking treatments.

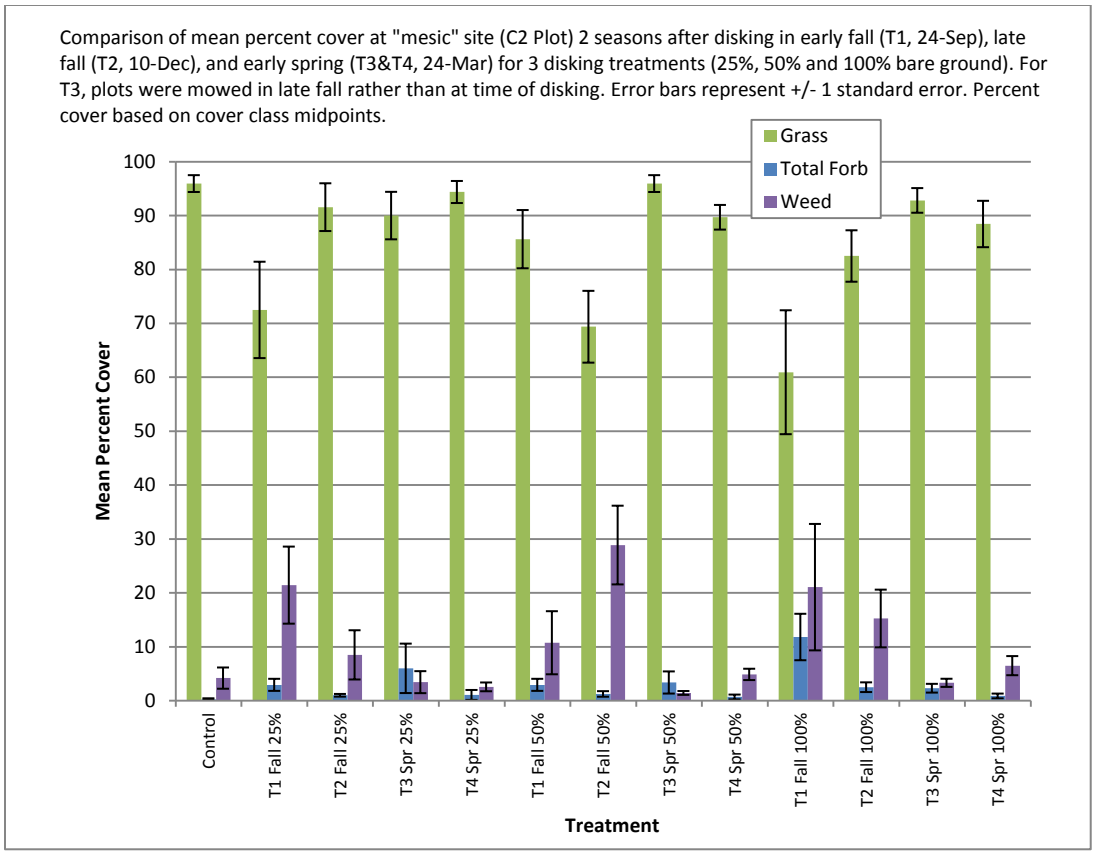

Figure 10: Comparison of mean percent cover for the mesic site, various disking treatments.

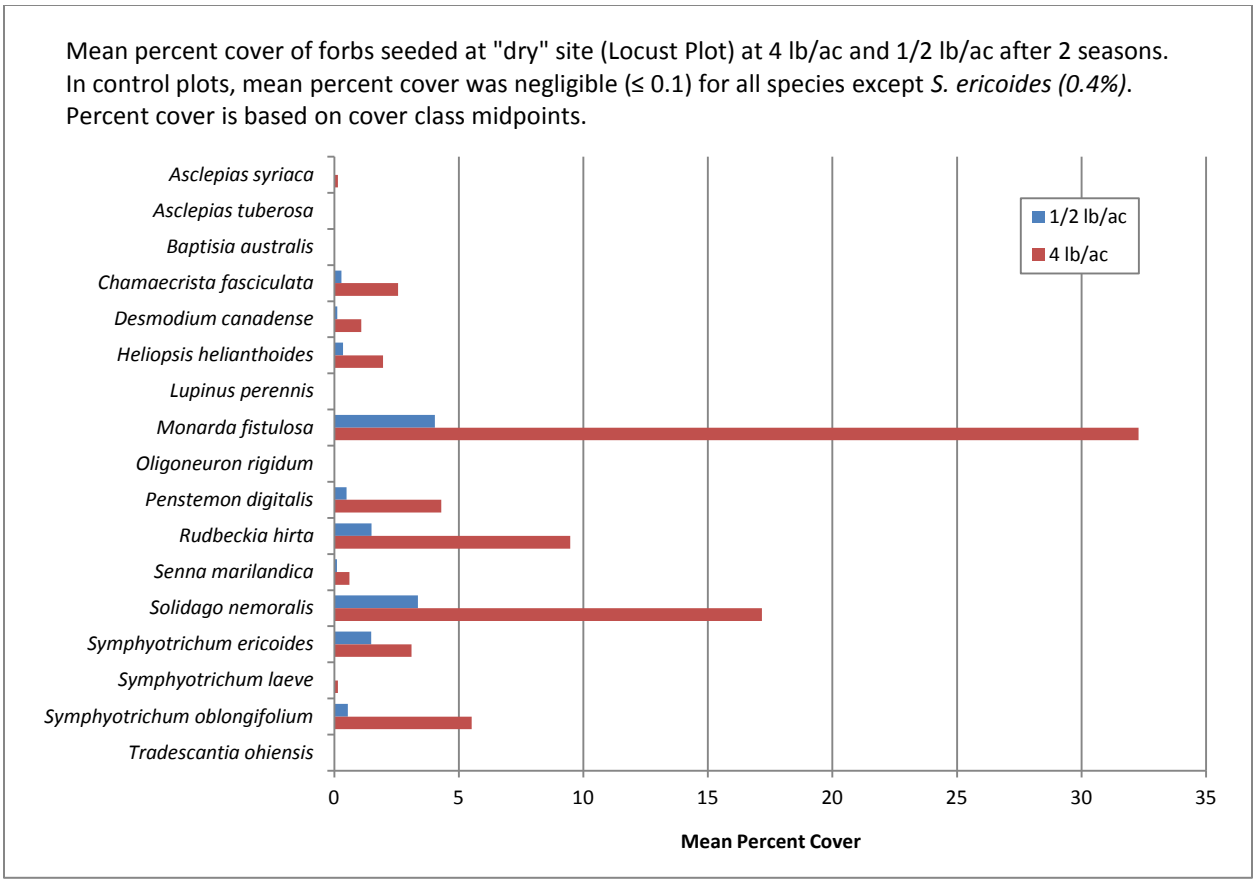

Figure 11: Mean percent cover at the xeric site.

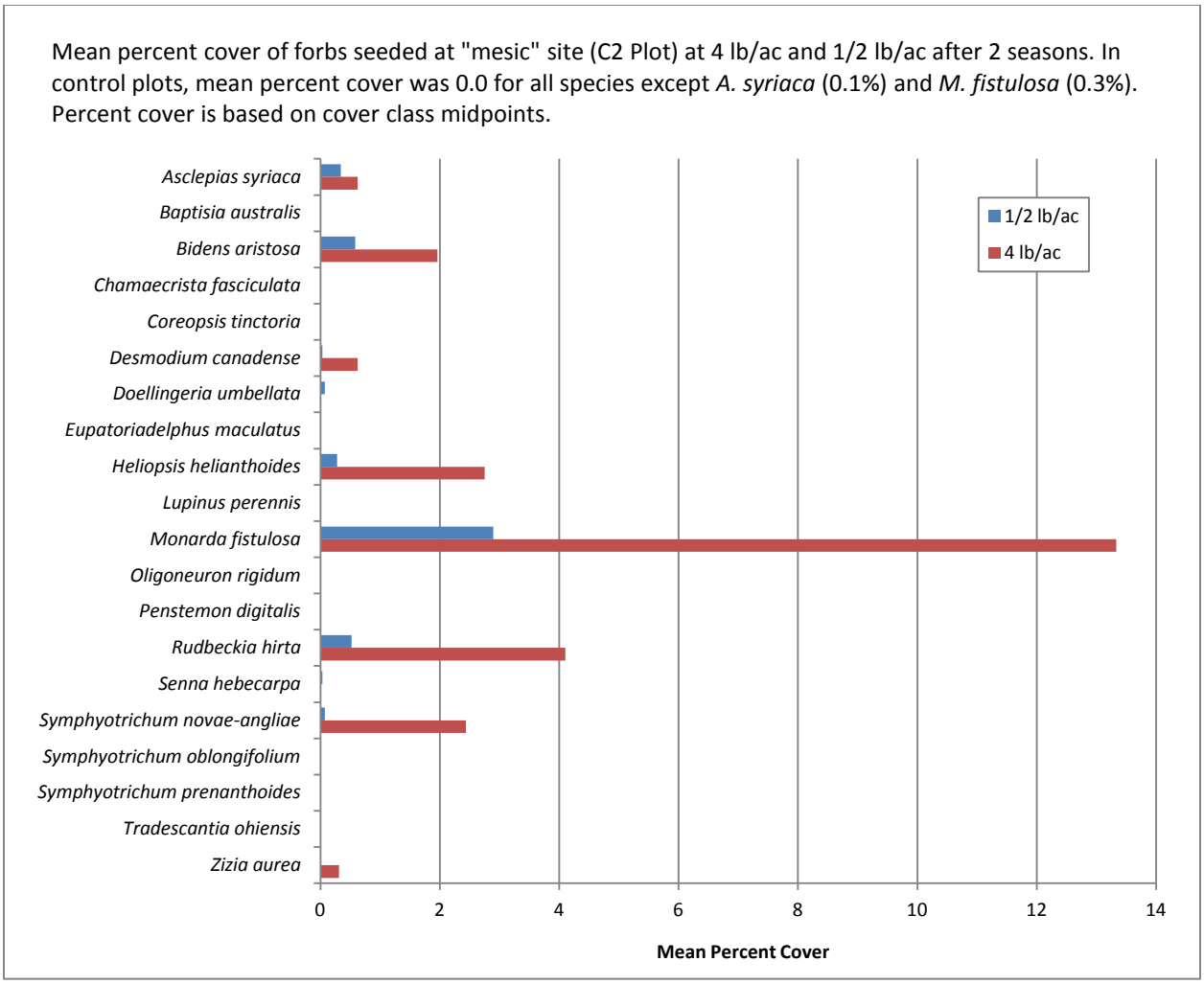

Figure 12: Mean percent cover at the mesic site.

EFFECTS OF NITROGEN FERTILITY ON THE SEED PRODUCTION OF TWO NATIVE PLANT SCPECIES: SOUTHEASTERN WILDRYE (*Elymus glabriflorus*) AND BEAKED PANICGRASS (*Panicum anceps*)

Study No: MDPMC-T-0804-BU

Study Leaders: Shawn Belt, Horticulturist, and Sara Tangren (Chesapeake Natives Inc.)

Objective: To investigate the most efficient fertilization rate (0, 30 or 60 pounds nitrogen per acre) in order to maximize seed production, while at the same time minimizing fertilization inputs. This study not only potentially saves production costs for producers, but will minimize nutrients reaching the Chesapeake Bay.

Introduction: In order to make locally native seed more affordable and more available for the Maryland State Highways Administration (SHA). Three species were identified Virginia wildrye, coastal panicgrass and grey goldenrod. The highly disturbed soils that SHA must revegetate are diverse, tough environments for plant life. The chances that some of the seed in an order will be well adapted to a particular stabilization site are optimized if that seed originated from a genetically diverse local collection. The use of locally native seed also preserves Maryland's natural heritage and supports local agriculture. This project has been established in order to make such seed more affordable and more available to SHA for use in roadside soil stabilization projects.

Procedure: For each species tested, the test plots consist of 270 plants (three fertilization rates by three replications = nine plots by 30 plants per plot). Each plot contains three rows of 10 plants (see Figure 13). In order to minimize the potential of nutrient contamination from adjacent plots only the center eight plants (highlighted in red) were harvested and evaluated.

X	X	X
X	X	X
X	X	X
X	X	X
X	X	X
X	X	X
X	X	X
X	X	X
X	X	X
X	X	X

Figure 13: Plot structure showing three rows of 10 plants. "Red" plants were harvested and evaluated while "black" plants were used to minimize adjacency issues.

A soil analysis of the top six inches of soil was conducted in March 2009. A low rating of organic matter (2.1%) with an estimated nitrogen release of 85 pounds per acre and nitrate (NO_3) of four parts per million (very low rating) was reported. The level of potassium was also low. In order that the deficient level of potassium is not an additional limiting factor potassium sulfate (0-0-50) was applied to the test plots.

The spring of 2009 the various rates of slow release nitrogen were broadcast into the test fields. Evaluation of the plant height, time of seed set, seed viability and number of reproductive tillers was conducted August through September 2009 (see Tables 11 and 12).

Status of Project: After internal review it was decided that after 2011 data collection the project would be concluded, with a final report summarizing all results to be prepared in 2012. All seed will be deposited within the National Plant Germplasm System so that the genetic variations of the seed collections are preserved long-term.

Table 11: Beaked panicgrass fertility trial results.

Repetition	Treatment	Seed Wt (g)	Notes
1	high	190.6	
2	high	136.9	
3	high	187.9	
1	low	198.2	
2	low	167.4	
3	low	137.6	
1	medium	181.7	
2	medium	147.2	
3	medium	269.9	Data point discarded – worker accidentally cut sample
Grand Mean seed weight		165 grams	
LSD [1](0.05)	high	171.8 grams	
	low	167.7 grams	
	medium	155.6 grams	

%CV[2] 14.58
[1]least significant difference test at 5% level of probability
[2]coefficient of variation

Table 12: Southeastern wildrye fertility trial results.

Repetition	Treatment	Seed Wt (g)
1	high	226.9
3	high	194.3
2	high	198.1
1	low	194.3
2	low	204.3
3	low	192.5
1	medium	192.0
2	medium	242.6
3	medium	200.7
Grand Mean seed weight		205 grams
LSD[1] (0.05)	medium	211.77 grams
	high	206.43 grams
	low	197.03 grams

%CV[2] 9.83
[1]least significant difference test at 5% level of probability
[2]coefficient of variation

WILDFLOWER PERSISTENCE STUDY

Study No: MDPMC-T-0804-WI

Study Leader: R. Jay Ugiansky, Resource Conservationist

Objective: Evaluate established wildflower species persistence within an established warm-season grass stand. Evaluate species included in the **WARM-SEASON GRASS MANAGEMENT TRIAL**, plus additional promising species. Species will be planted as plugs to better ensure establishment in the first year and remove germination and other field establishment variables.

Introduction: Wildflowers are food for insect larvae and provide pollen and nectar to pollinators. A diverse mix of wildflowers with blooms throughout the growing season is especially valuable to pollinators while supporting populations of beneficial insects, such as those that prey on crop pests. Wildflowers in grass plantings provide a varied food source and structural complexity to support a diverse community of birds, mammals and insects.

Warm-season grasses can come to dominate conservation plantings, resulting in limited plant species diversity, lack of structural complexity and a compromised ability to support diverse wildlife. Maryland NRCS is working to increase the wildflower diversity in its conservation plantings and thereby increase the ability of these plantings to support greater wildlife diversity. This study will determine the optimal methods for renovating warm-season grass stands to increase diversity and improve wildlife habitat. The study is being conducted at the National Plant Materials Center in Beltsville, Maryland in cooperation with Maryland NRCS State Biologist Steve Strano.

Procedure:
First year:
- Mow warm-season grass stand.
- Kill three inch diameter circles within the warm-season grass using the broad spectrum herbicide glyphosate.
- Plant 10 – 15 plugs of each wildflower species into the cleared circles (one species per circle).
- Make initial evaluations of height and vigor.

Second year and fifth year:
- Evaluate for survival, height and vigor in the second and fifth years.

Potential Products: New seeding recommendations for NRCS programs. Technical Notes and Plant Fact Sheets.

Status of Project: Second year evaluation was completed in the fall of 2008 by University of Maryland Students as part of a capstone class project. Summary of second year evaluation are included in Table 13.

Table 13: Wildflower persistence in the second year (2008) by species persisted, species not thriving and species not established and replanted in 2008.

Species persisted >80% height, 1-3 vigor	Species not established and replanted Oct. 2008
▪ *Rudbeckia hirta*	▪ *Heliopsis helianthoides*
▪ *Helenium flexuosum*	▪ *Senna marylandica*
▪ *Lespedeza capitata*	▪ *Monarda media*
▪ *Desmanthus illinoensis*	▪ *Symphiotrichum laeve*
▪ *Asclepias incarnata*	▪ *Rudbeckia hirta* (Maryland ecotype)
▪ *Bidens aristosa*	▪ *Symphiotrichum oblongifolius*
▪ *Trichostema dichotomum*	
▪ *Senna hebacarpa*	

Species not thriving <10% height, 9-10 vigor
▪ *Vicia americana*
▪ *Coreopsis tinctoria*
▪ *Baptisia tinctoria*
▪ *Desmodium ciliare*

NRCS-NPS GREAT SMOKY MOUNTAINS REVEGETATION PROJECT

Study No: MDPMC-T-9604-RE

Study Leader: Shawn Belt, Horticulturist

Objective: Provide seed cleaning services to Great Smoky Mountain National Park (GRSM) to facilitate parkland revegetation efforts at GRSM and the Foothills Parkway using site collected seed.

Introduction: The current interagency agreement between GRSM and the National Plant Materials Center (NPMC) was signed in September 2005, for the fiscal years 2005-2010. GRSM and Foothills Parkway, has a need to preserve the native plant resources and revegetate parklands. The NPS requires that restoration of native plants will be accomplished using germplasm from populations as closely related genetically and ecologically as possible to park populations. GRSM has harvested seed from indigenous populations, but does not have the personnel, expertise, facilities or equipment needed to clean process, test and store the seed. The NPMC does have the personnel and is equipped to clean, process and store quantities of seed sufficient to meet the NPS needs within the required time frame. Technical expertise as necessary to achieve this goal will be provided by the NPMC under this agreement.

Progress or status:

Seed Cleaning

This is the final report for the 2005 - 2010 contract; a 2011 – 2013 interagency agreement was signed extending this work. The Cades Cove increase fields harvest resulted in over 625 lbs (bulk) of grass, legume and wildflower seed harvested. Table 14 lists the 10 different lots of seed which were harvested. The seed was cleaned (de-bearded and then run through a clipper) by NPMC staff to yield 120 lbs Pure Live Seed (P.L.S. = bulk x purity x viability). Also included in the table are the species, amounts of seed harvested, and the resulting cleaned seed weights.

NPMC's Seed Cleaning Facility

There were a significant amount of improvements to the NPMC's ability to clean GRSM's seed. A new 2 screen Eclipse 324 clipper was purchased. While this new machine has required some trial and error by the staff in order to effectively clean the seed, it has already greatly increased our ability to clean large amounts of seed. Another seed cleaning machine was purchased, the Westrup LA-H brush machine. This new machinery was also complimented by a total redesign of our air filtration system. All new ducts were installed and in most cases the size of the ducts were diminished to increase the air speed and efficiency. This has greatly benefited the air quality and safety for the staff that clean the seed.

Virginia Wildrye Increase Field at the NPMC

Virginia Wildrye (*Elymus virginicus*) is a native, cool season grass which quickly germinates, making it a very highly used species for maintaining slope stability on the Foot Hills Parkway. Native grass and wildflower seed mixes contain up to 25% Virginia wildrye for these reasons. The seed also maintains high viability while in storage. The current amount of Virginia wildrye seed remaining in storage has dropped to ~50 lbs. In order to provide ample seed for future slope revegetation purposes it was decided that the NPMC would establish an increase field.

11,000 plugs were sown and grown in the winter 2010 in order to establish a ~1/2 acre increase field. The plugs were planted in the Spring of 2010, watered, weeded and harvesting should begin in the autumn of 2011.

Table 11: Seed harvested and cleaned by species, to support Great Smoky Mountains conservation activities.

Common Name	Species Code	Harvest year	Amount Cleaned	P.L.S.	Seed Test Date	Source
Big bluestem	ANGE	2010	139	18.8	9-30-2010	Cades Cove
Swamp sunflower	HEAN2	2010	7.5	1.2		Cades Cove
Roundhead lespedeza	LECA8	2010	13.2	1		Cades Cove
Wild bergamot	MOFI	2010	20.7	1		Cades Cove
Wild quinine	PAIN3	2010	11.1	.3	9-30-2010	Cades Cove
Sugarcane plume grass	SAGI	2010	15.6	3.4	9-30-2010	Cades Cove
Little bluestem	SCSC	2010	72.4	4.9	9-30-2010	Cades Cove
Indiangrass	SONU2	2010	176	71	9-30-2010	Cades Cove
Purpletop	TRFL2	2010	11.4	7.5	9-30-2010	Cades Cove
N.Y. Ironweed	VENO	2010	.7	.7		Cades Cove
			625	120		