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INTRODUCTION

The Rose Lake Plant Materials Center, as part of the USDA Natural Resources Conservation Service (NRCS), was established in 1957 on a 40-acre site at the Michigan Department of Natural Resources, Rose Lake Wildlife Research Station, and located 8 miles northeast of Lansing, Michigan.

The mission of the Plant Materials Program is to develop and transfer effective state-of-the-art plant science technology to meet customer and resource needs. The purpose of the Plant Materials Program is to carry out specialized activities in resource conservation, as part of the overall program of NRCS. It is the responsibility of the Plant Materials Center (PMC) to: 1) assemble, test and release plant materials for conservation use; 2) determine techniques for the successful use and management of conservation species; 3) facilitate the commercial increase of conservation species; and 4) provide for the development and transfer of state-of-the-art applied science technology.

The PMC Long Range Plan (LRP) identifies, guides and directs PMC operations toward solving high-priority resource concerns identified in the Indiana, Ohio, Michigan and Wisconsin Plant Material LRPs (see Appendix A for individual plans). The PMC LRP is consistent with goals and objectives identified in the NRCS Strategic Plan.

Long-Range Plan

- Educate and train field staff/partners on plant materials and the Plant Materials Program
  - includes basic plant identification, use of plants for conservation, propagation techniques and information on the Plant Materials Program process
- Research and develop plants and techniques for use in soil bioengineering to stabilize banks
  - includes streambanks, roadsides, shorelines and dunes
- Research and develop plants and techniques for greater erosion control and/or nutrient uptake to prevent sedimentation and nutrients from entering water supplies
  - specifically for use in filter strips, wetlands and livestock facilities
- Research and promote native plants for conservation work that can be used as alternatives to the currently prescribed introduced species, and native plants that are culturally significant
  - includes technology transfer, development of locally native ecotypes, and assistance to underrepresented groups with plant materials of cultural importance
- Research and develop native warm season grasses for pasture and prairie restoration
  - includes technology transfer on establishment and maintenance of warm season grasses, as well as, development of regional cultivars
- Promote windbreak establishment; research income producing species for use in windbreaks
- Research and develop plants for critical area stabilization
  - dry or sandy site such as mined lands and spoil areas are of particular concern
- Research plants that have potential as a biofuel

STUDIES 2002 - 2003

Study Number	Study Name	Purpose	Year Initiated
MIPMC-T-0101-CR	Isle Royale Restoration at Windigo, Mott Island and Rock Harbor	Technology	2001
MIPMC-T-0004-CR	Arrest Erosion Threatening Raspberry and Outer Island Light Stations	Technology	2000
MIPMC-T-0301-WO	Direct Seeding Tree and Shrub Establishment	Technology	2003
MI-PMC-T-0302-PA	Eastern Gamagrass (*Tripsacum dactyloides*) Cultivar Evaluation	Technology	2003
MI-PMC-T-0303-PA	Eastern Gamagrass (*Tripsacum dactyloides*) Production Evaluation	Technology	1998
26I106E	Shrub Willow, *Salix* spp., for Restoration of Riparian Areas	Release	1992
26I124L	Common Elderberry (*Sambucus canadensis*) and Red Elderberry (*S. pubens*) for Streambank Stabilization	Release	1997
26A097F	Prairie Sandreed, *Calamovilfa longifolia*, for Stabilizing Dune Areas	Release	1989
26C126V	Vegetative Hedges for Controlling Erosion in Areas of Concentrated Flow	Technology	1996
26I101G	Big Bluestem, *Andropogon gerardii*, for Forage Use	Release	1992
26I080J	Tick-trefoil, *Desmodium* spp., for Wildlife Food Plots	Release	1987
MIPMC-P-0001-CR	Great Lakes Composite of Canada Wildrye, *Elymus canadensis*	Release	2000
MIPMC-P-0201-CR	Development of Great Lakes Composite of Virginia Wildrye, *Elymus virginicus*	Release	2002
MIPMC-P-0204-CR	Development of Great Lakes Composite of Bottlegrush Grass, *Elymus hystix*	Release	2002
MIPMC-P-0206-OT	Initial Evaluation of Sweetgrass, *Heirochloe odorata*, from regional collections	Release1	2002
MIPMC-P-0207-CR	Increase and Release of Riverband Wildrye , *Elymus riparius*	Release	2002
MIPMC-P-0209-CR	Evaluation of Dune Willow, *Salix cordata*	Release	2002

Partnership and Program Development

Assisting other agencies and groups with projects relevant to our concerns has a two-fold advantage. First, developing partnerships allows expedient and effective land conservation by garnering the skills, knowledge and abilities of each agency or group involved. Second, it broadens the program's range of plant and conservation skills thereby widening our customer base and demand. Often these projects are formed as reimbursable to the plant materials program that, in turn, help fund staff and equipment needs.

Problems
Many partners lack either the skills or facilities to produce plants or complete research on various, adopted conservation projects.

Needs
Plants, planting skills and/or facilities to grow plants for conservation projects on public lands are needed.

Study No. MIPMC-T-0101-CR
Isle Royale National Park Restoration at Windigo, Mott Island and Rock Harbor

Introduction: While most of the land base of Isle Royale National Park is designated Wilderness and under continuous vegetative cover, there are areas of significant human development of park operations and visitor use. These developments are focused in specific areas and have an assortment of disturbance ranging from new to several years old. As such these areas are prime locations for non-native plant infestation, unsightly and subject to continued or potential erosion. At present the park does not have the capability or program to restore these areas. Through a Memorandum of Agreement with Isle Royale National Park the USDA Natural Resource Conservation Service, Rose lake Plant Materials Center agreed to 1) increase native material collected from the park and return 1800 plants for restoration purposes, 2) develop and monitor propagation technology for use in shallow soil areas of the park that specifically promotes lateral root growth, and 3) prepare a restoration guide for park staff that included collection, establishment and management techniques on various park plant species. The MOA extends through September 2005.

Accomplishments: A lateral root development study was designed and established in 2002. Data was collected on survival, spread, and canopy coverage of each species in the test. Sedge, wild strawberry, and raspberry appear to spread well in the shallow soil growing conditions.

Technology Development: The Rose Lake Plant Materials Center completed a draft of a propagation manual for Isle Royale National Park. The manual describes techniques and considerations for propagating and establishing plant species specific to the Isle Royale National Park. The manual is currently under review by Park personnel.

Study No. MIPMC-T-0004-CR

Arrest Erosion Threatening Raspberry and Outer Island Light Stations

Introduction: This project was initiated in 2000 to produce native plant stock for stabilizing slopes, preventing erosion, preserving native plant resources and revegetating park lands. Under a Memorandum of Agreement species to be propagated were selected from an amendable list. A minimum of 2 grass, 2 forb and 4 shrub species from this list were supplied by the Center based on the material's availability, viability and site adaptability for the intended use. The Agreement further specified deliverables as 30 pounds of Canada wildrye seed, 500 forb/grass plugs and 500 shrub transplants. Deliverables were distributed in 2002 and 2003. Additional plant distributions are planned for 2004.

Accomplishments: Fourteen species were propagated in 2002 and 2003 for delivery to the Park in 2003. A total of 1466 plants were delivered in June of 2003. Propagation efforts continue at the PMC greenhouse for plant delivery in 2004.

The following is a list of species propagated and number of plants delivered to Apostle Island National Park in 2003:

Red Elderberry – 349	Smooth Rose – 14
Poverty Oatgrass – 353	Western Panicgrass – 156
Redosier Dogwood – 53	Virginia Strawberry – 13
Staghorn Sumac – 19	Sandcherry – 91
Western Pearly Everlasting – 18	Beach Wormwood – 32
Speckled Alder – 54	Hairgrass – 101
Canada Wildrye – 35	Willow – 178

Technology Development and Observations: The Rose Lake Plant Materials Center developed a restoration plan for sand spit areas of Oak Island. The plan discussed the various factors to consider when developing a restoration program, including site characteristics, availability of plant materials, availability of water, and labor considerations. The plan also summarized the performance of the plant species that were propagated at the Rose Lake Plant Materials Center and established on Oak Island in 2001. Equisetum, sedge, low-sweet blueberry, common juniper, Canada wildrye and wild rose were well established and vigorous one year after transplanting. Pearly everlasting, churchmouse 3-awn, and wild strawberry establishment and vigor were inconsistent across planting sites.

Stabilization of Streambanks and Shorelines

Soil bioengineering is the applied art and science that uses living plant material as a main structural component to control erosion, sedimentation and flooding. It is a unique technology offering a responsible, attractive and distinct approach to land stabilization and habitat restoration. Soil bioengineering systems are intended to form a positive interaction with the complex relationships that connect our natural resources.

Problems

Reduced water quality from sedimentation and nutrient accumulation in our lakes and waterways is a concern among the Great Lake and Midwest states. Improper urban, agricultural and forestry land management practices resulting in excessive erosion and nutrient runoff have contributed to this situation. Nonpoint source pollution is estimated to be responsible for 99% of sediments, 88% of nitrates, 84% of phosphates, and 73% of the biological oxygen demand in our lakes and streams.

Needs

Although many other best management practices treat the cause of water quality degradation, soil bioengineering serves to accelerate the restoration process by treating the wound. With emphasis placed on native species, developing acceptable plant materials and innovative soil bioengineering techniques has been pushed further to the front. Focus in the Great Lake and Midwest states has been placed on native shrub species that:

- propagate vegetatively
- establish rapidly
- grow vigorously
- exhibit excellent erosion control qualities or features
- provide food, shelter or nesting for wildlife
- are low maintenance and wear resistant
- possess aesthetic qualities

Study No. 26I106E
Shrub Willow, *Salix* spp., for Restoration of Riparian Areas

Background

Willow is a genus of extremely diverse woody plants having a wide adaptation range from temperate to arctic. More than 50 species occur in North America along with numerous subspecies, varieties and hybrids. Willows are dioecious trees or shrubs with alternate deciduous leaves. A shrub-type willow is a plant that reaches less than 20 feet tall having multiple stems growing from or near the ground. Typically, willows do well where there is plenty of moisture and light. Many species of willow commonly occur on streambanks and riparian areas and propagate readily by vegetative means.

Description of Study
Make an assembly of native shrub-type willow species, and through comparative evaluation, select and release one or more cultivars that exhibit superior traits for stabilizing streambanks and riparian areas, and improving water quality.

Procedure
During the winter of 1991-92, dormant woody cuttings from 120 accessions of various shrub-type willow species were collected from Indiana, Michigan and Wisconsin. These cuttings were propagated in the greenhouse and transplanted the following spring to an initial evaluation site on the PMC. Accessions were grouped into one of three areas based on the USDA plant hardiness zone of the collection site. Data was collected for the initial study from 1992 through 1996. Based on the 1993 data, cuttings from the 63 accessions that exhibited the desired growth characteristics and sufficient vigor were divided into MLRA subgroups and placed into field plantings. Data was collected on field plantings from 1995 through 1997.

Twenty accessions were selected for an advanced study based on survival, plant height, canopy width and density, tiller density, rate of spread and aesthetics. Two varieties, "Bankers" and "Streamco", were included as standards for comparison. Cuttings were taken from the selected accessions and grown in the greenhouse during the 1997-98 winter. During the following spring the cuttings were transplanted to 6 study sites across Wisconsin, Indiana and Michigan (including the Center). Each site was established as a randomized, complete block with 4 replications. Four of these sites failed or were discontinued leaving 1 Wisconsin site and the Center site active. Percent survival, plant height, canopy width and canopy density data has been collected from the Michigan Test from 1998 – 2001. Data at the Wisconsin site was collected from 1998 – 2003.

Summary
Results from the Michigan test site identified accession 9069052 as having the best combination of vigor, height, canopy width, and canopy density. Growth characteristics of this accession were equivalent to, or better than, 'Streamco' or 'Bankers' willow that were used as standards in the test. That accession was released as Riverbend germplasm silky willow tested class of natural germplasm in 2003. A propagation block of Riverbend germplasm silky willow was established at the Rose Lake Plant Materials Center in 2003. Rooted cuttings will be available to interested parties for increase purposes in 2004.

Data from the Wisconsin test for 2002 and 2003 are summarized in Table 1 and Table 2. Data for those years were highly variable, and no significant differences among accessions were detected.

Table 1. Shrub Willow Evaluations from Wisconsin Test Site – 2002.

Accession	Survival (%)	Rank	Height (ft)	Rank	Width (ft)	Rank	Density (1 – 9)*	Rank	Spread (1-9)*	Rank
9069027	68	6	5.8	4	8.5	1	8.5	13	6.0	4
9055496	81	4	5.0	9	7.7	2	7.7	12	7.7	10
9069032	62	7	5.2	7	5.8	9	5.8	5	5.7	3
9068998	93	2	5.5	5	7.1	5	7.1	9	5.0	2
9055535	50	9	5.9	3	6.2	8	6.2	6	4.2	1
9069015	37	10	5.1	8	5.5	12	5.5	2	7.0	8
9069013	75	5	5.0	9	7.5	4	7.5	10	5.7	3
9055495	62	7	5.8	4	7.5	4	7.5	10	6.5	6
9068997	81	4	5.2	7	7.6	3	7.6	11	6.0	4
9055533	68	6	6.0	2	6.3	7	6.3	7	6.7	7
9070325	68	6	4.5	11	5.6	11	5.6	3	6.2	5
9068980	100	1	5.2	7	7.6	3	7.7	12	6.0	4
9068993	68	6	5.5	5	7.5	4	7.5	10	6.2	5
9055531	87	3	5.5	5	6.3	7	6.3	7	6.0	4
9069003	75	5	6.2	1	7.1	5	7.1	9	6.7	7
9055499	62	7	4.5	11	5.0	13	5.0	1	6.5	6
9069053	56	8	4.7	10	6.2	8	6.3	7	7.7	10
9069029	75	5	5.0	9	7.0	6	7.0	8	8.0	11
Bankers	81	4	5.4	6	5.7	10	5.7	4	7.2	9
Streamco	87	3	4.7	10	7.6	3	7.6	11	6.7	7

* 1 – 9 Scale: 1 = best density or spread, 9 = worst density or spread

There were no significant differences among accessions for the characteristics measured.

Table 2. Shrub Willow Evaluations from Wisconsin Test Site – 2003.

Accession	Survival (%)	Rank	Height (ft)	Rank	Width (ft)	Rank	Density (1 – 9)*	Rank	Spread (1-9)*	Rank
9069027	75	2	6.9	4	7.9	7	3.5	1	7.0	6
9055496	68	3	5.9	8	9.0	1	7.0	11	8..7	12
9069032	56	4	4.6	14	4.9	17	4.5	4	4.5	1
9068998	52	5	5.9	8	7.5	9	6.2	9	6.7	5
9055535	50	6	6.8	5	7.0	12	3.7	2	5.5	2
9069015	43	7	5.1	12	6.5	14	5.5	6	5.7	3
9069013	56	4	5.8	9	8.5	4	5.7	7	9.0	13
9055495	56	4	7.0	3	8.9	2	6.2	9	8.0	9
9068997	75	2	5.5	10	8.0	6	4.2	3	8.5	11
9055533	62	3	8.1	1	7.6	8	4.2	3	8.2	10
9070325	62	3	5.5	10	7.2	11	6.2	9	6.2	4
9068980	93	1	5.8	9	7.5	9	4.2	3	7.5	8
9068993	62	3	6.5	6	8.4	5	5.7	7	7.5	8
9055531	75	2	5.8	9	6.8	13	7.2	12	7.5	8
9069003	75	2	7.1	2	8.9	2	5.0	5	7.2	7
9055499	56	4	5.0	13	5.4	16	6.2	9	8.2	10
9069053	56	4	5.3	11	7.4	10	6.7	10	8.5	11
9069029	68	3	6.4	7	8.8	3	6.0	8	6.7	5
Bankers	68	3	6.4	7	6.1	15	7.0	11	8.2	10
Streamco	68	3	5.3	11	7.6	8	3.5	1	6.2	4

* 1 – 9 Scale: 1 = best density or spread, 9 = worst density or spread

There were no significant differences among accessions for the characteristics measured.

Study No. 26I124L
Common Elderberry (*Sambucus canadensis*) for Streambank Stabilization

Background

Elderberry is an upright, native shrub that can grow to 10 feet tall. The thick, yellowish-brown to light brown bark roughens and furrows with age, and stems and twigs are commonly covered with numerous, small, wart-like bumps (lenticels). Leaves are compound opposite with 5 to 11 coarse-toothed, elliptical leaflets. Common elderberry has a white pith; flowers born in white, flat-topped clusters and purple-black fruit. It is often found on wet or moist sites, such as along drainage ditches and wet fields.

Description of Study

Assemble, select and release native ecotypes of common elderberry for use in (a) soil bioengineering practices as locally-adapted plant material to stabilize streambanks, (b) native plant restoration projects, and (c) wildlife plantings as a food and shelter source. Additionally, this species has potential as income sources from berry production for human consumption. Exploring such uses in production agriculture would necessitate advanced testing to insure that quality and performance standards would be met.

Procedure

Thirty-seven collections of common elderberry cuttings were processed and planted in the greenhouse from late winter through early spring 1997 and 1998. In June 1998 cuttings were transplanted into 3 initial study areas located in Wisconsin, Indiana and the Center. Each study area was established in single-plant plots utilizing a completely randomized, block design x 4 or 5 replications. Damage incurred on one off-center site by drought and the other by flooding forced the termination of these study areas. Data was recorded on fruit abundance, plant height, canopy width, canopy density and vegetative spread at the Center site from 1998 through 2000. To combat the heavy feeding a 5-foot fence was constructed around the study in 1999. In March 2001 each accession was cut to a height of 1 foot. Harvested material was sectioned and used to grow cuttings for 2 new field trials each in Indiana, Wisconsin and Ohio. These sites were established in May and June as completely randomized block designs x 4 replications.

A study was established in 2003 at Rose Lake PMC to compare one accession from the initial evaluation to several commercially available cultivars. Softwood cuttings of accession 9070259 were planted in plots along with softwood cuttings of ‘York’, ‘Nova’, ‘Johns’, and ‘Scotia’ common elderberry obtained from the National Clonal Germplasm Repository in Corvallis, OR. The study was established as a randomized complete block design with three replicates per accession. Plots consist of single plants of each accession. Data on height, canopy density, spread, and fruit abundance will be collected in 2004 – 2006.

Summary

Data collected from the Rose Lake Plant Materials Center trial indicated Accession 9070259 had excellent growth characteristics for height, canopy density, spread, fruit abundance, and re-growth after pruning. This accession was selected for further evaluation and potential release. This accession will be evaluated in several MLRA's and plant hardiness zones in the Rose Lake PMC service area for area of adaptation and use in conservation plantings.

The accession studies established in Indiana, Ohio, and Wisconsin were terminated after 2003 due to poor long term survival. Observations in the two Wisconsin trials showed good to excellent growth in 2001, but no new growth on old stems in 2002. New stems emerged from the crown in many plots in 2002, but no plant growth was observed in any plots in 2003. No data are available from the studies conducted in Ohio or Indiana.

Stabilization and Restoration of Dune Areas

A diverse number of landforms, and plant and animal communities make up the Great Lakes shoreline, including those of the dune system. The greatest dunes of the Great Lakes occur along the east coast of Lake Michigan. This is principally due to the massive amounts of sand and sediment that eroded into Lake Michigan as glaciers retreated northward, and the prevailing westerly winds that gather energy traveling across this uninterrupted expanse of water. Wind velocity and direction, water levels, direction of water current, topography, and existing vegetation primarily determine the rate of erosion and deposition.

Problems
Development and other human activities along these dune systems alters protective dunes and wetlands, removes stabilizing vegetation, and generally reduces the shoreline's ability to combat strong winds and waves.

Needs
The Great Lakes region needs commercially available plant varieties, the technology to establish them, and information on dune systems. Released material should:

- be native to the dune systems
- have good vigor and establish readily
- exhibit erosion control qualities

Study No. 26A097F
Prairie Sandreed, *Calamovilfa longifolia,* for Stabilizing Dune Areas

Background
Calamovilfa longifolia is a tall, coarse, perennial sand binding grass with two distinct varieties: *magna* and *longifolia*. Literature indicates var. *longifolia* occurs in many dry prairies on the interior plains of Canada and the United States whereas var. *magna* characteristically occurs on active and semi-established dunes fringing Lake Huron and Lake Michigan. Studies have shown var. *magna* is a dominant dune builder on sites with slower sand deposition or windward blowout slopes, but has limited representation on rapidly depositing surfaces.

Prairie sandreed is a C_4 species that reproduces vegetatively by rhizomes and sexually by seed. Seed germination and seedling establishment are influenced by species-specific requirements and by heterogeneity of the environment. *Calamovilfa longifolia* expands into adjacent territory by producing short diving rhizomes on the periphery of a clump. The species follows a conservative growth form of slow radial spread. Such a growth form consolidates a local patch of resources and is resistant to invasion by other plant species. A 1985 study suggested prairie sandreed does not establish vegetatively in nature because the short driving rhizomes are woody, do not bear any dormant buds, and do not fragment by wave action.

In response to sand accretion, the tillers and rhizomes adopt an erect habit of growth, emerge from sand, and produce tillers at the new sand surface. The growth form with a high density of stout tillers within a localized area of clumps is exceptionally adept in trapping windblown sand.

Description of Study

Employ recurrent mass selection breeding procedures to develop a superior variety of prairie sandreed with improved seed production, drought tolerance and seedling vigor for the Great Lake states using 4 accessions previously selected for the desired characteristics.

Procedure

Twenty-eight collections from around the Great Lakes region were assembled in 1978. Four superior strains were identified in 1986 from Mason, Huron and Ottawa Counties in Michigan, and Porter County Indiana. Superiority was based on vigor, foliage abundance, disease and insect resistance, and stand establishment. In 1989 these four selections were transferred to a crossing block. Seed was collected in 1990 and 1991. Three thousand plants were grown in the greenhouse from this seed during late winter – early spring 1992. The 1,000 most vigorous seedlings were transplanted to a field selection nursery in 1992.

The best 200 plants were selected in 1993 to remain in the plot. Those not selected were removed. Two growth forms, upright and spreading, were distinguished. Those with upright growth form were transplanted to another plot for seed increase. The seed (F_2) was collected from those with the spreading growth form and used to produce 1000 F_2 plants for a selection nursery. In 1999 a Recurrent Restricted Phenotypic Selection (RRPS) process was used to reduce the potential for selection variation to be affected by the environment while increasing the potential for selection variation to be affected by genetic factors. To do this the selection nursery was spatially divided into 6 subplots. Twenty-five plants were selected from each subplot based on plant vigor, tiller formation and spread, and transplanted into an isolated area on the Center. These plants form the breeder field.

Summary

The seed from the breeder field was assigned accession number 9086408. Seed from the breeder field will also be used to establish a foundation field. Seedlings from breeder seed will be grown in a greenhouse and transplanted into a foundation seed field in 2004.

The original parent lines, F_1, and F_3 (breeder seed) plants will be included in a progeny test to compare growth characteristics of the progeny to the parent lines. That study is planned for 2004.

Study No MIPMC-P-0209CR
Evaluation of Dune Willow (*Salix cordata*)

Background

Salix cordata propagates efficiently from dormant cuttings. It is found growing on dry dune areas. The plant has potential conservation and landscaping uses on dune areas. It has the potential to trap sand or sediment on dunes and stabilize dune areas that are vulnerable to erosion.

One concern with using this species in dune restoration is that a flea beetle (Altica subplicata) uses the plant as a food source. The flea beetle can nearly defoliate a dune willow plant by September or October. Multiple years of exposure of dune willow to the flea beetle causes significant plant loss, and subsequent loss of dunescape erosion protection.

Description of Study

A dune willow population will be established at the Rose Lake Plant Materials Center and evaluated for three to five years for vigor, plant growth, and incidence of disease or insects throughout the growing season.

Procedure

A Sand Dune willow was collected at Warren Dunes by Michigan DNR personnel in 2001. Plants were propagated by planting dormant cuttings in greenhouse containers and transplanting the rooted cuttings in a field trial in 2002. A total of 58 plants were transplanted into the field trial.

Summary

Of the 58 plants transplanted in 2002, 46 plants (80%) survived the 2002/2003 winter. Some plant loss was attributed to winter kill and some due to animal damage. Dead plants were removed and replaced with rooted cuttings from the greenhouse in July of 2003. No flea beetle damage was observed during the 2003 growing season.

Stabilize Cropped Areas of Concentrated Water Flow

The concentration of cropped land in this region has resulted in legitimate concerns about sediment and nutrient runoff. There are several practices designed to combat runoff problems. Some to a greater or lesser extent require removal of land from production. Developing methods that control erosion, yet, keep the most land in production is a challenge.

Problems

Grassed waterways are often utilized to eliminate erosion and runoff concerns in areas of concentrated flow within cropped fields. In small watershed areas where the water flow is less aggressive this practice is often dismissed in lieu of periodic filling and reshaping of the eroded area. This allows more land to remain in production and eliminates any hindrance the waterway may pose to farming operations. Erosion and runoff, however, continue to be a problem.

Needs

Vegetative barriers should:

- contain species acceptable to prospective user and environmental legislation
- exhibit excellent erosion control qualities
- not impede normal farming operations
- be easy to maintained
- remove as little land from production as possible

Study No. 26C126V
Vegetative Hedges for Controlling Erosion in Areas of Concentrated Flow

Background

Pre-established strips of perennial grasses (vegetative barriers) transplanted within the crop rows and designed to impede water flow may have application in this area. The concept is that where runoff concentrates in rills or ephemeral gullies, grass hedges will pond water upslope causing a large portion of the sediment load to settle and fill the eroding areas. This will create small, benched terraces that diffuse and slow runoff, thus limiting further erosion and increasing water absorption. This study was initiated for miscanthus grass in 1993 and expanded to include native warm season grasses 1996. Additional field plantings were established in Michigan, Indiana, and Ohio in 2001 or 2002 which included miscanthus grass or eastern gamagrass.

Description of Study

Install pre-established strips (vegetative barriers) of miscanthus or eastern gamagrass onto cropped fields and evaluate for their effectiveness to control erosion.

Procedure

Whole plants from stands on the Center are harvested and divided into sprigs. A single line of sprigs are planted 2 to 3 inches apart in 3 inches wide, 5 to 10 inches deep soil-filled troughs of varying lengths. Troughs are formed with rolled plastic material to contain root growth, and lined with coconut fiber to maintain trough integrity during installation. Material is grown for several months in the greenhouse prior to installation insuring good root development. Troughs are lifted by the coconut fiber liner and placed into excavated strips of the crop field across and perpendicular to the path of concentrated flow, and within the row so as not to interfere with farming operations. Usually 2 strips of material five feet apart are placed on each flow area. Plantings were established with miscanthus in Michigan in 2001 and in Ohio in 2002. Eastern gamagrass was used as vegetative barrier material for a planting in Ohio in 2001 and in Indiana in 2002.

Miscanthus grass plants were established at four other Plant Materials Centers for testing establishment, growth and spread. Also, seed is collected and tested for the purpose of determining if this accession produces viable seed, that could allow establishment in areas other than its original planting location.

Summary

The miscanthus planting in Michigan was visually evaluated in 2003 for plant vigor, spread, and erosion control effectiveness. Miscanthus was generally healthy and well established in the areas planted in 2001, 2002, or 2003. There was no evidence of miscanthus spreading from where it was planted, and no seeds were evident in late October, 2003. Soil sediment and crop residue deposits were evident on the upslope side of each barrier. Survey stakes are present in the barriers and sediment buildup measurements are planned for 2004.

The eastern gamagrass planting in Indiana showed good growth during 2003. No rill or gully formation was noted on the down-slope side of the planting in October, 2003. The plot will be maintained in 2004 to evaluate sediment or residue entrapment, and further monitor the development of rills or gullies.

Miscanthus or eastern gamagrass plantings conducted in 2002 became well established during the 2002 growing season and broke dormancy in 2003. Those plantings were either sprayed with glyphosate or destroyed by cultivation in 2003.

Restoration or Reclamation of Disturbed Areas

There are a number of human activities that have the potential to dramatically alter the natural resources in an area. Construction of roads, travel lanes or utility corridors, agricultural or mining operations, and municipal or recreational development often have or will result in a drastic disturbance of the natural communities. Successful revegetation of these disturbed areas will require plant materials and the technology to use them.

Problems

With the heightened interest and promotion of native species, the availability of local and regional ecotypes has not kept pace with demand. This is particularly a problem with native

grass species for use in CRP plantings and restoration work. Some non-native species traditionally utilized for conservation activities have fallen under scrutiny due to their aggressive nature. This has generated an even greater need for native plant material and the corresponding research to replace these conventional conservation species.

Needs

The states covered by this PMC need commercially available quantities of locally and regionally native, or adapted, non-aggressive plant species, and the technology to use them. Selected species should have proven capabilities for one or more conservation concerns.

Study No. MIPMC-P-0001-CR

Great Lakes Composite of Canada Wildrye, *Elymus canadensis*

Background

Canada wildrye is a native perennial bunchgrass that grows to 4 feet with erect or arching culms and flat, wide (up to 0.8 inches), waxy, green, pointed leaves that grow from the base of the stem to the spike. Auricles are claw-like and clasping, arising from a broad, yellowish or light green collar. The thick, bristly spikelets can reach 10 inches in length, and are often 2 or 3 to a node.

It is a short-lived, cool-season grass found on sandy shores and dunes; wooded areas, especially along trails, rivers and streams; and other disturbed sites throughout much of the North America. Seedlings are vigorous and establish quickly, but are not highly competitive with other grasses. Growth begins later in the spring and lasts longer into the

summer than smooth brome. It is moderately drought tolerant and winter hardy. It has good tolerance to salinity and tolerates shade very well. Canada wildrye has exceptional seedling vigor and rapid establishment, thus an excellent species for use in erosion control plantings. Stands typically establish during the 1st year, reach peak production the 2nd or 3rd year, and then rapidly thin out.

This species is sometimes used in seeding mixtures where quick development and stabilization is needed. It is often an early successional component of prairie mixtures. Canada wildrye provides good forage quality during the early part of the grazing season but is generally considered inferior forage after it matures. It is fairly palatable to most livestock, and is rated good in energy value but poor in protein value. Canada wildrye has fair to good palatability as food for wildlife. It also provides nesting, brood, winter and escape cover

Description of Study

A collection of Canada wildrye was assembled from native stands in Michigan, Indiana, Ohio and Wisconsin. Material will be evaluated and composite selected for restoration or re-vegetation potential as conservation cover or stream bank protection in the Great Lake and Midwest states.

Procedure

Collections were made from native stands by field staff and partners. Each collection was accessioned and cleaned. On hundred ninety-six seeds from each accession were planted in the greenhouse early spring 2000 and germination rates recorded. A study area on the Center was sprayed with 2,4-D for initial weed control. Plugs from each accession were transplanted into plots in the study area late spring 2000. Each plot consisted of three 6-foot rows spaced 6 inches apart. Plants within a row were spaced 6 inches apart for a total of 39 plants/plot. Plots were spaced 30 inches apart to allow mowing for weed control and access to the plots. Plots were placed in a randomized complete block design x 3 replications. Each plot was evaluated for survival, vigor, plant density, height, lodging resistance, disease and insect damage, seed production, and germination over a 2-year period. Upon final evaluation accessions not selected were removed from the study area. Selected accessions were retained to become the breeder stock. Seed from breeder fields will be made available to growers as a tested class release.

Summary

Data recorded in 2001 and 2002 having significant differences among accessions are summarized in Table 1a and Table 1b, respectively. A summary of data combined over years is presented in Table 2. Plant survival was excellent. Only three plots lost more than 3 plants. Vigor was generally good to very good early but drop off at heading. There were large distinctions in plant lodging, plant height, and disease incidence in 2001, and differences in plant lodging and disease incidence in 2002.

Two accessions were identified as having superior characteristics of vigor, and lodging resistance. Accession 9084347 has been given the release name "Icy Blue germplasm Canada wildrye." In addition to excellent vigor, minimal lodging and minimal disease incidence, it has a whitish bloom on the leaves and stems that give it an "icy blue" appearance in the field. A breeder field of this accession was established in 2003. A release notice for this accession has been written and release of this material in 2004 is expected.

The second accession selected from this project was 9084183. This accession has been given the name "Eureka Germplasm Canada wildrye." This accession will be evaluated further for seed production and disease incidence before it is released.

Table 1a: 2001 Canada wildrye data means analysis[a].

Accession #	Early Vigor[b]	Disease Damage[b]	Lodging Rating[b]
	1 – 9	1 – 9	1 - 9
9084356	4.3 a	2.0 b	4.0 bc
9084347	1.7 c	2.0 b	3.0 cd
9084182	4.0 ab	2.0 b	3.7 bcd
9084183	2.3 c	6.0 a	1.3 d
9084211	2.3 c	2.0 b	4.0 bc
9084212	2.0 c	2.3 b	7.7 a
9084213	3.0 abc	2.0 b	4.7 bc
9084214	2.7 bc	2.3 b	5.0 bc
9084215	1.7 c	2.0 b	5.3 abc
9084216	3.3 abc	2.0 b	5.7 abc
9084217	2.3 c	2.0 b	6.3 ab
9084218	2.7 bc	2.0 b	3.7 bcd
9084219	3.3 abc	2.0 b	5.0 bc
9084220	1.7 c	2.0 b	6.0 ab
9084221	2.3 c	2.0 b	6.3 ab
9084222	3.0 abc	2.0 b	3.7 bcd

[a]Means within a column with the same letter are not statistically different using Duncan;s Multiple Range Test at alpha = 0.050. Means are based on three observations (replicates) per accession.

[b]Early Vigor: 1 = most vigorous, 9 = least vigorous; Disease Damage: 1 = least disease damage, 9 = most disease damage; Lodging Rating: 1 = least lodging; 9 = most lodging.

Table 1b: 2002 Canada wildrye data means analysis[a].

Accession #	Disease Damage[b]	Lodging Rating[b]
	1 – 9	1 – 9
9084356	1.0 c	4.7 abc
9084347	1.3 c	2.7 de
9084182	1.7 bc	4.7 abc
9084183	3.0 a	1.0 e
9084211	1.3 c	4.0 bcd
9084212	1.3 c	4.7 abc
9084213	1.0 c	4.0 bcd
9084214	1.0 c	4.7 abc
9084215	2.3 ab	3.3 cd
9084216	1.3 c	4.0 bcd
9084217	1.3 c	4.3 abcd
9084218	1.3 c	4.7 abc
9084219	1.0 c	6.0 a
9084220	1.0 c	4.7 abc
9084221	1.0 c	5.7 ab
9084222	1.0 c	3.3 cd

[a]Means within a column with the same letter are not statistically different using Duncan;s Multiple Range Test at alpha = 0.050. Means are based on three observations (replicates) per accession.

[b]Early Vigor: 1 = most vigorous, 9 = least vigorous; Disease Damage: 1 = least disease damage, 9 = most disease damage; Lodging Rating: 1 = least lodging; 9 = most lodging.

Table 2: 2001 - 2002 Canada wildrye combined data means analysis[a].

Accession #	Disease Damage[b]	Lodging Rating[b]
	1 – 9	1 - 9
9084356	1.5 c	4.3 bcd
9084347	1.7 c	2.8 d
9084182	1.8 c	4.2 bcd
9084183	4.5 a	1.2 e
9084211	1.7 c	4.0 bcd
9084212	1.8 c	6.2 a
9084213	1.5 c	4.3 bcd
9084214	1.5 c	4.8 abc
9084215	2.3 b	4.3 bcd
9084216	1.7 c	4.8 abc
9084217	1.7 c	5.3 ab
9084218	1.7 c	4.2 bcd
9084219	1.5 c	5.5 ab
9084220	1.5 c	5.3 ab
9084221	1.5 c	6.0 a
9084222	1.7 c	3.5 cd

[a]Means within a column with the same letter are not statistically different using Duncan;s Multiple Range Test at alpha = 0.050. Means are based on six observations (3 replicates X 2 years) per accession.

[b]Early Vigor: 1 = most vigorous, 9 = least vigorous; Disease Damage: 1 = least disease damage, 9 = most disease damage; Lodging Rating: 1 = least lodging; 9 = most lodging.

Study No. MIPMC-P-0201-CR

Great Lakes Composite of Virginia Wildrye, *Elymus virginicus*

Background

Virginia wildrye is a native, cool-season perennial bunchgrass with erect stems that reach to 4-ft high. Leaves are flat, up to ½-inch wide, and rough on both sides and the margins. Spikes are stiff and up to 5-inches long. The lower portion of the spike is often enclosed by the sheath. Lemmas have awns that reach 1 ½ -inches. Auricles are claw-like and clasping. Virginia wildrye is found in moist woods, meadows, and prairies throughout the United States east of the Rockies. It has good tolerance to flooding and moderate tolerance to drought. There are approximately 96000 seeds/lb.

Description of Study

A collection of Virginia wildrye was assembled from native stands in Michigan, Indiana, Ohio and Wisconsin. Material will be evaluated and composite selected for restoration or revegetation potential as conservation cover or streambank protection in the Great Lake and Midwest states.

Procedure

Collections were made from native stands by field staff and partners. Each collection was accessioned and cleaned. On hundred ninety-six cone-tainers from each accession were propagated in the greenhouse in August of 2002. Plugs from each accession were transplanted into plots in the study area October of 2003, and field sites in Indiana and Ohio in April 2003. Each plot consists of three 6-foot rows spaced 6 inches apart. Plants within a row are spaced 6 inches apart for a total of 39 plants/plot. Plots are spaced 30 inches apart to allow mowing for weed control and access to the plots. Plots were placed in a randomized complete block design x 3 replications. Each plot will be evaluated for survival, vigor, plant density, height, lodging resistance, disease and insect damage, seed production, and germination over a 3-year period. Upon final evaluation accessions not selected will be removed from the study area. Selected accession will remain and become the breeder stock. Seed from the breeder field will be made available to growers as a selected class release.

Summary

Data recorded in 2003 is summarized in **Table 1 and Table 2**. Plant survival was excellent. Vigor was generally good both early in the year and at heading. Accessions 9084344, 9084530, and 9084532 had low disease incidence, low lodging scores and maintained a consistent, upright growth habit through harvest. This evaluation will continue in 2004 and 2005.

Table 1. 2003 Virginia wildrye plant growth data, Rose Lake PMC test site. [1]

Treatment	Accession	Survival (Percent)	Disease 6/6/2003 (1 – 9)[2]	Disease 7/3/2003 (1- 9)[2]	Vigor at Heading (1 – 9)[2]	Lodging Score (1 – 9)[2]	Height at Harvest (inches)
1	9084167	100	1.16 d	2.5 d-f	2.0 cd	2.6 b-d	24 h
2	9084168	100	1.0 d	1.8 ef	2.0 cd	2.0 d	30 d-g
3	9084193	100	1.3 cd	2.6 de	2.0 cd	2.3 cd	24 h
4	9084306	100	1.0 d	2.3 ef	1.6 d	2.6 b-d	28 d-h
5	9084313	100	1.8 bc	4.6 ab	3.0 ab	3.0 bc	35 a-c
6	9084315	100	1.1 d	3.0 c-e	2.0 cd	2.0 d	25 gh
7	9084318	100	1.8 bc	4.3 ab	3.0 ab	2.3 cd	27 e-h
8	9084320	90	1.8 bc	4.3 ab	2.6 a-c	4.0 a	31 b-e
9	9084344	100	1.5 cd	1.8 ef	2.0 cd	2.3 cd	33 a-d
10	9084349	100	1.8 bc	4.6 ab	2.6 a-c	3.3 ab	32 b-e
11	9084350	100	1.3 cd	4.0 a-c	2.3 b-d	2.6 b-d	32 a-e
12	9084514	100	1.0 d	2.6 de	2.0 cd	2.0 d	29 d-h
13	9084521	100	2.1 b	4.6 ab	3.3 a	3.0 bc	35 a-b
14	9084530	100	1.1 d	1.8 ef	2.0 cd	2.3 cd	30 b-e
15	9084531	100	1.1 d	1.8 ef	1.6 d	2.6 b-d	28 e-h
16	9084532	100	1.1 d	2.0 ef	1.6 d	2.0 d	25 f-h
17	9084536	100	1.1 d	1.3 f	2.0 cd	2.3 cd	30 c-f
18	9086331	90	3.1 a	5.0 a	3.0 ab	3.0 bc	37 a
19	9086332	100	1.0 d	3.6 b-d	2.3 b-d	2.6 b-d	24 h
20	Omaha	100	1.0 d	1.8 ef	1.6 d	2.3 cd	31 b-e

[1]. Numbers within a column followed by the same letter are not statistically different using LSD (0.05)

[2]. Disease, lodging or vigor scale 1 – 9: 1 = no disease or lodging, excellent vigor; 9 = severe disease or lodging, poor vigor

Table 2. 2003 Virginia wildrye plant growth data, Findlay, Ohio test site. [1]

Treatment	Accession	Survival (Percent)	Early Vigor (1 – 9)[2]	Disease 7/2/2003 (1 – 9)[2]	Disease 9/12/2003 (1- 9)[2]	Vigor at Heading (1 – 9)[2]	Lodging Score (1 – 9)[2]	Height at Harvest (inches)
1	9084167	82	6.6	3.3	4.3	3.6	6.0	22
2	9084168	70	6.3	3.0	3.0	4.0	6.0	21
3	9084193	100	7	1.6	2.3	6.0	7.0	29
4	9084306	100	6.6	1.6	2.6	6.0	6.3	25
5	9084313	82	6.6	2.0	2.6	4.3	6.6	24
6	9084315	-----	----	----	----	----	----	----
7	9084318	100	5.6	3.0	3.6	5.0	6.0	28
8	9084320	87	6	2.6	4.0	5.0	5.6	24
9	9084344	90	6.6	2.0	2.6	5.0	6.6	25
10	9084349	100	7	2.0	2.6	5.3	5.3	23
11	9084350	100	6	2.6	3.0	5.6	6.3	25
12	9084514	82	6.3	3.0	3.0	5.3	6.6	23
13	9084521	100	6.3	2.0	2.6	5.3	6.6	25
14	9084530	78	7	2.0	3.3	5.0	6.3	26
15	9084531	87	6.6	2.3	3.6	4.6	6.3	26
16	9084532	87	6.3	2.3	3.3	4.0	5.3	22
17	9084536	82	6.6	3.3	3.0	4.3	6.6	23
18	9086331	90	6.6	1.6	2.6	5.0	6.3	27
19	9086332	100	6.6	1.6	3.3	6.3	5.0	27
20	Omaha	70	6.3	3.0	2.6	4.3	6.0	23

[1]. No statistical differences among accessions were noted for any observation in 2003.
[2]. Disease, lodging or vigor scale 1 – 9: 1 = no disease or lodging, excellent vigor; 9 = severe disease or lodging, poor vigor

Study Number: MIPMC-P-0207-CR
Increase and Release of Riverband Wildrye , *Elymus riparius*

Background:
The Wisconsin State Plant Materials Committee (WIPMC) identified the need for native cool season grasses for use in conservation activities. The lack of availability of native cool season greases from commercial growers was also identified. The WIPMC identified riverbank wildrye as a potential candidate for collection, study and possible release as a conservation plant. Riverbank wildrye is an erect plant with relatively short awns compared to the awns of Canada wildrye.

Study Description:
A source collection was made by WIPMC and was sent to Rose Lake PMC for study and evaluation.

Procedure:
Seed from the source collection was evaluated in the greenhouse for germination and early vigor during August of 2002. Germination was very high in greenhouse plantings. The remainder of the seed was planted into a seed increase field at the PMC in September of 2002. Plants grown in the greenhouse for the germination evaluation were transplanted into the same seed increase field.

Results:
Growth resumed in spring of 2003 and seed was produced from most plants in the field during that growing season. Seed from that field was harvested with a combine and cleaned with a fanning mill at the PMC. Seed cleaning was relatively easy, compared to Canada wildrye, because of the short awns on the riverbank wildrye seed.

Plans for 2004 include providing seed to PM committee members to plant in critical area treatments to determine if riverbank wildrye can be used effectively as a conservation plant.

Study No. MIPMC-P-0204-CR

Great Lakes Composite of Bottlebrush Grass, *Elymus hystrix*

Background

Bottlebrush grass is an erect, native cool-season, perennial bunchgrass that reaches 4-ft in height. Leaf sheaths can be smooth or hairy and leaf blades up to ½-in wide with rough texture. Spikes can be upto 10-in long with 1 – 4 spikelets per node. Spikelets spread horizontally as they mature, often becoming nearly perpendicular to the rachis. Lemmas have rough, straight awns that reach 1 ½ -in long. Bottlebrush grass is found in moist to dry woods from Nova Scotia to Quebec and North Dakaota, and south to Georga and Arkansas.

Description of Study

A collection of bottlebrush grass was assembled from native stands in Michigan, Indiana, Ohio and Wisconsin. Material will be evaluated and composite selected for restoration or revegetation potential as conservation cover or streambank protection in the Great Lake and Midwest states.

Procedure

Collections were made from native stands by field staff and partners. Each collection was accessioned and cleaned. On hundred ninety-six cone-tainers from each accession were propagated in the greenhouse in August of 2002. Plugs from each accession were transplanted into plots in the study area October of 2003, and field sites in Indiana and Wisconsin in April 2003. Each plot consists of three 6-foot rows spaced 6 inches apart. Plants within a row are spaced 6 inches apart for a total of 39 plants/plot. Plots are spaced 30 inches apart to allow mowing for weed control and access to the plots. Plots were placed in a randomized complete block design x 3 replications. Each plot will be evaluated for survival, vigor, plant density, height, lodging resistance, disease and insect damage, seed production, and germination over a 3-year period. Upon final evaluation accessions not selected will be removed from the study area. Selected accession will remain and become the breeder stock. Seed from the breeder field will be made available to growers as a selected class release.

Summary

Data recorded in 2003 at the Rose Lake PMC location are summarized in **Table 1.** Plant survival was highly variable between replicates and among accessions. No statistical differences were noted among accessions during the 2003 growing season. Replacement plants were inserted in appropriate plots to provide more uniformity among replicates for each accession. Data will be collected in 2004 and 2005 for this test. No data were collected from the Indiana or Wisconsin sites in 2003.

Table 1. 2003 Bottlebrush grass plant growth data, Rose Lake PMC test site. [1]

Treatment	Accession	Headed Plants (#/plot)	Disease 6/6/2003 (1 – 9)[2]	Disease 7/3/2003 (1- 9)[2]	Vigor at Heading (1 – 9)[2]	Lodging Score (1 – 9)[2]	Height at Harvest (inches)
1	9086418	2	1.2	2.0	2.0	5.0	35
2	9084186	12	1.5	3.8	3.0	3.0	32
3	9084187	7	1.3	4.2	3.0	3.0	33
4	9084191	13	1.2	3.2	3.0	2.2	28
5	9084192	5	1.3	3.0	3.0	2.5	37
6	9084308	7	1.1	3.5	2.5	3.0	38
7	9084309	8	1.6	2.5	2.2	4.0	33
8	9086330	4	1.0	2.8	2.0	3.0	27
9	9084316	6	1.0	3.8	3.0	2.2	29
10	9084322	6	1.2	3.8	3.0	3.3	34
11	9084360	8	1.5	3.1	2.7	3.8	35
12	9084361	5	1.3	3.8	3.8	3.0	28
13	9084394	3	1	4.1	4.2	2.8	20
14	9084395	7	1.9	2.8	2.2	2.8	24
15	9084433	9	1.3	3.8	2.8	3.3	34
16	9084517	9	1.5	3.8	2.3	3.8	37
17	9084518	4	1	3.0	2.8	2.0	26
18	9084533	1	1	2.0	3.0	3.0	18
19	9084535	9	1.3	2.5	2.2	3.0	31
20	9084537	9	1.3	3.0	2.8	2.8	38
21	9086361	3	1	3.5	3.5	3.5	29
22	9086374	9	1.2	3.8	2.8	3.3	27

[1]. No statistical differences among accessions were noted for any observation during 2003.
[2]. Disease, lodging or vigor scale 1 – 9: 1 = no disease or lodging, excellent vigor; 9 = severe disease or lodging, poor vigor

Study Number MIPMC-T-0206-OT
Initial Evaluation of Sweetgrass, *Hierochloe odorata,* from Regional Collections

Background:
Five Plant Materials Centers (Colorado, Kansas, Montana, Michigan, and North Dakota) are evaluating sweetgrass from native collections to determine genetic variability and areas of adaptation. Sweetgrass is a culturally significant plant to the American Indians and from preliminary observations has potential as a conservation plant as well as a plant community species for restorations. A coordinated evaluation of the native collected sweetgrass to a released variety, 'Radora' as the standard, will allow for documentation and determination of adaptation. 'Radora' originated from east central South Dakota and was released from South Dakota State University.

Procedure
Rose Lake PMC sent sweetgrass accession 9070225 samples to each of the cooperating PMCs in June, 2002 Rose Lake PMC received samples of sweetgrass accessions listed in Table 1.
Each accession was transplanted into field test plots consisting of a single row with six plants per plot in September, 2002. Plants were spaced 1-ft apart within the row, and rows were spaced 5-ft apart. Accessions were not replicated within the trial.

Divider barriers (1/4" X 8" X 60") were installed between plots in August, 2003. Due to low survival of several accessions, replacement plants of several accessions were transplanted in September 2003 (Table 3).

Table 1. The 2002 origin and accession number of seven regional sources of sweetgrass (*Hierochloe odorata)* at the Rose Lake PMC.

Origin	Accession
Minnesota	9084205
Colorado	9070988
Kansas	9050243
Michigan	9070225
Montana	9063351
North Dakota	9063128
South Dakota	'Radora'

Results

Plots were evaluated two weeks after planting. Data are summarized in Table 2. Each of the seven accessions had 100 percent survival two weeks after planting. Plant vigor at this evaluation date ranged from excellent for accessions from Michigan, Colorado, and Montana, to fair or poor for accessions from South Dakota, Minnesota, Kansas, and North Dakota. None of the entries developed seed culms, nor were there signs of disease.

Plots were evaluated for survival, growth, and spreading characteristics in May and September 2003. Data are summarized in Table 3 and Table 4. Plant survival was good to excellent in accessions from Montana, Michigan, North Dakota, Colorado, and Kansas. 'Radora' and the accession from Minnesota had 33 – 66% plant loss during the 2002/2003 winter. The only accession to produce any seed culms in 2003 was the one from Montana.

Plant growth during the 2003 growing season varied among the accessions in the trial. Accessions from Montana and Michigan were tallest and had the most tillers of any accession. The North Dakota accession showed good growth during 2003, though not as robust as those from Montana or Michigan. Growth and spread of the accession from Minnesota, and 'Radora' were the lowest of the accessions planted in the trial.

Trial Summary: 2002 – 2003

This evaluation indicates that there are differences in growth, spread, and survival of the sweetgrass accessions planted at the Rose Lake Plant Materials Center. The accessions from Montana and Michigan were the most vigorous, as demonstrated by survival, spread, and leaf height. 'Radora' and the accession from Minnesota were the least vigorous under the conditions of the trial.

Table 2. The 2002 performance of seven regional sources of sweetgrass (*Hierochloe odorata*) at the Rose Lake PMC;

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Accession	Survival	Vigor†	Overall†
	%		
Minnesota-9084205	100	3	3
Colorado-9070988	100	1	1
Kansas-9050243	100	5	5
Michigan-9070225	100	1	1
Montana-9063351	100	1	1
ND-9063128	100	7	7
SD-'Radora'	100	3	3

† Ratings: 1-excellent, 3-good, 5-fair, 7-poor, 9-none.
Planted September 10, 2002. Evaluations taken 9/26/2003, at 2 weeks after planting.

Table 3. The Spring, 2003 performance of seven regional sources of sweetgrass (*Hierochloe odorata)* at the Rose Lake Plant Materials Center.

Accession	Survival	Seed Culm	Seed Culm Ht.	Overall†
	%	*No./30 ft²*	*in*	
MN-9084205	33	0	--	7
ND-9063128	100	0	--	2
CO-9070988	100	0	--	2
KS-90501243	83	0	--	3
SD-'Radora'	67	0	--	7
MT-9063351	100	26	8 – 16	1
MI-9070225	100	0	--	2

† Ratings: 1-excellent, 3-good, 5-fair, 7-poor, 9-none.
Planted September 10, 2002. Evaluations conducted May 8, 2003.

Table 4. The Fall, 2003 performance of seven regional sources of sweetgrass (*Hierochloe odorata)* at the Rose Lake Plant Materials Center.

Accession	Leaf Length	Tillers	Rate of Spread†	Overall†	Replanting 9/18/03
	In	*no./30 ft²*			*no./30 ft²*
MN-9084205	5	2	7	7	6
ND-9063128	11	19	3	3	2
CO-9070988	9	5	7	5	5
KS-90501243	11	6	7	5	4
SD-'Radora'	12	8	8	7	5
MT-9063351	15	>50	1	1	0
MI-9070225	18	>50	1	1	0

† Ratings: 1-excellent, 3-good, 5-fair, 7-poor, 9-none.
Planted September 10, 2002. Evaluations conducted September 17, 2003.

Improved Warm Season Forage Grass

Warm and cool season grasses have contrasting patterns of yield distribution. Warm season grasses produce more than 60% of their yield in mid-summer, while cool season grasses have their greatest production in spring and fall. Cool and warm season grasses can best be used in grazing systems that utilize separate pastures for each grass type. Including warm season grasses in a grazing system permits resting cool season grasses in mid-summer which improves their vigor and enhances forage production in the late summer and early fall. Cool season grasses can be grazed in spring and fall, warm seasons during mid-summer.

Problems

Currently, there are no commercial native warm season grass varieties originating from the area covered by this PMC. In association, concerns are growing over the loss of native germplasm.

Needs

Native warm season grasses that:

- originated from the Great Lakes/Corn Belt area
- have good forage yields
- have good palatability and nutrition for livestock
- persist under grazing
- establish rapidly
- have good seed production

Study No. 26I101G
Big Bluestem, *Andropogon gerardii,* for Forage Use

Background

Big bluestem is a native, perennial warm season grass reaching heights of 8 feet at maturity. It has long white hairs on the upper leaf surface near the base of the blade. Lower leaf sheaths and blades are sometimes hairy. Big bluestem is bluish in color during most of the summer, but is often reddish purple when mature. Seedheads consist of two or three racemes that arise from a common joint of the on the stem and resemble a turkey's foot. Prior to European settlement it was a major constituent of the tall grass prairies and savannas across the Great Plains, Midwest and northeastern United States.

Warm season forage grasses such as big bluestem are being integrated into grazing systems to increase beef production during the summer months when cool season forage production declines. Unlike cool season grasses that have their greatest growth during cooler temperatures, warm season grass production peaks at higher temperatures. Utilizing these contrasting patterns of yield distribution helps to ensure adequate feed throughout the summer months and enhance cool season forage production in the late summer and fall.

Varieties of big bluestem vary in origin and maturity and should be selected for region of adaptability. Varieties adapted to southern regions are later maturing, taller and produce higher forage yields, however, they may not produce mature seed. There is also the potential for winter injury to occur under defoliation stress if grown and harvested by grazing or haying in northern regions. Varieties adapted to the north that are grown in the south mature earlier, are shorter, have lowered forage production and are more susceptible to leaf and stem diseases.

Description of Study

From assembled regional material select and release a big bluestem cultivar with improved forage characteristic. Other potential uses for this release will include wildlife habitat, erosion control, native habitat restoration and biomass production.

Procedure

Over 100 vegetative collections were assembled from Michigan, Indiana, Wisconsin and Ohio in 1992. Each accession was started in the greenhouse, grouped into regions of origin (northern, central and southern) then transplanted to an initial evaluation site under a randomized complete block (RCB) design with 4 replications. Data was collected on this material in 1993, 1994, 1996 and 1997. Ten accessions were selected for advanced testing from each region based on vigor, foliage, biomass production, height, tillering, and lodging, disease and insect resistance. In 1998 three advanced test sites were established in Wisconsin for the northern accessions, two in southern Michigan for the central accessions and three in Indiana for the southern accessions. Each study site was established as a RCB design with 3 replications. Two regionally-adapted, commercially-available varieties were included at each test site for comparison. Data collected will include survival counts, vigor and foliage ratings, heading date, height, lodging resistance and forage yields. A forage analysis for nitrogen, protein, phosphorus and acid detergent fiber (ADF) will also completed. Isolated increase sites will be established for each accession in the same state as the test plots to expedite the release process for potential varieties.

Summary – Indiana and Wisconsin Advanced Testing Studies

One study site in Indiana was discontinued 1999 due to deer damage and a second study was discontinued in 2001. Plant growth and forage quality data were taken from the study in LaGrange, IN during 2000, 2001 and 2002. Data from 2002 has been summarized in Table 1 for the LaGrange County, IN plots.

Accessions 9070138, 9070144 and 9070167 had excellent growth characteristics, dry matter yield , and forage quality characteristics during the 2002 growing season. The forage quality components such as percent crude protein (%CP) and percent total digestible nutrients (%TDN) were similar among the three accessions listed and the commercial standards Niagra and Roundtree. However, dry matter production was significantly higher for the three experimental accessions than for either commercial standard, providing higher crude protein per plot for those accessions compared to the standards.

Plant growth and forage quality data were taken during 2001 and 2002 from the advanced testing study in Washburn County, Wisconsin. Plant growth data were taken from that trial in 2003. Data from 2002 and 2003 have been summarized in Table 2a and Table 2b, respectively, for the Washburn County, WI plots. Accessions 9069072, 9069074, and 9070190 had excellent growth characteristics, dry mater yield, and forage quality characteristics during the 2002 growing season. Forage quality components such as %CP and %TDN were similar to the commercial standards Bison and Sunnyview. High dry matter production provided higher crude protein per plot for those experimental accessions compared to the standards.

There were significant differences in pollination date, plant height, and disease scores among accessions in 2003. 9069072 and 9069074 were similar to each other for those characteristics. Accession 9070190 pollinated earlier than 9069072. No disease was evident on any of those three accessions.

Summary – Michigan Seed Increase Plots

Five accessions from the Michigan (central accessions) advanced testing study were selected for further evaluation and establishment of seed increase plots. Those accessions are: 9070140, 9070149, 9070162, 9070163, and 9070197. They were selected based on plant growth and forage quality characteristics and all five showed better forage production characteristics than the standards Bonella and Champ. Seed was harvested from those plots in 2003.

Table 1. 2002 Big Bluestem Southern Accessions Advanced Test Data Summary[a]. (LaGrange County, Indiana plots)

	---------- Growth Characteristics ----------				---------- Tissue Analysis ----------				
Accession	**Survival**	**Green Wt**	**Dry Matter**	**Dry Wt[b]**	**C.P.[c]**	**Protein[d]**	**A.D.F.[c]**	**N.D.F.[c]**	**T.D.N.[c,e]**
	(%)	**(lb/plot)**	**(%)**	**(lb/plot)**	**(%)**	**(lb/plot)**	**(%)**	**(%)**	**(%)**
9070138	94 a	3.1 a-b	33.9 a-b	1.0 a	8.5 b-d	0.08 a	40.1 b-c	76.8 b-d	52.1 a-b
9070144	100 a	3.4 a-b	29.7 a-b	1.0 a	9.1 a-d	0.08 a	40.3 b-c	75.8 c-e	51.8 a-b
9070151	94 a	2.0 b-c	30.1 a-b	0.6 b-c	7.7 d	0.04 b	43.0 a	78.3 a	47.7 d
9070161	72 a-c	1.3 c-d	32.3 a-b	0.4 c-d	8.9 a-d	0.03 b	40.1 b-c	76.8 b-d	52.0 a-b
9070167	100 a	3.7 a-b	27.7 b	0.9 a-b	10.1 a	0.09 a	39.4 c	75.1 e	52.9 a-b
9070170	100 a	3.1 a-b	31.7 a-b	1.0 a	9.1 a-d	0.09 a	40.5 b-c	76.8 b-d	51.6 a-b
9070171	80 a-c	1.5 c-d	29.4 a-b	0.4 c-d	8.5 b-d	0.04 b	42.0 a-b	77.5 a-b	48.6 b-d
9070173	83 a-c	1.1 c-d	32.4 a-b	0.4 c-d	8.0 c-d	0.03 b	41.6 a-c	77.9 a-b	49.9 a-d
9070176	83 a-c	3.1 a-b	29.8 a-b	0.9 a-b	7.8 d	0.07 a	42.9 a	77.6 a-b	47.8 c-d
9070199	58 c	0.7 c-d	29.3 a-b	0.2 d	9.4 a-c	0.02 c	40.7 a-c	76.1 c-e	51.3 a-c
Niagra	88 a-b	1.8 c-d	29.3 a-b	0.5 c-d	9.5 a-b	0.05 b	39.6 c	75.5 d-e	52.5 a
Roundtree	60 b-c	0.6 d	35.2 a	0.2 d	8.3 b-c	0.02 c	41.0 a-c	77.1 a-c	50.7 a-d

[a] Numbers followed by the same letter within a column are not significantly different using LSD (0.05).
[b] Dry Wt (lb/plot) = green weight X % dry matter / 100.
[c] C.P. = crude protein; A.D.F = acid detergent fiber; N.D.F. = neutral detergent fiber; T.D.N. = total digestible nutrients
[d] Protein (lb/plot) = dry weight X % crude protein / 100.
[e] T.D.N. = 6.107 + (A.D.F.) (3.994) – (A.D.F.^{2}) (0.066) – 8.

Table 2a. 2002 Big Bluestem Northern Accessions Advanced Test Data Summary[a]. (Washburn County, Wisconsin plots)

	---------- Growth Characteristics ----------				---------- Tissue Analysis ----------				
Accession	**Survival**	**Green Wt**	**Dry Matter**	**Dry Wt[b]**	**C.P.[c]**	**Protein[d]**	**A.D.F.[c]**	**N.D.F.[c]**	**T.D.N.[c,e]**
	(%)	**(lb/plot)**	**(%)**	**(lb/plot)**	**(%)**	**(lb/plot)**	**(%)**	**(%)**	**(%)**
9069065	95 a	10.5 d-f	34.9 a-b	3.8 b-c	5.7 a-b	0.23 b	47.3 a-b	79.7 c-d	39.1 a-c
9069067	95 a	10.6 d-f	29.9 a-c	3.1 c	5.4 b	0.16 c-d	47.5 a-b	81.1 a-b	38.7 b-c
9069069	100 a	7.8 f-g	29.5 a-c	2.1 c-d	6.0 a-b	0.13 c-d	46.5 b-c	80.5 b-d	41.1 a-b
9069071	100 a	6.5 g	33.9 a-b	2.1 c-d	6.1 a-b	1.12 d-e	46.4 b-c	79.8 b-d	41.4 a-b
9069072	100 a	14.1 a-c	35.4 a-b	5.0 a-b	6.5 a-b	0.29 a	45.9 c0c	79.4 c-d	42.1 a-b
9069073	95 a	11.9 b-d	21.2 c	3.0 c-d	6.1 a-b	0.21 b-c	46.4 b-c	80.3 b-d	41.2 a-b
9069074	81 b*	15.2 a	30.5 a-c	5.0 a-b	6.6 a	0.33 a	45.6 c	79.3 d	42.8 a
9070135	95 a	11.1 c-e	34.8 a-b	3.8 b-c	5.4 b	0.20 b-c	47.2 a-c	80.7 b-c	39.6 a-b
9070190	95 a	14.7 a-b	35.6 a-b	5.8 a	5.7 a-b	0.32 a	47.3 a-c	79.6 c-d	39.2 a-c
9070202	100 a	8.1 e-g	40.8 a	3.2 b-c	4.1 c	0.13 d-e	48.8 a	82.4 a	35.6 c
Bison	90 a-b	5.5 g	24.4 b-c	1.2 d	5.7 a-b	0.07 e	46.5 b-c	80.3 b-d	41.1 a-b
Sunnyview	95 a	11.6 c-d	28.1 b-c	2.9 c-d	6.0 a-b	0.16 d	46.4 b-c	79.3 d	41.2 a-b

[a] Numbers followed by the same letter within a column are not significantly different using LSD (0.05).
[b] Dry Wt (lb/plot) = green weight X % dry matter / 100.
[c] C.P. = crude protein; A.D.F = acid detergent fiber; N.D.F. = neutral detergent fiber; T.D.N. = total digestible nutrients
[d] Protein (lb/plot) = dry weight X % crude protein / 100.
[e] T.D.N. = 6.107 + (A.D.F.) (3.994) – (A.D.F.^{2}) (0.066) – 8.
* Low survival due to accidental mechanical removal of several plants from one replicate.

Table 2b. 2003 Big Bluestem Northern Accessions Advanced Test Data Summary[a]. (Washburn County, Wisconsin plots)

	---------- Growth Characteristics ----------		
Accession	**Ave. Pollination**	**Plant Height**	**Disease Score[b]**
	Date	**(Inches)**	**(1 – 9)**
9069065	8-10-03 a-b	47 a-c	3.0 a
9069067	8-10-03 a-b	45 a-c	2.3 a-c
9069069	8-8-03 b	51 a-c	2.0 b-d
9069071	8-10-03 a-b	52 a-c	3.0 a
9069072	8-13-03 a	46 a-c	1.0 e
9069073	8-8-03 b	45 a-c	1.3 d-e
9069074	8-10-03 a-b	44 b-c	1.3 d-e
9070135	8-7-03 b-c	43 b-c	1.3 d-e
9070190	8-8-03 b	50 a-c	1.0 e
9070202	8-4-03 c	60 a	2.0 b-d
Bison	8-4-03 c	56 a-b	2.7 a-b
Sunnyview	8-13-03 a	39 c	1.7 c-e

[a] Numbers followed by the same letter within a column are not significantly different using LSD (0.05).
[b] Disease Score: 1 = no disease, 9 = severe infection

MIPMC-T-03-02-PA
Eastern gamagrass (*Tripsacum dactyloides* (L.) L.) for forage production

Background:
Eastern gamagrass is a native warm season grass that can be found from Massachusetts, west to Illinois and Nebraska, and south to Mississippi and Texas. It is a highly productive grass that is best adapted to wet habitats; and remnant colonies are commonly found in flood plains along stream banks. Eastern gamagrass is a relative if field corn (Zea mays) and is characterized by numerous short, well-developed rhizomes. Individual grass clumps can reach a diameter of 4 feet with seed heads growing on culms 3- to 9-ft tall.

Eastern gamagrass produces the majority of its growth from late spring through late September. It begins growing earlier in the spring than do other native grasses such as big bluestem (Andropogon gerardi) or switchgrass (Panicum virgatum). The distribution of eastern gamagrass yield throughout the summer makes this grass an excellent source of forage during the period of the year when cool-season grasses are relatively dormant.

Several eastern gamagrass varieties are well adapted to the central and southern United States. The Big Flats Plant Materials Center, near Corning, NY, is evaluating several eastern gamagrass accessions to determine adaptability in the northern regions of the United States. Little research has been done in Michigan to demonstrate adaptability of any eastern gamagrass releases or experimental accessions in the Great Lakes area.

Project description:
Seedlings of two commercial cultivars, 'Pete' and 'Highlander' and two experimental accessions from Big Flats Plant Materials Center, 9086456 (diploid) and 591483 (tetraploid) will be placed in an accession comparison test to determine survival, plant growth, and forage quality. A parallel study will be established using cold stratified seeds of each accession to determine establishment from seed, plant growth, and forage quality. A third study will be established using seeds from a single cultivar to evaluate the effect of row spacing and forage harvest (simulated grazing) practices on forage quality and stand survival.

Procedures:
Seedlings of 'Highlander' eastern gamagrass were received from the J.L. Whitten PMC near Coffeeville, MS on June 12, 2003. Seedlings of 'Pete', and accessions 9086456 and 591483 were received from the Big Flats PMC on June 13, 2003. Seedlings were transplanted into a field study site at Rose Lake PMC on June 16. Each plot contained three rows of five plants. Plants were spaced 36" apart within the row and rows were spaced 30" apart. The study was conducted in a randomized complete block experimental design with three replicates per accession. The site was irrigated to insure good survival after transplanting. All plots were fertilized and herbicides were applied as needed. Data will be taken from the center row of each plot throughout the course of the study.

Seeds of each accession were received from the PMC's listed above. The seeds were cold/wet stratified for six weeks. Seeds were planted into a field study site at Rose Lake PMC on July 22, 2003. Each plot contained three rows, spaced 30" apart, and seeds were planted 4" apart within each row. . The study was conducted in a randomized complete block experimental design with three replicates per accession. The site was irrigated to insure good survival after transplanting. All plots were fertilized and herbicides were applied as needed. Data will be taken from the center row of each plot throughout the course of the study.

A forage production study was initiated by planting 'Pete' eastern gamagrass on June 17, 2003 in plots having row spacing of 15" or 30" between rows. Plots with 15" row spacing were planted with a seeding rate of 2 seeds/row ft. Plots with 30" row spacing were planted with a seeding rate of 4 seeds/row ft. Seeds were planted 1" deep. Each plot will be divided in 2004 by superimposing three harvest (simulated grazing) practices. The study was conducted in a randomized complete block experimental design and split plot treatment arrangement with three replicates per treatment. The site was irrigated to insure good survival after transplanting. All plots were fertilized and herbicides were applied as needed. Data will be taken from the center of each plot throughout the course of the study.

Results:
Data were collected from each study in September, 2003 to evaluate survival and plant height. No significant differences in survival or plant height were found in the first accession evaluation study (from transplants). There were significant differences in plant populations in the study that was established from seed (Table 1). 'Highlander' had higher plant population than did either experimental accession. There were no differences in plant height among accessions.

There were no differences in plant population or plant height between row spacing treatments in the forage production trial. This should allow a uniform test condition for evaluation of harvest practices in 2004 – 2006.

Table 1. 2003 plant population and plant height of eastern gamagrass accessions established from seed.[a] Evaluation conducted September 17, 2003.

Accession number	Cultivar name	Plant population (plants/plot)	Plant height[b] (in)
421612	'Pete'	13 ab	11
9062680	'Highlander'	14 a	12
9086456	Experimental diploid	11 b	11
591483	Experimental tetraploid	7 c	12

a. Numbers followed by the same letter within a column are not significantly different using LSD (0.05).
b. There were no significant differences in plant height among accessions at this evaluation date.

Forest Improvement and Windbreak Technology

Forest land accounts for up to 30 percent of the agricultural land in Michigan. Considerable emphasis has been placed on establishing, maintaining, and improving forest land in Michigan, and several NRCS conservation programs encourage those practices.

In addition to forest land, trees and shrubs are used in windbreaks, riparian areas, filter strips, and wildlife corridors. There are many soil types in Michigan and the PMC service area, and windbreak planting is practiced on almost all of those soil types.

Problems:

- Tree and shrub transplanting can be expensive and labor intensive.
- Direct seeding of tree and shrub species is not well understood in the PMC service area.
- Soil type influences tree or shrub species selection for windbreaks and other woody species plantings. Species establishment in muck soils are not as well understood as establishment in upland soils.

Windbreak Establishment in Muck Soils - Followup

Study Description:
The USDA-NRCS Rose Lake Plant Materials Center established a combination field evaluation/demonstration windbreak in 1987 on Michigan State University's Muck Research Farm. The soil type was Houghton Muck – level, deep, organic soil with moderate permeability and neutral pH. The purpose of the planting was to evaluate plant performance on various shrub species used in windbreaks on organic soils. Initial evaluations were completed in 1991. Follow-up evaluations were conducted in 2003. Data for both years are summarized in Table 2.

Procedure:
Eleven Species were selected for this study. Common and scientific names of those species are in Table 1. Twenty bare-root plants of each species were planted in a single row with 180 cm (6 ft) spacing between plants. Chemical and mechanical weed control was applied during the first four years. Annual application of fertilizer, including manganese, was applied during the first four years according to soil test recommendations.

Results:

General Comments**:** Spirea survival in 1991 was poor and was removed after 1991 evaluations were made.

Observations from 1991 indicated that survival and growth rate for all species except Spirea were good. This was attributed to good weed control and fertility management during the establishment period. It was also observed that those species with a fibrous root system, such as 'Indigo' silky dogwood, were better able to resist frost heave than those species with a non-fibrous root system such as crabapple. Root exposure was not evident in the 2003 evaluation.

Comparison of 1991 and 2003 data:
Arrowwood and 'Cheyenne' privet demonstrated good uniformity in 1991 had comparable uniformity in 2003. 'Indigo' Silky dogwood had good uniformity in 1991 but uniformity was lower in 2003. The decreased uniformity was due, in part, to competition from wild grape and other weeds. That decreased uniformity caused a reduction in relative ranking among the species tested. Nannyberry, eastern ninebark, amur honeysuckle, tall hedge, and American cranberry had intermediate uniformity in 1991 and similar uniformity in 2003.

'Roselow' Sargent crabapple and 'Magenta' Crabapple had relatively poor uniformity in 1991 but demonstrated good uniformity in 2003. Crabapple and Sargent crabapple increased average height by 100 – 150% from 1991 – 2003. Average width of those species also increased by 400 – 500% over the 12-year period. Increased height, width, and uniformity increased the effectiveness rating for those species and increased the relative rank from 1991 to 2003. However, those species would require periodic pruning to keep the plants from encroaching into field boarders if they are used as windbreaks near agricultural production fields.

Study Summary:
The results from this study demonstrated that all the species tested, with the exception of Spirea, can be successfully used as windbreak material in organic soils. Weed control and proper fertility during establishment is critical for a successful planting. Weed control and appropriate pruning during the time span of the windbreak is required to maintain uniformity and overall effectiveness of the windbreak.

Table 1: Common and scientific names of species tested.

'Roselow' Sargent crabapple	*Malus sargentii* Rehder
Eastern ninebark	*Physocarpus opulifolius* (L.) Maxium
Spirea	*Spirea vanhouttei* (Broit) Zabe
Arrowwood	*Viburnum dentatum* L
'Indigo' Silky dogwood	*Cornus amomum* Miller
American cranberry bush	*Viburnum trilobum* Marshall
'Cling-Red' Amur honeysuckle	*Lonicera maackii* Maxim
Nannyberry	*Viburnum lentago* L.
Tall hedge	*Rhamnus frangula* var. *columnaris* L.
'Cheyenne' Privet	*Ligustrum vulgare* L.
'Magenta' Hybrid crabapple	*Malus* sp.

Table 2: DATA SUMMARY 1991 & 2003

Species	% Survival 1991	Ave. Ht. (cm) 1991	Ave. Ht. (cm) 2003	Ave. Width (cm) 1991	Ave. Width (cm) 2003	Uniformity 1/ 1991	Uniformity 1/ 2003	Effectiveness 2/ 1991	Effectiveness 2/ 2003	Relative Rank 1991	Relative Rank 2003
'Indigo' Silky Dogwood	100	250	250	320	550	2	4	2	3	1	4 3/
'Cheyenne' Privet	100	273	300	273	280	2	2	3	3	2	3
Arrowwood	100	210	260	210	360	3	4	3	3	3	5
'Cling-Red' Amur Honeysuckle	85	263	270	297	300	5	6	3	6	4	9
Eastern Ninebark	85	197	275	225	275	6	6	5	5	5	8
Tall Hedge	100	256	425	120	180	5	5	7	7	6	10
Nannyberry	100	232	360	209	550	5	4	5	5	7	7
'Magenta' Crabapple	88	212	600	141	600	7	3	7	2	8	2
American Cranberry bush	90	177	270	175	550	5	4	7	4	9	6
'Roselow' Sargent Crabapple	95	144	330	115	550	6	2	8	2	10	1
Spirea	20	88	**	106	**	8	**	9	**	11	**

1/ Uniformity of size and shape. 1= Identical - 10= Extremely variable
2/ Visual estimate of effectiveness as a windbreak based on size, density and uniformity 1= Excellent – 10= Totally ineffective
3/ 'Indigo' silky dogwood uniformity and relative rank were negatively impacted by wild grape competition
** Species no longer present in study

'Roselow' Sargent Crabapple 2003

'Magenta' Crabapple 2003

'Cheyenne' Privet 2003

'Indigo' Silky Dogwood 200

Study MIPMC-T-03-01-WO
Direct Seeding Tree and Shrub Establishment

Background:
Direct seeding of hardwoods offers an alternative to the high cost of establishing new, or re-stocking existing stands, of hardwood species in Michigan. Direct seeding of hardwoods is being conducted successfully in Indiana, Ohio, Wisconsin, Illinois, and Missouri. The practice is generally recognized as being an effective alternative to planting hardwood tree seedlings. Direct seeding of hardwoods is currently being offered as a cost-shared component in several USDA conservation programs in those states. There is little current research and written information specific to Michigan for establishing or enhancing hardwood stands by direct seeding.

Description of Study:
A selection of hardwood tree or shrub species will be planted as direct seeding in spring, 2003 or fall 2003. Plots will be evaluated for emergence, survival, and plant growth characteristics for up to five years.

Procedure:
Seeds of 14 hardwood tree or shrub species were planted on May 13 – 14, or November 20 - 21 in a field study at the Rose Lake Plant Materials Center. The soil in the test area is a sandy loam or loamy sand. Species used in the test are listed in Table 1. Each species was planted either as 1) broadcast on tilled soil, followed by dragging and cultipacking; 2) drilled into individual rows on tilled soil, followed by cultipacking; or 3) drilled into non-tilled soil, followed by cultipacking. Planting density was approximately 4500 seeds/acre for each species. Each planting method was replicated three times in a randomized complete block design. Non-tilled plots were sprayed with glyphosate herbicide to control all emerged vegetation before seeds were planted. A rodent control product was placed in several locations across the trial. No other herbicide maintenance, fertilizer, or irrigation was applied to the plots.

Summary (Spring 2003 planting):
Weather conditions during the 2003 growing season were warm and dry. Several oak species had some germination and establishment during the 2003 growing season (Table 2). Other heavy mast species, such as black walnut, black cherry, and shagbark hickory were not expected to germinate because those species require multiple years in the soil before they germinate. The light mast species had almost no germination and establishment during this season. The warm, dry weather may have been the cause for the low germination with most of those species. Arrowwood and serviceberry generally require multiple years in the soil for germination.

Table 1. Species planted in 2003 Direct Seeding Tree and Shrub Study

Common name	**Scientific name**
Heavy mast species	
Northern red oak	*Quercus rubra*
White oak	*Quercus alba*
Scarlet oak	*Quercus coccinea*
Bur oak	*Quercus macrocarpa*
Black walnut	*Juglans nigra*
Black cherry	*Prunus serotina*
Shagbark hickory	*Carya ovata*
Light mast species	
Arrowwood / Highbush cranberry*	*Virbunum dentatum / Virbunum trilobum*
Staghorn sumac	*Rhus typhina*
Green ash	*Fraxinus pennsylvanica*
White ash	*Fraxinus americana*
Red maple	*Acer rubrum*
Silver maple	*Acer saccharinum*
White birch	*Betula papyrifera*

* Arrowwood was used in the spring 2003 planting and highbush cranberry was used in the fall 2003 planting.

Table 2. 2003 seedling establishment for seeds planted in spring 2003.

Planting Method		N. Red Oak	White Oak	Scarlet Oak	Bur Oak	Black Walnut	Black Cherry	Shag. Hickory
		---------- plants / acre ----------						
Broadcast Tilled soil		400 (all oaks)				0	0	0
Drilled Tilled Soil		600	90	450	1090	0	0	0
Drilled Non-tilled soil		670	90	550	730	0	0	0
		Arrow-wood	Staghorn Sumac	Green Ash	White Ash	Red Maple	Silver Maple	White Birch
		---------- plants / acre ----------						
Broadcast Tilled soil		0	0	0	0	0	0	0
Drilled Tilled Soil		0	0	0	0	30	30	0
Drilled Non-tilled soil		0	0	30	30	60	120	0

Native Plant Species to Enhance Wildlife Habitat

With controversy surrounding non-native species, particularly in undomesticated settings, the interest in native ecotypes has risen sharply. Some non-native species historically used in wildlife plantings have been labeled aggressive or invasive, or less beneficial to wildlife than many native species.

Problems
There are a limited number of available native plant species intended for wildlife use that originated from the Great Lakes area.

Needs
Native species are needed for wildlife food plots, and shelter, nesting and brood rearing cover that:

- originated from the Great Lake/Corn Belt
- have good survival, vigor, seed and foliage production (unless source identified material)
- have documented wildlife benefit
- meet the criteria for a non-invasive plant

Study No. 26I080J
Tick-trefoil, *Desmodium* spp., for Wildlife Food Plots

Background
In the United States there are 30 species of *Desmodium*. All are native, perennial legumes with trifoliate or rarely 1 to 5 foliate leaves, purple flowers, and flat, deeply lobed or jointed pods. The joints of the pods easily separate and attach to clothing or animals by means of small hooked hairs, hence the common names tickclover, tick trefoil and beggar's lice. These species are well distributed throughout most of the eastern and central states with several also in the southwest. Most of species inhabit dry, sandy, open woods or slightly shaded areas. Seeds of *Desmodium* have been found in the stomachs of masked bobwhite, lesser scaup duck, eastern ruffed grouse, slate-colored junco, ring-necked pheasant, willow ptarmigan, Gambel quail, Mearns quail, red-eyed towhee, Virginia opossum and Bangs flying squirrel. Their seeds are also said to be eaten by the greater prairie chicken and sharp-tailed grouse in Minnesota, and Eastern turkey in Missouri.

Description of Study
Assemble and evaluate and collection of *Desmodium* spp. then select a superior accession for use in establishment of wildlife food plots. The development of harvesting, cleaning and seeding procedures for seed and plant increase will be included.

Procedure
In 1988, seed from 49 accessions of various *Desmodium* species was field collected from 8 states and 16 MLRA's, and assembled at the Rose Lake Plant Materials Center. Each accession was grown in the greenhouse for preliminary observation the following year. In 1990, 40 accessions were transplanted into field plots arranged in a randomized, complete block for an initial 2-year evaluation period. Five accessions were selected for advanced testing based on survival, vigor, foliage, flower and seed production, and maturity date. The advanced trial was completed in 1992.

Summary
Three accessions (**Table 1**) were selected for increase and release. Each accession will be issued as a tested release for the Great Lakes and upper Midwest regions and named after the county of origin. Generation 1 seed, equivalent to foundation seed, will be maintained at the Rose Lake Plant Materials Center. Foundation seed increase seed plots were established for each release in 2003. Additional plants will be added to those fields in 2004.

Table 1. *Desmodium* Species Selected for Release

Accession No	Release Name	Scientific Name	State of Origin	Maturity Period
9005087	Marion Germplasm Dillenius' tick-trefoil	*Desmodium glabellum*	IL	Mid-season
9055415	Alcona Germplasm Dillenius' tick-trefoil	*Desmodium glabellum*	MI	Early-season
9055428	Grant Germplasm Panicledleaf tick-trefoil	*Desmodium paniculatum*	WI	Mid-season

RELEASED MATERIAL

Affinity *Thuja occidentalis* L.

Northern white cedar

Basic

Released in 1993 (FY1993)

Accession Number: 9005060 *PI Number:* 477011

Release Type: cultivar

Plant Origin: native

Collection Location: Pulaski Co., IN

Characteristics:

Plant Type: tree

Plant Duration: perennial

Propagation: seed

Uses: field and farmstead windbreaks, screen or border planting in urban situations, winter browse

Imperial *Populus* × *canadensis* Moench (pro sp.)

Carolina poplar

Basic

Released in 1979 (FY1979)

Accession Number: Mich-88 *PI Number:* 432347

Release Type: cultivar

Plant Origin: introduced

Collection Location: Rice Co., MN

Characteristics:

Plant Type: tree

Plant Duration: perennial

Propagation: vegetative

Uses: windbreaks (especially around orchards) and pulpwood

Indigo *Cornus amomum* P. Mill.

Silky dogwood

Basic

Released in 1982 (FY1982)

Accession Number: *PI Number:* 468117

Release Type: cultivar

Plant Origin: native

Collection Location: Clinton Co., MI

Characteristics:

Plant Type: shrub

Plant Duration: perennial

Propagation: seed or veg.

Uses: single row windbreak under center pivot irrigation, field and farmstead windbreak, soil bioengineering, wildlife food.

Lancer *Lathyrus latifolius* L.

Perennial pea

Basic

Released in 1984 (FY1984)

Accession Number: *PI Number:* 477009

Release Type: cultivar

Plant Origin: naturalized

Collection Location: MI

Characteristics:

Plant Type: legume

Plant Duration: perennial

Propagation: seed

Uses: erosion control plant, wildlife cover plant, land reclamation, brush management, roadside seeding mixtures, critical area planting where objective includes beautification

Leelanau Germplasm *Viburnum opulus* L. var. *americanum* Ait.

Highbush cranberry

Basic

Released in July, 1999 (FY1999)

*Accession Number:*9031863 *PI Number:*

Release Type: selected

Plant Origin: native

Collection Location: Leelanau Co., MI

Characteristics:

Plant Type: shrub

Plant Duration: perennial

Propagation: vegetative

Uses: windbreaks (especially on wet or organic soils} and wildlife habitat

Magenta *Malus* P. Mill.

Hybrid crabapple

Basic

Released in 1990 (FY1990)

*Accession Number:*9005032 *PI Number:* 514275

Release Type: cultivar

Plant Origin: introduced

Collection Location: Clinton Co., MI

Characteristics:

Plant Type: tree

Plant Duration: perennial

Propagation: seed

Uses: small tree for single row windbreaks & beautification

Roselow *Malus sargentii* Rehd.

Sargent crabapple

Basic

Released in 1978 (FY1978)

Accession Number: 9005026 *PI Number:* 477986

Release Type: cultivar

Plant Origin: introduced

Collection Location: Japan

Characteristics:

Plant Type: tree

Plant Duration: perennial *:*

Propagation: seed

Uses: farm and field windbreaks

Southlow Germplasm *Andropogon gerardi*

Big bluestem

Basic

Released in 2001 (FY2001)

Accession number: 9084510

Release Type: Source Identified

Plant Origin: Native

Collection Location: Southern Lower Michigan

Characteristics:

Plant Type: warm season grass

Plant Duration: perennial

Propagation: seed

Uses: wildlife cover, filter strips,

Southlow Germplasm *Schizochyrium scoparium*

Little bluestem

Basic

Released in 2001 (FY2001)

Accession number: 9084511

Release Type: Source Identified

Plant Origin: Native

Collection Location: Southern Lower Michigan

Characteristics:

Plant Type: warm season grass

Plant Duration: perennial *:*

Propagation: seed

Uses: wildlife cover, filter strips,

Southlow Germplasm *Panicum virgatum*

Switchgrass

Basic

Released in 2001 (FY2001)

Accession number: 9084512

Release Type: Source Identified

Plant Origin: Native

Collection Location: Southern Lower Michigan

Characteristics:

Plant Type: warm season grass

Plant Duration: perennial *:*

Propagation: seed

Uses: wildlife cover, filter strips,

Southlow Germplasm *Sorghostrum nutans*

Indiangrass

Basic

Released in 2001 (FY2001)

Accession number: 9084513

Release Type: Source Identified

Plant Origin: Native

Collection Location: Southern Lower Michigan

Characteristics:

Plant Type: warm season grass

Plant Duration: perennial

Propagation: seed

Uses: wildlife cover, filter strips,

Customer Assistance Summary

2002:

The Rose Lake Plant Materials Center assisted 255 individuals or groups during 2002. Of those, 160 were partners or government agencies. They included:

Saginaw Chippewa Indian Tribe
Consulate of Mexico
International Institute
Michigan Department of Natural Resources
Michigan State University
Hispanic Association
Institato de Resorsos from Seville, Spain
Ducks Unlimited
Little Traverse Bay Band of Odawa Indians

The Rose Lake Plant Materials Center created 17 publications and made 15 presentations during 2002.

2003:

The Rose Lake Plant Materials Center assisted 233 individuals or groups during 2003. Of those, 97 were partners or government agencies. They included:

Michigan State University
Michigan Department of Natural Resources
Huron Potawatomi Indian Tribe
Representatives of the City of Farmington, MI
Representatives of Wyandotte Public Schools
ASAJA Institute in Zaragoza, Spain

The Rose Lake Plant Materials Center created 9 publications and made 12 presentations during 2003.