Rose Lake Plant Materials Center

2005 Technical Report

East Lansing, Michigan

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INTRODUCTION

History The Rose Lake Plant Materials Center (PMC), as part of the USDA Natural Resources Conservation Service (NRCS) Plant Materials Program, was established in 1958 on a 40-acre site at the Michigan Department of Natural Resources, Rose Lake Wildlife Research Station (42.8° N. Lat., 84.4° W. Long, Elevation 875 ft), and located eight miles northeast of Lansing, Michigan. Soil association is Boyer-Marlette-Houghton with well drained and moderately well drained, gently sloping to steep loamy sands to loams on moraines and very poorly drained muck in depressions.

Responsibilities The NRCS Plant Materials Program develops, tests, and transfers effective state-of-the-art plant science technology to meet customer and resource needs. The Plant Materials Program:

- Focuses on using plants as a natural way to solve conservation issues and re-establish ecosystem function.
- Collects, selects, and releases grasses, legumes, wildflowers, trees, and shrubs.
- Cooperates with public, private, commercial, and tribal partners and land managers to apply new conservation methods using plants.
- Provides plant materials and new applied technologies for national initiatives, like the Farm Bill.
- Offers plant solutions to battle invasive species, heal lands damaged by natural disasters, reduce the effects of drought, promote air and water quality, and produce alternative energy.

It is the responsibility of the Rose Lake PMC to:

- assemble, test, and release plant materials for conservation use;
- determine techniques for the successful use and management of conservation plant species;
- facilitate the commercial increase of conservation plant species; and
- provide for the development and transfer of state-of-the-art applied science technology.

Long Range Plan PMC operations are guided by a Long Range Plan which is a compilation of Plant Materials LRPs from Indiana, Ohio, Michigan, and Wisconsin. The PMC LRP is consistent with goals and objectives identified in the NRCS Strategic Plan.

STUDIES 2005

Study Number	Study Name	Purpose	Year Initiated	Report Page
26A097F	Prairie Sandreed (*Calamovilfa longifolia*) for Stabilizing Dune Areas	Release	1989	17
26C126V	Vegetative Hedges for Controlling Erosion in Areas of Concentrated Flow	Technology	1996	20
26I080J	Tick-trefoil (*Desmodium* spp.) for Wildlife Food Plots	Release	1987	52
26I106E	Shrub Willow (*Salix spp.*) for Restoration of Riparian Areas	Release	1992	15
26I124L	Common Elderberry (*Sambucus canadensis*) and Red Elderberry (*S. pubens*) for Streambank Stabilization	Release	1997	16
MIPMC-P-0201-CR	Development of Great Lakes Composite of Virginia Wildrye (*Elymus virginicus*)	Release	2002	22
MIPMC-P-0204-CR	Development of Great Lakes Composite of Bottlebrush Grass (*Elymus hystrix*)	Release	2002	26
MIPMC-P-0207-CR	Increase and Release of Riverbank Wildrye (*Elymus riparius*)	Release	2002	25
MIPMC-P-0208-CR	Evaluation and Release of Miscanthus Grass (*Miscanthus sinensis*)	Release	2002	21
MIPMC-P-0209-CR	Evaluation of Dune Willow (*Salix cordata*)	Release	2002	19
MIPMC-T-0004-CR	Arrest Erosion Threatening Raspberry and Outer Island Light Stations	Technology	2000	12
MIPMC-T-0206-OT	Evaluation of Sweetgrass (*Hierochloe odorata*) from Regional Collections	Technology	2002	28
MIPMC-T-0301-WO	Direct Seeding Tree and Shrub Establishment	Technology	2003	46
MIPMC-T-0302-PA	Eastern Gamagrass (*Tripsacum dactyloides*) Cultivar Evaluation	Technology	2003	31
MIPMC-T-0303-PA	Eastern Gamagrass (*Tripsacum dactyloides*) Production Evaluation	Technology	2003	31
MIPMC-T-0304-WL	Herbicide Seed Protectants for Warm Season Grasses	Technology	2003	35
MIPMC-T-0402-WO	Direct Seeding of Northern Red Oak (*Quercus ruba*)	Technology	2004	50
MIPMC-T-0404-BU	Windbreaks in Muck Soils	Technology	2004	43

PARTNERSHIP AND PROGRAM DEVELOPMENT

The Rose Lake PMC partners with other federal, state, and local agencies; tribes; and private entities to achieve its missions and goals. The PMC is always looking to create new partnerships while strengthening its many existing partnerships. Partnering has two advantages: First, partnering allows expedient and effective land conservation by garnering the skills, knowledge, and abilities of each agency or group involved. Second, it broadens the PMC's range of plant and conservation skills thereby widening the customer base and demand. Often partnerships are established as *reimbursables* which 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.

Memorandum of Understanding with Indiana Department of Natural Resources

Background The Indiana Department of Natural Resources (INDNR) Division of Fish and Wildlife and NRCS have mutual interests and goals concerning wildlife habitat management and conservation, specifically related to native plants from Indiana. The NRCS is the lead Federal agency for providing conservation assistance on private lands. The NRCS Plant Material Center's mission is to develop, test, and transfer effective state-of-the-art plant science technology, providing timely and effective vegetative solutions for identified customer and resource needs. The INDNR's mission is to professionally manage Indiana's fish and wildlife for present and future generations, balancing ecological, recreational, and economic benefits.

The Natural Resources Conservation Service and INDNR are cooperating to meet the demands of both public and private lands for establishing high quality wildlife habitats with native Indiana seed. Both agencies recognize the concern of introduced plant species (native and non-native) and the potential for these species to alter the genetics of existing native plant communities. Moreover, both agencies have recognized the need for testing and selecting plants native to Indiana for use in implementing their individual and mutual programs.

Memorandum of Understanding Through a Memorandum of Understanding (MOU) the INDNR and Rose Lake Plant Materials Center have agreed to cooperatively promote and propagate native plants from Indiana genotype sources for the expansion and implementation of both agencies' missions and programs. Specifically, they will cooperatively:

- Identify a list of plants that each agency deems important and set priorities for which species to work on first.
- Harvest seed from established fields or from remnant stands.
- Cooperatively review their MOU to determine any necessary revisions.

- Cooperatively release plant materials through the NRCS Plant Materials Program and publicize to commercial growers for establishment and increase for availability to the public.
- Secure Indiana Native Seed Certification of all seed.
- Promote the use of the released native plant material.

Releases Seed was collected from native stands (as designated by the Indiana Department of Natural Resources, Wildlife Division) of big bluestem (*Andropogon gerardii*), Indiangrass (*Sorghastrum nutans*), and little bluestem (*Schizachyrium scoparium*) within the State of Indiana in the early to mid 1990s. Seeds from these populations were planted into single crossing blocks for each species. Resultant seeds were planted in nine field plantings in central Indiana. Field plantings were evaluated for adaptability, potential for invasiveness, and usefulness in conservation planting.

Based on (1) the excellent field performance of these big bluestem, Indiangrass, and little bluestem composites over several years and locations; (2) the limited availability of plant material; and (3) the need for these products in ecosystem restoration and enhancement, seed stock of Prairie View Germplasm of these composites was released in 2005.

Prairie View Indiana Germplasm big bluestem is a perennial, warm season bunch grass with short, scaly rhizomes. Big bluestem attracts insects and provides seeds that are used as food sources by songbirds, game birds, and small mammals. Many wildlife species also utilize big bluestem for nesting, escape, and winter cover. Other anticipated uses of Prairie View big bluestem include increasing species diversity, controlling erosion, and restoring native plant environments.

Prairie View Indiana Germplasm Indiangrass is another perennial, warm season bunch grass. Its anticipated uses also include providing food/cover for wildlife, increasing species diversity, controlling erosion, and restoring native plant environments.

Prairie View Indiana Germplasm little bluestem, like the other Prairie View releases, is a perennial, warm season bunch grass. It also has the same anticipated conservation uses. Its 2- to 4-ft mature height makes it the shortest of the Prairie View grasses.

Seed stock all three Prairie View Indiana Germplasm grasses is available to commercial growers for seed increase and demonstration plantings. Seed requests may be submitted to:

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Cooperative Agreement for Ash Tree (*Fraxinus spp.*) Seed Collection

Background Ash trees in the PMC Service Area are being attacked and destroyed by Emerald Ash Borer (*Agrilus planipennis* (Fairmaire)). This introduced pest, first detected in summer 2002 in Southeast Michigan, has already spread to Indiana, Ohio, and Ontario.

With this impending disaster Rose Lake PMC has entered into a non-funded cooperative agreement with the USDA Agriculture Research Service (ARS). The agreement states that the PMC will initiate an ash tree seed collection and that the ARS National Center for Genetic Resource Preservation Center in Ft. Collins, Colorado will store samples of all the seed collected in their long term seed storage facility. Tribes are specifically mentioned in the agreement because of the PMC's previous assistance to tribes with black ash and other culturally significant plants.

Voluntary seed collections are being sought. The PMC will receive, process, label, and send seed to the Preservation Center. Tribal seed remains tribal property in storage with tribes retaining authority over sharing and distribution.

Presentations Plant Materials Specialist David Burgdorf as well as Plant Materials Center staff have made numerous presentations on the ash collection effort to government agencies including tribes, partners, and the general public. The effort has also received popular press and television coverage.

Collection Twenty ash seed samples were collected in Michigan, Minnesota, Ohio, and Wisconsin on tribal and non-tribal lands by NCRS and District personnel and the general public. PMC staff checked seeds for fill and obvious pests, cleaned, labeled, and forwarded seed to the USDA Forest Service National Seed Laboratory in Dry Branch, Georgia for X-raying (nondestructive viability test). Seeds were then to be shipped to the ARS National Center for Genetic Resource Preservation Center for long-term storage. After culling, eight samples were sent by the PMC to Georgia.

The collection continues. Collection information is available on the web at:

http://plant-materials.nrcs.usda.gov/mipmc/

Memorandum of Understanding for Ft. Custer Vegetative Restoration

Background Fort Custer Training Center (FCTC) in Southwest Michigan is 7500 acres of military tactical training area used by the Michigan National Guard and other branches of the armed forces. While FCTC is an important training facility, it is also home to a wide variety of natural resources, e.g., wildlife, forests, wetlands, surface water, and a variety of rare plant and animal species. Moreover, historic and cultural resources are located on the property. The facility is federally-owned and operated by the Michigan Department of Military and Veterans Affairs (MDMVA).

Memorandum of Understanding A memorandum of understanding between the NRCS Rose Lake PMC and the MDMVA was developed for restoration of native vegetation and habitats at Fort Custer. PMC staff will provide consultation and on-the-ground assistance for collection, propagation, establishment, and maintenance of native vegetation. PMC assistance with research and selection of proper native vegetation that meets the needs of the firing ranges, ammo bunkers, and tank sighting areas will mutually benefit MDMVA, FCTC, and NRCS.

Deliverables The following are being realized from the cooperative agreement between MDMVA and NRCS Rose Lake PMC:

- Identification and selection of specific native plant species for collection, increase, testing, and evaluation for conservation uses at FCTC, including grasses to reduce mowing needs on ammunition bunkers (see below) and firing ranges and native grasses for roadsides.
- Established production plots/fields of selected native plants (e.g., little bluestem, big bluestem, and Indiangrass) to provide seed to commercial growers and for use at FCTC for prairie plantings on post.
- Technical expertise on plan development for establishing native prairie plants on the tank range.
- Consultation and hands on implementation of weed control, planting, plot/field production, and management.
- Protocols for harvesting, cleaning, and handling of seed.

Ammunition Bunkers Demonstration and research plots for were established on an ammunition bunker (Table 1) in collaboration with environmental staff from FCTC. Plots were designed so that vegetation species and establishment methods for the bunkers could be evaluated. Evaluation criteria will include original range of the species (native vs. non-native), mowing and maintenance requirements, soil stabilization on the 30-40° slopes, fire hazard, etc. Experimental design is a randomized complete block with three replicates, facing northeast, east, and southeast. Treatment strips (species and/or establishment method) are 30 ft long up and down the slope and 3 or 7 ft wide.

Table 1. Vegetation and establishment methods for Ft. Custer ammunition bunker trials.

Common Name		Scientific Name	Establishment Method	Approximate Seed or Plant Population
Bermudagrass		*Cynodon dactylon* (L.) Pers.	Plugged into coir biodegradable mattress (with potting soil); established off-site; and transported to bunker in fall 2005	6 plants/ft^2
Periwinkle		*Vinca minor* L.	Plugged into coir biodegradable mattress (with potting soil); established off-site; and transported to bunker in fall 2005	Actual planting population not calculated due to stononiferous nature of Periwinkle
Sedum	Two row stonecrop	*Sedum spurium* Bieb. 'Tricolor'	Plugged into soil overlaid with 0.75-in X 0.75-in mesh coir fiber, biodegradable mats covering in summer 2005	3 plants/ft^2
	Stone- crop	*Sedum acre* L.	Same as above	Same as above
	Orange stonecrop	*Sedum kamtschaticum* Fisch. & C.A. Mey.	Same as above	Same as above
	Orange stonecrop	*Sedum spurium* Bieb. 'Fudlaglut'	Same as above	Same as above
Red fescue		*Festuca rubra* L.	Direct seeded on-site at bunker into soil overlaid with 0.5-in X 0.4-in mesh coir fiber, biodegradable mats in fall 2005	4 lbs/1000 ft^2
			Established off-site by direct seeding into coir biodegradable mattress (with potting soil); overlaid with 0.5-in X 0.4-in mesh coir fiber, biodegradable mats and transported to bunker in fall 2005	4 lbs/1000 ft^2
Buffalograss		*Buchloe dactyloides* (Nutt.) Engelm.	To be direct seeded on-site in spring 2006	To be determined
			To be direct seeded into biodegradable mattress and transported to bunker in spring 2006	To be determined

Study No. MIPMC-T-0004-CR
Arrest Erosion Threatening Raspberry Island and Outer Island Light Stations

Introduction The Apostle National Park is comprised of Raspberry Island, Outer Island, and others in Lake Superior near Bayfield, Wisconsin. Several of these islands have historic lighthouses that once guided mariners through the cold waters of Lake Superior. Continuous erosion of steep slopes has jeopardized these historic facilities. This project was initiated in 2000 to produce native plant stock for stabilizing slopes, preventing erosion, preserving native plant resources, and revegetating at Apostle Islands National Park.

The Park Service entered into several reimbursable agreements with NRCS and the Rose Lake PMC to provide technical assistance and to assist with collecting and growing plants. Under a Memorandum of Agreement grass, forb, and shrub species were selected for propagation based on the material's availability, viability, and site adaptability for the intended use.

The Rose Lake Plant Materials Specialist has also provided training to the Apostle Island National Park employees on several slope stabilization techniques. In April the park staff constructed their first vegetative crib wall on Raspberry Island under the direction of the Plant Materials Specialist. They also received guidance on the installation of a vegetative crib wall and slope grid system for Outer Island.

Accomplishments Following is a list of species propagated and number of plants delivered to Apostle Island National Park in 2005:

American Beachgrass – 581	Poverty Oatgrass – 101
Allegheny Blackberry – 65	Prickly Rose – 96
Beach Pea – 21	Red Elderberry – 122
Beachgrass – 95	Redosier Dogwood – 319
Bluejoint – 581	Redtop – 151
Bunchberry Dogwood – 172	Sandcherry – 356
Canada Goldenrod – 697	Shrubby Fivefingers – 155
Canada Wildrye – 962	Smooth Rose – 650
Common Juniper – 136	Speckled Alder – 181
Dwarf Scouring Rush – 76	Thimbleberry – 868

Evening Primrose – 190	Wavy Hairgrass – 861
Fireweed – 184	Western Pearly Everlasting – 539
Grayleaf Red Raspberry – 487	Willow – 8
Lowbush Blueberry – 206	Virginia Strawberry – 1104
Oakes' Evening Primrose – 157	Yellow Avens – 34
Pin Cherry – 62	

Plans The Rose Lake PMC is growing more plants and the Plant Materials Specialist continues to provide technical assistance for the installation of bioengineered structures. Project completion is expected in 2006.

STABILIZATION OF STREAMBANKS AND SHORELINES

Soil bioengineering is the art and applied 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 in the Great Lake and Midwest states. Poor urban, agricultural, and forestry land management practices resulting in excessive erosion and nutrient runoff have contributed to this situation. Nonpoint source pollution is responsible for an estimated 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 focuses on restoration. 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 Lakes 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. A shrub willow reaches less than 20-ft tall and has 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.

Procedure Dormant woody cuttings from 120 accessions of various shrub willow species were collected from Indiana, Michigan, and Wisconsin during the winter of 1991-92. Based on years of evaluation of vigor, height, canopy width, and canopy density at the Rose Lake PMC, Riverbend Germplasm Silky Willow (accession 9069052) was released as a tested class of natural germplasm in 2003 and is now available for increase purposes.

Observations Riverbend Germplasm Silky Willow was rated 'excellent' in vigor and disease tolerance following the 2005 growing season at the USDA/NRCS National Plant Materials Center in Beltsville, MD. However, it was completely defoliated by what staff there identified as leaf roller moth larvae.

Following the 2004-05 winter, Riverbend Germplasm Silky Willow at Rose Lake was diagnosed with Cytospora by pathologists at Michigan State University Diagnostic Services. Cytospora is an endophytic fungus that infects and causes cankers when environmental conditions are adverse. Salt spray from the road next to the willow may have created good entry points for the fungus.

Observations of insects and fungus will continue on Silky Willow at the National Plant Materials Center and at Rose Lake during 2006.

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

Background Elderberry is an upright, native shrub that can grow to 10-ft tall. The thick, yellowish-brown to light brown bark roughens and furrows with age. 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 white pith. Flowers are borne 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 an income source 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 in late 1997 through early 1998. Cuttings were transplanted into three initial study areas located in Wisconsin, Indiana, and the Center. Data was recorded on fruit abundance, plant height, canopy width, canopy density, and vegetative spread at the Center site from 1998 through 2000 but adverse weather forced the termination of studies in Wisconsin and Indiana. PMC-harvested material was sectioned and used to grow cuttings for new field trials in Indiana, Wisconsin, and Ohio, but these were terminated after 2003 due to poor long-term survival.

Anticipated Release Data collected from the Rose Lake Plant Materials Center trial indicates that Accession 9084126 has excellent growth characteristics for height, canopy density, spread, fruit abundance, and re-growth after pruning. Further evaluation is ongoing at the Rose Lake and National PMCs and in Wisconsin and is anticipated in several MLRAs and plant hardiness zones in the Rose Lake PMC service area. A new production block was established at the Rose Lake PMC in 2005 and a release is expected.

STABILIZATION AND RESTORATION OF DUNE AREAS

A diversity 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 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 plant material should:

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

Testing of Prairie Sandreed (*Calamovilfa longifolia*) Potential Release (Accession 9086408) from Study No. 26A097F

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. *Calamovilfa longifolia* expands into adjacent territory by producing short 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 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.

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

Objective: Develop potential release (Accession 9086408) and compare growth and to parental lines and standards.

Materials, Methods, and Experimental Design Plugs were established in the greenhouse in 2003 or earlier and planted in 2004 in two-row plots. Design was a randomized complete block with four replicates (or fewer for limited-inventory accessions).

Results Growth data from 2005 is provided in Table 1 below. Two of four replications were infested with quackgrass.

Table 1. Prairie sandreed growth at Rose Lake PMC, 2005.[1]

Accession	Vigor[2]	Disease[2]	Lodging[2]
9086408 (Potential Release)	2	2	2
9055449 (F1)	3	2	2.5
9004939 (Parent)	2	2	2
9004944 (Parent)	3	2	2
4770007 (Parent)	2.5	2	2.5
Pronghorn (Standard)	2	2	3
Goshen (Standard)	3	2	2

[1]Median value of 2, 3, or 4 plots scored on 11 July 2005.

[2]Vigor, disease, and lodging: 1=excellent vigor, no disease or lodging; 9=poor vigor, severe disease or lodging

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 No new data are available from 2005 field studies.

STABILIZE CROPPED AREAS OF CONCENTRATED WATER FLOW

Controlling sediment and nutrient runoff from cropland is a concern in the Rose Lake PMC service area. Developing methods that control erosion, while keeping the most land in production is a continuing effort.

Problems Grassed waterways are often utilized to address erosion and runoff 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 regulators
- exhibit excellent erosion control qualities
- not impede normal farming operations
- be easy to maintain
- 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 erosion control. 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 (*Miscanthus sinensis*) at Michigan State University Kellogg Biological Station (KBS) near Battle Creek, MI in collaboration with NRCS Field Office Staff in 1993. In 1996 the study was expanded to include native warm season grasses. Additional field plantings were established in Michigan, Indiana, and Ohio in 2001 or 2002 which included miscanthus or eastern gamagrass (*Tripsacum dactyloides*).

Description of Study Vegetative barriers of miscanthus or eastern gamagrass were evaluated for their effectiveness to control erosion in cropped fields.

Procedure Whole plants from miscanthus or eastern gamagrass stands on the MI PMC were harvested and divided into sprigs. A line of sprigs was planted 5 to 10 inches deep, spaced 3 inches apart, in rows 3 inches apart in soil-filled troughs of varying lengths. Troughs were formed with rolled plastic material to contain root growth, and lined with coconut fiber to maintain trough integrity during installation. Material was grown for several months in the greenhouse prior to installation insuring good root development. Troughs were lifted by the coconut fiber liner and placed into excavated strips of the crop

field perpendicular to the path of concentrated flow, and within the row so as not to interfere with farming operations. Usually two strips of material five ft apart were placed on each flow area. Plantings were established with miscanthus in Michigan in 2001 and Ohio in 2002. Eastern gamagrass was used as vegetative barrier material for a planting in Ohio in 2001 and in Indiana in 2002.

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 at KBS, but heavy rains in 2004 caused some breaks in the row. Survey stakes are present in the barriers and sediment buildup measurements are planned.

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. No observations were made in 2004 but observations will resume in 2005. The plot will be maintained 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.

Study No. MIPMC-P-0208-CR
Intercenter Component of
Evaluation and Release of Miscanthus Grass (*Miscanthus sinensis*)

Background The Rose Lake PMC has been working for about 15 years with miscanthus grass as a planting for vegetative barriers in concentrate flow areas. Miscanthus has performed extremely well in the field, but concerns have been raised about the possibility of its becoming an invasive species. The PMC has had field plantings for about ten years and has not identified any spread of this specific collection by seed. Tests of seed from field plantings for more than five years showed no viability.

Procedure Plants from the Rose lake PMC were divided, repotted in 2.5-in diameter plastic cones, and sent to six other PMCs in 2002. Cooperating PMCs were requested to record plant growth data and collect seeds for viability testing.

Results Miscanthus growth and development were excellent at PMCs in Mississippi, Missouri, and New York through 2004. (A fourth PMC reported complete plant mortality, but attributed it to a handling problem and not to the plants themselves.) In all the years of intercenter testing, no viable seed was reported except in Missouri. Seed collected at the Missouri PMC on 8 November 2005 in Missouri has been submitted to the Michigan state seed testing laboratory for germination testing.

RESTORATION OR RECLAMATION OF DISTURBED AREAS

Numerous human activities 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 results in a drastic disturbance of the natural communities. Successful revegetation of these disturbed areas requires 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 Conservation Reserve Program plantings and restoration work. Some non-native species traditionally utilized for conservation activities have come 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 the Rose Lake 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-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 0.5-in wide, and rough on both sides and the margins. Spikes are stiff and up to 5-in long. The lower portion of the spike is often enclosed by the sheath. Lemmas have awns that reach 1.5 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 is being evaluated and composite selected for restoration or revegetation potential as conservation cover or streambank protection in the Great Lake and Midwest states.

Procedures Virginia wildrye was collected from native stands by field staff and partners and accessioned. Plants from each of 19 accessions were started in the greenhouse and transplanted into field plots. Field plots in Michigan were established in 2002 and in Indiana and Ohio in 2003. Each plot is being evaluated for survival, vigor, plant density, height, lodging resistance, disease and insect damage, seed production, and germination. "Finalists" will be further evaluated in PMC and off-center trials. A randomized complete block advanced field trial with three replications trial was established at the

PMC. Plants were established in cone-tainers and transplanted to the field on 23 June 2005. Trial entries were:

9084531
9084344
9084514
Omaha (standard)

Summary Data recorded in 2005 on the trial established at the PMC in 2002 is summarized in Table 1. Quackgrass infestations were so heavy in some plots, especially in replications 2 and 3, that vigor, disease, lodging, and flowering observations were not recorded. Therefore, median was considered to be a better measure of central tendency than mean and is what was recorded in Table 1.

Data from other states and data from the just-established advanced trial at Rose Lake in was not recorded in 2005.

Table 1. Virginia wildrye plant growth data, Rose Lake PMC test site. 2005.[1]

Accession	Vigor[2]	Disease[2]	Lodging[2]	Flowering Date[3]
9084167	4	3	1	L
9084168	4	3	1	L
9084193	4	3	1	L
9084306	3.5	2.5	1	L
9084313	4	2.5	1	E
9084315	3	2	1	E
9084318	4	4.5	1	L
9084320	5	3	1	E
9084344	3	2	1	L
9084349	4	3	1	E
9084350	3	3	1	E
9084514	3	2	1	L
9084521	3	2	1	E
9084530	2	2	1	L
9084531	2	2	1	L
9084532	5	3	1	E
9084536	2	1	1	E
9086331	4	3	1	E
9086332	4	2	1	L
Omaha	4	2.5	1	L
Grand Median	4	2.5	1	L

[1]Median value of 1, 2, or 3 replications as evaluated on 27 June 2005.

[2]Vigor, disease, and lodging: 1 = excellent vigor, no disease or lodging; 9 = poor vigor, severe disease or lodging

[3]E=flowering on or before 6/27/05. L=flowering after 6/27/05.

Study No. MIPMC-P-0207-CR
Increase and Release of Riverbank Wildrye (*Elymus riparius*)

Background The Wisconsin State Plant Materials Committee (WIPMC) suggested the need for native cool season grasses for use in conservation activities, noting also the lack or unavailability of native cool season grasses from commercial growers. The WIPMC identified riverbank wildrye as a 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 the 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.

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.

Seed was provided to PM committee members in 2004 to plant in critical area treatments to determine if riverbank wildrye can be used effectively as a conservation plant.

Results Data from plantings in Bismarck, ND and Sheboygan Falls, WI are provided in Table 1 below.

Table 1. Riverbank wildrye plant growth data at two locations. 2005.

	Bismark, ND 3 Oct 2005	Sheboygan Falls, WI 25 July 2005
Stand	1	1
Density	1	1
Vigor	1	1
Spread	7	
Forage Production	3	"Good potential"
Plant Height (in)	22	36-40
Comments	"Excellent seed yield, no major disease"	"Looks great!"
1=excellent, 3=good, 5=fair, 7=poor, 9=very poor		

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 up to 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 Dakota, and south to Georgia 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. Seed from the breeder field will be made available to growers as a selected class release.

Procedures Collections were made from native stands by field staff and partners. Each collection was accessioned and cleaned. Cone-tainerized plants from each accession were established in the greenhouse and transplanted to field sites at the PMC and in Indiana and Ohio in 2003. Plots were placed in a randomized complete block design with 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.

Based on selections from plots established in 2003, on 24 June 2005 these "Finalists" were placed in a randomized complete block field plot after having been established in greenhouse cone-tainers:

9086418

9084535

9084191

9084533

9084360

9084186

Summary Data recorded at the Indiana location is summarized in Table 1**.** According to the data recorded from Indiana, seed head production as recorded in the table also reflected plant survival.

Table 1. 2005 Bottlebrush grass growth, Indiana test site.[1]	
Accession Number	**Seed Head Production[2] (g/plot)**
9084518	8.6
9084316	19.5
9084308	1.1
9084310	20.2
9084309	5.2
9084535	20.7
9086330	11.4
9084322	0.8
9084533	6.2
Mean	10.4
LSD	21.1
[1]Seed heads collected by S. Hole and B. Steiner, 1 Sept 2005	
[2]Seed head production reflects height and vigor	
Accessions in **bold** have been tentatively identified as "finalists"	

Study No. 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. Preliminary observations suggest its potential as a conservation plant as well as a plant community species for restorations. A coordinated evaluation and comparison of the native sweetgrass collection to a released variety, 'Radora' as the standard, will allow for determination and documentation of adaptation. 'Radora' originated from east central South Dakota and was released from South Dakota State University.

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'

Materials and Methods Rose Lake PMC sent sweetgrass accession 9070225 samples to each of the cooperating PMCs. Rose Lake PMC received samples of other sweetgrass accessions listed in Table 1 in June 2002. 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 boards (0.25 in X 8 in X 60 in) were installed between the plots to prevent rhizomes from inter-mingling. Plots were hand weeded to remove crabgrass and other annual weeds from the plot. Due to poor survival or growth rate of accessions from Minnesota, North Dakota, Colorado, Kansas, and South Dakota, additional plants (from original source shipments) of those accessions were transplanted into their respective plots in September 2003. Plots were evaluated in July 2004 and July 2005.

Results and Summary This evaluation indicates that there are differences in growth, spread, and vigor of the sweetgrass accessions planted at the Rose Lake Plant Materials

Center. In two years of data MI-9070225 was the performance leader with MT-9063351 just behind (Table 2). These overall ratings of 'excellent' in 2004 (based on summation of rate of spread, number of rhizomes, vigor rating, seed culms, leaf height, and seed culm height) were corroborated in 2005 by overall visual observations in which they were declared "Winner" and "Runner Up," respectively. Ratings for ND-9063128 were inconsistent: "Fair" in 2004 and "Winner" in 2005. Performance of others, including the 'Radora' standard, was inferior to in both years.

Table 2. Performance of regional sources of sweetgrass (*Hierochloe odorata*) at the Rose Plant Materials Center.

Accession	**2004 Overall Rating**[1]	**2005 Overall Rating**[2]
MN-9084205	6	
ND-9063128	5	Winner
CO-9070988	4	
KS-9050243	6	
SD-'Radora'	4	
MT-9063351	1	Runner up
MI-9070225	1	Winner

[1]Ratings: 1=excellent, 3=good, 7=poor

[2]Blank indicates overall performance inferior to "Winners" and "Runner up"

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 forage grass varieties originating from the area covered by the Rose Lake PMC. Concerns are growing over the loss of native germplasm.

Needs Native warm season grasses are needed that:

- originate 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. MIPMC-T-0302-PA and MIPMC-T-0303-PA
Eastern Gamagrass (*Tripsacum dactyloides*) for Forage Production

Background Eastern gamagrass is a native warm season perennial that can be found throughout the eastern half of the US. It is a highly productive grass that is best adapted to wet habitats. Remnant colonies are commonly found in flood plains along stream banks. Eastern gamagrass is in the same taxonomic family (Poaceae) as field corn (*Zea mays*) and is characterized by numerous short, well-developed rhizomes. Individual grass clumps can reach a diameter of 4 ft 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 gerardii*) and 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 commercial cultivars 'Pete' and 'Highlander' and two experimental accessions from Big Flats Plant Materials Center, 9086456 (diploid) and 591483 (tetraploid), were placed in a field comparison to determine survival, plant growth, and forage quality. A second study was established using a single cultivar to evaluate the effect of row spacing and forage harvest height (simulated grazing) on forage quality and stand survival.

Accession Study Procedures In June 2003 seedlings of 'Highlander' and 'Pete' eastern gamagrass were received from the J.L. Whitten PMC near Coffeeville, MS and accessions 9086456 and 591483 were received from the Big Flats PMC. Seedlings were transplanted into a field study site at Rose Lake PMC. Each plot contained three rows of five plants. Plants were spaced 36 inches apart within the row and rows were spaced 30 inches apart. The study was conducted in a randomized complete block with three replicates per accession (although one replication was subsequently abandoned due to competition from a huge pignut hickory tree). The site was irrigated to insure good survival after transplanting. All plots were fertilized and herbicides were applied as needed. Data is being taken from the center row of each plot throughout the course of the study.

Forage Production Study Procedures A forage production study was initiated by planting 'Pete' eastern gamagrass on 17 June 2003 in plots having row spacing of 15 inches or 30 inches between rows. Plots with 15-in row spacing were planted with a seeding rate of 2 seeds/row ft. Plots with 30-in row spacing were planted with a seeding rate of 4 seeds/row ft. Seeds were planted 1 inch deep. Each plot was divided in 2004 by superimposing two cutting heights (simulated grazing). The study was conducted in a randomized complete block experimental design with four replicates per treatment. The site was irrigated to insure good survival after transplanting. All plots were fertilized and herbicides were applied as needed. Data is being taken from the center of each plot throughout the course of the study.

Accession Study Results Dry matter production differences were observed in 2005 with NY Tetraploid and 'Highlander' significantly out yielding 'Pete' and NY Diploid (Table 1). No significant yield differences were observed in 2004. Quality results and analysis are pending.

Forage Study Results No significant differences were observed in 2005 among the four row width and cutting height combinations (Table 2). Significant differences were observed in 2004 with narrow rows yielding approximately 50% more than the wide (data now shown). Figure 1 shows the convergence of yields of all four systems and the increased yield in 3 of 4 systems compared to 2004. Quality results and analysis are pending.

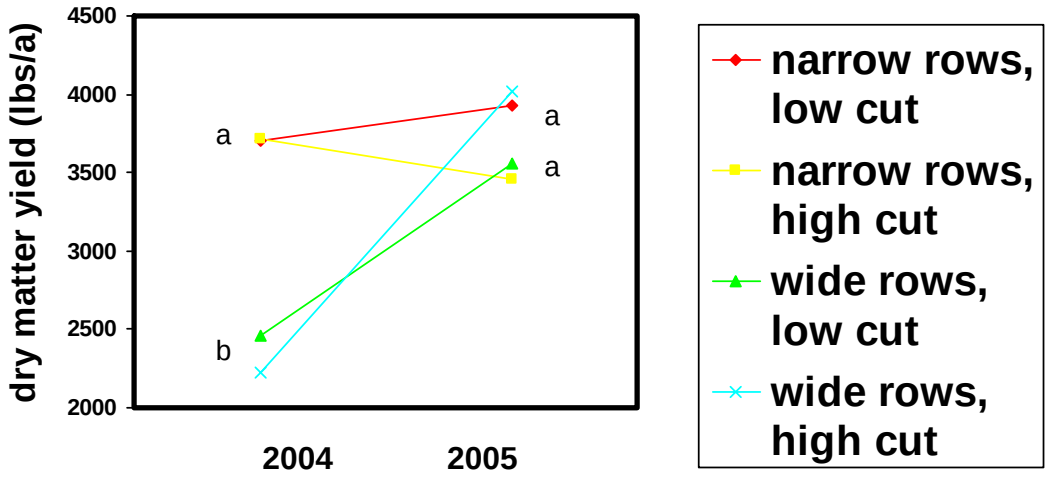
Table 1. Gamagrass dry matter yield in two-cut system.

	-----Dry Matter Yield (lbs/plot)-----	
Cultivar	2005	2004
'Pete'	4.6	1.7
'Highlander'	6.2	2.0
NY Diploid (Accesion 9086456)	3.9	2.0
NY Tetraploid (Accession 591483)	6.3	2.0
Mean	5.3	1.9
LSD (0.05)	1.4	1.3

Table 2. Effect of row spacing and cutting height on 'Pete' eastern gamagrass forage yield in two-cutting system. E. Lansing, MI 2005

Row Spacing X Cutting Height	Dry Matter Yield (lbs/acre)
15-in rows, 6-in cutting height	3927
15-in rows, 12-in cutting height	3453
30-in rows, 6-in cutting height	3561
30-in rows, 12-in cutting height	4015
LSD(0.05)	571

Figure 1. Two-year gamagrass production trends.



Points preceded or followed by same letter not significantly different within year at 0.05 alpha level.

MIPMC-T-0304-WL
Herbicide Seed Protectants for Warm Season Grasses (2005)

Background Grass weed control options during the establishment of warm season grasses, especially switchgrass (*Panicum virgatum*), are limited. Although Plateau® herbicide is registered for use on big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), and Indiangrass (*Sorghastrum nutans*) at planting, it is not registered for any use on switchgrass and only on established prairie sandreed (*Calamovilfa longifolia)*. A herbicide that could be applied preemergence at planting to control annual grass weeds would be an important tool for the establishment of warm season grasses. Syngenta Crop Protection, Inc. manufactures Concep® III, a seed treatment that is labeled to protect grain sorghum (*Sorghum bicolor*) from acetamide herbicide injury. (Acetamide herbicides control annual grass weeds when applied preemergence.) Research data on the effect of this herbicide seed protectant on switchgrass and other warm season grasses is limited.

Native warm season grasses including switchgrass, big bluestem, little bluestem, and Indiangrass provide food/cover for wildlife, increase species diversity, control erosion, and restore native plant environments. They attract insects and provide seeds that are used as food sources for songbirds, game birds, and small mammals. These warm season grasses may also be useful in combination with other native warm season and cool season grasses for erosion control because of their massive root systems.

Project Description Switchgrass and big bluestem seeds were treated with Concep® III seed protectant. Treated and untreated seeds were field-planted at the Rose Lake PMC. Acetamide herbicides Dual® II Magnum® and Outlook®, were applied preemergence at various rates. Plants were evaluated for emergence and growth.

Procedures Seeds of Southlow Michigan Germplasm switchgrass and Southlow Michigan Germplasm big bluestem were submitted to Syngenta for treatment with Concep® III seed protectant. Separate experiments were established for switchgrass and big bluestem in contiguous parcels at the Rose Lake PMC. Switchgrass and big bluestem seeds were planted at approximately 50 and 20 seeds/linear ft of row, respectively, on 2 June 2005 in loamy sand. Seeds were distributed on the surface and lightly tamped with a garden rake. Herbicide treatments were applied using a backpack sprayer one day after planting.

Irrigation water was supplied as necessary to maintain optimum conditions to promote germination and emergence.

Both experiments were conducted in a randomized complete block design with three replicates for each treatment combination. Treatments were arranged in a split-plot with Herbicide X Rate as the whole plot and Protectant vs. No Protectant as the subplot.

Application rates of Dual® II Magnum® and Outlook® were 0, 1X, 2X, and 3X based on the labeled rate for sorghum on loamy sand. Data were collected on emergence and plant height on 22 Aug 2005 and subjected to analysis of variance.

Switchgrass Results No differences were found in plant emergence and height response to Concep® III seed protectant where no acetamide herbicides were present (Table 1). Plant responses to Dual® II Magnum® and Outlook® herbicide at 1X, 2X, and 3X in the absence or presence of Concep® III were likely confounded when herbicides were leeched through the seed zone by percolating irrigation water. Both Dual® II Magnum® and Outlook® herbicides are water soluble and large volumes of irrigation water were applied.

Table 1. Switchgrass response to seed protectant in absence of herbicide.

Concep® III	Emergence (plants/20 linear ft)	Plant Height (inches)
No	24.7	11.3
Yes	17.3	9.3
$LSD_{0.05}$	31.7	5.0

Big Bluestem Results No differences were found in plant emergence and height response to Concep® III seed protectant where no acetamide herbicide was present (Table 2). Plant responses to Dual® II Magnum® and Outlook® in the absence or presence of Concep® III were likely confounded when herbicides were leeched through the seed zone by percolating irrigation water.

Table 2. Big bluestem response to seed protectant in absence of herbicide.

Concep® III	Emergence (plants/20 linear ft)	Plant height (inches)
No	28.7	9.0
Yes	33.7	10.3
$LSD_{0.05}$	10.8	3.8

Summary No effect of the Concep® III seed protectant was observed where acetamide herbicides were absent. This indicates that Concep® III may be used as seed protectant in switchgrass and big bluestem establishment without deleterious effects. Further study will be necessary to determine the effectiveness of Concep® III for protecting switchgrass and big bluestem from acetamide herbicide injury.

MIPMC-T-0304-WL
Herbicide Seed Protectants for Warm Season Grasses (2004)

Background Grass weed control options during the establishment of warm season grasses, especially switchgrass (*Panicum virgatum*), are limited. Although Plateau® herbicide is registered for use on big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), and Indiangrass (*Sorghastrum nutans*) at planting, it is not registered for any use on switchgrass and only on established prairie sandreed (*Calamovilfa longifolia)*. A herbicide that could be applied preemergence at planting to control annual grass weeds would be an important tool for the establishment of warm season grasses. Syngenta Crop Protection, Inc. manufactures Concep® III, a seed protectant or safener that is labeled to protect grain sorghum (*Sorghum bicolor*) from acetamide herbicide injury. (Acetamide herbicides control annual grass weeds when applied preemergence.) Research data is not available on the effect of this herbicide seed protectant on switchgrass and other warm season grasses.

Native warm season grasses including switchgrass, big bluestem, little bluestem, and Indiangrass provide food/cover for wildlife, increase species diversity, control erosion, and restore native plant environments. They attract insects and provide seeds that are used as food sources for songbirds, gamebirds, and small mammals. These warm season grasses may also be useful in combination with other native warm season and cool season grasses for erosion control because of their massive root systems.

Project Description Switchgrass and big bluestem seeds were treated with Concep® III seed protectant. Treated and untreated seeds were planted in greenhouse flats. An acetamide herbicide, Dual® II Magnum®, was applied preemergence at various rates. Plants were evaluated for emergence and growth.

Procedures Seeds of Southlow Michigan Germplasm switchgrass and Southlow Michigan Germplasm big bluestem were submitted to Syngenta for treatment with Concep® III seed protectant. Switchgrass and big bluestem seeds (0.6 and 1.4 g/treatment, respectively) were planted in greenhouse flats on 29 July 2004 using a mineral topsoil that would be equivalent to a medium textured soil. Herbicide treatments were applied using a backpack sprayer immediately after planting. Plants were observed for two months after seeding. The experimental design was a randomized complete block with four replicates for each treatment combination. Treatments were arranged in a split plot with Dual® II Magnum® herbicide rate (0, 1X, 2X, and 3X label rate for sorghum) as the main plot and Concep® III vs. no protectant as the sub-plot. Data was collected on emergence, plant height, vigor, and above ground biomass and subjected to ANOVA.

A field study was also established, but results (not reported) were confounded by uncontrolled spray drift.

Results Differences were found in plant emergence and growth response to herbicide rate (Table 1). Switchgrass emergence, plant height, and biomass were greater at the 0 herbicide rate than with 1X, 2X, and 3X and switchgrass vigor rating was lower (i.e., plants were more vigorous). Similar patterns were observed in big bluestem emergence, height, biomass, and vigor (Table 1).

Differential plant response to protectant vs. no protectant was also observed. Plants from seed-protected switchgrass exhibited greater emergence and plant height and were more vigorous (Table 1). No deleterious effects were observed with protectant. Big bluestem exhibited similar responses with protected seeds showing higher emergence rates, taller plants, more biomass, and lower vigor ratings than with non-protected seeds.

Statistical interactions were observed between herbicide rate and protectant. For example, switchgrass emergence rate with non-protected seeds was more negatively affected than in seed that had been protected with the protectant (Figure 1). Similar interactions were observed in plant height and vigor of both species (Figures 2-6).

Application Summary Greenhouse studies demonstrated the effectiveness of a commercially available seed protectant in preventing injury from acetamide herbicides in switchgrass and big bluestem establishment. If field studies support this same conclusion, warm season grass growers may have a new tool for herbicide control of annual grasses that will not harm the switchgrass and big bluestem being established.

Table 1. Plant response to acetamide herbicide and seed safener in greenhouse in 2004.

	Emergence at 27 DAP[a] (plants/flat)		Height at 27 DAP[a] (inches)		Height at 53 DAP[a] (inches)		Vigor[b] at 53 DAP[a]		Biomass at 53 DAP[a] (grams fresh wt.)	
	Switchgrass	Big Bluestem	Switchgrass	Big Bluestem	Switchgrass	Big Bluestem	Switchgrass	Big Bluestem	Switchgrass	Big Bluestem
Herbicide Rate										
0	35	50	9.9	9.4	45	27	1	1	18.9	17.9
1X	27	48	4.5	8.4	17	17	4	4	4.7	7.1
2X	14	42	2.4	8.5	11	20	7	4	4.2	8.8
3X	12	43	1.5	8.1	5	19	8	4	0.4	9.5
significance[c]	0.001	0.1	0.001	n.s.	0.001	0.05	0.001	0.001	0.001	0.01
Safener										
w/o	14	40	3.4	8.4	16	19	6	4	6.5	8.6
w/	29	51	5.8	8.8	23	22	4	3	7.6	13.0
significance[c]	0.001	0.01	0.0001	n.s.	0.001	0.001	0.001	0.001	n.s.	0.001
Interaction										
Herbicide Rate X Safener										
significance[c]	0.1	n.s.	0.001	n.s.	0.01	0.05	0.01	0.1	n.s.	n.s.

[a]DAP = days after (7/29/2004) planting

[b]1=most vigorous, 9=least vigorous

[c]n.s. = not significant (P>0.1)

Figure 1.

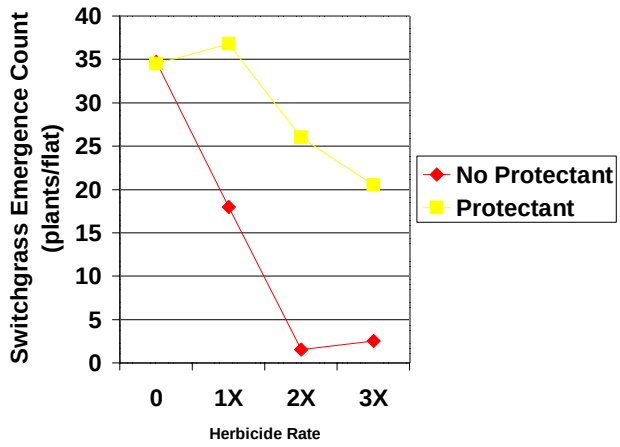


Figure 2.

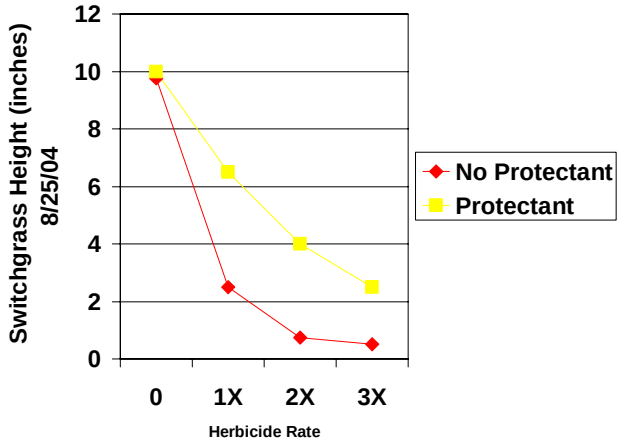
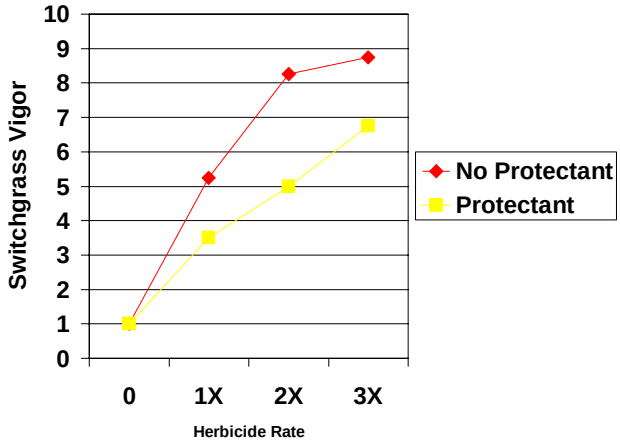


Figure 3.



1=most vigorous, 9=least vigorous

Figure 4.

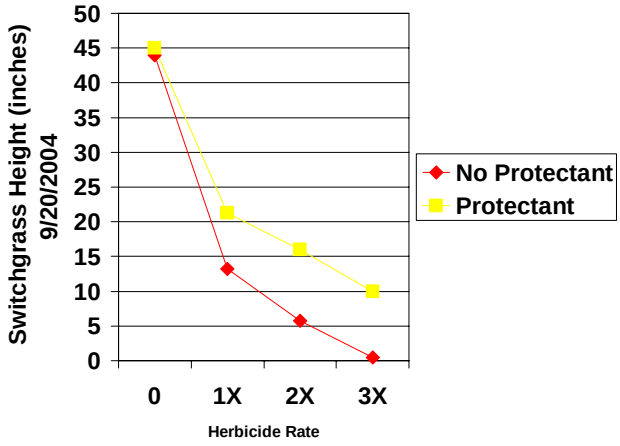
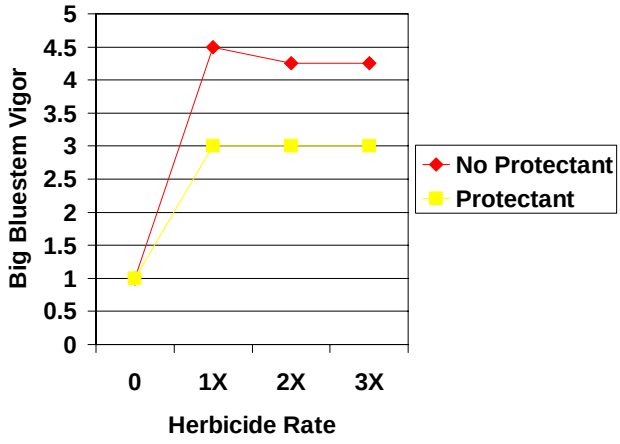
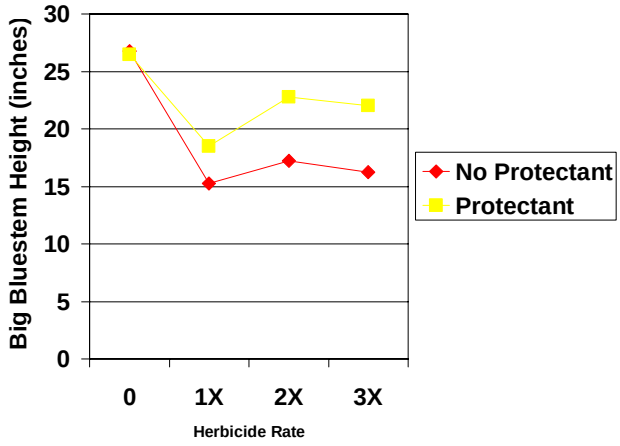


Figure 5.



1=most vigorous, 9=least vigorous

Figure 6.



FOREST IMPROVEMENT AND WINDBREAK TECHNOLOGY

Forestland accounts for up to 30 percent of the agricultural land in Michigan. Considerable emphasis has been placed on establishing, maintaining, and improving forestland in Michigan. Several NRCS conservation programs encourage these practices.

In addition to forestland, trees and shrubs are used in windbreaks, riparian areas, filter strips, and wildlife corridors. Windbreak planting is practiced on almost all soil types within the PMC service area.

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 is not as well understood as establishment in upland soils.

Study No. MIPMC-T-0404-BU
Windbreaks in Muck Soils

Background Huron County in North Central Ohio has a significant area of muck soil. Called Celeryville Marsh, this area is known for its vegetable production. But wind erosion threatens the soils and their productivity. In the past farmers removed nearly all the trees to expand their fields and because the trees exhibited undesirable characteristics. Now windbreaks are needed to provide protection to this valuable soil. Renewed interest in establishing windbreaks has created a demand for information on which species will perform best and be accepted by farmers. Desirable characteristics include rapid growth, sufficient height for wind erosion protection, longevity, little breakage, low maintenance, and limited spread.

Description of Study Plant species were selected and evaluated for establishment and survival in windbreaks on muck soils. A series of "tall" species and a series of "short" species were planted in replicated plots to determine the effectiveness of those species as windbreak components.

Materials and Methods Twelve tree or shrub species were evaluated for effectiveness as windbreaks. "Tall" plants included arborvitae, hybrid crabapple, bald cypress, pin oak, and austree willow. "Short" plants included privet, silky willow, silky dogwood, highbush cranberry, Sargent's crabapple, black chokeberry, and lilac.

The Rose Lake Plant Materials Center provided 'Affinity' arborvitae, Riverbend Germplasm silky willow, 'Magenta' hybrid crabapple, 'Indigo' silky dogwood, and

Leelanau Germplasm highbush cranberry. Ohio DNR and OARDC provided the other species needed for the study.

OARDC planted the species in randomized, replicated field plots during spring 2004. The species will be evaluated annually for growth characteristics and general windbreak effectiveness.

Results Observations on first year performance are provided in Table 1. Quantitative data collection is planned for 2006.

Table 1. First year performance of tree and shrub species at OARDC, Huron County, OH.		
Species	Overall Performance[1]	Comments[2]
"Affinity" Arborvitae	C	"major problem" with lifting out of soil (heaving) observed
"Riverbend" Silky Willow	B	
Bald Cyprus	F	95% dead. Variously attributed to chemical applications, winter heaving, and possible animal damage
Pin Oak	A-	Very slight problem with heaving in of muck soil
Austree Willow	A+	Fast grower
"Cheyenne" Privet	A+	
"Magenta" Crabapple	B	
"Silky" Dogwood	B	Plants only slightly heaved and slightly leaning
"Leelanau" Highbush Cranberry	C	Will have to be reestablished due to heaving
"Roselow" Sargent's Crabapple		No plants survived after initial spring planting
Black Chokeberry	A-	Slow grower
"Legacy" Late Lilac	A-	3 of 15 plants out of soil and had to be replanted
[1]Evaluators used "old school grade card" scale for overall performance [2]Observations were made and recorded on 29 Mar 2005.		

Study No. MIPMC-T-0301-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 successful in Indiana, Ohio, Wisconsin, Illinois, and Missouri. The practice is generally recognized as an effective alternative to planting hardwood tree seedlings. Direct seeding of hardwoods is currently a cost-shared component in of USDA conservation programs in some states. There is little current research or written information specific to Michigan for establishing or enhancing hardwood stands by direct seeding.

Description of Study A selection of hardwood tree and shrub species was planted by direct seeding in 2003. A second study was established in 2003 and 2004. Plots are being evaluated for emergence, survival, and plant growth characteristics for up to five years.

Procedure Seeds of seven heavy mast and seven light mast hardwood tree and shrub species were planted in field studies at the Rose Lake Plant Materials Center. (Species are listed in Table 1.) Planting dates were May 2003 and November 2003 in the first study. Planting density was approximately 4500 seeds/acre for each species. Soil in the test area is Boyer sandy loam or loamy sand. Each species was:

1) broadcast on tilled soil, followed by dragging and cultipacking;
2) drilled in rows (rows 1.5 ft apart, seeds 8-in spacing within rows) in tilled soil, followed by cultipacking; and
3) drilled in rows (rows 1.5 ft apart, seeds 8-in spacing within rows) in non-tilled soil, followed by cultipacking

Separate heavy mast and light mast studies were established each with three replications 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 fertilizer or irrigation was applied. Stands were evaluated in 2003, 2004, and 2005. Plants were counted in rows in the drilled plots and by a transect method in the broadcast plots.

A second study was established with plantings in fall 2003 and spring 2004 and with seeds drilled into tilled and non-tilled soil. Each treatment combination was planted in rows 1.5 ft apart with 8-in seed spacing within rows (43560 seeds per acre). There were three replications in a randomized complete block design. Species were pignut hickory (*Carya glabra*), shellbark hickory (*Carya laciniosa*), bitternut hickory (*Carya cordiformis*), common winterberry (*Ilex verticillata*), and sugar maple (*Acer saccharum*).

Results Significant stand differences were observed in the heavy mast species (Table 1). Stands of larger-seeded species, planted in the fall, and drilled (vs. broadcast) generally exceeded the grand mean of 545 plants per acre. Stands of smaller-seeded species (i.e.,

black cherry), planted in the spring and broadcast (vs. drilled) generally were below the grand mean. Plant heights of broadcast plants are shown in Table 2A.

The grand mean of light mast species was 8 plants per acre (Table 3). Only 3 of the 7 planted species were observed in the stand count and no broadcast-planted trees were observed.

Results of the second study (Table 4) corroborated findings of the first study: Fall-plantings and heavier, larger mast seeds fare better than spring-plantings and lighter, smaller mast seeds.

Discussion Droughty soil and growing season conditions (summer of 2003) may have reduced the emergence of seedlings, especially for light-seeded species which were planted at a shallow, but appropriate depth. Fall planting dates give seeds the advantage of the earliest possible start to the growing season and an opportunity to extend roots deeper into the soil before summer heat and drought begin.

Drilled seed has the advantage of relatively accurate and consistent seed depth. Broadcast seeding produces a more natural plantation but a random seed depth; some will be deeper than ideal depth and some will be on the soil surface and subject to drying and consumption by seed-eating mammals and birds.

The trend in forest regeneration is toward increasing rates of trees planted per acre. A comparison of normal tree seedling planting practice shows that direct seeding can result in a higher number of seedlings per acre compared to seedling planting. A common seedling tree planting rate is 436 per acre (10-ft X 10-ft spacing). Acceptable survival for many purposes is 80% or about 350 seedlings per acre. Table 2 shows that several direct seeded species and techniques equaled or exceeded the typical seedling tree planting rates and survival expectations.

Although an economic analysis was not included in this study, it would appear that direct seeding could be accomplished at lower costs per acre than many tree seedling plantations. Because direct seeding can result in higher numbers of seedlings per acre the cost per established seedling may be much lower with direct seeding than with seedling tree planting.

Table 1. Species planted in first direct seeding tree and shrub study in 2003.

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*	*Viburnum dentatum / Viburnum 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. Stand of heavy mast species in first study as evaluated in July 2005.

	Northern Red Oak	White Oak	Scarlet Oak	Bur Oak	Black Walnut	Black Cherry	Shagbark Hickory
	---------- plants/acre and (percent of seeds planted)----------						
Spring '03 Till Drill	450 (10%)	30 (1%)	270 (6%)	900 (20%)	105 (2%)	0 (0%)	0 (0%)
Spring '03 No-till Drill	270 (6%)	195 (4%)	240 (5%)	885 (20%)	0 (0%)	0 (0%)	60 (1%)
Fall '03 Till Drill	1650 (37%)	480 (11%)	540 (12%)	1005 (22%)	2775 (62%)	60 (1%)	2580 (57%)
Fall '03 No-till Drill	1575 (35%)	270 (6%)	840 (19%)	720 (16%)	2115 (47%)	0 (0%)	1950 (43%)
Spring '03 Broadcast	405 (9%)	45 (1%)	0 (0%)	390 (9%)	0 (0%)	0 (0%)	0 (0%)
Fall '03 Broadcast	420 (9%)	30 (1%)	0 (0%)	540 (12%)	405 (9%)	30 (1%)	705 (16%)

Grand Mean = 546 (12%)

$LSD_{0.05}$ = 153 (3%) (between or among any entries in table)

Planting Density=4500 seeds/acre

Table 2A. Plant heights of heavy mast species in first study as evaluated in July 2005.							
	Northern Red Oak	White Oak	Scarlet Oak	Bur Oak	Black Walnut	Black Cherry	Shagbark Hickory
	----------inches----------						
Spring '03 Broadcast	8-12	6-8	n.a.	4-6	n.a.	n.a.	n.a.
Fall '03 Broadcast	3-6	4-6	n.a.	4-6	12-20	4-6	4-6
n.a. = not applicable. No plants observed.							

Table 3. Stand of light mast species in first study as evaluated in July 2005.							
	Viburnum spp.	Staghorn Sumac	Green Ash	White Ash	Red Maple	Silver Maple	White Birch
	---------- plants/acre and (percent of seeds planted)----------						
Spring '03 Drill Till	0	0	0	0	0	0	0
Spring '03 Drill No-till	33 (0.7%)	0	33 (0.7%)	0	0	0	0
Fall '03 Drill Till	33 (0.7%)	0	0	0	0	133 (3.0%)	0
Fall '03 Drill No-till	33 (0.7%)	0	0	0	0	67 (1.5%)	0
Spring '03 broadcast	0	0	0	0	0	0	0
Fall '03 broadcast	0	0	0	0	0	0	0
Grand Mean=8 (0.2%)							
$LSD_{0.05}$=15 (0.3%) (between or among any entries in table)							
Planting Density=4500 seeds/acre							

Table 4. Stand in second study as evaluated in July 2005.					
	---------- percent of seeds planted ----------				
	Pignut	Shellbark	Bitternut	Winterberry	Sugar Maple
Fall 2003 Drill Till	23	60	27	0	0
Spring 2004 Drill Till	3	41	11	5	0
Fall 2003 Drill No –till	38	64	49	4	0
Spring 2004 Drill No-tilled	10	27	11	4	0
Grand Mean=18					
$LSD_{0.05}$=8 (between or among any entries in table)					
Planting Density=43560 seeds/acre					

Study No. MIPMC-P-0402-WO
Direct Seeding of Northern Red Oak (*Quercus rubra*)

Background Beech bark disease causes significant defect and mortality in American beech (*Fagus grandifolia*). The disease results when bark, attacked and altered by the beech scale (*Cryptococcus fagisuga*) is invaded and killed by fungi, primarily *Nectria coccinea* var. *faginata*, and sometimes *N. galligena*.

Beech bark disease is becoming a serious pest in the Eastern Upper Peninsula (UP) and in the West Central Lower Peninsula of Michigan, threatening to destroy the beech component of these forests and spread throughout Michigan. Though not a prized wood for timber, American beech is an important heavy mast crop for wildlife. In some areas of Michigan, particularly the Eastern UP, it is the only heavy mast crop available to bear, turkey, deer, and grouse. Much interest has been generated in replacing beech as it dies off with red oak, since it is the hardiest and most northerly growing of the black oak group. There has been some discussion of whether direct seeding might be a reasonable alternative to transplanting.

Materials and Methods Side-by-side comparisons of direct-seeded and transplanted Northern red oak (*Quercus rubra*) were established in the Eastern UP in 2004. Site selection was based on proximity of broken canopy and open sunlight so oak seedling performance could be evaluated in both environments.

Acorns and seedlings were supplied by the Rose Lake PMC to cooperators representing nine sites in the Upper Peninsula. Suggested field design was a row of 100 red oak acorns to be planted next to a row of 25 red oak seedlings with three rows of each treatment per test site. Broken canopy and open sunlight sites were to be paired and in close proximity. Acorns were to be planted 1.5-in deep (2 times the diameter of the acorn) approximately 1 ft apart within a row with rows spaced 5 ft apart. Seedlings were to be spaced 4 ft apart within a row with rows spaced 5 ft apart.

Planting date was in spring 2004. Data were collected in 2004 and 2005 and will be collected again in 2006 on oak survival and average plant height. Data were also to be collected on other species that establish in the test site, including species name, density, and height.

Results and Discussion Survival and height data, recorded in August or October of the second year following spring establishment, are presented in Table 1. Survival and height generally appeared greater in transplants than direct-seeded plants. Differences in response to broken canopy vs. open sunlight were not apparent.

Little or no increase in plant height was observed since the previous year (2004 data not shown), perhaps due to the dry summer. Apparent increases in population of directed-seeded trees since the previous year (2004 data not shown) may be attributable to the difficulty of finding the little, newly-emerged seedlings in the first year.

Design differences among the eight locations rendered them not amenable to an across-all-sites statistical analysis.

Table 1. Second year performance of direct seeded and transplanted northern red oak in Michigan's Upper Peninsula. 2005.

Location	Site Description	Treatment[a]	Survival (%)[b]	Height (inches)[b]
Luce County (site 1)	Broken canopy opening, northern hardwood stand	Direct Seeding	91	4
		Transplant	100	9
Luce County (site 2)	Edge open meadow, east side	Direct Seeding	40	4
		Transplant	86	8
Luce County (site 3)	Edge open meadow, west side	Direct Seeding	25	3
Luce County (site 4)	Edge open meadow, lower elevation	Direct Seeding	60	4
		Transplant	95	9
Luce County (site 5)	Broken canopy opening, aspen clear cut	Direct Seeding	82	3
		Transplant	67	8
Luce County (site 6)	open meadow	Direct Seeding	40	4
		Transplant	83	8
Luce County (site 7)	Broken canopy opening, aspen	Direct Seeding	38	4
Mackinac County (Northern Timberland Ventures site)	old pasture reverting back to forest. sandy loam	Direct Seeding	31	4
		Transplant	77	9

[b]survival and height rated 17 Aug 2005 (Luce County) and 2 Oct 2005 (Mackinac County)

NATIVE PLANT SPECIES TO ENHANCE WILDLIFE HABITAT

With controversy surrounding non-native species, particularly in undomesticated settings, 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.

Problem Availability of Great-Lakes area native plant species for wildlife use is limited.

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

- originate from the Great Lakes/corn belt
- have good survival, vigor, and seed and foliage production
- have documented wildlife benefit
- meet the criteria for non-invasive plants

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 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 This study plans calls for assembly and evaluation of *Desmodium spp*. and selection of 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 eight states and 16 MLRAs, and assembled at the Rose Lake Plant Materials Center. Each accession was grown in the greenhouse for preliminary observation the following year. In 1990, forty 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.

Anticipated Releases 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 with additional plants added to those fields in 2004 and 2005.

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

APPENDIX A

RELEASED MATERIAL

'Affinity' (*Thuja occidentalis*) Northern White Cedar
Released: 1993 (FY1993)
Accession Number: 9005060 (PI Number: 477011)
Release Type: cultivar
Plant Origin: native
Collection Location: Pulaski Co., IN
Plant Type: tree
Plant Duration: perennial
Propagation: seed
Uses: field and farmstead windbreaks, screen or border planting in urban situations, and winter browse

Icy Blue Germplasm (*Elymus canadensis*) Canada Wildrye
Released: 2004 (FY2004)
Accession Number: 9084347
Release Type: tested germplasm
Plant Origin: native
Collection Location: LaPorte County, IN
Plant Type: cool season grass
Plant Duration: perennial
Propagation: seed
Uses: restoration, wildlife cover, and erosion control

'Imperial' (*Populus canadensis* Moench var. *eugenei* (Simon-Louis) Schelle) Carolina Poplar
Released: 1979 (FY1979)
Accession Number: Mich-88 (PI Number: 432347)
Release Type: cultivar
Plant Origin: introduced
Collection Location: Rice Co., MN
Plant Type: tree
Plant Duration: perennial
Propagation: vegetative
Uses: windbreaks (especially around orchards) and pulpwood

'Indigo' (*Cornus amomum*) Silky Dogwood
Released: 1982 (FY1982)
Accession Number: 9031863 (PI Number 468117)
Release Type: cultivar
Plant Origin: native
Collection Location: Clinton Co., MI
Plant Type: shrub
Plant Duration: perennial
Propagation: seed or vegetative
Uses: single row windbreak under center pivot irrigation, field and farmstead windbreak, soil bioengineering, and wildlife food

'Lancer' (*Lathyrus latifolius*) Perennial Pea
Released: 1984 (FY1984)
Accession Number: (PI Number 477009)
Release Type: cultivar
Plant Origin: naturalized
Collection Location: MI
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 var. americanum*) Highbush Cranberry
Released: 1999 (FY1999)
Accession Number: 9031863
Release Type: selected
Plant Origin: native
Collection Location: Leelanau Co., MI
Plant Type: shrub
Plant Duration: perennial
Propagation: vegetative
Uses: windbreaks (especially on wet or organic soils) and wildlife habitat

'Magenta' (*Malus sp.*) Hybrid Crabapple
Released: 1990 (FY1990)
Accession Number: 9005032
Release Type: cultivar
Plant Origin: introduced
Collection Location: Clinton Co., MI
Plant Type: tree
Plant Duration: perennial
Propagation: seed
Uses: small tree for single row windbreaks & beautification

Prairie View Indiana Germplasm (*Andropogon gerardii* Vitman) Big Bluestem
Released: 2005 (FY2005)
Accession number: 9086588
Release Type: Selected
Plant Origin: Native
Collection Location: Indiana
Plant Type: warm season grass
Plant Duration: perennial
Propagation: seed
Uses: wildlife food/cover, erosion control, increased species diversity, and native environment restoration

Prairie View Indiana Germplasm (*Schizachyrium scoparium* (Michx.)) Little Bluestem
Released: 2005 (FY2005)
Accession number: 9086577
Release Type: Selected
Plant Origin: Native
Collection Location: Indiana
Plant Type: warm season grass
Plant Duration: perennial
Propagation: seed
Uses: wildlife food/cover, erosion control, increased species diversity, and native environment restoration

Prairie View Indiana Germplasm (*Sorghastrum nutans* (L.) Nash) Indiangrass
Released: 2005 (FY2005)
Accession number: 9086566
Release Type: Selected
Plant Origin: Native
Collection Location: Indiana
Plant Type: warm season grass
Plant Duration: perennial
Propagation: seed
Uses: wildlife food/cover, erosion control, increased species diversity, and native environment restoration

Riverbend Germplasm (*Salix sericea*) Silky Willow
Released: 2003 (FY2003)
Accession Number: 9069052
Release Type: tested
Plant Origin: native
Collection Location: Daviess County, IN
Plant Type: shrub
Plant Duration: perennial
Propagation: vegetative
Uses: streambank/shoreline restoration and riparian corridors

'Roselow' (*Malus sargentii*) Sargent's Crabapple
Released: 1978 (FY1978)
Accession Number: 9005026 (PI Number: 477986)
Release Type: cultivar
Plant Origin: introduced
Collection Location: Japan
Plant Type: tree
Plant Duration: perennial
Propagation: seed
Uses: farm and field windbreaks

Southlow Germplasm (*Andropogon gerardii*) Big Bluestem
Released: 2001 (FY2001)
Accession number: 9084510
Release Type: Source Identified
Plant Origin: Native
Collection Location: Southern Lower Michigan
Plant Type: warm season grass
Plant Duration: perennial
Propagation: seed
Uses: wildlife cover filter strips

Southlow Germplasm (*Panicum virgatum*) Switchgrass
Released: 2001 (FY2001)
Accession number: 9084512
Release Type: Source Identified
Plant Origin: Native
Collection Location: Southern Lower Michigan
Plant Type: warm season grass
Plant Duration: perennial
Propagation: seed
Uses: wildlife food/cover, erosion control, increased species diversity, and native environment restoration

Southlow Germplasm (*Schizachyrium scoparium*) Little Bluestem
Released: 2001 (FY2001)
Accession number: 9084511
Release Type: Source Identified
Plant Origin: Native
Collection Location: Southern Lower Michigan
Plant Type: warm season grass
Plant Duration: perennial
Propagation: seed
Uses: wildlife food/cover, erosion control, increased species diversity, and native environment restoration

Southlow Germplasm (*Sorghastrum nutans*) Indiangrass
Released: 2001 (FY2001)
Accession number: 9084513
Release Type: Source Identified
Plant Origin: Native
Collection Location: Southern Lower Michigan
Plant Type: warm season grass
Plant Duration: perennial
Propagation: seed
Uses: wildlife food/cover, erosion control, increased species diversity, and native environment restoration

APPENDIX B

CUSTOMER ASSISTANCE SUMMARY

The Rose Lake Plant Materials Center recorded 77 customer assists during FY 2005. Time spent per assist ranged from 10 minutes to 4 hours. Assistance was provided to individuals and groups. Partners and government agencies receiving assistance included:

ABC 53 News
Apostle Island National Lakeshore
Bay Mills Community College
Ft. Custer Military Training Center
Huron Potawatomi Indian Tribe
Indiana DNR
Jasper-Pulaski Fish & Wildlife Center
Little Superior Band of Odawa Indians
Michigan DNR
MI Dept. of Agriculture
Michigan State University
Ohio State University
Saginaw Chippewa Indian Tribe
Syngenta Corporation
University of Michigan
VA Medical Center
WKZO Farm Television

The Rose Lake Center created 23 publications and made 21 presentations during 2005. Presentations were to groups ranging to 150 people (e.g., NRCS All-Employee Meeting and Picnic on 17 August 2005).

APPENDIX C

2005 WEATHER

Table 1. Temperature and precipitation near Rose Lake PMC for 2005 growing season.[1]

	May	June	July	Aug	Sept	Oct
Average Daily Maximum (°F)	64.9	82.7	84.4	81.9	77.7	62.0
Average Daily Minimum (°F)	39.2	57.5	58.4	56.5	48.2	37.6
Precipitation (in)	1.15	2.34	2.80	3.19	4.25	0.40

[1]Data based on records from Michigan State University Muck Research Farm in Laingsburg, MI, about 3 miles from Rose Lake PMC. Data available on-line at http://www.agweather.geo.msu.edu/mawn/

Summary Compared to long-term averages for nearby weather stations (St. Johns, MI and Owosso, MI), Rose Lake PMC was:

cooler and dryer in May,
warmer and dryer in June,
cooler in August,
wetter in September, and
cooler and dryer in October.

Long-term temperature and precipitation data is not available from the Michigan State University Muck Research Farm in Laingsburg, MI.