Rose Lake
Plant Materials Center
2010 Technical Report

East Lansing, Michigan

USDA-NRCS Rose Lake Plant Materials Center
7472 Stoll Road
East Lansing, MI 48823

http://plant-materials.nrcs.usda.gov/mipmc/
Center Phone: 517-641-6300
Center Fax: 517-641-4421

Plant Materials Specialist Phone: 517-641-7831
Plant Materials Specialist Cell: 517-281-5939
Plant Materials Specialist Fax: 517-641-4421

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USDA-NRCS ROSE LAKE PLANT MATERIALS CENTER

Center Staff
John Leif, Manager
John Durling, Agronomist
Sergio Pérez, Biological Sciences Technician
Elaine Gerona, Office Automation Assistant
Gail Bischoff, Biological Aide

Plant Materials Specialist
David W. Burgdorf

Central Region Materials Specialist
Joel L. Douglas

National Program Leader
John M. Englert

State Conservationist Advisory Committee
Garry Lee, Chair, Michigan
Jane Hardisty, Indiana
Terry J. Cosby, Ohio
Patricia Leavenworth, Wisconsin
William J. Gradle, Illinois
Astor F. Boozer, New York
Denise Coleman, Pennsylvania

State Plant Materials Committees

Indiana
Ken Collins, Ch.
Dave Burgdorf, Adv.
John Leif, *ex officio*
Kelley Barkell
Barry Fisher
Susan Grivas
Adam Heichelbech
Susannah Hinds
Jo Hodgett
Brian Ingmire
Ellen Jacquart
Brianne Lowe
Jim Norris
Doris Scully
Vic Shelton
Dave Stratman
Jenny Vogel
Shannon Zezula

Wisconsin
Greg Rebman, Ch.
Dave Burgdorf, Adv.
John Leif, *ex officio*
Matt Blohowiak
Brian Briski
Ryan Galbreath
Elizabeth Gillen
Pattie Haack
Brian Hillers
Terry Kelly
Tom Melnarik
Phil Meyer
Pat Murphy
Mike Patin
Brian Pillsbury
Merrie Schamberger
Jason Thomas
Robert Weihrouch
Michele Wilkinson

Michigan
Andy Henriksen, Ch.
James Scott, Adv.
Dave Burgdorf, Adv.
John Leif, Adv.
Karen Blair
Jerry Davis
Stacy Kimble
Demarys Mortenson
Carol Schadd
Thomas Tauzer
Jennifer Taylor
James Williams

Ohio
MaryAnn Core, Ch.
Dave Burgdorf, Adv.
Mike Laughrey, Adv.
John Leif, *ex officio*
Matt Duncan
Nicholas Lee
Jonathan Mauk
Mark Reynolds
Mark Scarpitti
Gina Schworm

Introduction

Rose Lake Plant Materials Center (RLPMC) was established in 1958 on a 40-acre site at the Michigan Department of Natural Resources, Rose Lake Wildlife Research Station (42.798° North, 84.414° West, 875 ft ASL) 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.

Rose Lake PMC is part of a network of 27 Plant Materials Centers serving all 50 states and territories. It serves Indiana, Michigan, Ohio, Wisconsin, and portions of Illinois, New York, and Pennsylvania. The mission, purpose, goals, and objectives of the Plant Materials Program as stated in the National Plant Materials Manual and provided below.

Mission The mission of the NRCS Plant Materials Program (PMP) is to develop, test, and transfer plant science technology to meet customer and natural resource needs. Natural Resources Conservation Service PMP activities are consistent with the objectives of the current USDA and NRCS Strategic Plans, namely to provide timely and effective vegetative solutions for identified resource needs.

Purpose The purpose of the NRCS PMP is to:

(1) Assemble, test, and release plant materials for conservation use.
(2) Determine techniques for successful use and management of conservation plants.
(3) Facilitate the commercial increase of conservation plants.
(4) Provide for the timely development and transfer of effective applied plant science technology to solve conservation problems.
(5) Promote the use of plant science technology to meet the goals and objectives of the USDA and NRCS Strategic Plans.

Goals and Objectives The PMP revised its Strategic Plan to reflect changes outlined in the 2006-2010 NRCS Strategic Plan. The goals and objectives for the PMP are:

(1) Strategic Goal 1 – Identify and evaluate plants and develop technology for their successful establishment and maintenance to solve natural resource conservation problems.
    - (i) Objective 1.1: Conserve and enhance soil resources with plant science technology.
    - (ii) Objective 1.2: Improve water quality and quantity with plant science technology.
    - (iii) Objective 1.3: Enhance fish and wildlife resources with plant science technology.
    - (iv) Objective 1.4: Identify and develop plants and plant technology to mitigate air quality issues.
(2) Strategic Goal 2 – Provide plant materials and plant technology that are economically feasible for meeting resource concerns.

(i) Objective 2.1: Provide for and promote the commercial production of NRCS plant releases to ensure that adequate seed and plants are available for use in cooperative conservation programs.

(ii) Objective 2.2: Maintain and improve the productivity of agricultural lands and watersheds through plants and plant management technology.

(iii) Objective 2.3: Increase the alternative uses and specialized uses of conservation plant releases to meet emerging needs.

(3) Strategic Goal 3: Provide equal access for all Americans to the PMP.

(i) Objective 3.1: Deliver products and services fairly and equitably.

(ii) Objective 3.2: Promote the products of the PMP through effective communications and program delivery.

(iii) Objective 3.3: Increase the use of plant materials to address issues of human health, safety, and aesthetics.

(iv) Objective 3.4: Make effective use of Internet-based technology to provide customer-focused service.

Long Range Plan Rose Lake PMC operations are guided by a Long Range Plan (LRP) which is a compilation of Plant Materials LRPs from Indiana, Ohio, Michigan, and Wisconsin. The RLPMC LRP was updated and approved by the State Conservationists Advisory Committee in June 2009. The RLPMC LRP is consistent with goals and objectives identified in the NRCS Strategic Plan.

Studies

Study Number	Study Name	Purpose	Year Initiated	Report Page
Supplement to 26I080J	Propagation Methods for Desmodium Species	Release	1987	47
26I124L	Elderberry [(*Sambucus nigra* L. ssp. *canadensis* (L.) R. Bolli]	Release	1997	20
MIPMC-P-0201-CR	Development of a Great Lakes Release of Virginia Wildrye (*Elymus virginicus* L.)	Release	2002	25
MIPMC-P-0204-CR	Development of a Great Lakes Release of Bottlebrush Grass (*Elymus hystrix* L.)	Release	2002	42
MIPMC-P-0207-CR	Evaluation and Release of Riverbank Wildrye (*Elymus riparius* Wiegand)	Release	2007	16
MIPMC-P-0503-WL	Evaluation and Great Lakes Release of American Plum (*Prunus americana* Marsh.)	Release	2005	16
MIPMC-P-0504-WE	Development of a Great Lakes Release of Buttonbush (*Cephalanthus occidentalis* L.)	Release	2005	16
MIPMC-P-0601-CR	Evaluation and Release of Broomsedge Bluestem (*Andropogon virginicus* L.)	Release	2006	16
MIPMC-P-0603-WE	Evaluation and Release of Canada Bluejoint [*Calamagrostis canadensis* (Michx.) Beauv.]	Release	2006	38
MIPMC-P-0706-WL	Evaluation and Release of Coralberry (*Symphoricarpos orbiculatus* Moench)	Release	2006	16
MIPMC-P-0906-PA	Selection and Evaluation of Improved Big Bluestem (*Andropogon gerardii* Vitman) for Use as Forage for Livestock	Release	2009	44
MIPMC-P-0907-RI	Selection and Release of Northern Honeysuckle (*Diervilla lonicera* Mill.)	Release	2009	16
MIPMC-P-0910-PA	Yellow Alfalfa [*Medicago sativa* L. ssp. *falcata* (L.) Arcang.] Release	Release	2009	46
MIPMC-P-0911-WO	Woodland Bluegrass (*Poa sylvestris* A. Gray) Evaluation and Release	Release	2009	16
MIPMC-T-0004-CR	Interagency Agreement Involving Apostle Islands National Lakeshore	Technology	2000	12
MIPMC-T-0701-TE	National Ash (*Fraxinus* spp.) Seed Collection Initiative	Technology	2007	9
MIPMC-T-0704-CP	Cross Pollination Potential of PMC Miscanthus Grass (*Miscanthus sinensis* Andersson)	Technology	2007	22
MIPMC-T-0709-CP	Tall Wheatgrass Biofeedstock Study for Potential Use in Biofuel (Liquid, Thermal, and Thermochemical) Applications in NE, Mid-Atlantic, and Upper Midwestern States	Technology	2009	30
MIPMC-T-0801-WE	Evaluation of Species for Use in Vegetative Treatment Areas as a Component of Residential Sewage Treatment Systems	Technology	2008	54
MIPMC-T-0802-WI	Demonstration Planting of Selected Plants for Use by Native Pollinators	Technology	2008	56
MIPMC-T-0901-WO	Ginger (*Asarum* L.) Evaluation	Technology	2009	41
MIPMC-T-1002-CP	Plant Growth Parameters for Brassicaceous Cover Crops	Technology	2010	26
MIPMC-T-1003-CP	Evaluation of Various Grass Species for Use in Vegetative Barriers	Technology	2010	23

Partnership and Program Development

Rose Lake PMC partners with other federal, state, and local agencies; universities; tribes; and private entities to achieve its missions and goals. Rose Lake PMC is always looking to create new partnerships while strengthening its many existing partnerships. Partnering has two advantages: First, partnering facilitates conservation by garnering the knowledge, skills, and abilities of each agency or group involved. Second, it broadens RLPMC's range of plant and conservation skills thereby widening the customer base and demand. Often partnerships result in *reimbursable agreements* which help in technology development and information gathering for releasing Conservation Plants.

Study No. MIPMC-T-0701-TE
National Ash (*Fraxinus* spp.) Seed Collection Initiative

Ash trees in the RLPMC Service Area are being attacked and destroyed by Emerald Ash Borer [*Agrilus planipennis* (Fairmaire)]. This introduced pest, first detected in summer 2002 in southeastern Michigan, has spread to Illinois, Indiana, Iowa, Kentucky, Maryland, Minnesota, Missouri, New York, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, Wisconsin, and adjacent Canadian provinces.

In response to this impending disaster RLPMC entered into a non-funded cooperative agreement with the USDA Agriculture Research Service (ARS) whereby RLPMC would initiate a seed collection effort and the ARS National Center for Genetic Resource Preservation Center in Ft. Collins, Colorado would store seed in their long-term storage facility. Tribes were specifically mentioned in the agreement because of RLPMC's previous assistance to tribes with black ash and other culturally significant plants.

Approximately 250 samples from collections in 2005-08 were submitted to ARS. These came from California, Colorado, Illinois, Indiana, Maryland, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania, Utah, Virginia, West Virginia, and Wisconsin on non-tribal and tribal lands and were provided by NRCS and District personnel and the general public.

Through a recent modification of the above agreement, approximately 50 additional ash seed samples collected in 2009 (plus several from 2010) were submitted to the US Forest Service for processing and eventual storage with Germplasm Resources Information Network (GRIN).

In 2011 and following the US Forest Service has agreed to receive samples directly from collectors, communicate data recordation needs and collection procedures, and handle processing and archival functions. Attempts are being made to create an auto forward from RLPMC's ash collection website (www.ashseed.org) to a US Forest Service website so that browsers may be apprised of these changes.

Over the last half of decade, in addition to collecting and processing ash seed, RLPMC staff and Plant Materials Specialist Dave Burgdorf made numerous presentations on ash seed to government agencies, tribes, other partners, and the general public. Posters and brochures were

distributed to NRCS Field Offices and other partners. The ash seed collection effort also received popular press and television coverage.

Moreover, in collaboration between RLPMC and Michigan State University, Professor Deb McCullough and her graduate students and post-docs are publishing results of ash borer-related research conducted at RLPMC where a 200 – 300 ash tree plantation had been established in the 1980s. Publications include:

> Mercader, R.J., N.W. Siegert, A.M. Liebhold, and D.G. McCullough. 2011. Estimating the effectiveness of three potential management options to slow the spread of emerald ash borer populations in localized outlier sites. Canadian Journal of Forest Research. In press.
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> Mercader, R.J., N.W. Siegert, A.M. Liebhold, and D.G. McCullough. 2011. Simulating the influence of the spatial distribution of host trees on the spread of the emerald ash borer, *Agrilus planipennis*, in recently colonized sites. Population Biology 53. In press.
>
> Tluczek, A.R., D.G., McCullough, and T.M. Poland. 201X. Influence of host stress on emerald ash borer (*Agrilus planipennis* Fairmaire) (Coleoptera: Buprestidae) adult density, development, and distribution in *Fraxinus pennsylvanica* trees. Environmental Entomology. Submitted.

Memorandum of Understanding for Ft. Custer Vegetative Restoration

Background Fort Custer Training Center (FCTC) in southwestern Michigan is 7,500 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 various 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 RLPMC and the MDMVA was developed for restoration of native vegetation and habitats at Fort Custer. Rose Lake PMC staff has provided consultation and on-the-ground assistance for collection, propagation, establishment, and maintenance of native vegetation. RLPMC assistance with research and selection of proper native vegetation that met the needs of the firing ranges, ammo bunkers, and convoy reaction course areas mutually benefitted MDMVA, FCTC, and NRCS.

Date of Flowering Observations A nursery plantation of native plants collected at FCTC is maintained at RLPMC. Many of these plants are known habitat for important beneficial insects, i.e., pollinators and predators and parasites of crop plants. Figure 1 depicts observed flowering dates of some of these plants.

	May				June				July					Aug				Sept					Oct			
Zizia aurea	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx					
Penstemon digitalis				xxx	xxx	xxx	xxx	xxx	xxxx																	
Tradescantia ohiensis					xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxxx			
Coreopsis lanceolata					xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxxx		
Asclepias exaltata						xxx	xxx	xxx	xxx	xxxx																
Oenothera fruticosa						xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxxx									
Lobelia spicata						xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxxx						
Anemone virginiana							xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Asclepias tuberosa								xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxxx								
Verbena stricta									xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxxx								
Euphorbia corollata									xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxxx						
Monarda fistulosa									xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxxx						
Pycnanthemum virginianum									xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxxx						
Cacalia atriplicifolia										xxx	xxxx															
Teucrium canadense										xxx	xxx	xxx	xxxx													
Desmodium illinoense										xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxxx						
Desmodium obtusum										xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxxx						
Desmodium sessilifolium										xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxxx						
Solidago speciosa										xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxxx	
Vernonia missurica										xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxxx	
Desmodium canadense													xxx	xxx	xxx	xxx	xxx	xxxx								
Lespedeza hirta													xxx	xxx	xxx	xxx	xxx	xxxx								
Agastache nepetoides													xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxxx						
Coreopsis tripteris													xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxxx			
Solidago hispida													xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxxx			
Symphyotrichum cordifolium															xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Symphyotrichum oolentangiense															xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Eurybia macrophylla																	xxx	xxx	xxx	xxx	xxx	xxx	xxxx			

Figure 1. Bloom periods of Ft. Custer Military Training Center native plants when grown at Rose Lake PMC. 2009-10.

Interagency Agreement between NRCS Plant Materials Program
and National Park Service – Apostle Islands National Lakeshore
Agreement Number: F614008N470
As Component of Study No. MIPMC-T-0004-CR

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

The National Park Service entered into several reimbursable agreements with NRCS and RLPMC to provide technical assistance, to assist with collecting and growing plants, and to develop propagation protocols. Under an interagency agreement between NRCS Plant Materials Program and National Park Service, grass, forb, and shrub species were selected for propagation based upon plant material availability, viability, and site adaptability for the intended use.

Current Efforts During the summer of 2009 Park Service staff collected seeds and/or vegetative materials from beachgrass (*Ammophila breviligulata*), bearberry (*Arctostaphylos uva-ursi*), crinkled hairgrass (*Deschampsia flexuosa),* Canada mayflower (*Maianthemum canadense*), blueberry (*Vaccinium angustifolium* or *myrtilloides*), wild rose (*Rosa blanda*), juniper (J*uniperus communis*), huckleberry (*Gaylussacia baccata*), blue-bead lily (*Clintonia borealis*) and Bunchberry dogwood (*Cornus canadensis*) and sent them to RLPMC. Rose Lake PMC staff developed and implemented propagation protocols. Approximately 5,700 plants were delivered in Conetainers® to the Park Service in 2010 with additional plants to be delivered later. Remaining vegetatively propagated beachgrass was planted into a polycross block at the Plant Materials Center for further testing. Seed propagation protocols are summarized in Table 1.

Table 1. Evaluation of germination protocol for seed of Apostle Island native plants. 2009-10.

	Treatment	Scarification	Stratification	Seedling Emergence (%)	
Bearberry (*Arctostaphylos uva-ursi* (L.) Spreng.)	1	H_2SO_4 soak for 3 hr	90 day warm (30°C) followed by 120 day cold (4°C)	results pending completion of study	
	2	H_2SO_4 soak for 3.5 hr	90 day warm (30°C) followed by 120 day cold (4°C)	results pending completion of study	
	3	H_2SO_4 soak for 4 hr	90 day warm (30°C) followed by 120 day cold (4°C)	results pending completion of study	
	4	H_2SO_4 soak for 7 hr	90 day warm (30°C) followed by 120 day cold (4°C)	results pending completion of study	
Canada mayflower (*Maianthemum canadense* Desf.)	Treatment	Scarification	Stratification	Germination (%)	
				Accession 9086886	Accession 9086895
	1	None	30 day cold (4°C)	1	0
	2	None	60 day cold (4°C)	2	54
	3	None	90 day cold (4°C)	29	0
Blueberry (*Vaccinium angustifolium* Aiton or *V. myrtilloides* Michx.)	Treatment	Scarification	Stratification	Seedling Emergence and Survival after 14 Days (%)	
	1	None	60 day cold (4°C)	0	
	2	None	90 day cold (4°C)	0	

Table 1 cont'd.				
Juniper (*Juniperus communis* L.)	Treatment	Scarification	Stratification	Seedling Emergence (%)
	1	None	60 days warm (30°C) followed by 60 days cold (4°C) followed by 60 days warm (30°C) followed by 60 days cold (4°C)	results pending completion of study
	2	H_2SO_4 soak for 30 min	60 days warm (30°C) followed by 60 days cold (4°C) followed by 60 days warm (30°C) followed by 60 days cold (4°C)	results pending completion of study
	3	H_2SO_4 soak for 30 min	60 days cold (4°C) followed by 60 days warm (30°C) followed by 60 days 60 days cold (4°C)	results pending completion of study
Huckleberry (*Gaylussacia baccata*)	Treatment	Scarification	Stratification	Seedling Emergence (%)
	1		30 days warm (30°C) followed by 60 day cold (4°C)	0
	2		30 days warm (30°C) followed by 90 day cold (4°C)	0
Blue-bead lily *Clintonia borealis*)	Treatment	Scarification	Stratification	Seedling Emergence (%)
	1	None	90 days warm (30°C) followed by 90 day cold (4°C)	0
	2	None	60 days warm (30°C) followed by 120 day cold (4°C)	0
	3	H_2SO_4 soak for 30 min	60 days warm (30°C) followed by 90 day cold (4°C)	0
	4	None	75 days warm (30°C) followed by 105 day cold (4°C)	0

Table 1 cont'd.				
Bunchberry dogwood (*Cornus canadensis* L.)	Treatment	Scarification	Stratification	Germination (%)
	1	H_2SO_4 soak for 1 hr	90 days warm (30°C) followed by 90 day cold (4°C)	44
	2	None	45 days warm (30°C) followed by 140 day cold (4°C)	56
	3	None	60 days warm (30°C) followed by 150 day cold (4°C)	0

Plant Material Collections

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

Study No. MIPMC-P-0503-WL
Evaluation and Great Lakes Release of American Plum (*Prunus americana* Marsh.)

Study No. MIPMC-P-0504-WE
Development of a Great Lakes Release of Buttonbush (*Cephalanthus occidentalis* L.)

Study No. MIPMC-P-0601-CR
Evaluation and Release of Broomsedge Bluestem (*Andropogon virginicus* L.)

Study No. MIPMC-P-0706-WL
Evaluation and Release of Coralberry (*Symphoricarpos orbiculatus* Moench)

Study No. MIPMC-P-0907-RI
Selection and Release of Northern Honeysuckle (*Diervilla lonicera* Mill.)

Study No. MIPMC-P-0911-WO
Woodland Bluegrass (*Poa sylvestris* A. Gray) Evaluation and Release

The collection, assembly, selection, and release of new plant varieties and/or germplasm are integral to the Plant Materials Program. Every release starts with a collection. To this end RLPMC is in the process of collecting riverbank wildrye, American plum, buttonbush, coralberry, and broomsedge bluestem plant materials from throughout the service area. Details are provided in Table 2.

Table 2. Plant materials collections on-going at Rose Lake PMC in 2010.			
Common name	Scientific name	Description	Collection Location (number of collections received)
Riverbank wildrye	*Elymus riparius* Wiegand	Riverbank wildrye is a native, cool-season, clump-forming perennial grass without rhizomes. It grows from 3 – 4 ft tall, blooms from June to Aug., and produces small seed heads. Seed heads are 3 – 8 in long with two spikelets at each node.	Calhoun Co., MI (1); Fairfield Co., OH (1); Morgan Co., OH (1); Sheboygan Co., WI (1)
American plum	*Prunus americana* Marsh.	American plum is a native, small tree. It is found in thickets, borders of woods, streambanks, floodplains, and fencerows. Flowers are white and 5-petaled. The one inch drupe is stone-seeded and red to yellow. The fruit is palatable to wildlife and humans. *Prunus americana* is closely related to *P. nigra*, Canadian plum.	Henderson Co., IL (1); Hillsdale Co., MI (1); Clinton Co., MI (1); Wood Co., OH (1); Madison Co., OH (1); Pickaway Co., OH (1); Ashland Co., WI (4); Bayfield Co., WI (1); Dane Co., WI (2); Fon du Lac Co., WI (1); Green Co., WI (1); Madison Co., OH (1); Sheboygan Co., WI (3)
Buttonbush	*Cephalantus occidentalis* L	Common buttonbush is a native, multi-stemmed wetland shrub. Mature plant is up to 12 ft tall. White flowers in spherical clusters form one-inch diameter button-like seed heads. Dark green, glossy, deciduous foliage is opposite or whorled.	Monroe Co., IN (1); Washington Co., IN (1); Noble Co., OH (2); Dane Co., WI (1); LaCrosse Co., WI (3)
Broomsedge bluestem	*Andropogon virginicus* L.	Broomsedge bluestem is native to Rose Lake RLPMC service areas. It is a warm-season, herbaceous, perennial bunch grass that begins its growth when the average daytime temperature is between 60° to 65° F. It benefits wildlife, is ornamental, and has potential conservation application. It is found on low fertility soils and prevents erosion where similar warm-season grasses cannot be found. It is grazed readily by cattle in spring and early summer, but decreases rapidly in forage quality and palatability with advancing maturity.	Pike Co., OH (1)
Coralberry	*Symphoricarpos orbiculatus* Moench	Coralberry is a native, perennial shrub. It is 2 to 7 ft tall with egg-shaped, oppositely arranged leaves. Once established, it reproduces by lateral stems up to 4 ft long that root and grow in a cluster. Its common name is from its rich, red, coral-colored fruit that persist late into the winter and its specific scientific name is for the shape of the berries (i.e., oribiculatus means round).	Marion Co., IN (1)

Table 2 cont'd.			
Northern Honeysuckle	*Diervilla lonicera* Mill.	Northern honeysuckle (*Diervilla lonicera* Mill.), also known as dwarf bush-honeysuckle, is a low growing shrub native to Michigan and adjoining states. It tolerates coarse and medium soils but does not tolerate anaerobic conditions. Northern honeysuckle can survive in soil with pH ranging from 4.8 – 7.0. It has showy flowers that may be attractive to pollinators, and fruit that may be valuable to wildlife.	collection notice issued in 2010
Woodland Bluegrass	*Poa sylvestris* A. Gray	Woodland bluegrass is a native perennial grass that grows about 2-3 feet tall sending up several unbranched culms. Each culm terminates in a panicle of spikelets about 4 – 8 inches long. This grass prefers dappled sunlight to light shade, moist to mesic conditions, and a rich loamy soil. Most vegetative growth occurs during the spring. It is adapted to coarse and medium textured soils but is not well adapted to fine textured soils. Woodland bluegrass is shade tolerant and tolerant to anaerobic conditions, but is not drought tolerant. The plant blooms in mid-spring and seed production is complete by early – midsummer. There is no known commercial seed source for this species.	collection notice issued in 2010

Plants for Stabilization of Streambanks and Shorelines

Soil bioengineering is the art and applied science that uses dormant 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 Lakes states and Midwest. 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 sediment, nitrates, and phosphates deposition and increased 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 states and Midwest 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. 26I124L
Elderberry [(*Sambucus nigra* L. ssp. *canadensis* (L.) R. Bolli]

Plant Description Elderberry is an upright, native shrub, growing 4–12 ft tall. Stems are covered with numerous, small lenticels and have white pith. Leaves are opposite with 5–11 coarse-toothed, elliptical leaflets. Numerous ¼ in fragrant white flowers emerge from late June into August borne in flat-topped, terminal clusters. The clusters measure 4–10 in across. Fruit is purple to black with crimson juice. Each berry contains 3-5 small seeds. Seed dispersal occurs from July to October, usually through ingestion by birds and mammals. There are about 230,000 seeds per pound.

This shrub is widespread and abundant. Elderberry occupies well-drained, slightly acid soil bordering streams, and the adjacent bottomlands, but also grows on gray forest soils and muck. American elder grows best in full sunlight. Once established, elderberries soon outcompete other herbs. Thickets of elderberry are replaced by more shade-tolerant species during the later stages of forest succession, but individual plants and small runners will persist under a forest canopy.

Evaluation and Release Thirty-one collections of common elderberry were assembled from five states. Dormant vegetative cuttings from each collection were planted in the greenhouse to establish plants for field testing. In 1998 plants from the greenhouse were placed in replicated field experiments in Michigan for a 3-year evaluation of survival, vigor, plant height and width, disease resistance, and flower abundance.

Data collected from the RLPMC trial indicated that Accession 9084126 (identified as *Sambucus nigra* L. ssp. *canadensis* (L.) R. Bolli in August 2009 by Alan Prather, Director of the Michigan State University Herbarium) had excellent growth characteristics for height, canopy density, spread, fruit abundance, and regrowth after pruning. Rose Lake PMC named and released accession 9084126 as Vintage Germplasm common elderberry as a selected ecotype in August of 2010. This publication is anticipated:

> Leif J.W., J.C. Durling, and D.W. Burgdorf. 201X. Notice of release of Vintage germplasm common elderberry: a selected class of natural germplasm. Native Plants Journal. Submitted.

Vintage Germplasm common elderberry is intended for use in streambank and shoreline stabilization. It can be used for enhancement of riparian corridors and provide food and shelter for wildlife. The anticipated area of use of Vintage Germplasm is within the Great Lakes region and upper mid-west United States, which is well within the species' range.

Vegetative material of this release will be maintained by the USDA-NRCS RLPMC, East Lansing, Michigan, and is available in limited quantities to interested parties for increase purposes.

Plants for Vegetative Barriers

Conservation buffers are areas or strips of land maintained in permanent vegetation to help control pollutants and manage other environmental problems. Grassed waterways (NRCS 412 Standard) and vegetative barriers (NRCS 601 Standard) are two of 10 conservation practices commonly thought of as buffers.

A grassed waterway with vegetated filter system is a natural or constructed vegetated channel that is shaped and graded to carry surface water at a nonerosive velocity to a stable outlet that spreads the flow of water before it enters a vegetated filter. However, this land-area extensive practice is sometimes dismissed in lieu of periodic filling and reshaping of the eroded area.

Vegetative barriers, a less land-area extensive conservation practice, can be a viable alternative to grassed waterways and other conservation practices. Vegetative barriers are narrow, permanent strips of stiff stemmed, erect, tall, dense perennial vegetation established in parallel rows and perpendicular to the dominant slope of the field. They are designed to reduce sheet and rill erosion, reduce ephemeral gully erosion, manage water flow, stabilize slopes, and trap sediment.

Vegetative barriers should:

- Include noninvasive, desirable plants
- Exhibit excellent erosion control qualities
- Not impede normal farming operations
- Be easy to maintain
- Remove as little land from production as possible

Rose Lake PMC has been working for more than 15 years with miscanthus grass (*Miscanthus sinensis* Andersson) as a planting for vegetative barriers. Miscanthus has performed extremely well in the field managing water flow, stabilizing slopes, and trapping sediment; removing very little land from production; easing farming through concentrated flow areas; emerging through sediment and resuming growth from buried nodes; remaining intact and erect year around; and providing immediate functionality when installed as sod strips.

Miscanthus growth and development has been excellent at RLPMC and at reporting locations in several states. However, the production of viable miscanthus seed in central Ohio and elsewhere has corroborated concern about possible unwanted spread. Rose Lake PMC has taken these approaches to addressing concerns about possible unwanted spread: an on-center study (MIPMC-T-0704-CP) is being conducted to determine potential for *Miscanthus sinensis* to cross pollinate and form viable seed and suitability of non-miscanthus species for vegetative barriers is being investigated.

Study No. MIPMC-T-0704-CP
Cross Pollination Potential of PMC Miscanthus Grass (*Miscanthus sinensis* Andersson)

Description An accession of *Miscanthus sinensis* that has been tested through the Rose Lake PM Program is being grown in close proximity to other accessions to determine the potential for the RLPMC accession to cross pollinate with another population and form viable seed.

Status of Knowledge *Miscanthus sinensis* (miscanthus grass, Chinese silvergrass) is a perennial bunchgrass that has been used in landscaping across the United States for many years. It has stiff stems and forms a strong root system, which makes it a good candidate for use in conservation practices such as Vegetative Barriers (NRCS 601 Standard). Some miscanthus grass populations have been shown to produce viable seed and invade areas where not desired. The miscanthus accession that has been tested at RLPMC has not demonstrated the ability to produce viable seed after 15 years of testing. Some miscanthus populations are known to be male-sterile, and some references state that miscanthus cannot complete its life cycle when grown in northern states.

Materials and Methods Miscanthus from RLPMC, a miscanthus from Indiana known for seed production potential, and five commercially available miscanthus varieties were established in an outside miscanthus crossing block at RLPMC in spring 2009. Field plot design was RCB with four replicates. Each replicate had two plants of each variety in 4 ft^2 area. An additional two plants of Rose Lake miscanthus were entered in each replicate also in a 4 ft^2 area. Plots were observed weekly and survival, height, and anthesis date were recorded. Mature seedheads from the Michigan miscanthus were harvested and seeds were separated and sent to the Kansas Crop Improvement Laboratory for tetrazolium testing.

Miscanthus from RLPMC was provided to the Ohio Seed Improvement Association in 2009. It was planted in a field planting near Columbus, OH. Pollination bags were placed over selected plants to isolate flowers from outside pollen sources. Seeds from these plants were sent to the Kansas Crop Improvement Association for tetrazolium testing. Seeds from non-bagged seed heads were also submitted for testing.

Results and Discussion Differences in plant height and anthesis date were observed (Table 3). Michigan miscanthus flowered later (17 Oct) than others except *Miscanthus sinensis* 'Morning Light' (which flowered only in one replicate and that in November). Tetrazolium testing showed 0% viability of the Michigan miscanthus. Other miscanthuses were not tested.

At the Ohio location seeds collected from the bagged Michigan miscanthus seed heads had viable seed, suggesting that Michigan miscanthus may have the potential to self pollinate. Further testing will be necessary to determine whether such is the case.

Table 3. Miscanthus plant height and anthesis date at Rose Lake PMC. 2010		
Accession	Height on 26 Aug 2010 (ft)[1]	Mean date of first anthesis[1]
Miscanthus sinensis 'Autumn Red Flame Grass'	2.6 d	7 Sep 2010 a
Miscanthus sinensis (Indiana Accession 9086651)	3.7 c	8 Oct 2010 cd
Miscanthus sinensis (Michigan entry #1)	4.8 b	17 Oct 2010 d
Miscanthus sinensis (Michigan entry #2)	4.8 b	17 Oct 2010 d
Miscanthus sinensis var. *gracillimus*	7.3 a	30 Sep 2010 bc
Miscanthus sinensis 'Morning Light'	2.8 d	3 reps did not flower[2]
Miscanthus sinensis 'Super Stripe'	3.8 c	30 Sep 2010 bc
Miscanthus sinensis 'Zebra Grass'	4.3 bc	24 Sep 2010 b
[1]Means with the same letter within the same column do not differ significantly at $LSD_{(0.05)}$		
[2]Not included in ANOVA.		

Study No. MIPMC-T-1003-CP
Evaluation of Various Grass Species for Use in Vegetative Barriers

Objective This study is intended to measure growth and development of several grass species (i.e. miscanthus, switchgrass, and prairie cordgrass). Data collected will be used to evaluate plants for use in vegetative barriers and to supplement data used by RUSLE2 (Revised Universal Soil Loss Equation, Version 2) and other conservation planning tools.

Various grasses have been evaluated for use in vegetative barriers. Ease of establishment, longevity, stem density and stiffness, competitiveness with crop, resistance to herbicides used on crops, and ability to emerge through sediment or to resume growth from buried stem nodes are characteristics that are important for plant utilization in vegetative barriers.

Procedure Separate field experiments were designed and established for growth measurement and for response to soil deposition. Table 4 shows species entered in both experiments and Table 5 shows parameters to be measured. Most parameters shown in Table 5 were measured in 2010 for baseline purposes. Observations will continue in 2011. These traits have been evaluated for several species in various locations, but not in Michigan for miscanthus (*Miscanthus sinensis* Andersson var. gracillimus Hitchc.) switchgrass (*Panicum virgatum* L. 'Northwind' and Panicum virgatum L. 'Heavy Metal'), and prairie cordgrass (*Spartina pectinata* Bosc ex Link).

Table 4. Species established in growth measurement and soil deposition study at Rose Lake PMC. 2010.
Miscanthus sinensis Andersson var. *gracillimus* Hitchc.
Panicum virgatum L. 'Heavy Metal'
Panicum virgatum L. 'Northwind'
Spartina pectinata Bosc ex Link

Table 5. Parameters to be measured in Evaluation of Various Grass Species for Use in Vegetative Barriers at Rose Lake PMC.	
Growth Measurements	Soil Deposition
Plant height @ 30 day intervals	Plant height @ flowering and season end
Stems/plant @ flowering and season end	Stems/plant @ flowering and season end
Plant height @ flowering	Stem diameter @ flowering and season end
Canopy width @ season end	Canopy width @ season end
Seed head height @ season end	Seed head height @ season end

Cover Crops and Conservation Cover

Cover crops are legumes, grasses, or other herbaceous plants established for seasonal cover and other conservation purposes. Cover crops protect the soil from erosion during vulnerable times, e.g., after harvest in the fall through establishment of crop in the spring.

Organic and sustainable farming systems are especially reliant on cover crops for soil fertility and pest management. Legume cover crops capture nitrogen from the air. Cover crops capture nitrogen and release it as the cover crop decays. Weeds are suppressed and disease cycles are broken with appropriate timing. Cover crops may also provide supplemental forage for grazing or harvesting.

Study No. MIPMC-P-0201-CR
Development of Great Lakes Composite of Virginia Wildrye (*Elymus virginicus* L.)

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 Lakes states and Midwest.

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 at RLPMC and elsewhere. Based` on for survival, vigor, plant density, height, lodging resistance, disease and insect damage, seed production, and germination as observed in plots established in 2002, 2003, and 2005 “finalists” were selected.

Seed from original collections as available and seed collected from plots were used to start plants in the greenhouse 23-24 Feb 2010. Seedlings were transplanted to Conetainers® then to field plots on 25 May 2010 in a randomized design with four replicates.

Continuing Observations Field data collection will resume in 2011.

MIPMC-T-1002-CP
Plant Growth Parameters for Brassicaceous Cover Crops

Background Cover crops may be grown during or between primary cropping seasons. They are not grown primarily for harvest; rather, to benefit the environment or other crops. Benefits of cover crops include reduced fertilizer and pesticide costs, improved yields by enhancing soil health, soil erosion prevention, water quality protection, and soil moisture conservation. *Brassica* and *Raphanus* spp. have been used as cover crops following small grain harvest. In addition to soil erosion prevention, several of these species have been shown to reduce soil compaction and reduce nematode populations.

Brassicaceous species [e.g. *Brassica* spp. (mustard, rape, and turnip) and *Raphanus sativus* (oilseed radish)] have been evaluated as cover crops planted after small grain harvest to provide protection from soil erosion and a host of other benefits. This study is intended to measure the growth and biomass production of several *Brassica* and *Raphanus* spp. The data collected will be used to supplement data used by RUSLE2 and other conservation planning tools.

Conservation planning tools, such as RUSLE2, require plant growth measurements to accurately predict the conservation effects of plants. Little plant growth data for *Brassica* and *Raphanus* spp. are available. This project is intended to provide data for RUSLE2 and/or other conservation planning tools.

This brassicaceous cover crop evaluation is being conducted in collaboration with colleagues at the Michigan State University Kellogg Biological Station Cover Crops Program and the USDA-NRCS Central National Technology Support Center and the modelers and conservation planning tool developers which they represent.

Experimental Design and Plot Establishment Oats were drilled in April 2010 in a 1¼ acre field. Broadleaf weeds were controlled with herbicide. Potash was applied at 30 lbs/acre K_2O per soil test recommendation and N at 60 lbs/acre in a split application (½ in June and ½ after oat harvest). Oats were harvested in August and straw was incorporated with multiple tillage operations. Plots (10 ft X 30 ft for each treatment) were laid out with four replicates to minimize within block soil variation. Brassicaceous cover crops were drilled on 13 Aug at rates shown in Table 6 and watered to maintain optimum growth conditions. A post emergence herbicide was used to control volunteer oats.

Table 6. Entries in brassicaceous cover crop plant growth trial at Rose Lake PMC. 2010.	
Entry	Seeding Rate (lbs/acre)
Oilseed Radish: Groundhog	10
Oilseed Radish: Defender	10
Oilseed Radish: Daikon VNS Lot# LMR6	10
Oilseed Radish: Daikon Nema Common	10
Oilseed Radish: Daikon Midwood	10
Oilseed Radish: Driller	10
Oilseed Radish: GS-733	10
Oilseed Radish: IR-14	10
Oilseed Radish: CISEXPCOL	10
Oilseed Radish: CISEXPNZS	10
Oilseed Radish: CISEXPMBS	10
Oilseed Radish: CISEXPLITH	10
Tillage Radish	10
Forage Turnip: PASJA	2
Forage Turnip: APPIN	2
Mustard: Pacific Gold - Mighty Mustard	8
Mustard: Ida Gold	8
Mustard: White – Accent	8
Mustard: Brown	8
Rapeseed: Dwarf Essex	5

Data Collection These parameters were measured beginning 27 Aug and continuing at 15-day intervals through 9 Nov (6 harvest dates):

- Stand count
- Percent cover
- Flower presence
- Length or height and maximum diameter (roots and stems)
    - Root
    - Leaf canopy
    - Stem when present below leaves (e.g. mustard)
    - Above ground taproot when heaved (e.g. oilseed radish)
- Biomass (constant weight at 60° C)
    - Below ground
    - Stem when present below leaves (e.g. mustard) or taproot when heaved (oilseed radish)
    - Leaf
- N and ash composition of above (12 Oct only)

Plans are being made to determine the effect of the brassicas on yield of a subsequent rotational crop by growing such on same site in 2011.

Results The 2011 RLPMC Technical Report will report results. Other possible means of results dissemination include technical notes, Extension bulletins, posters and papers at scientific and producer meetings, and support databases for RUSLE2 and other conservation planning tools.

Plants as Bioenergy Sources

With the increased concern over dwindling reserves of known fossil fuels and possible global climate change has come commensurate interest in plant biomass as an energy source. Interest in bioenergy plants for their role in carbon sequestration is also increasing.

The National Plant Materials Program Strategic Plan calls for increased alternative uses and specialized uses of conservation plant releases to meet emerging needs (Objective 2.3, 2006 – 2011 Plan). Further, it suggests collaboration by the Plant Materials Program with external agencies to develop bioenergy technology. The following meets Strategic Plan objectives in both its research application and collaborative approach.

Study No. MIPMC-T-0709-CP
Tall Wheatgrass Biofeedstock Study for Potential Use in Biofuel (Liquid, Thermal, and Thermochemical) Applications in NE, Mid-Atlantic, and Upper Midwestern States

Multistate Final Report

Evaluation of Tall Wheatgrass for Use as a Biofuel Feedstock in Cool Season Grass Regions of the US

James Briggs[1/], P. Salon[2/], J. Leif[3/], J. Durling[3/], L. St. John[4/], D. Tilley[4/], A. Young – Matthews[5/], C. Smith[5/], H. Plumb[6/], J. Williams[7/], R. Ugiansky[8/], H. Dial[9/], M. Rosales[9/], R. Hybner[10/], M. Stannard[11/]

Abstract

Switchgrass (*Panicum virgatum* L.) and other warm season species have high potential as a biofuel feedstock in much of the Midwestern and southern United States, but have limited application in areas dominated by cool season grasses. Tall wheatgrass (*Thinopyrum ponticum* [Podp.] Z.-W. Liu & R.-C. Wang) is a perennial cool-season bunchgrass with potential as a species of interest for biofuel production, but limited information exists on comparative biomass production of existing cultivars managed as a single, late season harvest. The objective of this study was to comparatively evaluate four commercially available cultivars of tall wheatgrass , 'Jose', 'Alkar', 'Largo', and 'Szarvasi-1', for potential use as a biofuel crop in the cool season grass ecosystems of the United States. Study locations were at USDA-NRCS Plant Material Centers (PMCs) in Arizona, California, Washington, Idaho, Colorado, Michigan, Montana, New York, and Maryland. Established in 2007 data from the study was collected in 2008 and 2009 from plots receiving minimal production inputs. Dry matter yield and mineral analyses characterized performance among entries. Biomass yields at the California PMC site were the highest among all testing sites and averaged 4.5 – 6.8 tons/acre with no significant difference ($P < 0.05$) between cultivars. Seeding rates of 8, 20, and 40 lbs PLS per acre did not affect total biomass yields. Szarvasi-1 had the highest biomass yields and highest percentage of lignin at maturity, as well as the lowest percentage of ash and potassium. Tall wheatgrass appears to have the greatest potential as a large biomass producer in Mediterranean type climate's representative of central California.

1/ James Briggs, Plant Materials Specialist. USDA-NRCS West Region Technology Support Center, Portland, OR.
2/ P. Salon, Plant Materials Specialist. USDA-NRCS Big Flats Plant Materials Center, Big Flats NY.
3/ J. Leif, Manager, and J. Durling, Agronomist. USDA-NRCS Rose lake Plant Materials Center, East Lansing, MI.
4/ L. St. John, Manager, and D. Tilley, Range Scientist. USDA-NRCS, Aberdeen Plant Materials Center, Aberdeen, ID.
5/ C. Smith, Agronomist, and A. Young-Matthews, Agronomist. USDA-NRCS Lockeford Plant Materials Center, Lockeford, CA.
6/ H. Plumb, Range Conservationist. Upper Colorado Environmental Plant Center, Meeker, CO.
7/ J. Williams, Manager. USDA-NRCS Corvallis Plant Materials Center, Corvallis, OR.
8/ R. Ugiansky, Agronomist. USDA-NRCS National Plant Materials Center, Beltsville, MD.
9/ M. Rosales, Manager, and H. Dial, Asst. Manager. USDA-NRCS Tucson Plant Materials Center, Tucson, AZ.
10/ R. Hybner, Agronomist. USDA-NRCS Bridger Plant Materials Center, Bridger, MT.
11/ M. Stannard, Manager. USDA-NRCS Pullman Plant Materials Center, Pullman, WA.

Introduction

Switchgrass and other warm season species have high potential as a biofuel feedstock in much of the Midwestern and southern US, but have limited application in areas of the northeast and large portions of the western US dominated by cool season grasses (McLaughlin 2009). Tall wheatgrass is a perennial, decaploid (2n=70) (Asay and Jensen 1996) cool-season bunchgrass from southern Europe and Asia Minor. The species has a rapid growth rate with a mature height of 5 feet. Tall wheatgrass is well adapted to areas receiving a minimum of 15 inches of precipitation at elevations between 4500-6500 feet. The species is frequently grown in the intermountain West and northern Great Plains of North America (Asay and Jensen 1996). Tall wheatgrass may have potential as a species of interest for biofuel production due to its adaptation to a wide range of soil textures and soil conditions including those that are highly alkaline or saline, large biomass yields, and commercially available cultivars (Vogel and Moore, 1998). There are an estimated 75,320 seeds/lb. Tall wheatgrass is known for high seedling vigor and a slow rate of spread via seed (USDA-NRCS, 2006).

Hungarian researchers reported a tall wheatgrass cultivar, Szarvasi-1 (Agricultural Research Development Institute), as having good yield and quality characteristics for biofuel production. Alkar is adapted to USDA Plant Hardiness Zone (PHZ) 5 and Largo and Jose are adapted to PHZ 4. Alkar is tolerant to wet conditions and is later maturing than Largo and Jose. Although it performs best in areas having greater than 15 inches precipitation per year, tall wheatgrass responds well to irrigation both in areas with high precipitation and in areas with low precipitation (Lauriault et al., 2002).

Aase and Pikul (1995) investigated tall wheatgrass as a vegetative barrier for control of wind erosion in the Northern Great Plains and reported heights of 4 feet and erect stems throughout the winter months which also provide wildlife cover and nesting habitat. The grass remained upright over the winter months in trials at Big Flats, NY. Tall wheatgrass matures later than other cool season grasses. This characteristic is desirable in a biofuel system where maximizing biomass production is the desired goal and obtainable with a single harvest after the grass matures (Lauriault et al., 2002). Yields of tall wheatgrass under simulated grazing in different climates and with various fertilizer and irrigation treatments have resulted in large variability in reported yields. In Bushland, TX, Jose yielded 5.0 tons/acre (Lauriault et al., 2002). In Los Lunas, NM (Lauriault et al., 2002) 5.8 tons/acre were reported with applications of 128 lb/acre actual N, while at the same location only 2.1 tons/acre was reported with a split application of 203 lb/acre of total N. A study in Tucumcari, NM reported maximum yearly yields of 2.0 tons/acre with irrigation and split application of 148 lb/acre N (Lauriault et al., 2002). Yields of 5.8 tons/acre are consistent with high management yields of other cool season grasses (Moser 1996).

The objective of this study was to comparatively evaluate biomass production and biofuel quality estimates of Alkar, Largo, Jose, and Szarvasi-1 for potential use as a biofuel feedstock in the cool season grass ecosystems of the western and northeastern United States.

Materials and Methods

Tall wheatgrass cultivars Jose, Szarvasi-1, Alkar, and Largo were established at the Arizona, Idaho, Oregon, Washington, Colorado, Montana, Michigan, Maryland, and New York PMCs. Study entries were seeded into plots arranged in a randomized complete block (RCB) design. Plots were planted at 8 PLS pounds per acre at the Arizona, California, Colorado, Idaho, Montana, Oregon and Washington PMCs, and 20 and 40 PLS pounds per acre at the New York, Michigan, and Maryland PMCs. PMCs installed 4 – 6 replicates of each entry in plots 8-16 feet wide and 20 feet long. Row spacing was 6-12 inches within plots, depending on available equipment.

PMCs managed plots to maintain recommended levels of P and K based on soil tests. Nitrogen was applied at a rate of 100 lb/acre as ammonium nitrate or ammonium sulfate, or urea at the 3rd leaf stage in the spring of each growing year. Weeds were controlled through the duration of the study, and irrigation water applied as needed to supplement average rainfall. Total amounts or irrigation water applied was not monitored. Plots were harvested at maturity at all locations. A grab sample was collected for dry matter determination, fiber and mineral content.

Mineral and fiber analyses were performed by Dairy One Forage Testing Laboratory, Ithaca, NY using standard techniques. Samples provided by the participating PMCs were analyzed for a wide range of constituents including dry matter (crude protein, acid detergent fiber, neutral detergent fiber, TDN, lignin, total ash) and a series of mineral analysis (P, K, Ca, Mg, S, Fe, Mn, Zn, Cu, B). PMCs additionally noted percent stand and any problems (disease, insects, and nutrient problems) which may have adversely impacted production.

Results and Discussion

None of the tall wheatgrass cultivars included in this trial survived the first summer at Tucson, AZ. At other locations all tall wheatgrass cultivars established and grew well. Plots installed at the Washington PMC site located in Prosser, WA had initially good establishment, but were removed in 2008 due to other priorities of the land owner.

First year (2008) results (data not shown) indicated that Largo and Alkar were the best performing entries among tall wheatgrass entries in both stand establishment and vigor. Biomass yield ranged from 1.6 -2.0 tons/acre among tall wheatgrass entries with no entry having significantly better yields at all locations. Szarvasi-1 performance was generally ranked poorer than the other tall wheatgrass entries, although this may be due to the poor quality of the seed (germination less than 50%) received for this trial.

Results from 2009 show biomass yield among tall wheatgrass entries varying by location (Table 7), however in most locations mean dry matter yield was well below the average yield expected of switchgrass (USDA, 2009), the premier biofuel feedstock. The California location was the exception. Biomass reported at Lockeford was twice the biomass yields recorded at other PMCs. When averaged over locations tall wheatgrass cultivars Szarvasi-1 and Largo tended to produce the most biomass (3.2 tons/acre).

No significant differences ($P \leq 0.05$) in yield among cultivars were observed at the California, Colorado, Maryland, or New York PMC trials in 2009. In Idaho and Montana, Largo and Jose had significantly higher yield than Alkar and Szarvasi-1. The Idaho and Montana PMCs were the driest sites, which may indicate that Szarvasi-1 and Alkar had less drought tolerance than Largo and Jose. In Michigan, Szarvasi-1 had significantly higher yields than Alkar, Largo, and Jose. In Oregon Szarvasi-1, Jose, and Largo had significantly higher yields than Alkar. Seeding rates had no effect on total mean dry matter yield. Montana PMC yields by seeding rate were not included in the data analysis.

At all sites tall wheatgrass did not yield substantial amounts of biomass until the second growing season (Table 7). Fiber and minerals analyses for all entries were comparable to switchgrass grown in southern Iowa (Lemus, 2002). Analysis showed that chemical attributes of N, K, Ca, S, Cl among all entries were within ranges that would not present operational concerns if the tall wheatgrass is cut at time of maturity and used for direct combustion to generate energy (Tables 8-11) (Lewandowski and Kicherer1997).

Table 7. Yields of Alkar, Largo. Jose, Szarvasi-1 tall wheatgrass cultivars at Plant Material Centers 2009.

Cultivar	California PMC	Colorado PMC	Idaho PMC	Maryland PMC	Michigan PMC	New York PMC	Montana PMC	Oregon PMC	Mean Yield
	----------Tons/acre----------								
Szarvasi-1	6.9 a[1/]	3.1 a	0.8 b	3.1 a	2.7a	4.8 a	0.9 a	3.6 a	3.2
Largo	6.2 a	4.3 a	1.2 a	2.9 a	2.0 b	4.4 a	1.1 a	3.2 a	3.2
Alkar	5.3 a	3.4 a	0.8 b	3.0 a	2.0 b	4.4 a	0.9 a	2.4 b	2.8
Jose	4.5 a	3.4 a	1.2 a	3.2 a	1.9 b	4.6 a	1.1 a	3.4 a	2.9
Mean	5.7	3.6	1.0	3.1	2.2	4.6	1.0	3.2	

[1/] -Different lower case letters after the mean yield WITHIN a column indicate significant differences at the $P \leq 0.05$ level.

Table 8. Mean chemical composition values of Alkar tall wheatgrass harvested from the California, Colorado, Idaho, Michigan, and Montana PMCs during 2009.

Cultivar	NDF[1/]	ADF[1/]	Lig[1/]	Ash	N	K	Cl	S
	----------Percent (%)----------							
California	73.0	44.7	5.4	6.5	1.2	1.9	0.2	0.2
Colorado	68.0	40.8	7.4	6.1	1.1	0.8	0.1	0.1
Idaho	82.0	50.1	6.3	6.3	0.6	0.9	0.4	0.1
Michigan	78.6	47.0	5.9	4.8	1.4	1.6	0.2	0.1
Montana	73.7	46.2	5.7	5.1	0.8	1.1	0.1	0.1
Mean	75.1	45.8	6.1	5.8	1.0	1.3	0.2	0.1

[1/] - NDF = neutral detergent fiber; ADF = acid detergent fiber; Lig = lignin

Table 9. Mean chemical composition values of Jose tall wheatgrass harvested from the California, Colorado, Idaho, Michigan, and Montana PMCs during 2009

Cultivar	NDF[1/]	ADF[1/]	Lig[1/]	Ash	N	K	Cl	S
	----------Percent (%)----------							
California	70.7	44.3	6.0	6.2	1.0	1.6	0.2	0.2
Colorado	68.4	42.4	7.6	6.2	1.1	0.6	0.1	0.2
Idaho	77.3	52.4	8.1	6.7	0.6	0.9	0.4	0.1
Michigan	78.0	47.6	6.2	4.2	1.4	1.4	0.2	0.1
Montana	76.8	44.5	5.1	4.7	0.7	1.0	0.1	0.1
Mean	74.2	46.2	6.6	5.6	1.0	1.1	0.2	0.2

[1/] - NDF = neutral detergent fiber; ADF = acid detergent fiber; Lig = lignin

Table 10. Mean chemical composition values of Largo tall wheatgrass harvested from the California, Colorado, Idaho, Michigan, and Montana PMCs during 2009

Cultivar	NDF[1/]	ADF[1/]	Lig[1/]	Ash	N	K	Cl	S
	----------Percent (%)----------							
California	73.1	45.2	5.5	6.6	1.0	2.0	0.2	0.2
Colorado	70.6	43.8	6.8	5.8	1.0	0.6	0.1	0.3
Idaho	82.0	50.1	6.3	5.9	0.6	0.9	0.4	0.1
Michigan	78.4	47.2	5.2	4.6	1.4	1.6	0.2	0.1
Montana	75.4	46.2	5.7	5.7	0.8	1.1	0.1	0.1
Mean	75.9	46.5	5.9	5.7	1.0	1.2	0.2	0.2

[1/] - NDF = neutral detergent fiber; ADF = acid detergent fiber; Lig = lignin

Table 11. Mean chemical composition values of Szarvasi-1 tall wheatgrass harvested from the California, Colorado, Idaho, Michigan, and Montana PMCs during 2009

Cultivar	NDF[1/]	ADF[1/]	Lig[1/]	Ash	N	K	Cl	S
	----------Percent (%)----------							
California	71.3	48.4	6.9	5.6	1.1	1.5	0.2	0.2
Colorado	70.2	43.8	7.2	6.0	1.0	0.6	0.1	0.1
Idaho	75.9	51.9	7.2	5.9	0.5	0.9	0.4	0.1
Michigan	81.7	50.7	5.8	4.4	1.3	1.5	0.1	0.2
Montana	73.2	45.0	7.3	4.1	0.7	1.0	0.2	0.1
Mean	74.5	48.0	6.9	5.2	0.9	0.9	0.20	0.1

[1/] - NDF = neutral detergent fiber; ADF = acid detergent fiber; Lig = lignin

Conclusions

Although Szarvasi-1 established much slower than the other tall wheatgrass entries in this study and biomass yields were not significantly greater than the other tall wheatgrass entries its yields trended higher in the second year. Szarvasi-1 may also be better suited as a biofuel feedstock than the other tall wheatgrass entries due to its higher lignin content and lower percentage of ash and potassium.

Based on biomass yields in these trials tall wheatgrass appears to offer the best potential as an energy crop in the Mediterranean type climate of California. Yields elsewhere, while adequate for pasturage, would likely require substantial inputs to obtain yields adequate for energy production.

Additional trials of Szarvasi-1 and Largo should be conducted in the Mediterranean climatic region to evaluate establishment speed using higher quality seed, biomass production potential under low, intermediate, and high management intensities. Additionally, biomass production potential should be evaluated under higher levels of soil salinity and alkalinity to evaluate the potential of using tall wheatgrass as an alternative energy crop on salt affected lands determined unsuitable for more traditional crops.

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Plants for Wetland Restoration

Wetlands are transitional areas between terrestrial and fully aquatic ecosystems. They include swamps, marshes, and bogs. Wetlands perform many important functions: They improve water quality by trapping nutrients such as nitrogen and phosphorous, toxic substances, and disease-causing microorganisms. They slow and intercept runoff, protect shorelines and banks from erosion, and protect upland areas from floods. Wetlands also provide valuable habitat for wildlife.

Problem Historically, humans have made large-scale efforts to drain wetlands for development or to flood them for use as recreational lakes. Since the 1700s the US has lost 50% of its wetlands. With this loss and degradation of wetlands comes:

- decreased water quality
- lost wildlife habitat
- increased flooding
- less groundwater recharge
- diminished recreational opportunities and aesthetics

Need In order for wetlands to be restored and for new wetlands to be created, information related to plant species establishment and management is required and plant material must be made available. Rose Lake PMC has assembled and is testing Canada bluejoint [*Calamagrostis canadensis* (Michx.) Beauv.] to address this need.

Study No. MIPMC-P-0603-WE
Evaluation and Release of Canada Bluejoint [*Calamagrostis canadensis* (Michx.) Beauv.]

Background Canada bluejoint grows in dense tufts 1.5 – 5 ft tall, typically in meadows, bogs, and wet thickets or as an understory plant in open, wet woods. Seed heads are open and nodding during flowering, becoming somewhat contracted as the seed ripens. Each flower has a small tuft of hair at the base. The foliage and stem are comparatively soft and lax. This grass gets its name from the bluish-purple stem nodes and slender, bluish leaves. Leaf blades have a rough surface. The roots have numerous creeping rhizomes. The seed heads are purplish-green during flowering. Mature seed is smooth, yellow-brown, ellipsoid, and about 1/16 inch long. Bluejoint is perennial and native to much of the US except the Gulf Coast states. *C. canadensis* is a widely variable species.

Description A collection of Canada bluejoint was assembled from native stands. This material is being evaluated and selected for potential release.

Materials and Methods Native Canada bluejoint from Indiana, Michigan, and Wisconsin was assembled and accessioned. Plants were established from seed in the greenhouse and transplanted into the field. Field plots were established in a wet area in 2006 in LaPorte County, Indiana and at RLPMC with accessions listed in Table 12. Field plots are being evaluated for survival, vigor, disease and insect damage, height, lodging, seed production, and germination over the duration of the study plan.

Data collection at the Indiana plot was discontinued in 2008. This was due to constraints on travel to remote locations and staff time as well as the poor performance at this site of all bluejoint entries.

Table 12. Canada bluejoint accessions established in 2006 in evaluation plots in Michigan and Indiana.

Accession	Origin	Entry Location
9084188	Chippewa County, Michigan	MI
9084330	Pulaski County, Indiana	IN, MI
9084331	White County, Indiana	IN, MI
9084357	Polk County, Wisconsin	IN, MI
9084529	Starke County, Indiana	IN, MI
9086445	Roscommon County, Michigan	MI
9086446	Roscommon County, Michigan	IN, MI
9086529	Ontonagon County, Michigan	IN, MI
9086623	Ontonagon County, Michigan	IN, MI

Results Plant growth data from RLPMC plots is presented in Table 13. In accessions where plants survived in only 2 or 3 replicates, missing values were supplied by Statistix®8's missing value function and analysis of variance was performed with degrees of freedom adjusted.

Height differences among accessions were observed in all years. Tallest accessions were 9084330, 9086445, and 9086446 and shortest was 9086623 (Table 13). Differences were observed in vigor, disease, and lodging in some years. First flowering dates differed among accessions and among years. The latest accession to flower was 9084357. Significant differences were observed in bulk seed yield, but PLS/plot has not been determined.

Data will be collected from the Michigan plots again in 2011.

Table 13. Canada bluejoint plant growth data. Rose Lake PMC.

Accession	Vigor[1]	Disease[1]	Insect Damage[1]	Lodging[1]	Height (ft)[1,2]	First Anthesis Date	Seed yield (g/plot)[3]
	2007- 2010	2007 - 2010	2007-2010	2007-2010	2007 - 2010	2009 – 2010	2009 - 2010
9084188	No significant differences among accessions at 0.05	No significant differences among accessions at 0.05	No observable differences in insect damage	No significant differences among accessions at 0.05	3.0 bc	Early to mid June	No significant differences among accessions at 0.05
9084330					3.7 a	Early to mid June	
9084331					2.8 c	Early to mid June	
9084357					2.8 c	Most did not reach anthesis	
9084529					3.2 abc	Early to mid June	
9086445					3.5 ab	Early to mid June	
9086446					3.6 a	Early to mid June	
9086623					2.0 d	Most did not reach anthesis	
9086529	No plants survived. Not included in ANOVA.						

[1]Evaluated on 16 July 2007, 31 July 2008, 7 July 2009, and on 17 June 2010

[2]Means with the same letter do not differ significantly at $LSD_{(0.05)}$

[3]Harvested on 5 and 13 Aug 2009 and on 12 Aug 2010

Plants of Cultural Significance

Study No. MIPMC-P-0901-WO
Ginger (*Asarum* L.) Evaluation

Background The Bay Mills Indian Community has requested assistance with evaluation and selection of ginger which they consider to have cultural significance.

Plot Layout Observation plots with four plants each of five ginger accessions (Table 14) were established July 2009 at RLPMC in a location with light shade to partial sunlight.

Table 14. Ginger accessions established in 2009 in evaluation plots at Rose Lake PMC.

Accession	Origin
9086800	Lake Victoria, Shiawassee Co., MI
9086801	YMCA, Shiawassee Co., MI
9086802	Owosso River, Shiawassee Co., MI
9086803	Ingham Co., MI
9086873	Iron Co., MI

Observations Canopy spread and cover and canopy height were observed and recorded throughout the growing season (Table 15). However, observation plots were not replicated and randomized so analysis of variance was not run. Wildlife browse was observed in some plots. Observations may continue in 2011.

Table 15. Plant growth observations for ginger at Rose Lake PMC.

Accession	Canopy width (in)[1]	Natural height of canopy (in)[1]
9086800	15	7
9086801	10	4
9086802	7	5
9086803	7	5
9086873	7	5

[1]Observed on 18 Aug 2010.

Plants for 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 regionally-sourced and adapted ecotypes has not kept pace with demand. This is especially true 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 served by RLPMC need commercially available quantities of 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-0204-CR
Development of a Great Lakes Release of Bottlebrush Grass (*Elymus hystrix* L.)

Background Bottlebrush grass is a cool-season, perennial bunchgrass. It may be found growing in moist to dry woods from Nova Scotia to Manitoba in Canada and south to Arkansas and Georgia. Bottlebrush-shaped spikes may 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. Leaf sheaths may be smooth or hairy. Leaf blades may be up to ½-in wide with rough texture. Lemmas have rough, straight awns that reach 1½-in long. Plants grow to 4 ft.

Description of Study A collection of bottlebrush grass was assembled from native stands in Michigan, Indiana, Ohio and Wisconsin. Materials are being evaluated for restoration or revegetation potential as conservation cover or streambank protection in the Great Lakes states and Midwest. Seed from the breeder field will be made available to growers as a selected or tested class release.

Procedures Collections were made from native stands by field staff and partners. Each collection was accessioned and cleaned. Plants from each accession were established in Conetainers® in the greenhouse and transplanted to field sites at RLPMC and in Indiana and Ohio in 2003. Finalists from these locations were established in plots at RLPMC in 2005. Plots were RCB with three replicates evaluated for survival, vigor, plant density, height, lodging resistance, disease and insect damage, seed production, and germination.

Results Based on evaluations of plots established in 2003, "Finalists" (Table 16) were reestablished in plots at RLPMC in June 2005.

Table 16. "Finalist" bottlebrush accessions from plots established in 2003 at RLPMC and in Indiana and Ohio.

Accession	Origin
9084186	Polk Co., WI
9084191	Adams Co., OH
9084360	Polk Co., WI
9084533	Jackson Co., IN
9084535	Jackson Co., IN
9086418	MI

Further Study Seedlings of accessions shown in Table 17 with four additional accessions collected at Ft. Custer in 2007 were started in the greenhouse and transplanted from Conetainers® into a new site with light shade to partial sunlight at RLPMC in 2009. Plot design is RCB with three replicates. A release is anticipated pending results of this study.

Table 17. Bottlebrush plant growth data.

Accession	Origin	Winter survival[1,2] (%)	First anthesis[2]	Seed yield/plot (g)[2]
9084186	Polk Co., WI	85a	14-Jun-2010 c	26.1a
9084191	Adams Co., OH	82a	23-Jun-2010a	7.9a
9084360	Polk Co., WI	82a	23-Jun-2010a	7.1a
9084533	Jackson Co., IN	85a	17-Jun-2010 bc	6.4a
9084535	Jackson Co., IN	79a	19-Jun-2010 b	19.8a
9086418	Ft. Custer, MI	94a	23-Jun-2010a	23.0a
9086653	Ft. Custer, MI	97a	10-Jun-2010 d	8.1a
9086654	Ft. Custer, MI	85a	10-Jun-2010 d	4.9a
9086655	Ft. Custer, MI	88a	10-Jun-2010 d	4.4a
9086656	Ft. Custer, MI	91a	10-Jun-2010 d	13.3a

[1]Evaluated on 28 May 2010.
[2]Means followed by same letter do not differ significantly at $LSD_{(0.05)}$ within same column.

Plants for Improved Forage

Forages offer a natural solution for addressing many conservation challenges. Quality forage, wildlife habitat, erosion control, nutrient filtering, streambank protection, biofuel, improved soil quality, and reduced nitrogen requirements on row crop and pasture land are among the benefits of forages. The Plant Materials Program and cooperating agencies are major contributors of many forage selections that are planted on private and public lands for the conservation of natural resources.

Study No. MIPMC-P-0906-PA
Selection and Evaluation of Improved Big Bluestem (*Andropogon gerardii* Vitman) for Use as Forage for Livestock

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

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

Description of Study Five big bluestem accessions were identified as having superior forage characteristics through Plant Materials Study 26I101G initiated in 1992 (Table 18). These five parent lines were allowed to cross pollinate. Recurrent selection of these progeny will be used to develop a forage quality big bluestem release through the NRCS Plant Materials Program.

Materials and Methods In 2007 RLPMC excavated 10 – 20 individual plants from each of five isolated clone populations and placed them in gallon pots. Potted plants were placed in the RLPMC shade house in 2008 and allowed to randomly cross pollinate with each other. Seeds were harvested, stratified, and planted in greenhouse flats in December 2008. From these seedlings approximately 200 plants were visually selected for forage by the Plant Materials Specialist and Grazing Lands Specialist for forage characteristics and used to establish an isolated poly-cross block.

Plants in the poly-cross block are being observed and rouged for unacceptable disease levels and flowering that is not synchronous with most other plants in the block. A small quantity of seed was harvested in September 2010.

Commercially available forage bluestems (e.g. Bonilla, Bonanza, and Niagra) will be grown in isolation for comparison of seed germination and forage characteristics. Cycles of selection of the RLPMC big bluestem will continue until a release is developed with forage characteristics, seed germination, and seedling vigor that are comparable or superior to the commercial standards.

Table 18. Parent lines of anticipated release of big bluestem for forage.

Accession	Origin
9070139	Porter County, Indiana
9070149	Jasper County, Indiana
9070162	Porter County, Indiana
9070163	Jasper County, Indiana
9070197	Washtenaw County, Michigan

Study No. MIPMC-P-0910-PA
Yellow Alfalfa [*Medicago sativa* L. ssp. *falcata* (L.) Arcang.] Release

Objective The objective of this study is to evaluate a selection of yellow flowered alfalfa for use in conservation practices, produce foundation seed of this selection, and co-release this selection in cooperation with Michigan State University. Rose Lake PMC will produce foundation seed for use in field trials and release through the Plant Materials Program. Seed will be made available to commercial seed producers through the allocation process.

Backgound Yellow alfalfa (AKA yellow-flowered alfalfa) is a subspecies of alfalfa (*Medicago sativa*). It has been grown in the United States since the early 1900s. Yellow alfalfa is a perennial legume growing up to 30 inches high with multiple erect stems. It has alternate sets of three oval-shaped, hairy leaflets with yellow flowers. Yellow alfalfa has growth requirements (pH, nutrients, and moisture) similar to purple flowered alfalfa. It blooms for a longer duration in the growing season than does purple flowered alfalfa and has been shown in Michigan to produce as much forage in a two cut system as purple flowered alfalfa produces in a three cut system.

In addition to livestock forage yellow alfalfa is consumed by game animals and birds. Small mammals also graze on alfalfa. Yellow alfalfa can be a source of nectar and pollen for insects and is particularly attractive to solitary bees such as leaf cutter bees.

Researchers at South Dakota State University (SDSU) evaluated several populations of yellow alfalfa for forage production, resistance to potato leaf hopper damage, resistance to alfalfa weevil damage and resistance to phytophthora root rot. From those trials a population was selected for further evaluation as a forage crop. Research at SDSU and Michigan State University demonstrated that this selection of yellow alfalfa produces as well as, or better than purple flowered alfalfa or birdsfoot trefoil. Yellow alfalfa is a perennial legume that fixes atmospheric nitrogen.

Seed Production In spring 2010 seeds of yellow alfalfa were inoculated and planted in the greenhouse. Seedlings were transplanted into Conetainers® and moved to the shadehouse as plant development and weather conditions permitted. Approximately 6500 seedlings were mechanically transplanted in a ¼ acre field that been tilled and limed per soil test recommendations. Irrigation was supplied to maintain optimum growing conditions, rows were cultivated, herbicides were applied, and weeds were hoed and pulled. Blue-flowered alfalfa plants were regularly rouged. Fencing was installed to exclude deer.

Field maintenance and rouging will continue in 2011.

Native Plant Species to Enhance Wildlife Habitat

Interest in native plant species for wildlife habitat has been increasing, but availability remains limited. In the Rose Lake PMC service area native species are needed for wildlife food plots, shelter, nesting, and brood rearing cover. Desirable plant attributes include:

- good survival, vigor, and seed and foliage production
- documented wildlife benefit
- Non invasivity

Supplement to Study No. 26I080J
Propagation Methods for Desmodium Species

Background Approximately 75 *Desmodium* (tick-trefoil) species are native to the US where they inhabit dry, sandy, open woods or slightly shaded areas. They are perennial legumes with trifoliate leaves, purple flowers, and flat, deeply lobed or jointed pods. The pods easily split and attach to clothing or animals by means of small hooked hairs, hence the common name tick-trefoil. Desmodium seed is a food source for upland and game birds and songbirds and plants are an excellent deer browse.

Rose Lake PMC has released three desmodium accessions (Table 19) for use in natural resources conservation. Other desmodium species are available through the Plant Materials Program and horticultural outlets.

Desmodium spp. are typically propagated from seed. Several propagation techniques have been reported. *Desmodium canadense* was scarified with emery cloth, stratified at 4° C for 28 days, and inoculated with cowpea-type *Rhizobium* at planting (Thomas, 2007). Hand scarification and exposure to concentrated sulfuric acid were both effective in breaking dormancy of *D. canadense* (Susko, 2008). *Desmodium illinoense* was field planted in autumn and did not receive any seed treatment (Blessman et al., 2001). Rose Lake PMC reported (USDA-NRCS, 2008) that stratification at 4° C improved germination and emergence compared to no treatment with several D*esmodium spp.* (USDA-NRCS, 2008).

The objective of this study was to compare preplant treatments for increasing the germination and emergence of several *Desmodium spp*.

Materials and Methods Seeds of Alcona Germplasm Dillenius' tick-trefoil, Grant Germplasm panicledleaf tick-trefoil, Marion Germplasm Dillenius' tick-trefoil, and wild-collected *D. canadense , D. illinoense, D. obtusum, and D. sessilifolium* were removed from their seedpods with a brush huller and cleaned with a two-screen fanning mill. Seed treatments were as shown in Table 20.

Table 19. Desmodium species released by Rose Lake Plant Materials Center.

Accession Number (PI Number)	Release Name	Scientific Name	Origin	Maturity Period	Release Year
9005087	Marion Germplasm Dillenius' tick-trefoil	*Desmodium glabellum* (Michx.) DC.	Marion Co., IL	Mid-season	2009
9055415 (654405)	Alcona Germplasm Dillenius' tick-trefoil	*Desmodium glabellum* (Michx.) DC.	Alcona Co., MI	Early-season	2006
9055428 (654406)	Grant Germplasm panicledleaf tick-trefoil	*Desmodium paniculatum* (L.) DC.	Grant Co., WI	Mid-season	2006

Table 20. Desmodium seed treatments at Rose Lake Plant Materials Center. 2010.			
Treatment Number	Scarification	Stratification	Inoculum
1	None	None	None
2	None	None	Cowpea-type *Rhizobium* at planting
3	None	28-day @ 4° C w/ moisture	None
4	None	28-day @ 4° C w/ moisture	Cowpea-type *Rhizobium* at planting
5	Sandpaper	None	None
6	Sandpaper	None	Cowpea-type *Rhizobium* at planting
7	Sandpaper	28-day @ 4° C w/ moisture	None
8	Sandpaper	28-day @ 4° C w/ moisture	Cowpea-type *Rhizobium* at planting

Experimental design was a randomized complete block with four replicates of 25 seeds each. After being treated seeds were planted in potting soil in a greenhouse where temperature, light, and moisture were maintained to maximize germination and emergence. Germination and emergence counts were recorded daily until no further emergence was observed. Long-term effects of inoculum were not evaluated. Analysis of variance was performed with the treatment as the independent variable and total emergence and days from 1st emergence to last emergence as dependent variables.

Results Treatment differences were observed in total emergence with all accessions. Greatest (or not significantly different) emergence was observed in the absence of scarification and stratification. That is, neither scarification nor stratification improved emergence. Treatment differences were observed with only three (Marion, *D. obtusum*, and *D. sessilifolium*) of seven accessions in the number of days from 1st emergence to last emergence and these differences were small and inconsistent.

Table 21. Effect of seed treatment on emergence of *Desmodium spp.* at Rose Lake PMC. 2010.

	Treatment[1]	Days from 1st emergence to last emergence	Total emergence (%)
Alcona Germplasm Dillenius' tick-trefoil (Accession 9055415)	1	9	86
	2	7	83
	3	9	79
	4	7	71
	5	2	58
	6	7	65
	7	2	43
	8	4	27
	$LSD_{(0.05)}$	n.s.	18

	Treatment[1]	Days from 1st emergence to last emergence	Total emergence (%)
Grant Germplasm Panicledleaf tick-trefoil (Accession 9055428)	1	9	75
	2	9	69
	3	11	59
	4	11	59
	5	11	52
	6	17	53
	7	9	40
	8	7	36
	$LSD_{(0.05)}$	n.s.	13

	Treatment[1]	Days from 1st emergence to last emergence	Total emergence (%)
Marion Germplasm Dillenius' tick-trefoil (Accession 9055087)	1	13	82
	2	13	88
	3	15	79
	4	6	76
	5	7	46
	6	7	52
	7	4	34
	8	4	26
	$LSD_{(0.05)}$	6	15

Table 21 cont'd.

	Treatment[1]	Days from 1st emergence to last emergence	Total emergence (%)
Desmodium canadense (Accession 9086709)	1	13	79
	2	13	85
	3	9	91
	4	11	86
	5	6	75
	6	9	78
	7	7	76
	8	6	52
	$LSD_{(0.05)}$	n.s.	20

	Treatment[1]	Days from 1st emergence to last emergence	Total emergence (%)
Desmodium illinoiense (Accession 9086694)	1	14	98
	2	17	93
	3	11	92
	4	11	74
	5	14	79
	6	16	82
	7	16	83
	8	11	84
	$LSD_{(0.05)}$	n.s.	18

	Treatment[1]	Days from 1st emergence to last emergence	Total emergence (%)
Desmodium obtusum (Accession 9086695)	1	15	81
	2	17	80
	3	13	78
	4	14	53
	5	7	57
	6	7	62
	7	4	45
	8	6	59
	$LSD_{(0.05)}$	9	21

Table 21 cont'd.			
	Treatment[1]	Days from 1st emergence to last emergence	Total emergence (%)
Desmodium sessilifolium (Accession 9086707)	1	14	77
	2	18	84
	3	13	75
	4	15	67
	5	18	62
	6	17	72
	7	9	41
	8	11	45
	$LSD_{(0.05)}$	9	14

[1]Treatments:
1= no scarification, no stratification, no inoculum
2= no scarification, no stratification, Cowpea-type *Rhizobium* at planting
3= no scarification, 28-day @ 4° C w/ moisture, no inoculum
4= no scarification, 28-day @ 4° C w/ moisture, Cowpea-type *Rhizobium* at planting
5= surface scarification, no stratification, no inoculum
6= surface scarification, no stratification, Cowpea-type *Rhizobium* at planting
7= surface scarification, 28-day @ 4° C w/ moisture, no inoculum
8= surface scarification, 28-day @ 4° C w/ moisture, Cowpea-type *Rhizobium* at planting

Summary Results from this experiment with the *Desmodium spp.* tested showed no evidence that subjecting seeds to scarification or stratification increased germination and emergence. With regard to scarification these results are consistent with those of Dittus and Muir (2010) in their work with *D. paniculatum*.

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Plants for Residential Sewage Treatment Systems

Study No. MIPMC-T-0801-WE
Evaluation of Species for Use in Vegetative Treatment Areas as a Component of Residential Sewage Treatment Systems

Logan County (OH) Health District approved a residential sewage treatment system that includes a 9 ft × 30 ft (270 ft^2) constructed wetland or vegetative treatment area. The Plant Materials Specialist was asked to recommend and evaluate plant species for this area.

Materials and Methods This procedure was outlined in the study plan:

1. review applicable NRCS Practice Standards and Specifications for wetland and/or vegetative treatment area construction in Ohio and other Great Lakes states
2. consult with Technical Support Disciplines personnel and others and to visit sites where similar technology has been attempted or employed and to visit proposed site in Logan County, Ohio
3. review rules and regulations for residential sewage treatment in Ohio and other Great Lakes states
4. develop selection and evaluation criteria for plants to be used in vegetative treatment areas
5. establish selected plants at vegetative treatment area site in Logan County, Ohio evaluate according to criteria established in 3 above

Planting Plan Plants were installed on a grid, with 1 plant/ft^2. Rows were oriented across the wetland (perpendicular to water flow) with 9 plants/row. There were 27 rows. Plants in Table 22 were established in the Rose Lake PMC greenhouse and transplanted on 29 Apr. 2008 by the Plant Materials Specialist with assistance from the Ohio Plant Materials Committee and the Logan County Health District.

Table 22. Plants established in Logan County, Ohio vegetative treatment area.

Common name	Scientific name
Canada bluejoint	*Calamagrostis canadensis*
Prairie sandreed	*Calamovilfa longifolia*
Sweetgrass	*Hierochloe odorata*
Prairie cordgrass	*Spartina pectinata*
Wool grass	*Scirpus cyperinus*

Evaluation These evaluation criteria were developed by RLPMC staff:

- number of growing (surviving) plants
- plant height (inches)
- plant diameter at soil level (inches)
- overall vigor (1 – 9 scale, 1=excellent, 9=poor vigor)
- notes on disease, insects, or other concerns

Weather information – rainfall and high/low temperatures for each month.

Site specific information – occurrence of floods, excessive drought, other conditions that may affect performance of the plants.

Results Canada bluejoint survived and performed well but prairie sandreed did not. Plant growth characteristics from 2009 are presented in Table 23. No data were collected in 2010 due to inadvertent mowing.

Table 23. Height, diameter, survival, and vigor of plants in vegetative treatment area. Logan County, OH. 11 May 2009.

	Height (in)	Diameter (in)	% Survival	Vigor[1]
Canada bluejoint	35	10	100	1
Prairie sandreed	8	2	11	9
Sweetgrass	16	14	96	4
Prairie cordgrass	21	10	70	4
Wool grass	19	6	96	3
Iris	23	4	n.a.[2]	1
Boneset	9	n.a.[2]	n.a.[2]	1

[1]scale: 1 = excellent vigor; 9 = poor vigor

[2]n.a. = information not available

Data collection will continue in 2011.

Plants as Habitat for Native Pollinators

Study No. MIPMC-T-0802-WI
Demonstration Planting of Selected Plants for Use by Native Pollinators

Background This study plan was developed collaboratively and with partial funding from the Xerces Society for Invertebrate Conservation. The plan suggested the establishment of beneficial insect plantings to demonstrate usage of flowering plants – especially native trees, shrubs, perennial forbs, and annual forbs – for the creation of habitat for important beneficial insects, i.e., pollinators and predators and parasites of crop pests. Proposed planting arrangements included a hedgerow of shrubs and small trees, a linear planting of annual and perennial forbs, and/or a meadow planting of beneficial plants for pollinators. The habitat plantings included locally appropriate genetic stock. Native herbaceous plants were chosen based on field work conducted by scientists at Michigan State University. Shrubs and small trees were chosen in consultation with local and regional experts based on genera known to be important sources of pollen and nectar for bees and other pollinators. Plantings will be monitored for the abundance and diversity of bees and other beneficial insects and bloom periods will be recorded.

Hedgerow and Linear Planting Hedgerow and linear plantings of perennial herbaceous and woody plants were established at Rose Lake PMC in 2008 (Tables 24 and 25). Species were arranged in anticipated order of bloom with the earliest bloomers at the southwest end. The planting was enclosed in a deer exclusion fence. See cover photo.

Observations Plants near the southwest end of the plot (*Fragaria virginiana* and *Salix interior*) generally bloomed first. Bloom times of perennial herbs are shown in Figure 2. *Solidago spp.* and others on the northeast end were still blooming after a frost.

The hedgerow and linear planting as well as the meadow planting (below) were featured in various RLPMC tours. A tour on 24 June 2010 was part of a short course on the establishment and importance of habitat for pollinator insects which was offered in cooperation with the Xerces Society and Michigan State University. Some 50 guests included personnel from Michigan and Indiana NRCS, conservation district, and the State of Michigan as well as conservation partners from Michigan, Ohio, and Indiana. The National Program Leader for the Plant Materials Program and East and Central Regional Plant Materials Specialists were also on hand for the workshop.

Meadow Planting Non-stratified and stratified seeds of perennial forbs, grasses, and legumes were planted with a Truax drill in a one-acre meadow, split to compare non-stratified and stratified seed. Non-stratified seed was planted on 17 May 2010 and stratified seed on 7 June 2010 after being subjected to a 31-day cold stratification. Mixed seed was sown at a bulk rate of approximately 6 lbs/a. Species and seeding rates are shown in Table 26. Metering the moist, stratified seed through the drill was very difficult and would not be recommended without significant procedural or equipment modifications. Meadow composition will be observed in 2011 and following.

Table 24. Perennial herbs established in linear planning at Rose Lake PMC in 2008.
New England aster (*Symphyotrichum novae-angliae)*
Riddell's goldenrod *(Oligoneuron riddellii)*
Hairy goldenrod *(Solidago hispida)*
Showy goldenrod *(Solidago speciosa)*
Palespike lobelia (*Lobelia* spicata)
Missouri ironweed *(Vernonia missurica)*
Wild bergamot *(Monard fistulosa)*
Yellow giant hyssop *(Agastache nepetoides)*
Black-eyed Susan *(Rudbeckia hirta)*
Eastern purple coneflower *(Echinacea purpurea)*
Culver's root *(Veronicastrum virginicum)*
Butterfly milkweed *(Asclepias tuberosa)*
Hairy penstemon *(Penstemon hirsutus)*
Tall white beard-tongue *(Penstemon digitalis)*
Prairie spiderwort *(Tradescantia ohiensis)*
Golden alexanders *(Zizia aurea)*
Wild strawberry *(Fragaria virginiana)*

Table 25. Woody plants established in hedgerow planting at Rose Lake PMC in 2008.
Meadowsweet *(Spiraea alba)*
Common ninebark *(Physocarpus opulifolius)*
Choke cherry *(Prunus virginiana)*
Michigan rose *(Rosa setigera)*
American wild plum *(Prunus americana)*
Swamp rose *(Rosa palustris)*
Redbud *(Cercis canadensis)*
Common elderberry *(Sambucus canadensis)*
Buttonbush *(Cephalanthus occidentalis)*
Sandbar willow *(Salix interior)*
Serviceberry *(Amelanchier sp.)*

	April			May			June			July			Aug			Sept			Oct			Nov		
Fragaria virginiana		X	X	X	X	XXX										X	X	XXX						
Zizia aurea				X	X	X	X	X	X	X	X	X	X	X	X	X	XXX							
Penstemon digitalis						X	X	X	X	XXX														
Penstemon hirsutus							X	X	X	XXX														
Tradescantia ohiensis							X	X	X	X	X	X	X	X	X	X	X	X	XXX					
Echinacea purpurea							X	X	X	X	X	X	X	X	X	X	X	X	X	X	XXX			
Rudbeckia hirta								X	X	X	X	X	X	X	X	X	X	X	X	X	X	XXX		
Monard fistulosa										X	X	X	X	X	X	X	X	XXX						
Asclepias tuberosa											X	X	X	X	XXX									
Agastache nepetoides											X	X	X	X	X	X	X	XXX						
Vernonia missurica														X	X	X	X	X	XXX					
Solidago speciosa															X	X	X	X	X	X	X	X	XXX	
Solidago hispida															X	X	X	X	X	X	X	X	XXX	
Veronicastrum virginicum																X	X	XXX						
Symphyotrichum novae-angliae																X	X	X	X	X	XXX			
Oligoneuron riddellii																X	XXX							

Figure 2. Bloom periods of herbaceous perennials at Rose Lake PMC. 2009-10.

Table 26. Species and rates for Rose Lake pollinator field planting. 2010.			
Genus species	Common Name	oz/a	Approximate seeds/a
Amorpha canescens	lead plant	1.0	16,000
Aquilegia canadensis	Columbine	0.3	9,500
Asclepias tuberose	butterfly milkweed	1.0	4,300
Asclepias verticillata	whorled milkweed	1.0	11,000
Aster ericoides	heath aster	0.5	100,000
Aster macrophyllus	big-leaved aster	1.0	27,000
Baptisia alba	white wild indigo	0.5	850
Bouteloua curtipendula	sideoats grama	20.0	120,000
Bromus kalmia	prairie brome	20.0	160,000
Carex brevior	plains oval sedge	2.0	58,000
Cassia fasciculate	partridge pea	2.0	5,400
Coreopsis lanceolata	lance-leaf coreopsis	2.0	40,000
Dalea purpurea	purple prairie clover	2.0	30,000
Desmodium sessilifolium	sessile-leaved tick trefoil	1.0	5,000
Echinacea purpurea	purple coneflower	2.0	13,200
Euphorbia corollata	flowering spurge	0.5	4,000
Geranium maculatum	wild geranium	0.3	1,250
Helianthus divaricatus	woodland sunflower	2.0	9,600
Helianthus occidentalis	western sunflower	1.0	14,000
Heuchera richardsonii	prairie alum root	0.5	350,000
Koeleria macrantha	Junegrass	2.0	400,000
Lespedeza capitata	round-headed bushclover	1.5	12,000
Liatris aspera	button blazing star	1.0	16,000
Liatris scariosa	northern blazing star	0.7	7,200
Lupinus perennis	wild lupine	2.0	2,200
Monarda fistulosa	wild bergamot	1.0	70,000
Penstemon hirsutus	hairy beardtongue	0.5	124,000
Potentilla arguta	prairie cinquefoil	1.0	230,000
Pycnanthemum tenufolium	slender mountain mint	0.3	94,500
Rudbeckia hirta	black-eyed susan	1.0	92,000
Schizachyrium scoparium	little bluestem	20.0	300,000
Sisyrinchium albidum	common blue-eyed grass	1.0	20,000
Solidago nemoralis	old field goldenrod	0.5	150,000
Solidago speciosa	showy goldenrod	0.5	47,500
Symphyotrichum oolentangiense	sky blue aster	0.5	40,000
Tradescantia ohiensis	Ohio spiderwort	1.0	8,000
Verbena stricta	hoary vervain	1.0	28,000
Vernonia fasiculata	prairie ironweed	0.5	12,000
Veronicastrum virginicum	Culver's root	0.5	400,000
Zizea aurea	golden Alexander	2.0	22,000

Appendix A

Released Material

'Affinity' (*Thuja occidentalis* L.) Northern White Cedar
Released: 1993 (FY1993)
Accession Number: 477011 (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

Alcona Germplasm [*Desmodium glabellum* (Michx.) DC.] Dillenius' Tick-Trefoil
Released: 2006 (FY2006)
Accession Number: 9055415 (PI Number: 654405)
Release Type: tested germplasm
Plant Origin: native
Collection Location: Alcona Co., MI
Plant Type: legume
Plant Duration: perennial
Propagation: seed
Uses: wildlife food plots as an alternative to introduced plant species

Grant Germplasm [*Desmodium paniculatum* (L.) DC.] Panicledleaf Tick-Trefoil
Released: 2006 (FY2006)
Accession Number: 9055428 (PI Number: 654406)
Release Type: tested germplasm
Plant Origin: native
Collection Location: Grant Co., WI
Plant Type: legume
Plant Duration: perennial
Propagation: seed
Uses: wildlife food plots as an alternative to introduced plant species

Icy Blue Germplasm (*Elymus canadensis* L.) Canada Wildrye
Released: 2004 (FY2004)
Accession Number: 9084347 (PI Number: 641962)
Release Type: tested germplasm
Plant Origin: native
Collection Location: LaPorte Co., IN
Plant Type: cool-season grass
Plant Duration: perennial
Propagation: seed
Uses: restoration, wildlife cover, and erosion control
Registration Document: Durling, J.C., J.W. Leif, and D.W. Burgdorf. 2006. Registration of Icy Blue Canada Wildrye Germplasm. Crop Sci. 46:2330-2331.

'Imperial' *Populus* ×*canadensis* Moench (pro sp.) [*deltoides* × *nigra*] Carolina Poplar
Released: 1979 (FY1979)
Accession Number: 432347 (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* P. Mill.) Silky Dogwood
Released: 1982 (FY1982)
Accession Number: 468117 (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

Koch Germplasm [*Calamovilfa longifolia* (Hook.) Scribn. var. *magna* Scribn. & Merr.] Prairie Sandreed
Released: 2007 (FY2007)
Accession Number: 9086408 (PI Number: Ames 29312)
Release Type: selected
Plant Origin: native
Collection Location: costal zones along Lakes Michigan and Huron
Plant Type: warm-season grass
Plant Duration: perennial
Propagation: seed or vegetative
Uses: wind erosion control, dune stabilization, and water quality improvement

'Lancer' (*Lathyrus latifolius* L.) 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* L. var. *americanum* Ait.) Highbush Cranberry
Released: 1999 (FY1999)
Accession Number: 9031863 (PI Number: 608015)
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 (PI Number: 514275)
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

Marion Germplasm [*Desmodium glabellum* (Michx.) DC.] Dillenius' tick-trefoil
Released: 2009 (FY2009)
Accession Number: 9005087
Release Type: tested germplasm
Plant Origin: native
Collection Location: Marion Co., WI
Plant Type: legume
Plant Duration: perennial
Propagation: seed
Uses: wildlife food plots as an alternative to introduced plant species
Registration Document: Leif JW, Durling JC, Burgdorf DW. 2010. Notice of release of Dillenius' tick-trefoil: a selected class of natural germplasm. Native Plants Journal 11(1):23-25.

Prairie View Indiana Germplasm (*Andropogon gerardii* Vitman) Big Bluestem
Released: 2005 (FY2005)
Accession number: 9086588 (PI Number: 642389)
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 (PI Number: 642388)
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: 9086556 (PI Number: 642387)
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* Marsh.) Silky Willow
Released: 2003 (FY2003)
Accession Number: 9069052 (PI Number: Ames 27796)
Release Type: tested
Plant Origin: native
Collection Location: Daviess Co., IN
Plant Type: shrub
Plant Duration: perennial
Propagation: vegetative
Uses: streambank/shoreline restoration and riparian corridors

'Roselow' (*Malus sargentii* Rehder) Sargent's Crabapple
Released: 1978 (FY1978)
Accession Number: 477986 (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 Michigan Germplasm (*Andropogon gerardii* Vitman) Big Bluestem
Released: 2001 (FY2001)
Accession number: 9084510 (PI Number: 642398)
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
Registration Document: Durling, J.C., J.W. Leif, and D.W. Burgdorf. 2007. Registration of Southlow Michigan Big Bluestem Germplasm. Crop Sci. 47:455.

Southlow Michigan Germplasm (*Panicum virgatum* L.) Switchgrass
Released: 2001 (FY2001)
Accession number: 9084512 (PI Number: 642395)
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
Registration Document: Durling, J.C., J.W. Leif, and D.W. Burgdorf. 2008. Registration of Southlow Michigan Germplasm Switchgrass. Journal of Plant Registrations. 2:60.

Southlow Michigan Germplasm [*Schizachyrium scoparium* (Michx.) Nash] Little Bluestem
Released: 2001 (FY2001)
Accession number: 9084511 (PI Number: 642397)
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
Registration Document: Durling, J.C., J.W. Leif, and D.W. Burgdorf. 2007. Registration of Southlow Michigan Little Bluestem Germplasm. Journal of Plant Registrations. 1:134.

Southlow Michigan Germplasm (*Sorghastrum nutans* L. Nash) Indiangrass
Released: 2001 (FY2001)
Accession number: 9084513 (PI Number: 642396)
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
Registration Document: Durling, J.C., J.W. Leif, and D.W. Burgdorf. 2008. Registration of Southlow Michigan Germplasm Indiangrass. Journal of Plant Registrations. 2:56.

Vintage Germplasm Common Elderberry [*Sambucus nigra* L. ssp. *canadensis* (l.) R. Bolli]
Released: 2010
Accession number: 9084126
Release Type: Selected
Plant Origin: Native
Collection Location: Tipton County, Indiana
Plant Type: shrub
Plant Duration: perennial
Propagation: seed or vegetative
Uses: streambank and shoreline stabilization, enhancement of riparian corridors, and food and shelter for wildlife
Registration Document: Leif, J.W., J.C. Durling, and D.W. Burgdorf. 201X. Notice of release of Vintage germplasm common elderberry: a selected class of natural germplasm. Native Plants Journal. Submitted.

Appendix B

PUBLICATIONS AND PRESENTATIONS

Results of experiments and observations at RLPMC are disseminated through publications, presentations, and other means. This paper appeared in a peer review publication:

Leif, Durling, and Burgdorf. 2010. Notice of release of Dillenius' tick-trefoil: a selected class of natural germplasm. Native Plants Journal 11(1):23-25.

Others were published and distributed by RLPMC and/or http://plants.usda.gov/ and http://plant-materials.nrcs.usda.gov/mipmc/:

Durling, Leif, and Burgdorf. 2010. Rose Lake PMC 2009 Technical Report. 52p.

Gerona. 2010. Wildflower Hedge Poster. RLPMC. 1p.

Gerona. 2010. Wildflower Meadow Poster. RLPMC. 1p.

Leif and Gerona. 2010. Plant Releases Available to Commercial Growers. RLPMC. 2p.

Leif and Gerona. 2010. Rose Lake PMC Winter Newsletter 2010. RLPMC. 6p.

Leif and Gerona. 2010. Rose Lake PMC. RLPMC. New brochure. 2p.

Leif and Gerona. 2010. Rose Lake PMC Summer 2010 Newsletter. RLPMC. 3p.

Leif and Gerona. 2010. Rose Lake PMC Winter 2010 Newsletter. RLPMC. 6p.

Leif and Gerona. 2010. Vintage Germplasm Common Elderberry. RLPMC. 2p.

Leif, Burgdorf, and Gerona. 2010. 'Magenta' Hybrid Crabapple. RLPMC. Original 2005/ New 2010. 2p.

Leif, Durling, and Burgdorf. 2010. Final Report - Apostle Islands 3rd Quarter FY 2010. RLPMC. 4p.

Leif, Durling, and Burgdorf. 2010. Northern Sweetgrass Plant Fact Sheet. RLPMC. 2p.

Leif, Durling, and Burgdorf. 2010. Notice of Release of Vintage Germplasm Common Elderberry Selected Class of Natural Germplasm. RLPMC. 7p.

Leif, Durling, and Burgdorf. 2010. Quarterly Progress Report-1st Quarter FY10 Apostle Island. RLPMC. 4p.

Leif, Durling, and Burgdorf. 2010. Quarterly Progress Report-4th Quarter FY09 Apostle Island. RLPMC. 1p.

Leif, Durling, and Burgdorf. 2010. Rose Lake PMC 2009 Annual Report of Activities. RLPMC. 8p.

Leif, Durling, and Burgdorf. 2010. Sweetgrass Plant Fact Sheet. RLPMC. 2p.

Leif. 2010. Plant Fact Sheet, American Elder. RLPMC. 2p.

Leif. 2010. Plant Guide, Common Elderberry. RLPMC. 6p.

Appendix C

Weather and Climate

Growing season temperature and precipitation data, 2010[1] and long-term[2], for Rose Lake PMC.						
	May	June	July	Aug.	Sept.	Growing Season
Average Daily Maximum (°F)	71.4	78.6	84.9	83.5	70.6	77.8
	69.7	79.9	83.7	82.0	74.4	77.9
Average Daily Minimum (°F)	47.0	56.1	58.9	57.8	48.7	53.7
	45.3	55.5	59.2	57.7	50.5	53.6
Precipitation (in)	4.26	3.15	2.27	0.24	3.85	13.77
	2.95	3.64	2.97	3.08	2.58	15.22

[1]Rose Lake PMC data based on records from Michigan State University Muck Research Farm in Laingsburg, MI, about 3 miles NE of Rose Lake PMC. Data available on-line at http://www.agweather.geo.msu.edu/mawn/
[2]Long-term calculated as median of Clinton, Ingham, and Shiawassee values as recorded in respective soil surveys.

2010 Weather Summary Precipitation was greater than normal in May and September but less than normal from June through August for a growing season deficit of approximately 1½ inch. Growing season temperatures were close to normal.

Climate Rose Lake PMC is inland approximately 100 miles from Lakes Michigan, Huron, and Erie. Rose Lake PMC's proximity to the Great Lakes influences what would otherwise be a continental climate toward semi-maritime. Prevailing winds are westerly. Annual precipitation is approximately 30 inches, distributed throughout the year. The frost-free growing season averages 140 – 145 days, from mid-May to early Oct. January and July are the coldest and warmest months, respectively.

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