

Elsberry Plant Materials Center

2006 Annual Technical Report



Winter 2006

2006 Release – Refuge Big Bluestem – PM Specialist, Jerry Kaiser

PLANT SOLUTIONS FOR CONSERVATION NEEDS

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**ELSBERRY PLANT MATERIALS CENTER
2006**

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ELSBERRY PLANT MATERIALS CENTER

VISION – Excellence in developing plant science technology to help people help the land.

MISSION – To assist land users, federal, state and local partners, and industry growers in Illinois, Iowa and Missouri, in protecting, conserving, and improving natural resources by providing plant materials and plant related technology.

STRATEGY – The Elsberry Plant Materials Center vision and mission is advanced through evaluating and selecting superior plants, developing cultural and management technology, promoting the use of plants and related technology, through field and demonstration plantings, leading tours, and training NRCS employees and others on plant science technology. Plant Materials Committees in Illinois, Iowa and Missouri identify and prioritize plant materials technology needs and the three state conservationists establish direction and funding for the center.

GOALS – The Elsberry Plant Materials Center (PMC) provides plants for conservation, produces foundation seeds and plants or their equivalent, and promotes their use in solving natural resource problems on both private and public land. Beneficial uses for these plant materials include livestock forages, biomass and timber production, carbon sequestration, air quality, erosion reduction, wetland restoration, wildlife food and cover, water quality improvement, streambank and riparian area protection, and other unique conservation needs. In addition to conservation plant release, the PMC also develops establishment and management technology for successful use of plants in resource conservation programs.

TACTICS – Specialists at the center identify plants that show promise for addressing a specific conservation need, develops related technology and test their performance in the field. After species are proven beneficial for solving the conservation problem, they are released to the private sector for commercial production for general public use. Opportunities for success are to continue working through NRCS field offices, soil and water conservation districts and other conservation partners who come in contact with clients in need of special plants and related technology for special situations. USDA programs that emphasize and utilize plant materials and plant science technology include Conservation Technical Assistance, Environmental Quality Incentive Program, Conservation Reserve Program, Wetlands Reserve Program, Grassland Reserve Program, and Wildlife Habitat Incentive Program with some opportunities in the Conservation Security Program, Resource Conservation and Development, and the Small Watershed and Flood Prevention program. The Elsberry Plant Materials Center also has the opportunity to support increasing interest in urban conservation by providing plants with unique landscape architecture value in addition to their erosion and sediment control, water and air quality benefits. Emerging opportunities in the agricultural sector lie in biomass for bioenergy production and carbon sequestration.

2006
Annual Technical Report
Elsberry Plant Materials Center
Elsberry, Missouri

<i>Introduction</i>	6
<i>Plant Materials Center Operations</i>	6
<i>Tours, Visitors, and Meetings</i>	7
<i>Climatic Data</i>	8
<i>Study Activities:</i>	
<u>29I093R</u> – Miscellaneous Herbaceous Plant Evaluation	9
<u>29I097G</u> – Assembly and Evaluation of Big Bluestem, <i>Andropogon gerardii</i>	13
<u>29I101J</u> – Assembly and Evaluation of Arrowwood, <i>Viburnum dentatum</i> , L.	21
<u>29I107G</u> – Assembly and Evaluation of Eastern Gamagrass, <i>Tripsacum dactyloides</i> , L.	24
<u>29I108G</u> – Assembly and Evaluation of Low Growing Rhizomatous Switchgrass for Use in Waterways, Filter Strips and Other Conservation Uses	30
<u>29I110J</u> – Assembly and Evaluation of Chokecherry, <i>Prunus virginiana</i>	36
<u>29A116W</u> – Evaluation of Miscellaneous Trees and Shrubs	38
<u>29I124G</u> – Production of Native Iowa Ecotypes of Grasses and Forbs for Roadside, Critical Areas, and All Other Vegetative Plantings Where Native Grasses and Forbs are Now Being Planted	45
<u>29A128J</u> – Flowering Dogwood, Interagency Study Between Department of Interior, National Parks Service, National Capital Region and Department of Agriculture	52
<u>29I135J</u> – Assembly and Evaluation of Hazelnut, <i>Corylus americana</i> , Walt.	53
<u>29I136J</u> – Assembly and Evaluation of Wild Plum, <i>Prunus americana</i> , Marsh.	62
<u>29A137O</u> – Wetland/Riparian Propagation	74
<u>29I141G</u> – Assembly and Evaluation of Little Bluestem, <i>Schizachyrium scoparium</i> , Michx.	85
<u>29I142G</u> – Production of Native Missouri Ecotypes of Grasses, Legumes, and Forbs for Roadsides, Critical Areas, and All Other Vegetative Plantings Where Native Plants are Now Being Planted	104

Table of Contents - continued

MOPMC-P-0001, <u>WO, WL, WE</u> – Assembly, Evaluation and Selection of Bur Oak, <i>Quercus macrocarpa</i> , Michx.	109
MOPMC-P-0002, <u>WE, WL</u> – Assembly, Evaluation and Selection of False Indigo Bush, <i>Amorpha fruticosa</i> , L.	127
MOPMC-P-0003, <u>PA, WL</u> – Evaluation and Release of Eastern Gamagrass, <i>Tripsacum dactyloides</i> , L.	136
MOPMC-T-0105, <u>PA</u> – Compatibility Study Using Native Warm Season and Cool Season Grasses with Native Legumes and Forbs	140
MOPMC-T-0106, <u>BU</u> – Collection and Evaluation of Native Cool Season Grasses and Sedges for Filter Strips	150
MOPMC-T-0208, <u>PA</u> – Testing Warm Season Grasses for Forage Quality	162
MOPMC-T-0310, <u>PA, WL</u> – Incorporating Native Warm Season Grasses into Cool Season Pasture with Grazing Management	175
MOPMC-T-0311, <u>RI, BU</u> - Controls of Reed Canarygrass in Riparian Buffer Plantings	177
MOPMC-T-0412, <u>WE, WL, RI</u> – Testing Selected Trees for Tolerance to the Herbicide Outrider	187
MOPMC-P-0613, <u>PA, WL</u> – Evaluation and Release of a Shade Tolerant Big Bluestem, <i>Andropogon gerardii</i> , L., for Silvopasture	202
MOPMC-P-0614, <u>PA, WL, BF</u> – Evaluation and Release of Switchgrass, <i>Panicum virgatum</i> L.	205
MOPMS-T-0615, <u>WL-WO</u> - Direct Seeding of Woody Shrubs for Establishing Shrub Cover for Wildlife Habitat of the Following Species. False Indigo Bush, <i>Amorpha fruticosa</i> , (a native legume), American Plum, <i>Prunus americana</i> , Roughleaf Dogwood, <i>Cornus drummondii</i> , Fragrant Sumac, <i>Rhus aromatica</i> , Chokecherry <i>Prunus virginiana</i> , Arrow-wood <i>Viburnum dentatum</i> , American Hazelnut, <i>Corylus Americana</i> , (all are native woody shrubs.)	207
<i>2006 Plant Releases from the Elsberry PMC (Notices of Release)</i>	211
<i>Releases From the Elsberry PMC to Date</i>	222
<i>Studies/Projects at the Elsberry PMC 1958 to Date</i>	227
<i>Herbaceous and Woody Seed and Plant Production 2006</i>	232

INTRODUCTION

The Elsberry Plant Materials Center (PMC) was established in June 1934 and is the oldest Center in the nation. It is one of 27 PMCs in the United States. The Center is located approximately 60 miles northwest of St. Louis, Missouri, on Highway 79. It includes 243 acres of various soil types. The Elsberry PMC primarily serves Illinois, Iowa and Missouri; however, it makes significant contributions to other states in the Midwest region.

Emphasis is focused on using native plants as a healthy way to solve conservation problems and protect ecosystems. The program seeks to address priority needs of field offices and land managers in both public and private sectors by working with a broad range of plant species, including grasses, forbs, legumes, trees, and shrubs,

The Elsberry PMC assembles, tests, selects and develops improved plants and reliable techniques for successfully establishing and maintaining plants for conservation uses.

Of particular importance is finding suitable plants for wetland situations, high traffic areas, wildlife food and habitat, farmstead and field windbreaks, wind barriers, pastures, landscape and beautification, roadside restoration, riparian plantings, woodland, and erosion control on cropland. Each of the three states served by the Center has identified its plant materials problems, needs and priorities. PMC activities are directed toward meeting the needs and priorities set forth in the states' long-range plans. As early as 1939 the Center began searching for plants to respond to specific conservation problems. During the PMC's earlier existence it produced 10,000,000 seedlings for use in windbreaks during the dust bowl era. Today the Elsberry Plant Materials Center is still striving to solve a new realm of conservation problems in an ever changing world.

PLANT MATERIALS CENTER OPERATIONS

The Center's operations are carried out in accordance with policies set forth in the National Plant Materials Handbook.

Guided by the Center's Multi-Year Business Plan, plant species are collected (mainly local field collections [95%]). Other collections come from locations within the species range in the United States. Center personnel then prepare the seed/plant for planting. Each collection is given an identification number (accession) and planted in a uniform nursery. Initial evaluation data is recorded on such factors as seedling emergence and vigor, rate of growth, disease and insect resistance, and ability to spread. Also recorded are date and amount of bloom, seed production, winter hardiness, and foliage characteristics. Selections are made and seed increased for advanced evaluation plantings. Field plantings are then conducted to determine plant performance and soil and climatic adaptation throughout its intended area of use. Evaluations are made comparing selected candidate accessions with "standards of comparison" such as

cultivars or varieties that are already in the commercial market, or other species used for the same purpose.

After several years (10-15) of evaluation, selected accessions are cooperatively released with the USDA-Agricultural Research Service (ARS), State Agricultural Experiment Stations, Conservation Commissions, Universities, Departments of Transportation, and/or other interested agencies. The Center releasing a named variety is responsible for maintaining the breeder and foundation seed. These fields undergo annual inspections by the Missouri Crop Improvement Association to insure that seed is available to commercial producers and ultimately to the public for solving conservation problems.

Additional avenues have been established and used by the Plant Materials discipline to release plants to the commercial market: Source Identified Releases, Selected, and Tested Releases. These three new avenues provide a quicker release of plants as compared to cultivar release (10-15 years).

The Elsberry Plant Materials Center has released over 80 plants during its 72-year history. In 2006 there were three new plant releases. The PMC released 2 selected class (Refuge Big Bluestem, *Andropogon gerardii* and Midwest Premium Wild Plum, *Prunus Americana*) and one source identified (Central Iowa Germplasm Pale Purple Coneflower, *Echinacea pallida*) releases. There were also four releases of (Corinth, Jefferson, Tazewell, and Nicholson) roughleaf dogwood, *Cornus drummondii*, that were discontinued. Currently the Elsberry Plant Materials Center has 78 active releases and of these 78 releases, 75 of them are native to the Elsberry PMC service area.

TOURS, VISITORS AND MEETINGS

In 2006 the Elsberry Plant Materials Center registered 218 visitors and the following is a list of groups which met at the Elsberry Center.

2006 Elsberry Plant Materials Center Visitors

State Resource Conservationists
Missouri Department of Conservation and NRCS/PMC Meeting
Introduction to Soils and Soils Survey
Marsh Bird Survey
Clarence Cannon Watershed Trustees Meeting
Annual Plant Materials Center Tour/Training
Equipment Calibration/Seed Course Training
Missouri Ecotype Committee
Tim Bradley Group of St. Louis

**CLIMATIC DATA – CALENDAR YEAR 2006
TEMPERATURE (Fahrenheit)**

<u>Month</u>	<u>74 Year Monthly High Average</u>	<u>2006 Monthly High Average</u>	<u>2006 Monthly High Departure</u>	<u>74 Year Monthly Low Average</u>	<u>2006 Monthly Low Average</u>	<u>2006 Monthly Low Departure</u>
January	38.13	47.45	+9.32	17.97	32.84	+14.87
February	43.21	45.21	+2.00	22.19	22.43	+ 0.24
March	53.85	54.48	+0.63	36.08	35.74	- 0.34
April	66.79	72.53	+5.74	41.48	47.70	+ 6.22
May	76.47	74.84	-1.63	55.99	53.45	- 2.54
June	85.33	84.23	-1.10	70.22	62.80	- 7.42
July	89.58	90.65	+1.07	63.73	68.42	+ 4.69
August	87.53	86.71	-0.82	61.65	67.61	+ 5.96
September	80.35	76.00	-4.35	48.63	54.70	+ 6.07
October	69.32	63.03	-6.29	42.61	42.6	+ 0.04
November	50.59	55.67	+5.08	31.89	36.61	+ 4.72
December	42.05	45.58	+3.53	22.51	28.13	+ 5.62
Total 2006			+13.18			+38.13

	2006	Typical
Last Killing Frost (26° and below)	March 25	April 15
First Killing Frost (26° and below)	October 25	October 15
Number of Frost-Free Days	214	184

**CLIMATIC DATA – CALENDAR YEAR 2006
Precipitation (Inches)**

<u>Month</u>	<u>76 Year Average</u>	<u>2006 Total</u>	<u>Departure</u>
January	1.95	2.39	+0.44
February	1.96	0.15	-1.80
March	3.18	4.49	+1.31
April	3.65	1.99	-1.66
May	4.12	2.58	-1.54
June	3.77	2.74	-1.03
July	3.42	4.03	+0.61
August	3.40	1.94	-1.46
September	3.28	2.25	-1.03
October	3.02	2.62	-0.40
November	2.94	3.05	+0.11
December	2.46	3.15	+0.69
Total	37.09	31.38	-5.76

Study: 29I093R

Study Title: Miscellaneous Herbaceous Plant Evaluation.

Study Leader: Bruckerhoff, S. B.

Introduction:

Plants arrive at the Plant Materials Center (PMC) from many sources and for many different purposes. Most of the plants are assigned to a specific study. Plants are also received that are not tied to a specific study. These can be from other PMC's for area of adaptation or plants in advanced stages of evaluation. Plants are received from individuals who are interested in an unfamiliar species or a plant with unusual characteristics. Many species existing on the center are not involved with an active study addressing a specific problem.

Problem:

Keeping track of numerous miscellaneous plants around the PMC without an organized evaluation system became inefficient. This study organizes miscellaneous plant material coming into the center for evaluation.

Objective:

Evaluate winter hardiness, insect and disease resistance, and vigor of plants for climatic adaptation. Plants brought in for other specific reasons like forage production, landscape beautification, shoreline stabilization, etc., will be evaluated accordingly.

Procedure:

As miscellaneous plants are received at the center, they are assigned an accession number and as much background information as available or necessary are documented. The accession is then assigned a location for planting that best suits its needs for evaluation. Plants are evaluated as necessary. Many plants are left for plant identification sessions or demonstrations for several years.

Discussion:**1984-1990**

This study was initiated in April 1984 in the PMC pipeline area. There are approximately 150 different accessions of the following species of plants: indiagrass, switchgrass, big bluestem, purpletop, little bluestem, buffalograss, wheatgrass, fescue, timothy, ryegrass, redtop, orchardgrass, kura clover, blackeyed susan, and lespedeza. Factors involved in evaluations dealt with area of adaptation.

1991-1994

Approximately 75 accessions were added during 1991. Forty of them were warm season grasses used in three FEP (Field Evaluation Planting) variety studies: 29A111G, 29A118G, and 29A127G. Twenty-six were accessions of common cool season grasses and legumes used for pasture and hay in the three-state area. These were commonly used for plant identification sessions.

1995-1998

The accessions added in 1997 are being looked at for forage. They include 'Steadfast' birdsfoot trefoil, 'Mandan' Canada wildrye, and several bermudagrasses including Hardy and OK-74-12-6. Also zoysia grass, centipedegrass, and buffalograss from the Fort Leonard Wood Wear Tolerance Study are being looked at for adaptation. Several big bluestem accessions from Study 29I097G are being evaluated as landscape plants.

1999

The accessions added in 1999 are a Lincoln County Missouri collection of Virginia wildrye and a Crawford County Missouri collection of Virginia wildrye variation geneses. These species are being looked at for shade tolerance for riparian areas and covercrop for tree plantings.

2000

No new accessions were added in 2000. Two species that are getting the most interest are the Lincoln County accessions of Virginia wildrye and 'Tufcote' bermudagrass.

The Lincoln County accession of Virginia wildrye is a shade tolerant cool season grass that has potential for a cover crop for woody plantings as well as a possible buffer species along riparian areas. This accession should be in commercial production and available soon.

The 'Tufcote' bermudagrass accession was tested at Fort Leonard Wood for wear tolerance and showed very good potential. It could be used on playgrounds, sports fields, lawns, as well as having potential for high livestock use areas. This species is not native and does show potential for spreading so it should not be planted in areas where it could escape and cause problems.

2001

Three new species of native legumes were added in 2001. Native legumes are seldom used in mixtures with warm season grasses planted for pastures primarily because of their cost, lack of availability, and lack of knowledge on which ones will perform best in a mixture.

The following species were planted for observational evaluation: goats rue, *Tephrosia virginiana*; sensitive brier, *Schrankia uncinata*; and Sampson's snakeroot, *Orbexilium pedunculatum*.

The Lincoln County Missouri collection of Virginia wildrye, accession 9083169, has shown excellent vigor and seed production. Forage quality is comparable to tall fescue, spring

green-up earlier than tall fescue and seedhead emergence is approximately two weeks later than tall fescue. This accession is scheduled for release in 2002.

2002

One new collection was planted in the miscellaneous block. Accession 9083240, western wheatgrass, *Pascopyrum smithii*, was planted as greenhouse plugs May 10, 2002. This material was collected in Audrain County, Missouri.

The Lincoln County Missouri collection of Virginia wildrye, accession 9083169, was released as a selected class and given the name Cuivre River. The Cuivre River selection has early vigorous growth that is earlier than tall fescue. Booting occurred at the end of May to the first week of June at Elsberry. This is approximately two weeks later than tall fescue.

Although Cuivre River was released as a selection and only limited testing has been done, its anticipated uses are wildlife food/cover, plant diversity in wetland and riparian plantings, covercrop for woody plantings, erosion control, and forage.

Cuivre River has not been tested for grazing but forage clippings were taken at different stages of growth and compared to tall fescue clippings from adjacent plots. Forage quality of the Cuivre River selection compared favorably to tall fescue as indicated by data below.

Clipping Date	Percent Protein		Percent ADF		Percent NDF	
	<u>TF</u>	<u>VWR</u>	<u>TF</u>	<u>VWR</u>	<u>TF</u>	<u>VWR</u>
4/24/02		27		26		47
5/30/01	9	12	40	34	61	60
10/11/01	15	15	31	34	52	55
11/15/01	20	17	22	24	37	44

TF = tall fescue; VWR = Cuivre River Virginia wildrye; ADF = acid detergent fiber; NDF = neutral detergent fiber.

2003

One new accession was added during 2003 and this was the medium height, forage type switchgrass that was selected and isolated from the low growing switchgrass assembly.

2004

Three accessions of cluster fescue, *Festuca paradoxa*, were added during 2004. The plants were germinated in the greenhouse from seed and transplanted April 7, 2004, to the initial evaluation area, tier F/a. The accessions established well and had excellent survival the first year. The plants will be evaluated on percent stand, vigor, height, and seed production next year. See collection information below.

Genus	Species	Common Name	Accession No.	Origin
Festuca	paradoxa	Cluster fescue	9083254	Tucker Prairie, MO
Festuca	paradoxa	Cluster fescue	9083255	Paintbrush Prairie, MO
Festuca	paradoxa	Cluster fescue	9083252	Harrison Co, MO

2005

No new accessions were added in 2005. The *Festuca paradoxa* was evaluated along with the other species in the forage quality study. The plants became very dormant by early summer and did not recover but made significant regrowth in the fall.

2006

New accessions planted are as follows;

Observational Nursery

Genus	Species	Common Name	Accn No.	From	Date Pltd
Desmodium	glabellum	Dillenius Tick Trefoil	9055415	MIPMC	5/5/06
Desmodium	glabellum	Dillenius Tick Trefoil	9005087	MIPMC	5/5/06
Desmodium	paniculatu m	Panicledleaf Tick Trefoil	9055428	MIPMC	5/5/06
Calamovilf a	longifolia	Prairie Sandreed	9086408	MIPMC	5/5/06
Elymus	riparius	Riverbank Wildrye	9086450	MIPMC	5/5/06
Elymus	canadensis	Icy Blue Canada Wildrye	9084347	MIPMC	5/5/06
Salix	sericea	Riverbend Silky Willow		MIPMC	6/15/06
Paspalum	floridam	Harrison Florida Paspalum	9043874	ETPMC	4/15/06

Study: 29I097G

Study Title: Assembly and Evaluation of Big Bluestem, *Andropogon gerardii* Vitman.

Study Leader: Bruckerhoff, S. B.

Introduction:

Big bluestem is a tall, warm-season, perennial, native grass with stiff, erect culms; flattened and keeled sheaths; membranous ligules; and flat or folded leaf blades. Big bluestem has developed a very efficient spreading root system that may reach depths of 5-8 feet (150-200 cm). Big bluestem reaches a mature height of 3-4 feet (90-120 cm) in northern latitudes, and 6-8 feet (180-240 cm) or more in the southern part of its natural range. Although short rhizomes may be present, it usually makes a bunch type growth. Big bluestem is composed of many ecotypes with a wide range of adaptation to soil and climate. Big bluestem is one of the most widespread and important forage grasses of the North American tallgrass prairie region. It is usually associated with one or more of the other three dominant species, Indiangrass (*Sorghastrum nutans* (L) Nash.), switchgrass (*Panicum virgatum* L.), and little bluestem (*Schizachyrium scoparium* (Michx.) Nash.). Big bluestem occurs on subirrigated lowlands, nearly level to gently undulating glacial till plains, overflow sites, level swales and depressions, residual and glacial uplands, and stream terraces and bottomlands along rivers and tributaries. The abundant, leafy forage is palatable to all classes of livestock.

Problem:

There is a need for an adapted variety of big bluestem for pasture and range seedings, surface mine reclamation, critical area planting, recreational area development and other conservation uses in Arkansas and Southern Missouri.

Objective:

The objective is to assemble, evaluate, develop and cooperatively release an adapted variety and/or varieties of big bluestem for conservation use in the following Major Land Resource Areas: 116A, 116B, 117, 118, and 119.

Cooperators:

USDA-NRCS Plant Materials Center at Elsberry, Missouri and the USDA-NRCS Plant Materials Center at Booneville, Arkansas.

Assembly:

The assembly consists of vegetative materials from adapted ecotypes throughout Northwestern Arkansas and Southwestern Missouri Major Land Resource Areas: 116A, 116B, 117, 118, and 119. Collection dates were between November 9 and 13, 1987. Four collection sites per county within the geographic area of collection were made. The number of sites was determined by the size of the county. The study plan supplement lists the states and the number of sites per county.

Procedure:

Four collections per county in the targeted Major Land Resource Areas were requested. The intent was to get a broad genetic base of plant material; therefore, the site selection attempt was to get as diverse sampling as practical when selecting superior big bluestem plants in the field. If a county had more than one Major Land Resource Area, collections were made in each area. Collections were from typical locations, which included natural grasslands (range), relic areas, and road right-of-ways. Avoided areas were those that may have been artificially seeded. Where possible, collections came from diverse soil textural types, such as sandy and silty; or range site groupings such as: (1) Run-in sites represented by overflow, or subirrigated; (2) normal upland sites represented by sandy, silty or clayey. Six subsamples (6" x 6" x 8" deep) were collected vegetatively at each site.

The samples were transported in material provided by the Plant Materials Center that included cartons, plastic bags, accession data sheets, and instructions for handling.

Plant Materials Center personnel picked up the cartons containing the samples at designated central locations within each administrative area in November 1987.

Transplanting procedures included temporary storage and handling. The samples were first assigned accession numbers and placed in temporary storage. On February 15, 1988, each subsample was transplanted into separate containers and maintained under controlled greenhouse conditions. The plants were then divided between two locations, Elsberry, Missouri and Booneville, Arkansas Plant Materials Centers, and established in space plant initial evaluation nurseries.

Discussion:**1987-1989**

A total of 370 accessions (collections) of big bluestem were initially collected during November, 1987, from the targeted areas: 194-Missouri; 85-Arkansas; 82-Oklahoma; and 8-Illinois. Individual plantlets were separated, transplanted into cone-tainers, and grown out in Forrest Keeling Nursery's greenhouse from February until May 1988. More than 4400 individual plantlets were transplanted into a space plant nursery with two replications and six plants per replication. The nursery is located in Field #14 at the PMC and was planted June 1988. The entire nursery was irrigated three times weekly in 1988 to insure good survival. Data collected in 1988 was mostly survival. Data collected in 1989 included survival, vigor, disease resistance, plant size, foliage size, and abundance and visual seed production. Accessions from each state were selected from the above criteria. The numbers selected from each state were as follows: Arkansas-14, Missouri-46, and Oklahoma-13. Table #1 shows the 73 accessions selected from the initial space plant nursery located in Field #14 on the PMC. These plants were vegetatively removed from the initial evaluation nursery in November 1989.

1990-1991

The plants selected in 1989 were transplanted into cone-tainers and grown out in the greenhouse that winter. These plants were planted in an isolated crossing block in Field #1 on May 23, 1990. Fifteen bulk pounds of clean seed were harvested in 1991.

1992-1993

The seed harvested in 1991 was sorted by weight and grown in cone-tainers in the greenhouse from January until April. Approximately 500 plants were planted in Field #7 in April and May 1992 for further evaluation.

Beginning in July 1993, the great flood began flooding approximately 86 acres on the PMC. The area where this planting was located was completely inundated with approximately eight feet of water. Just prior to the flooding of this site (July 8, 1993), the PMC staff uprooted 62 selections of big bluestem and re-established them to an upland site on the PMC (Field #8).

1994-1996

The nursery block established in Field #8 in July 1993 was evaluated for forage quality and quantity, seed production, plant maturity differences, and disease and insect resistance. Twenty-eight of the 62 plants were selected and allowed to cross. Seed from this crossing block is a composite of the original 73 accessions collected and is the breeders' block for the new accession 9078831. Seed was harvested in 1995 and 1996 and a seed increase plot will be established in 1997. The Booneville PMC also has made their selection and both will be included in the advanced evaluation.

1997-1998

The diversity in the original nursery block containing all 370 accessions is tremendous. There is a lot of variation within this species. The need for plant diversity for prairie restoration led to the release of the source-identified composite of all 370 accessions. This composite was given the accession number 9062323 and given the name OH-370 which stands for a composite of 370 collections made from the Ozark Highlands of Southern Missouri, Northern Arkansas, Eastern Oklahoma, and Southern Illinois. This plant was released in April 1997.

A 0.4-acre increase planting of 9078832 was planted May 22, 1997, in Field # 6. This planting was established in a conventional seedbed in 36" rows. The first year the planting produced 10 pounds bulk clean seed and in 1998 it produced 27 pounds bulk clean seed. The 1998 seed tested poorly but it is not known why. When seed becomes available from the Arkansas PMC the study will begin an advanced evaluation to compare the new accession, 9078831 with available varieties and also the accession Booneville has selected out of the original assembly of 370 collections.

The original planting was again evaluated the spring of 1997 looking for a tall, stiff stemmed, upright plant to use in wind barriers. Wind erosion is a problem in the flat and sandy crop fields in the bootheel area of Missouri. Switchgrass windbarriers are being tried in areas where field windbreaks using trees are not acceptable. Big bluestem was requested by the Missouri plant materials committee as an additional species to go along with switchgrass since the nursery is still intact. Five accessions (Table #2) were selected and increased vegetatively in the greenhouse and transplanted into an isolation block in Field #4. This block contained 126 plants and of those, 34 plants were selected to represent the crossing block that will serve as the breeders' block for a wind barrier selection. The final accessions represented in this block are 9065960, 9056913, and 9056914.

Selections were also made for landscape and beautification (Table # 3). These selections were transplanted into the rod row initial evaluation area for further evaluation.

1999

The increase plot of 9078831 was expanded in 1999 but did not develop as the 1997 original increase plot did. This accession is scheduled for release as a pre-varietal selection in 2000 if enough seed is available and field plantings are successful.

The wind barrier selection block was again evaluated in 1999 and narrowed down to a single accession, 9066960 (Table #2).

No additional selections were made for landscape plants in 1999 (Table #3).

2000

The increase plot of 9078831 was again expanded in 2000 but again was very slow to germinate. Seed was sent for testing and the sample contained a high percentage of dormant seed. This pre-varietal selection was scheduled to be released in 2000 and given the name OZ-70 that stands for Ozark Highland composite of 70 collections. The release has been delayed until a solution can be found for its high seed dormancy.

Seed was harvested from the wind barrier block and an increase planting will be made in 2001.

2001

The increase plot of 9078831 (OZ-70) was again expanded in 2001 but this year it was planted the first week of March to allow for stratification. Seed harvested in 2000 was used in the planting because seed less than one year old appears to have more dormancy than seed that has had time in storage. The portion of the plot that was planted in 2001 established well and even produced a small amount of seed the first year.

Seed harvested from the wind barrier accession was propagated in the greenhouse and transplanted into an evaluation nursery. The evaluation nursery has approximately 250 plants on a three-foot grid. These plants will be evaluated for two additional years for height, biomass production and lodging. This plant will be released as a tall, stiff stemmed selection.

2002

Field testing has shown possible problems with establishment of OZ-70 big bluestem. A trial was started using replicated plots to compare the establishment of OZ-70 with 'Rountree' big bluestem. First year data indicates that Rountree establishes quicker with higher stand density than OZ-70. It also indicated that the winter dormant plots (planted March 14, 2002) of OZ-70 were better than the spring planted plots (planted June 21, 2002). This was reversed with the Rountree. This information supports the high seed dormancy problem indicated in seed tests. These plots will be monitored one more year to see if the slow establishment has to do with the long-term density of the plots.

A comparison between new seed and one-year-old seed is planned for 2003. Seed tests indicate a problem with seed dormancy in new seed. Storage for one year could help rectify this problem.

2003

A trial comparing new (previous year's harvest) and older seed (one to five years old) was conducted in 2003. Establishment was quicker if new seed was winter dormant planted.

This supports that newly harvested seed has higher seed dormancy but all lots of seed developed into successful stands the establishment year.

The technical review committee recommended proceeding with a Selected Release for this accession and OZ-70 Germplasm Big Bluestem was released December 2003.

Release Documentation

The OZ-70 selection has very good forage production and vigor that appears to be comparable or better than Rountree. OZ-70 is approximately two weeks later in booting than Rountree and forage quality is better when tested at Elsberry (see below). Rountree exhibits considerable more rust when compared to OZ-70 in Southern Missouri. OZ-70 also has very good seed production with a 2003 yield of 280 bulk pounds of clean seed per acre.

Forage clippings of OZ-70 Germplasm were compared with Rountree. These samples were replicated and taken at different stages of growth. Forage quality of the OZ-70 selection compared favorably to Rountree as indicated by following data.

Clipping Date	Percent Protein		Percent ADF		Percent NDF	
	OZ-70	Rountree	OZ-70	Rountree	OZ-70	Rountree
6/19/02	14.3	8	30.9	35.7	55.8	60.8
7/8/02	8.2	5.8	34.1	33.0	59.3	60.5
8/30/02*	11.4	11.9	34.3	34.7	54.6	56.6

*Regrowth material from 7/8/02 clipping.

ADF=acid detergent fiber; NDF=neutral detergent fiber.

OZ-70 Germplasm big bluestem was compared to 'Rountree' big bluestem for establishment and Rountree was quicker to establish indicating better seedling vigor when new (previous year's harvest) seed was planted. A seeding trial was conducted in 2003 and compared seed harvested in 2002, 2001, and a mixture of seed harvested in 1997 through 2000.

The results below indicate some seed dormancy in new crop seed but all plots developed very good to excellent stands and had seedhead production the first year.

	Stems Per Row Foot	Percent Cover
Winter dormant planting, 2002 seed	16	92
Winter dormant planting, 2001 seed	14	78
Winter dormant planting, 97-00 seed	8	65
Spring planting 2002 seed	10	60
Spring planting 2001 seed	14	87
Spring planting 97-00 seed	10	75

2004

The tall, erect, lodging resistant big bluestem currently being evaluated as a wind barrier selection, (accession 9083274) was increased for advanced testing. Seed was harvested in 2003 from the remaining plants in the final evaluation block. The increase block established well but no seed was harvested in 2004. Limited seed production is anticipated for 2005 and available for advanced testing in 2006.

Shorter growing collections were also isolated and evaluated. Six collections were narrowed to three (accessions 9056902, 9056905, and 9056906) and allowed to cross. This composite (accession 9078832) was harvested in 2003 and used to establish an increase block in 2004. Seed production is anticipated for 2005 and available for advanced testing in 2006. This selection will be evaluated for use in vegetative buffers and filters.

2005

The two increase blocks of big bluestem that were established in 2004 (tall, lodging resistant, - accession number 9083274 and shorter growing, - accession 9078832) both produced seed in 2005. These blocks were planted April 28, 2004. Accession 9083274 produced 65.7 bulk pounds on 0.183 acre for a yield of 359 bulk pounds per acre. Accession 9078832 produced 144.9 bulk pounds on 0.51 acre for a yield of 287 bulk pounds per acre.

2006

The two increase blocks of big bluestem planted April 28, 2004 were again managed for seed production. Neither plot was enlarged.

The tall, lodging resistant accession, 9083274, yielded 59.1 bulk pounds on 0.183 acre for a yield of 323 bulk pounds per acre. The year was very dry during parts of the growing season. Seed quality was poor resulting in a very poor percent PLS.

The shorter growing accession, 9078832, yielded 193.2 bulk pounds on 0.51 acre for a yield of 379 bulk pounds per acre. Again seed quality was not very good resulting in a poor percent PLS.

The shorter growing accession (9078832) also is very resistant to lodging and these characteristics look good for this accession's use in conservation programs. With adequate seed on hand for field plantings and grower interest, this accession was released as a selected class release in 2006 (see 2006 releases section for release notice).

**Study 29I097G - Assembly and Evaluation of Big Bluestem,
Andropogon gerardii, Vitman.**

Table #1

Accessions Selected for Crossing Block

<u>Collector</u>	<u>State</u>	<u>County</u>	<u>Accession Number</u>	<u>MLRA</u>	<u>Soil</u>
Levonna S. Vekman	Arkansas	Faulkner	9056956	118	Leadville
Mark L. Kennedy	Arkansas	Fulton	9056968	116A	Geesville
Luther O. Shaw	Arkansas	Izard	9056920	116A	Mako
NRCS-Field Office	Arkansas	Logan	9056964	118	Taff
NRCS-Field Office	Arkansas	Madison	9056962	118	Leadvale
Stephen T. Ford	Arkansas	Madison	9056945	117	Nixa-SL
John Y. Harrington	Arkansas	Madison	9056923	116A	Estate-SC
John Y. Harrington	Arkansas	Madison	9056952	116A	Estate-SC
Lane L. Gentry	Arkansas	Perry	9056922	119	Clebit
John D. Kopf	Arkansas	Scott	9056936	119	Carnasaw
Jeremy R. Funk	Arkansas	Sharp	9056914	116A	Gepp
NRCS-Field Office	Arkansas	White	9057058	118, 134	
NRCS-Field Office	Arkansas	White	9057060	118,134	
Robert S. Garner	Arkansas	Yell	9056908	119,118	Clebit-FSL
H. Dan Philbrick	Missouri	Barry	9056832	116B	
Dudley W. Kaiser	Missouri	Benton	9056840	116B	Bardley
NRCS-Field Office	Missouri	Camden	9056724	116A	Gatewood
William K. Quage	Missouri	Cedar	9056800	116B	Hector
Patricia A. Beneke	Missouri	Cole	9056821	115	Goutewood
Patricia A. Beneke	Missouri	Cole	9056806	115	Gatewood
Melodie Marshall	Missouri	Crawford	9056820	116B	
Melodie Marshall	Missouri	Crawford	9056886	116B	
Melodie Marshall	Missouri	Crawford	9056767	116B, 116A	Lebanon
Myron C. Hartzell	Missouri	Dent	9056773	116B	Coulstone
Myron C. Hartzell	Missouri	Dent	9056763	116B	Lebanon
John L. Lumb	Missouri	Douglas	9056833	116B	Doniphan
Art Kitchen	Missouri	Franklin	9056855	115	Crider
Art Kitchen	Missouri	Franklin	9065771	115	Union
NRCS-Field Office	Missouri	Gasconade	9056848	116B	Gladden
Clayton P. Robertson	Missouri	Gasconade	9056875	116B	
H. Lane Thurman	Missouri	Greene	9056716	116B	Chirty Silt Loam
NRCS-Field Office	Missouri	Hickory	9056839	116A	
Stanley Lamb	Missouri	Iron	9056774	116A	Midco
Howard Combes	Missouri	Howell	9056753	116A	Doniphan
Joe H. Everett	Missouri	Jefferson	9056842	115	GL
NRCS-Field Office	Missouri	LaCledde	9056741	116A	Cherty Silt Loam
Kees VanderMer	Missouri	LaCledde	9056791	116A	Union
Cecile Allen	Missouri	Lawrence	9056709	116B	Viraton
Ron R. McMurtrey	Missouri	McDonald	9056719	116A	
Larry E. Lewis	Missouri	Miller	9056732	116B	SIL
Larry E. Lewis	Missouri	Miller	9056868	116B	SIL
Henry E. Knipker	Missouri	Moniteau	9056890	116B	Glensted
Mary Beth Roth	Missouri	Morgan	9056831	116B	

Study 29I097G – Assembly and Evaluation of Big Bluestem, *Andropogon gerardii*, Vitman.

Table #1 - continued

<u>Collector</u>	<u>State</u>	<u>County</u>	<u>Accession Number</u>	<u>MLRA</u>	<u>Soil</u>
Mary Beth Roth	Missouri	Morgan	9056837	116B	
Stephen E. Robbins	Missouri	Organ	9056770	116A	
William R. Dilbeck	Missouri	Polk	9056828	116B	
NRCS-Field Office	Missouri	Pulaski	9056746	116A	Wilderness
Clarence Wagy	Missouri	Reynolds	9056701	116A	
Charles E. Johnson	Missouri	Ripley	9056895	116A	
Charles E. Johnson	Missouri	Ripley	9056894	116A	
Steve Wall	Missouri	Shannon	9056762	116A	
Claude A. Peifer	Missouri	Ste. Genevieve	9056819	116B	Bloomsdale
Edward L. Templeton	Missouri	St. Francois	9056845	116A	Crider
Carl Wehrman and Dude Davidson	Missouri	Taney	9056712	116A	Clarksville
Jeff A. Lamb	Missouri	Texas	9056728	116A	Goss
NRCS-Field Office	Missouri	Wayne	9056854	116A	
Patrick L. Adams	Missouri	Washington	9056817	116A	Silty Clay Loam
Patrick L. Adams	Missouri	Washington	9056870	116A	Silty Clay Loam
John N. Emerson	Missouri	Webster	9056737	116B	
Dan D. Divine	Missouri	Wright	9056733	116B	
Andrew R. Inman	Oklahoma	Adair	9056996	117	Hector Complex
Billy D. Dudley	Oklahoma	Cherokee	9057010	116A, 117	Newtonia
Billy D. Dudley	Oklahoma	Cherokee	9057016	116A, 117	Talpa-Rock
Kenneth W. Swift	Oklahoma	Choctaw	9057025	112	Muskogee SL
Warren R. Sanders	Oklahoma	Coal	9057005	119	Boham
Steve D. Clark	Oklahoma	Latimer	9057014	118, 119	Stigler SL
Robert E. Blackman	Oklahoma	Mayes	9056995	112, 116A	Hector
Sam L. Viles	Oklahoma	McIntosh	9057035	118	Karma SL
Patrick I. Bogart	Oklahoma	Okmulgee	9057032	112, 118	Taloka SL
Patrick I. Bogart	Oklahoma	Okmulgee	9057037	112, 118	Taloka SL
NRCS-Field Office	Oklahoma	Ottawa	9057030	116A, 112	ETA-SL
William R. Bin	Oklahoma	Pushmataho	9957052	119	Bosville
William R. Bin	Oklahoma	Pushmataho	9057046	119	Bernow FSL

Wind Barrier Selection Isolation Block

Table #2

<u>Collector</u>	<u>State</u>	<u>County</u>	<u>Accession Number</u>	<u>MLRA</u>	<u>Soil</u>
	Arkansas	Logan	9056960	118	Laedvale

Study 29I097G – Assembly and Evaluation of Big Bluestem, *Andropogon gerardii*, Vitman.

Landscape Selection Rod Row Area

Table #3

<u>Collector</u>	<u>State</u>	<u>County</u>	<u>Accession Number</u>	<u>MLRA</u>	<u>Soil</u>
Clarence Wagy	Missouri	Carter	9056703	N116A	Opequon
Clarence Wagy	Missouri	Reynolds	9056708	N116A	Clarksville
Myron Hartzell	Missouri	Dent	9056812	116A	Elsah
Kenneth W. Swift	Oklahoma	Latimer	9057025	119	Freestone Variant - Bernow Variant Complex
	Oklahoma	McCurtain	9057049	1336	Kinta Clay Loam
Dennis W. Shirk	Missouri	Maries	9056877	116A	Lebanon
Larry B. Cash	Arkansas	Carroll	9056934	116A	Nixa

Study: 29I101J

Study Title: Assembly and Evaluation of Arrowwood, *Viburnum dentatum* L.

Study Leader: Cordsiemon, R.

Introduction:

Arrowwood is an upright bushy shrub to five meters; bracts are glabrous, becoming gray; leaves suborbicular to ovate, 3-8 cm long, short acuminate, rounded or subcordate, coarsely dentate, glabrous and lustrous above, glabrous beneath or bearded in the axils of the veins, with 6-10 pairs of veins; petiole 1-2.5 cm long; cymes slender stalked, 5-8 cm across, glabrous; stamens longer than corolla. Flowers are globose-ovoid, 6 mm long, blue-black.

Problem:

There is a need for developing arrowwood for use as wildlife food and habitat in the three states being served by the center.

Objective:

The objective is to assemble, comparatively evaluate, select and release an adapted cultivar of arrowwood.

Discussion:

1988-1992

Collections were requested from the three-state service area but only nine were made. There was concern regarding the correct species being collected because of its rare occurrence in the service area according to the literature reviewed. The collections were stratified and placed in the greenhouse for germination but none germinated.

1993

One hundred and fifty plants were obtained with a field collection origin in the state of Iowa. These plants were planted in Field #7e in May 1993. All plants were surviving in good to excellent condition up to the time of the great flood of 1993.

Approximately eight and a half feet of floodwater inundated this planting. Once the floodwaters receded, it became apparent that the entire planting was destroyed.

More plants will be sought for possible replacing in 1994 or 1995.

1994

This project was reestablished April 25, 1994 in Field #11e at the PMC. There was no seed from native collections available at this time so six accessions of plant materials were purchased from nursery production stock. Three accessions were named and three were common stock with origins from Iowa and Illinois. The summer of 1994 experienced several significant dry periods and although they were hand watered several times, some replanting of the smaller plants was necessary.

1995-1996

The planting was evaluated for survival, height, spread, and form. Survival of five of the six accessions was excellent. The Iowa source was established with smaller plants but had only about 60% survival.

1997-1999

Accession 9068590, origin Iowa; source, Forrest Keeling Nursery, was selected based on the following characteristics: seed production, insect and disease resistance and form. Seed of this accession was harvested in 1997, 1998 and 1999 and propagated in the PMC greenhouse. These plants will be used in field plantings in Iowa starting in the spring of year 2003. Plans are to release this accession as a selected class germplasm in year 2004-2005.

2000

Plans were to release accession 9068590, arrowwood in year 2001 but because of the need for field planting evaluations to support this release; the release date will need to be put off until at least 2004 or 2005. Nine ounces of clean seed were harvested from the planting located in Field #11 on the PMC on July 19, 2000. Seed was matured and had begun to shatter at the time of harvest. This accession will be evaluated in field plantings only in the state of Iowa.

The source of this accession (9068590) of arrowwood is Floyd County, Iowa near Charles City.

2001

The selected accession of arrowwood (9068590) produced a medium amount of seed this year (0.33 pound). The seed was harvested on July 9, 2001 from a planting located in Field 11 on the PMC. This accession will be placed in field plantings only in the state of Iowa in 2002.

2002

Accession 9068590 from Floyd County Iowa was selected from the *Viburnum dentatum* L., arrowwood assembly. Seed was harvested from this selection on July 22, 2002. This selection produced 1.30 pounds of clean seed. The following is a listing of seed production by year through 2002.

Year of Harvest	Amount of Seed Harvested
2000	9.00 ounces
2001	0.33 pound
2002	1.30 pounds

2003

Two plants of accession 9068590 were removed (transplanted) from the initial planting and relocated in an isolated area in Field #6 in the fall of 2003. Seed (3.30 pounds) from these plants were harvested (July 27, 2003) and planted in the PMC greenhouse. The plantlets will be used in Iowa's field planting program. A tested class release is scheduled for 2005.

2004

Seed produced in 2003 was a cross of the initial planting material and as of 2004 the transplanted plants have not produced isolated seed. The Elsberry PMC and Forrest Keeling Nursery are in the process of propagating bareroot material from the 2003 production. This material will be used in field plantings. The 2005 growing season should produce seed for the first time since the relocation of the selected material (Accession 9068590).

2005

The selected trees of arrowwood, 9068590, again did not produce seed due to the hot, dry summer. The selected plants are doing well and continually growing, but the lack of rain caused the trees to shut down seed production. Plans for 2006 are to irrigate if the growing season looks to be dry.

2006

This study has been put on hold at this time.

Study: 29I107G

Study Title - Assembly and Evaluation of Eastern Gamagrass, *Tripsacum dactyloides*, L.

Study Leader: Bruckerhoff, S. B.

Introduction:

Eastern gamagrass, *Tripsacum dactyloides* L., is a tall warm season perennial grass found from Florida to Texas and Mexico, north and west to Massachusetts, New York, Michigan, Illinois, Missouri, Iowa and Nebraska. Eastern gamagrass grows in large clumps with thick rhizomes, broad flat leaves, the staminate and pistillate flowers in separate parts of the same many-flowered spikes. The pistillate spikelets are solitary and occur in hollowed portions on opposite sides of the thickened hard joints of the lower part of the rachis; this pistillate portion breaks up at maturity into several one-seeded joints. The staminate spikelets are two-flowered and in pairs on one side of a continuous rachis. Eastern gamagrass occurs on prairies, open limestone slopes, borders of woods and thickets, fields, and along roadsides and railroads. Refer to literature review.

Problem:

Eastern gamagrass is high quality forage with few available varieties and none of local origin in the PMC service area. There is need for a better-adapted variety of eastern gamagrass for pasture and range seedings, silage production, recreational area development and other conservation uses in the Midwestern and Eastern states for summer forage and vegetation.

Objectives:

The objective is to assemble, evaluate (identify superior plants), develop and release an adapted variety and or varieties of eastern gamagrass for conservation use in Missouri, Iowa, Illinois, Indiana and Ohio.

Procedure:

The assembly consists of vegetative material from adapted ecotypes primarily from the three-state service area. Additional collections came from Indiana, Ohio, Tennessee, Kentucky, and eastern Nebraska. The targeted collection area included the following Major Land Resource Areas: 103 (south), 104 (south), 105 (south), 106 - 115, 121, 122, 125, 126, 128, 131 (north), and 134 (north). Four collections from four different sites per county were requested. When possible, collections should come from different soil textural types.

Vegetative collections were taken from natural prairie stands or prairie remnants. The intent was to get a broad genetic base of plant material; therefore, attempting to get as diverse sampling as is practical when selecting superior eastern gamagrass plants in the field. Vegetative collections were taken from typical natural areas, prairies, borders of woods, thickets, and along roadsides and railroads. Areas that may have been seeded were avoided.

The samples were collected when the plant was dormant in the fall, divided into plantlets in the winter and placed into square open bottom containers and grown out in the greenhouse. Twelve plants per accession were planted.

The plants were planted in a randomized complete block with three replications. Each plot had three plants and all plants were planted on four-foot centers. A border row was planted around the three replications. This study was planted into a clean tilled seedbed with recommended fertility and weed control. Plants were evaluated for survival, vigor, height, spread, disease and insect resistance, lodging, amount of seed production, plant phenology, forage quantity, and regrowth.

Discussion:

1989-1990

The collection of samples went very well the fall of 1989. Two hundred forty-three samples were collected over a seven-state area. The primary area of collection was Missouri, Iowa, and Illinois with the majority coming from Missouri. Other states sending collections were Nebraska, Tennessee, Indiana, and Virginia.

During February 1990, each sample was cut apart and planted into 2 7/8-inch square by 5 1/2-inch tall open bottom containers for root development by air pruning. Twelve plants of each accession were planted and grown out in the greenhouse. The week of May 7, 1990, the plants were transplanted into a randomized complete block with three replications and three plants per replication. Extra plants were used for the border rows. The study was established at the PMC in Field #7F.

1991-1992

The planting was evaluated several times throughout 1991. Evaluations were made for survival, vigor, disease and insect resistance, amount of seed production, plant phenology, lodging, and size, height, width, and amount of foliage.

The planting was again evaluated in 1992 with an emphasis on amount of regrowth after clipping and late season vigor.

1993

The planting was evaluated in 1993 but was also destroyed by the flood. Before the planting was inundated with approximately eight feet of floodwater, PMC personnel were able to vegetatively remove 45 accessions that were rated the best and replanted them (July 2, 1993) to an upland site. The 45 accessions (Table #1) were selected based on their performance documented with three years of evaluation data. The plants were transplanted during a poor time of year but with irrigation they all survived.

1994-1996

The 45 best accessions were evaluated for forage quality and quantity, phenology, and number of chromosomes. Selections of the top five to ten accessions will be made in early 1997 from data taken in 1995 and 1996 (Table # 2). The plants will be increased in the greenhouse and planted into a crossing block in 1997.

1997-1998

Based on the evaluations of the 45 plants that were saved, the best 13 (Table # 2) were increased in the greenhouse and planted in Field # 6. There was only one plant per

accession of these 45 plants that were evaluated, so additional plants were planted for future consideration.

The top four rated diploids, 9061911, 9061984, 9061991, and 9061948 were increased vegetatively in the greenhouse and planted in an isolation block in Field # 7F. This block will be harvested and used as a breeder block for a possible varietal release. Seed from this block will be used to start an increase planting and to also start a new evaluation nursery for recurrent selection. The accession 9061911 was also established in an isolation block by itself as the top diploid and will be compared against the composite. The accession 9061924 was also planted in an isolation block and will be evaluated as a possible northern source as it was the best northern collection and might be best suited for Northern Missouri and Southern Iowa.

Increase plots of the two top rated tetraploids, 9061944 and 9062018, were also established from vegetative material started in the greenhouse.

1999

The composite of the four top rated diploids (9061911, 9061984, 9061991, and 9061948) were assigned the accession number 9083214. Seed was harvested in July and will be used for advanced testing and to also start an increase (foundation) field. Seed was also harvested from the following increase plots: 9061911, 9061924, 9061944, and 9061984.

2000

An increase (foundation) field was planted May 15, 2000, for accession 9083214 using stratified seed. The planting was small and will be expanded in 2001. It did not produce seed in 2000 and was also thin. Accessions 9083214 (composite of the four best diploids), 9061911 (the best diploid), and 9061924 (best northern diploid) were propagated in the greenhouse for use in the advanced study of eastern gamagrass with Agricultural Research Service (ARS) in Woodward, Oklahoma (study MOPMC-P-003-PA, WL). The two best tetraploids (1944 and 9062018) were also propagated in the greenhouse but did not germinate. Seed was harvested from the breeders' blocks of all the above mentioned accessions.

2001

The increase (foundation) field for the accession 9083214 was expanded in 2001 but the stand was thin the first year. The seed was wet treated for stratification and planted April 18, 2001. Two rows of plants propagated in the greenhouse from stratified seed were planted alongside the increase planting. These plants were transplanted in mid April and performed poorly early due to cool weather.

A crossing block in Field #6 consisting of eight diploid accessions was also harvested in 2001. This block contained accession numbers 9061991, 9061948, 9062005, 9062085, 9061937, 9061911, 9061924, and 9061984. This composite was assigned the accession number 9083237. Plants from seed grown from this composite will be planted in an evaluation nursery at the PMC.

2002

An evaluation nursery of the composite 9083237 was started in Field #13 at the PMC. Additional seed from the crossing block in Field #6 was treated and propagated in the greenhouse while selecting for quick emergence.

2003

Seed was again harvested from the crossing block in field #6 and was treated and propagated in the greenhouse. These plants will be used to expand the evaluation nursery in field #13 at the PMC.

2004

The evaluation nursery for accession 9083237 was expanded. This accession is a composite of eight diploids, one of which is a northern Missouri collection. This accession is also being evaluated at the University of Northern Iowa, Cedar Falls, Iowa.

2005

This was an establishment year for the evaluation nursery of accession 9083237 and the nursery was not evaluated.

Accession 9083214 was harvested for seed and tested very poor.

2006

The release of 'Verl' Eastern Gamagrass gives our service area another cultivar for consideration. 'Verl' has been planted as far North in our service area as Cedar Falls, Iowa and has survived and thrived under no pressure. The PMC will put the development of other Eastern gamagrass selections on hold at this time.

Study 29I107G -Selected Accessions of Eastern Gamagrass

Table #1

Collector	State	County	Accession Number
Patrick L. Adams	Missouri	Clinton	9061968
Christopher C. Bordon	Illinois	Calhoun	9062012
William L. Brouk	Missouri	Benton	9061948
Dennis J. Browning	Missouri	Daviess	9061896
Dennis J. Browning	Missouri	Daviess	9061897
Paul Frey	Missouri	Dallas	9062082
Paul Frey	Missouri	Dallas	9062085
Darin W. Gant	Missouri	Stoddard	9061991
C. Mark Green	Missouri	Christian	9062032
Kenneth N. Gruber	Missouri	Rodaway	9061924
Terry A. Gupton	Tennessee	Roane	9034521
Robert T. Hagedorn	Missouri	Johnson	9061940
Thomas J. Hagedorn	Missouri	Pettis	9061911
Montie b. Hawks	Missouri	DeKalb	9061970
Montie B. Hawks	Missouri	DeKalb	9061971
Lynn A. Jenkins	Missouri	Newton	9062005
Lynn A. Jenkins	Missouri	Newton	9062006
David V. Johnson	Missouri	Worth	9061957
Arthur P. Kitchen	Missouri	Franklin	9062071
Viletta F. Langston	Missouri	Stone	9062034
Bob McClenny	Virginia		9034551
Steve A. McMillin	Missouri	Butler	9061994
D. Scott Patterson	Missouri	Cass	9061944
Al Peifer	Missouri	Perry	9061995
Lisa A. Ptasnik	Illinois	Massac	9062015
Lisa A. Ptasnik	Illinois	Massac	9062018
Shepherd Farms	Missouri		9061869
Shepherd Farms	Missouri		9062048
Shepherd Farms	Missouri		9062089
James E. Sturn	Missouri	Mercer	9061892
Edward L. Templeton	Missouri	St. Francois	9061999
Edward L. Templeton	Missouri	St. Francois	9062002
USDA-NRCS-Quicksand-PMC	Tennessee	Anderson	9034501
USDA-NRCS-Quicksand-PMC	Tennessee	Anderson	9034502
USDA-NRCS-Quicksand-PMC	Tennessee	Anderson	9034503
USDA-NRCS-Quicksand-PMC	Tennessee	Anderson	9034504
Curtis W. Walker	Missouri	Andrew	9061923
Stan Wall	Missouri	Shannon	9061992
Stan Wall	Missouri	Shannon	9061984
Ed J. Weilbacher	Illinois	Randolph	9062010
David L. White	Iowa	Wayne	9061876
Melvin Womack	Indiana	DuBois	9062069
Darrel D. Wright	Nebraska	Pawnee	9061887
David L. Wright	Missouri	Hickory	9061906
David L. Wright	Missouri	Hickory	9061937

Study 29I107G - Assembly and Evaluation of Eastern Gamagrass, <i>Tripsacum dactyloides</i> , L.							
		Top Rated Accessions					Table #2
		Percent Protein					
Accession Number	Ploidy Level	Percent Protein			Regrowth 3/	Regrowth	
		5/3/1996	6/27/1996	7/19/1996	8/27/1996	10/15/1996	
9061911	Diploid	17.2	12.0	7.5	11.0	5.9	
9061984	Diploid	19.4	11.7	9.3	13.5	8.1	
9061991	Diploid	17.3	11.1	9.3	11.1	8.2	
9061948	Diploid	17.3	11.4		13.2	7.5	
9062005	Diploid	17.3	11.7	8.6	11.7	9.5	
9061924	Diploid	17.0	10.3	7.2	11.6	7.8	
9062085	Diploid	16.9	11.0	7.0	9.4	8.8	
9061937	Diploid	18.8	14.1	6.9	13.0	6.5	
Pete	Diploid	11.6	7.0	5.3	11.0	5.2	
9061944	Tetraploid	15.6	10.1	8.8	11.7	7.6	
9062018	Tetraploid	18.4	9.4	7.0	11.0	8.7	
9061994	Tetraploid	16.0	10.0	6.3	11.0	9.1	
9061999	Tetraploid	18.2	13.3	7.7	12.2	9.0	
9062032	Tetraploid	16.7	11.6	9.0	10.2	9.4	
Accession Number	First	_1/	_2/		_3/	_4/	
	Seedhead Emergence	Forage Quantity	Vigor	Forage Height (ft)	Forage Regrowth	% Seed Fertility	
9061911	6/16/1996	1	1.3	5.0	1	59.6	
9061984	6/16/1996	1	1.6	5.3	2	41.5	
9061991	6/24/1996	1	2.0	5.0	1	66.9	
9061948	6/8/1996	2	2.0	5.0	2	71.7	
9062005	6/8/1996	2	2.8	4.9	4	82.7	
9061924	6/10/1996	2	1.9	4.0	1	75.9	
9062085	6/1/1996	5	1.9	4.3	3	83.3	
9061937	6/1/1996	3	3.0	4.5	4	85.2	
9061944	6/24/1996	3	2.1	4.8	1	76.4	
9062018	7/1/1996	2	2.3	4.3	3	59.6	
9061994	7/1/1996	3	2.7	4.4	3	67.6	
9061999	6/24/1996	3	2.9	4.4	4	68.4	
9062032	6/24/1996	2	2.1	4.7	3	67.7	
_1/ Forage quantity was a visual 1 to 9 rating with 1 being the best.							
_2/ Vigor was a visual 1 to 9 rating of overall condition of the plant with 1 being the best. This is an average of 10 evaluations throughout the growing season.							
_3/ All plants were clipped to an 8 inch height on 7/22/96 and plants were rated for amount of regrowth on a 1 to 9 scale. Samples of regrowth were sent in for analysis.							
_4/ Percent of 400 seed that are viable; 100 seeds harvested four times at one week intervals.							

Study: 29I108G

Study Title: Assembly and Evaluation of Low Growing, Rhizomatous Switchgrass, *Panicum virgatum* L. for Use in Waterways, Filter Strips and Other Conservation Uses.

Study Leader: Bruckerhoff, S. B.

Introduction:

Switchgrass is a warm-season, perennial, native grass. Plants are usually green or glaucous, with numerous scaly creeping rhizomes. Culms are erect, tough and hard, one to two meters rarely to three meters tall; sheaths glabrous; blades 10-60 centimeters long, three to 15 millimeters wide, flat glabrous, or sometimes pilose above or near the base, rarely pilose all over; panicle 15-50 centimeters long; acuminate; first glume clasping, two-thirds to three-fourths as long as the spikelet. Switchgrass frequents a wide variety of habitat, usually sunny including dry or moist prairies, moist seepage of rocky glades and buff escarpments, gravel bars of streams, open woods and along railroad tracks.

Problem:

There is a need for an adapted variety of a dense low growing, strongly rhizomatous switchgrass for use in waterways, filter strips, and for other conservation uses in Missouri, Illinois, Iowa, and adjacent states.

Objective:

The objective is to assemble, select, and develop a dense low growing strongly rhizomatous switchgrass, with good seedling vigor and seed characteristics, for use in waterways and streambank corridors.

Procedure:

The assembly consists of the collection of vegetative material from adapted ecotypes in Iowa, Illinois, and Missouri. The targeted collection area includes the following Major Land Resource Areas: 102b, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 131, and 134. Five collections from each NRCS administrative area were requested.

Vegetative collections were taken from natural prairie stands, prairie remnants or individual short growing plants growing in areas that are seasonally wet like a waterway. Total height of the plant was to be no more than three feet.

The samples were collected when the plant was dormant in the fall, divided into plantlets in the winter and placed into square open bottom containers and grown out in the greenhouse. Twelve plants per collection were grown out in the greenhouse.

The plants were planted into a randomized complete block with three replications. Each plot had three plants and all plants were planted on four-foot spacing. A border row was planted around the three replications. This study was planted into a clean tilled seedbed with recommended

fertility and weed control. Plants were evaluated for survival, vigor, height, and spread that included rhizomatous characteristics, disease and insect resistance, lodging, and seed production.

Discussion:

1990-1991

The collections of *Panicum virgatum* L., low growing highly rhizomatous switchgrass was initiated in November 1990 and extended through 1991. One hundred eighteen collections were obtained from Major Land Resource Areas 102B-116, 131 and 134 in Missouri, Illinois and Iowa. The total number of collections received was 22-Illinois; 28-Iowa and 68-Missouri. All collections were assigned accession numbers and stored in a cool damp building.

1992-1993

The collections were vegetatively propagated in cone-tainers and placed in the greenhouse in January 1992. These plants were then transplanted in Field #7c on the PMC on June 9, 1992, in a randomized complete block with three replications. Baseline evaluations were taken this year; survival, spread, height, and number of panicles per plant. More detailed evaluations were scheduled for succeeding years.

Beginning in July 1993, the great flood began inundating the area where this project was located. Prior to the flooding of this site (July 2, 1993), additional evaluations were started and 67 accessions were vegetatively moved to an upland site on the PMC for continued evaluation. Table #1 lists the selected accessions, origins, and collectors.

1994-1995

Evaluations were continued on the 67 accessions during 1994 and 1995. The original planting in Field #7c that was flooded in 1993 was also checked for survivors. The planting was flooded by as much as eight feet of water for almost eight weeks. Nine plants were found that showed life and were dug up and moved to an upland site. These nine plants represented three accessions (Table #2).

Five accessions were selected out of the block of 67 for a short growing rhizomatous type. The five accessions (Table #3) were allowed to cross and seed was harvested and grown out in the greenhouse. The five accessions were also dug and increased in the greenhouse in containers.

1996

The five selected accessions (Table #3) were planted into a crossing block June 26, 1996. Half the block was from clonal material from each of the five accessions and the other half was from seed harvested from each of the five plants that were allowed to cross with each other. The accessions of each half of the planting were replicated five times with five plants per replication. Unwanted plants will be eliminated and the remainder of the block will be used for seed increase.

1997-1998

The three accessions (Table #2) of flood tolerant switchgrass were vegetatively increased in the greenhouse. Approximately 250 plants were transplanted April 1997 in Field #7. This is now the breeders' block for the accession 9083170 that is a composite of the three accessions listed in Table #2. Seed was harvested from this plot the first year and used to start a small increase plot in 1998. A small amount of seed was harvested from this increase plot the first year. It is also planned to increase the size of this plot in 1999.

The low growing switchgrass block containing five accessions (Table #3) was again evaluated in 1997. Thirty-five plants were selected from the block of 250. Selected plants were allowed to cross and produce seed. This seed was also used to start an increase field in 1998. This small increase plot produced minimal seed the first year. Seed was again harvested from the 35 plants in 1998 and will be used to make the increase plot size bigger in 1999. The 35 selected plants are the breeder's block for the new accession 9083172 that is a composite of the five accessions in Table #3.

1999

The increase plot of flood tolerant switchgrass, accession 9083170, was expanded in May 1999. This planting did not do well, possibly poor seed germination combined with a very dry summer. Weed control was also poor. Establishment of field plantings was also poor. Expanding the increase plot will again be planned for 2000. Seed was harvested from the breeder's block and the 1998-increase plot. This seed was small due to dry weather.

The increase plot of low growing switchgrass, accession 9083172, was also expanded in May 1999. This planting also did poorly, again possibly poor seed germination combined with a very dry summer. Weed control was also poor. Field testing will begin when seed becomes available. Expanding the increase plot will be planned for year 2000. Seed was harvested from the original 35-plant breeder's block and also the increase field. This seed was also small due to dry weather.

2000

Increase plots of the flood tolerant switchgrass, accession 9083170, and the low growing switchgrass, accession 9083172, were again planted in 2000. These plantings were very sparse and slow to establish. The plantings made in 1999 contained some plants with minimal seed produced. Plantings will again be tried in 2001 with more stratification.

2001

The increase plots of the low growing switchgrass, accession 9083172, that were planted in 1998 and 1999 have filled in and produced seed. The plots planted in 2000 and 2001 have failed. This accession appears to have high seed dormancy and combined with excessive weed competition caused poor establishment. An increase planting is planned for 2002 on an upland site with less weed problems.

The increase plots of the flood tolerant switchgrass, accession 9083170 that was planted in 1998 produced seed in 2001. The 1999 planting was very thin and the 2000 and 2001 plantings have failed. This accession appears to have high seed dormancy. Another increase planting is planned in 2002 with additional stratification.

Accession 9062244 was observed in the nursery block in field eight as having high forage production (very leafy), medium height, and late maturity. Protein analysis of a sample taken was 15.6%. This plant was increased in the greenhouse from vegetative material and planted into a 200-plant nursery in 2000. Unwanted plants were rogued out and seed was harvested in 2001. Plants that germinate quicker from the heaviest seed will be placed in an evaluation nursery in 2002.

2002

The low growing switchgrass, accession 9083172, increase plots had limited seed production in 2002. The 17.3-pound bulk seed produced will be used in the field-planting program for advanced testing. An additional 1.5 acres increase field was planted in 2002. No seed was harvested the establishment year from this plot.

The flood tolerant switchgrass, accession 9083170, increase plots also had limited seed production in 2002. The 32.5-pound bulk seed produced will be used in the field-planting program. Due to an extremely wet spring, no additional seed increase field was planted in 2002.

The medium height forage type switchgrass, accession 9062244, was propagated in the greenhouse and plants were selected for quick establishment and seedling vigor. These plants were transplanted into an evaluation nursery in Field #1 at the PMC.

2003-2004

The low growing switchgrass, accession 9083172, increase plots have been expanded but are slower than expected to develop and produce seed. Available seed is being used in the field planting program for advanced testing.

The flood tolerant switchgrass, accession 9083170, increase plots have been expanded but are also slower than expected to develop and produce seed. Available seed is being used in the field planting program for advanced testing.

The medium height forage type switchgrass, accession 9062244, was again propagated in the greenhouse and the evaluation nursery was expanded in 2003. The plants were allowed to develop and mature in 2004 with evaluations to begin in 2005.

2005

Seed was harvested from the low growing and flood tolerant increase plots. Both of these accessions are being evaluated in the field planting program with mixed results. Seed dormancy is a problem and results in poor and inconsistent establishment.

The medium height switchgrass accession will be placed into a study of its own and go through a recurrent selection process in the development of an improved forage type switchgrass.

2006

Seed was again harvested from the low growing and flood tolerant increase plots. Both are showing poor stand development on heavy soil types with moderate to heavy clay content. These two selections will undergo more testing and selection to improve seedling vigor.

Study 29I108G-Selected Accessions of Low Growing Switchgrass

Table #1

<u>Accession #</u>	<u>State</u>	<u>County</u>	<u>MLRA</u>	<u>Collector Name</u>
9062155	Iowa	Louisa	108	Dean L. Pettit
9062157	Iowa	Cherokee	107	Lon Allan
9062158	Iowa	Clay	103	John P. Vogel
9062160	Iowa	Freemont	107	NRCS F. O.
9062163	Iowa	Hamilton	103	Dana C. Holland
9062165	Iowa	Woodbury	107	John P. Vogel
9062166	Iowa	Monona	107	Michael J. Kuera
9062178	Iowa	Muscatine	108	Douglas S. Johnson
9062181	Illinois	Champaign	108	Leon W. Wendt
9062188	Illinois	Macoupin	108	Ivan N. Dozier
9062189	Illinois	Macoupin	115	Ivan N. Dozier
9062190	Illinois	Macoupin	108	Ivan N. Dozier
9062195	Illinois	Carroll	105	Raymond J. Hudak
9062196	Illinois	Carroll	105	Raymond J. Hudak
9062205	Missouri	Barton	112	Jerry L. Cloyed
9062207	Missouri	Bates	112	Robert D. Bouland
9062208	Missouri	Pettis	116A	Thomas J. Hagedorn
9062209	Missouri	Christian	116A	C. Mark Green
9062211	Missouri	Ozark	116A	Carroll W. Foster
9062212	Missouri	Johnson	112	Robert T. Hagedorn
9062213	Missouri	Madison	116A	Sandra L. Lewis
9062214	Missouri	Ste. Genevieve	116B	Renee L. Phillips
9062215	Missouri	Oregon	116A	Stephen E. Robbins
9062216	Missouri	Shannon	116A	Steve Wall
9062217	Missouri	Reynolds	116A	Clarence W. Wagy
9062218	Missouri	Christian	116A	C. Mark Green
9062219	Missouri	Perry	116B	Claude E. Peifer
9062220	Missouri	Reynolds	116A	Clarence W. Wagy
9062221	Missouri	Dade	116B	Todd E. Mason
9062222	Missouri	Morgan	116B	James A. Maberry
9062223	Missouri	Franklin	116B	Arthur P. Kitchen
9062224	Missouri	Cedar	116B	Kim C. Ehlers
9062225	Missouri	Christian	116A	C. Mark Green
9062227	Missouri	Ozark	116	Carroll W. Foster
9062228	Missouri	Texas	116	Jeff A. Lamb
9062229	Missouri	Texas	116	Jeff A. Lamb
9062234	Missouri	Saline	107	Wayne E. McReynolds
9062237	Missouri	Ray	107	James M. Rehmsmeyer
9062238	Missouri	Worth	109	David A. Stevens
9062239	Missouri	Sullivan	109	Stuart A. Lawson
9062240	Missouri	DeKalb	109	Wm. A. Throckmorton

Table #1 - continued

<u>Accession #</u>	<u>State</u>	<u>County</u>	<u>MLRA</u>	<u>Collector Name</u>
9062242	Missouri	DeKalb	109	Wm. A. Throckmorton
9062243	Missouri	Buchanan	107	Rodney Saunders
9062244	Missouri	Dent	116	Myron C. Hartzell
9062246	Missouri	Sullivan	109	Stuart A. Lawson
9062247	Missouri	Buchanan	107	Rodney Saunders
9062248	Missouri	Sullivan	109	Stuart A. Lawson
9062250	Missouri	Nodaway	109	Kenton L. Macy
9062251	Missouri	Worth	109	David A. Stevens
9062252	Missouri	Daviess	109	James A. Sturm
9062253	Missouri	Daviess	109	James A. Sturm
9062254	Missouri	Maries	116A	Dennis W. Shirk
9062255	Missouri	Maries	116B	Dennis W. Shirk
9062256	Missouri	Maries	116A	Dennis W. Shirk
9062257	Missouri	Maries	116A	Dennis W. Shirk
9062259	Missouri	Shannon	116A	Steve Wall
9062261	Missouri	Shannon	116A	Steve Wall
9062265	Missouri	Sullivan	109	Stuart A. Lawson
9062267	Missouri	Gentry	109	Gary J. Barker
9062268	Missouri	Platte	107	Terry A. Breyfogle
9062269	Missouri	Sullivan	109	Stuart A. Lawson
9062270	Missouri	Platte	107	Terry D. Breyfogle
9062271	Iowa	Page	104	Kevin J. McCall
9062272	Illinois	Fayette	104	Brad S. Simcox
9062274	Iowa	Madison	108/109	Larry Beeler/Tom Oswald
9062193	Illinois	Fayette	113	Brad S. Simcox

Selected Accessions of Wet Tolerant Switchgrass**Table #2**

<u>Accession #</u>	<u>State</u>	<u>County</u>	<u>MLRA</u>	<u>Collector Name</u>
9062193	Illinois	Fayette	113	Brad S. Simcox
9062213	Missouri	Madison		Sandra L. Lewis
9062235	Missouri	Miller	116	Matt L. Burcham

Final Accessions Selected for Low Growing Switchgrass**Table #3**

<u>Accession #</u>	<u>State</u>	<u>County</u>	<u>MLRA</u>	<u>Collector Name</u>
9062205	Missouri	Barton	112	Jerry L. Cloyed
9062225	Missouri	Christian	116A	C. Mark Green
9062252	Missouri	Daviess	109	James A. Sturm
9062255	Missouri	Maries	116B	Dennis W. Shirk
9062257	Missouri	Maries	116A	Dennis W. Shirk

Study No. 29I110J

Study Title: Assembly and Evaluation of Chokecherry, *Prunus virginiana* L.

Study Leader: Cordsiemon, R.

Introduction:

Chokecherry is one of the most widely distributed native tall shrubs or small trees in North America. It occurs from Newfoundland south to Georgia and west to California and British Columbia. In the Midwest its habitat includes moist sites in open areas, along fencerows, roadsides, borders of woods as well as sandy or rocky hillsides and ravines. Three varieties have been described: var. *virginiana* in the eastern United States, var. *melanocarpa* in the west, and var. *demissa* along the Pacific Coast. Some forms have yellow rather than dark red or black fruit. The leaves of var. *melanocarpa* are thicker and cordate rather than oval, oblong or obovate as in var. *virginiana*. The fruit is less astringent.

Adaptive characteristics of chokecherry includes fast growth, dependable fruit crops, tolerance to harsh climatic extremes, and the ability to grow in a wide variety of soil types.

Problem:

There is a need for developing a cultivar/selection of chokecherry for use as wildlife food and habitat in the three states served by the Center.

Objectives:

Assemble, comparatively evaluate, select, and release adapted cultivars/selections of chokecherry.

Discussion**1989-1992**

Seed collection was initiated in 1989 and 11 collections were made before the State Conservationists' Advisory Committee put the study on hold in 1992 due to lack of personnel at the PMC to carry out the work involved. The intent was to make 40-50 collections from the three-state service area to be placed in a randomized complete block planting.

1993-1996

The project remained in an inactive status until 1996. At this time a decision was reached to germinate the seed that was collected earlier. Based on the viability of this seed collection, it may become necessary to recollect this species.

1997-1998

Seed collections of chokecherry were stratified and placed in the greenhouse for germination (March 1997). A total of 15 collections were made but only 11 germinated. Enough plants of the 11 collections were obtained to initiate a randomized complete block planting with 12 replications. This planting was made on June 23, 1998 in Field #6 on the PMC.

1999-2001

Table #1 lists the accessions of chokecherry collected, collector's name, state, county, MLRA, and soil type. Plans are to continue evaluations for survival, fruit production, height, spread, insect and disease resistance and vigor until selection(s) are made. Several accessions produced light to heavy fruit production. An Eastern tent caterpillar *Malacosoma americanum* infestation was noticed throughout this planting (all accessions) in years 2000 and 2001; however there was no serious damage recorded on any accession in this assembly. A solution of Malathion (one tablespoon per gallon of water) was sprayed on all plants. Control was almost instant in both years.

2002

Evaluations for this study were made on April 25, July 11 and October 9. The following characteristics were documented: vigor, insect and disease resistance, height, spread, and fruit production. The eastern tent caterpillar, *Malacosoma americanum*, infested this planting again this year. No chemical (Malathion) was applied this year in order to determine the extent of damage caused by these insects. Table #1 reflects the evaluations along with accession information.

2003

Evaluations of plants were made again this year for selection purposes and all the other plants were removed from the planting (July 2003). Selections of plants were based on the following characteristics: vigor, insect and disease resistance, height, spread and fruit production. The remaining plants will be allowed to cross-pollinate. The seedlings will be bare rooted and placed in a field planting program in the three-state service area of Missouri, Illinois and Iowa.

2004

Collections were made from the selected trees and over 5.2 pounds of clean seed were harvested. The new collection from selected material has been assigned the accession number 9083259. The fruit will be harvested, de-pulped and planted and grown out as seedlings in the PMC greenhouse. Seed from the 2004 collection will be used to start seedlings for field plantings in the three-state service area. A tested class release is scheduled for 2008.

2005

Dry weather during the summer months of the 2005 growing season prevented the selection block from producing fruit. Seedlings were grown out in the greenhouse from 2004 seed. Poor germination and disease contributed to small number of seedlings. Plans are to produce more seedlings for 2006.

2006

The seedlings that were grown in the greenhouse were stepped up with only 55 trees surviving. All 55 seedlings were planted into a production block in field 11 during the middle of August. Seed collections were made from field 6 and plans are to stratify some of the seed in order to propagate more seedlings and expand the production block in field 11.

Accession Information

Table #1

<u>Collector</u>	<u>State</u>	<u>County</u>	<u>MLRA's</u>	<u>Soil</u>	<u>Accession</u>
R. W. Nuboer	Illinois	Carroll	111	Seaton Silt Loam	9008107
R. W. Nuboer	Illinois	Whiteside	108	Silt Loam	9057068
R. W. Nuboer	Illinois	Carroll	111	Fayette Silt Loam	9057069
R. E. Szafoni	Illinois	McLean	108	Unknown	9057089
W. D. Glass	Illinois	Iroquois	110	Sandy Loam	9057143
J. R. Heim	Illinois	Ogle	108	Unknown	9057162
J. P. Vogel	Iowa	Woodbury	107	Kennebec	9057181
J. P. Vogel	Iowa	Woodbury	107	Kennebec Silt Loam	9068669
Maggie Cole	Illinois	Cook	110	Unknown	9068542
Jimmy Henry	Missouri	Lincoln	115	Menfro Silt Loam	9008147
J. R. Heim	Illinois	Lee	108	Martinsville Silt	9068587
Maggie Cole	Illinois	Cook	110		9068660
Maggie Cole	Illinois	Cook	110		9008157
Nancy Pals	Illinois	Coles	108		9068667
Bart C. Pals	Illinois	Effingham	113		9068183
William A Throckmorton	Missouri	DeKalb	109	Lamoni	9068668
Kent A. Boyles	Illinois	Tazewell	108	Stronghurst Silt Loam	9068664
Louis Byford	Missouri	Atchison	107	Napier Silt Loam	9068658

Study No. 29A116W

Study Title: Evaluation of Miscellaneous Trees and Shrubs.

Study Leader: Cordsiemon, R.

Introduction:

The evaluation of woody plant materials on the USDA-NRCS Elsberry Plant Materials Center began in 1989. Since that time plants have been added for multiple purposes. The evaluations of these plant materials have been in cooperation with the USDA-ARS, Plant Introduction Station, Ames, Iowa; Missouri Department of Conservation; and other plant materials centers.

Problem:

Trees and shrubs are needed to provide for windbreaks, recreation, and multipurpose use in the Midwest Region and provide multiple wildlife benefits throughout the three-state area. New selections, collections and public and private releases need to be evaluated as potential conservation species.

Objective:

The objectives of this study are to assemble and evaluate woody plant materials (both collections in the wild and also released cultivars) for conservation uses, area of adaptation, and to select and increase limited quantities of promising woody plants for advanced evaluation. Superior accessions or those exhibiting unique characteristics will be placed in field evaluations and field plantings in the three-state area being served by the PMC.

Assembly:

Plant materials of various woody species representing many species have been planted on the PMC. The sources include other PMC's, commercial nurseries, and other agencies.

Discussion:

1994-2004

This study is a long-term ongoing evaluation of miscellaneous trees and shrubs that are not part of a collection made over several years. New species will be planted as they arrive at the Center. Although this study was started in 1989, it includes some species from past studies. Presently there are 29 different species included. Twenty-two are exhibiting 100 percent survival. Five species have failed to survive. For more information regarding plant performances refer to Table #2.

The trees and shrubs in this study are often utilized during plant identification courses held at the Center.

Table #1 reflects the species included in this assembly, accession numbers, sources and dates planted. Table #2 reflects the plants' performance for years 1990-1992, 1998-2003.

There were no evaluations conducted and no new species added in 2004. There are two new species planned for 2005 that will be received from the Plant Introduction Station in Ames, Iowa. The entire assembly is scheduled to be evaluated in 2005. Very little attention was given to this study in 2004 because the PMC was understaffed.

2005

An evaluation of survival was made in the summer of 2005. Trees and shrubs that had died were noted. The condition of the trees were also evaluated. Black chokeberry (*Aronia melanocarpa*) and common buttonbush (*Cephalanthus occidentalis*) were added to this study. These trees and shrubs will again be evaluated for their survivability and use in conservation.

2006

In April, three new species were added for evaluation, Musclewood (*Carpinus caroliniana*), Bur oak (*Quercus macrocarpa*), and Laurel willow (*Salix pentandra*). There were five trees planted of each species and evaluated for general conditions of the plants (bud break, plant injury, etc.) The buttonbush (*Cephalanthus occidentalis*) and black chokeberry (*Aronia melanocarpa*) were replanted in the fall, 11/14/2005, after dying from an earlier spring planting. They too were evaluated, but for survival, height, spread, injury, type of care given, plant performance, and variations among plants.

List of species included in study.

Table #1

<u>Common Name</u>	<u>Genus</u>	<u>Species</u>	<u>Accession Number</u>	<u>Alternate No.</u>	<u>Source</u>	<u>Date Planted</u>
'Densehead' mountain ash	<i>Sorbus</i>	<i>alnifolia</i>		7761	F.K. Nursery	11/65
'Ruby' reidosier dogwood	<i>Cornus</i>	<i>stolonifera</i>	443229		Big Flats PMC	5/89
Late lilac	<i>Syringa</i>	<i>villosa</i>	9006228		Bismarck PMC	5/89
'Redstone' cornelian cherry dogwood	<i>Cornus</i>	<i>mas</i>	9055585		Elsberry PMC	5/89
'Roselow' sargent crabapple	<i>Malus</i>	<i>sargentii</i>	477986		Roselake PMC	5/89
'Elsmo' lacebark elm	<i>Ulmus</i>	<i>parvifolia</i>	9004438		Asia	5/89
Blueleaf honeysuckle	<i>Lonicera</i>	<i>korolkowii</i>	9062152		Nebraska	5/89
Birch	<i>Betula</i>	<i>species</i>	502295		Ames, IA	4/90
Willow oak	<i>Quercus</i>	<i>phellos</i>		4723	Ames, IA	4/90
Fragrant epaulettetree	<i>Pterostyrax</i>	<i>hispida</i>		A80779	Ames, IA	4/90
Bradford pear	<i>pyrus</i>	<i>calleryana</i>		19173	Ames, IA	4/69
Prairie rose	<i>Rosa</i>	<i>setigera</i>	495616		Ames, IA	4/90
Ural false spirea	<i>Sorbaria</i>	<i>sorbifolia</i>		7778	Ames, IA	4/90
Weeping lilac	<i>Syringa</i>	<i>pekinensis</i>	478008		Ames, IA	4/90
Flameleaf sumac	<i>Rhus</i>	<i>copallina</i>		7764	Ames, IA	4/90
Western paper birch	<i>Betula</i>	<i>occidentalis</i>	495882		Ames, IA	4/90
Amur honeysuckle	<i>Lonicera</i>	<i>mackii</i>	477998		Ames, IA	4/90
Mountain ash	<i>Sorbus</i>	<i>reducta</i>		A-8371	Ames, IA	4/90
Blackhaw	<i>Viburnum</i>	<i>prunifolium</i>		2813	Ames, IA	4/90
Largeleaf dogwood	<i>Cornus</i>	<i>macrophylla</i>		10178	Ames, IA	4/90
Border privet	<i>Ligustrum</i>	<i>obtusifolium</i>	477010		Ames, IA	4/90
Willow oak	<i>Quercus</i>	<i>phellos</i>		4724	Ames, IA	4/90
Arrowwood	<i>Viburnum</i>	<i>dentatum</i>			Elsberry, MO	4/90
Redbud	<i>Cercis</i>	<i>canadensis</i>	496399		Ames, IA	5/91
Birch	<i>Betula</i>	<i>species</i>	14942		Ames, IA	5/91
'Wichita' osage orange	<i>Maclura</i>	<i>pomifera</i>			Kansas	5/91
'Denmark' osage orange	<i>Maclura</i>	<i>pomifera</i>			Denmark, IA	6/92

Common Name	Genus	Species	Accession Number	Alternate No.	Source	Date Planted
Magenta	<i>Malus</i>	<i>species</i>	514275		Roselake PMC	4/93
Ocean view beach plum	<i>Prunus</i>	<i>maritima</i>	518824		Cape May PMC	5/93
'Sandy' rugosa rose	<i>Rosa</i>	<i>rugosa</i>			Cape May PMC	5/93
Wildwood bayberry	<i>Myrica</i>	<i>pennsylvanica</i>	548966		Cape May PMC	5/93
Wildwood bayberry	<i>Myrica</i>	<i>pennsylvanica</i>	434150		Cape May PMC	5/93
Wildwood bayberry	<i>Myrica</i>	<i>pennsylvanica</i>	548964		Cape May PMC	5/93
Ocean view beach plum	<i>Prunus</i>	<i>maritima</i>	518822		Cape May PMC	5/93
Ocean view beach plum	<i>Prunus</i>	<i>maritima</i>	518823		Cape May PMC	5/93
'Oahe' hackberry	<i>Celtis</i>	<i>occidentalis</i>	476982		Bismarck PMC	5/93
'King Red' Russian olive	<i>Elaeagnus</i>	<i>angustifolia</i>	434029		NPMC	5/93
Black Chokeberry	<i>Aronia</i>	<i>melanocarpa</i>	9083269	Ames 27371	Ames, IA	11/05
Common Buttonbush	<i>Cephalanthus</i>	<i>occidentalis</i>	9083270	Ames 27336	Ames, IA	11/05

Study 29A116W - Evaluation of Miscellaneous Trees and Shrubs																							Table #2								
Plt. No.	Sc. Name	Accn. / Alt. No.	Date Plt.	No. Plt.	No. Survived								Ave. Ht. (Ft.)								Ave. Wd. (Ft.)										
					90	91	92	98	99	OO	O1	O2	O3	90	91	92	98	99	OO	O1	O2	O3	90	91	92	98	99	OO	O1	O2	O3
1	Sorbus alnifolia	7761	11/65	2	2	2	2	2	2	2	2	2	2	21	22	22	25	26	25.7	26	26	26	8.2	8.2	8.2	12	12.4	12.9	13.3	13.3	13
2	Cornus stolonifera	443229	5/9/1989	4	4	4	4	4	4	4	4	4	4	0.7	3.7	3.9	4	4.7	4.7	5.3	5.4	5.4	1.8	3.6	4.8	3.5	4	4.2	4.7	4.9	5
3	Syringa villosa	9006228	5/9/1989	4	4	4	3	0	0	0	0	0	0	0.4	0.7	2.3	0	0	0	0	0	0	1.2	1.3	2.4	0	0	0	0	0	0
4	Cornus mas	9055585	5/9/1989	3	3	3	3	3	3	3	3	3	3	1.4	1.9	2.8	4.5	5	5	6.2	6.4	6.4	0.4	0.8	1.4	4.5	5	5.5	6.5	7	7.3
5	Malus sargentii	477986	5/9/1989	3	3	3	3	0	0	0	0	0	0	2	2.7	2.9	0	0	0	0	0	0	1	1.7	2.6	0	0	0	0	0	0
6	Ulmus parvifolia	9004438	5/9/1989	2	2	2	2	2	2	2	2	2	2	5.4	9.6	11.8	27	27	27.6	28.3	28.4	28.6	3.3	6.4	7.4	16	16.5	17	18	18.4	18
7	Lonicera korolkowi	9062152	5/9/1989	6	6	6	6	6	6	6	6	6	6	4	6.8	8	12	12	12.4	12.8	12.9	12.9	5.6	8.8	9.8	13	13.3	13.8	14	14.3	14.2
8	Betula species	502295	4/16/1990	3	1	1	1	1	1	1	1	1	1	3.4	3.4	4.1	6	6.5	6.8	7.5	7.7	7.9	1.5	1.9	2.8	5	5.7	6	6.5	6.8	7
9	Quercus phellos	4723	4/16/1990	4	4	4	4	4	4	4	4	4	4	1.7	2.6	4.1	23	23	23	23	23	23	1	1.8	3.7	12	12	12.9	12.9	13	13.2
10	Pterostyrax hispida	A-8079	4/16/1990	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	Pyrus calleryana	19173	4/21/1969	2	2	2	2	2	2	1*	1	1	1	27	27	27	29	30	17*	18	18	18	20	20	21	33	33.6	15*	15.5	15.8	16.3

Study 29A116W - Evaluation of Miscellaneous Trees and Shrubs - Table #2 continued																															
Plt. No.	Sc. Name	Acc./ Alt. No	Date Plt.	No. Plt.	No. Survived								Ave. Ht. (Ft.)								Ave. Width (Ft.)										
					90	91	92	98	99	00	01	02	03	90	91	92	98	99	00	01	02	03	90	91	92	98	99	00	01	02	03
12	Rosa setigera	495616	4/16/1990	2	2	2	2	2	2	2	2	2	2	1.5	3.7	4.7	6.6	7	7	7	7	7	1.6	5.5	5.9	10	10.4	10.7	11	11.3	11
13	Sorbaria sorbifolia	7778	4/16/1990	7	7	7	7	7	7	7	7	7	7	1	1.8	2.3	5	5	5	5	5	5	0.6	1.8	2.1	6	6.5	6.9	7.1	7.3	7.5
14	Syringa pekinensis	478008	4/16/1990	3	2	2	2	2	2	2	2	2	2	1	1	1.5	7	7.3	7.7	8	8.2	8.4	0.7	1	2	7.5	7.8	8	8.2	8.5	8.7
15	Rhus copallina	7764	4/16/1990	4	2	2	2	2	2	2	2	2	2	1.6	2.9	5.3	7	7.7	7.9	8.2	8.4	8.6	0.8	2.8	5.3	8	8.3	8.5	8.9	9	9.2
16	Betula occidentalis	495882	4/16/1990	3	2	2	2	2	2	2	2	2	2	1.3	4.5	3	8	8.8	9.1	8.8	9	9.2	0.3	2.4	3.9	5	5.6	5.9	6.2	6.7	6.9
17	Lonicera maackii	477998	4/16/1990	4	3	3	3	3	3	3	3	3	3	0.7	1.5	2.7	7.8	7.9	7.9	7.9	7.9	7.9	0.6	1.2	2.7	4.5	5	5.5	5.9	6.2	6.5
18	Sorbus reducta	A-8371	4/16/1990	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	Viburnum prunifolium	2813	4/16/1990	4	2	2	2	2	2	2	2	2	2	2.6	2.7	3.4	8	8.5	8.7	9	9	9.2	0.7	1.3	2.4	5	5.3	5.5	6	6.4	6.7
20	Cornus macrophylla	10178	4/18/1990	3	3	3	3	3	3	3	3	3	3	1.7	2.2	3	7.5	7.9	8	8.2	8.2	8.2	0.5	0.9	1.7	4.5	5	5.4	5.7	6	6.3
21	Ligustrum obtusifolium	477010	4/18/1990	4	3	3	3	0	0	0	0	0	0	1.4	2.4	2.6	0	0	0	0	0	0	0.8	2.3	2.3	0	0	0	0	0	0
22	Quercus phellos	4724	4/18/1990	4	4	4	4	4	4	4	4	4	4	1.3	3.1	4.4	13	13	13.5	14	14	14.1	0.8	2.4	3.8	12	12.4	12.7	13.4	13.7	14.1

Study 29A116W - Evaluation of Miscellaneous Trees and Shrubs - Table #2 continued																															
Plt No	Sc. Name	Acc./ Alt. No	Date Plt.	No. Plt.	No. Survived								Ave. Ht. (Ft.)								Ave. Width (Ft.)										
					90	91	92	98	99	O0	O1	O2	O3	90	91	92	98	99	O0	O1	O2	O3	90	91	92	98	99	O0	O1	O2	O3
23	Viburnum dentatum	9062310	4/91	5	4	4	4	4	4	4	4	4	4	2	4.3	4.5	7	7	7	7	7	7	0.5	2	2.4	4.5	4.7	4.9	5.3	5.5	5.7
24	Cercis canadensis	496399	5/8/1991	3	3	3	3	3	3	3	3	3	3	0.5	3.2	3.7	11	11	11.6	11.9	12	12	0.25	0.5	2.7	10	10.5	10.8	11.4	11.7	12
25	Betula nigra	14942	5/8/1991	5	3	3	3	3	3	3	3	3	3	0.5	0.7	1.4	11	11	11.7	12.3	12.6	12.8	0.4	0.4	1.4	7	7.4	7.9	8.2	8.5	8.7
26	Maclura pomifera		4/92	1	1	1	1	1	1	1	1	1	1	0.5	0.5	1	13	13	13.5	13.9	13.9	13.9	0.25	0.3	2.5	13	13.2	13.7	14.3	14.6	15.3
27	Maclura pomifera		6/19/1992	1	1	1	1	1	1	1	1	1	1	0.5	0.5	1	13	13	13.5	14	14	14	0.25	0.3	0.5	7	7.3	7.7	8	8.3	8.5
28	Eleagnus umbellata		4/26/1999	5			5	5	5	5	5	5					2.5	3	3	3	3.3	4.5			1.5	2	3	3.4	3.8	4	4.5
29	Salix Mat. X Alba		4/14/1995	2			2	2	2	2	2	2					30	31	31	31	31	31.2				10	10.5	11	11.3	11.5	12.4

Study: 29I124G

Study Title: Production of Native Iowa Ecotypes of Grasses and Forbs for Roadside, Critical Areas, and All Other Vegetative Plantings Where Native Grasses and Forbs are Now Being Planted.

Study Leader: Cordsiemon, R.

Introduction:

Well-adapted native grass, legume, and forb plantings offer many advantages as low cost sustainable vegetative cover for management of soil and water resources. Native plant communities resist noxious weed invasion, provide excellent erosion control, and generally require relatively low maintenance.

These characteristics make them an excellent selection for use in roadside plantings, critical areas, long term land retirement programs, and all other vegetative plantings where monocultures of native grasses are being planted. This is especially true along public transportation right-of-ways. These transportation corridors constitute a major land resource and management problem in the state of Iowa. Based on 1987 Natural Resources Inventory (NRI) data, over one million acres of Iowa land are devoted to rural transportation.

Proper vegetation management along these corridors is an important element in controlling soil loss and unwanted weedy plant species. Many of these acres are now seeded to introduced cool-season grass and legume species which are often invaded by noxious weeds requiring extensive mowing or herbicide treatment programs. These management techniques are expensive and can also result in additional water quality problems where herbicides are used extensively.

Managing or re-seeding these acres to promote native grasses, legumes, and forbs offers a low cost environmentally sound approach to roadside vegetation management. Herbicide use, soil erosion, and most mowing can be reduced significantly where a vigorous native grass, legume, and forb mixture dominates a roadside right-of-way. In addition, these goals are consistent with on-going NRCS programs designed to improve ground and surface water quality, reduce soil loss and increase wildlife habitat.

Problem:

Many adapted native species are either currently not commercially available or available only in very limited quantities. When native species are available, the origin is often from considerable distance away and adaptation can be a concern. The species that are available are often as a 'variety' that has been developed for pasture and hay. These are generally high forage producing and more vigorous than wild collections of seed that have not been through an evaluation and breeding program. Seed of local origin that have not been improved or selected for superior forage yield is more likely to remain in a prairie mixture without crowding out other species and becoming monoculture. There is a need for additional native grass, legume, and forb species for use in roadside and other types of conservation plantings.

Objective:

The objective of this study is to accelerate the collection and increase of selected native grass, legume, and forb species through a cooperative program between the University of Northern Iowa (UNI), USDA Natural Resources Conservation Service (NRCS), and the Iowa Roadside Integrated Vegetation Management Program (IRVM).

Cooperators:

The USDA Natural Resources Conservation Service, Plant Materials Center; the University of Northern Iowa; and the Integrated Roadside Vegetation Management Office.

Procedures:

The state of Iowa was divided into three zones: North, Central, and South (Table #1). Seed collected from within each zone was kept separate from the other zones. The IRVM office organized seed collections from each zone. Collections were made from native prairie remnants throughout each zone striving for a relatively equal and representative collection. Seed from each collection site was inventoried by location and a small portion was started in the greenhouse at UNI and transplanted into plots. The remainder of the seed was sent to the PMC, cleaned, and seeded for increase plots. Seed from the plots at UNI was hand harvested and also used to start increase plots or mixed with additional seed and became available to seed growers. When enough seed becomes available, the species is released as 'Source Identified' germplasm from the zone in which it was collected. Source identified seed has not been improved by evaluation and selection or plant breeding procedures.

Discussion:

The study officially started October 1, 1990, at the beginning of fiscal year 1991 with agreements signed. Seed collections had started earlier in the year and seed was available for increase plots the spring of 1991. Most of the plots started from 1991 to 1993 were destroyed in the flood the summer of 1993. Plant re-establishment started in 1994 and new plots have been started each year. Progress of species released to growers as 'Source Identified' germplasm can be seen in Table #2.

2000

New increase plots established in 2000 were *Liatris asper*, rough blazing star; *Monarda fistulosa*, horsemint; and *Lobelia siphilitica*, great blue lobelia. Surflan was used for weed control and the horsemint was not resistant.

New plant releases for 2000 were Northern Iowa Germplasm Big Bluestem, Northern Iowa Germplasm Tall Dropseed, Northern Iowa Germplasm Roundhead Lespedeza, and Southern Iowa Germplasm Prairie Blazing Star.

2001

There were no new plant releases through the plant materials program in 2001 but seed of previous releases was allocated to growers. Initial seed increase is now in production at the new UNI Native Roadside Vegetation Center at the University of Northern Iowa, Cedar Falls, Iowa. A new plot of Southern Iowa June grass was established at the PMC from plants started in the greenhouse. This species exhibits very slow growth and a serious problem is weed control.

2002

There were no new increase plots established in 2002. Seed production and allocation to growers continued on previously established plots.

New plant releases for 2002 were Northern, Central and Southern Iowa Germplasm New England Aster, Northern and Southern Iowa Germplasm Pale Purple Coneflower, Southern and Central Iowa Germplasm Rigid Goldenrod, and Southern Iowa Germplasm Tall Dropseed.

2003

In 2003 there were no new plantings or increases added. Production and allocations to growers continued from previously established plots. Weed control was maintained by using a non-selective herbicide in late winter/early spring on most plots, followed by a pre-emergent herbicide on all plots. Late spring and summer weed control was achieved by manual labor and selective herbicides.

There were eight new plant releases for 2003. They were Southern Iowa Germplasm Wild Burgamot (*Monarda fistulosa*), Northern, Central, and Southern Iowa Germplasm Rough Blazing Star (*Liatris aspera*), Northern Iowa Germplasm Purple Prairie Clover (*Dalea purpurea*), Central Iowa Germplasm Switchgrass (*Panicum virgatum*), Northern and Central Iowa Germplasm Junegrass (*Koeleria macanthra*). Refer to the table of contents for a complete list of 2003 PMC releases.

2004

The Iowa Ecotype Program continued to produce seed for the three different zones on the center in 2004. Although there were no new plots established and no plot increases, the PMC plans to introduce five new Iowa releases in 2005. Weed control was very similar to that of 2003, with the use of non-selective herbicide early and manual labor and selective herbicide later in the growing season. There were some plots taken out of production in 2004 (refer to Table #2) because of consistently low seed production.

2005

The releases scheduled for 2005 were held off until 2006 because there was a lack of available seed. Plots were maintained the same as the past two years. Unproductive plots that had a supply of seed on inventory were mowed and not maintained or harvested.

2006

In fiscal year 2006 the PMC released Central Iowa Germplasm Pale Purple Coneflower (*Echinacea pallida*), 9068612. Future releases are still planned. Each species that the PMC is working with should have a release from each of the three zones. Those releases that are not represented will be a priority for the next few years. Fiscal year 2007 is scheduled to have two releases, northern and central zones of wild bergamot, (*Monarda fistulosa*). In fiscal year 2008 and 2009 the PMC will finish out the Iowa Ecotype Program with the releases of southern zone purple prairie clover, (*Dalea purpurea*), southern zone Junegrass, (*Koeleria macanthra*), and northern and southern zones of switchgrass, (*Panicum virgatum*). The Elsberry PMC and the University of Northern Iowa cooperatively grow and have seed on hand for commercial production.

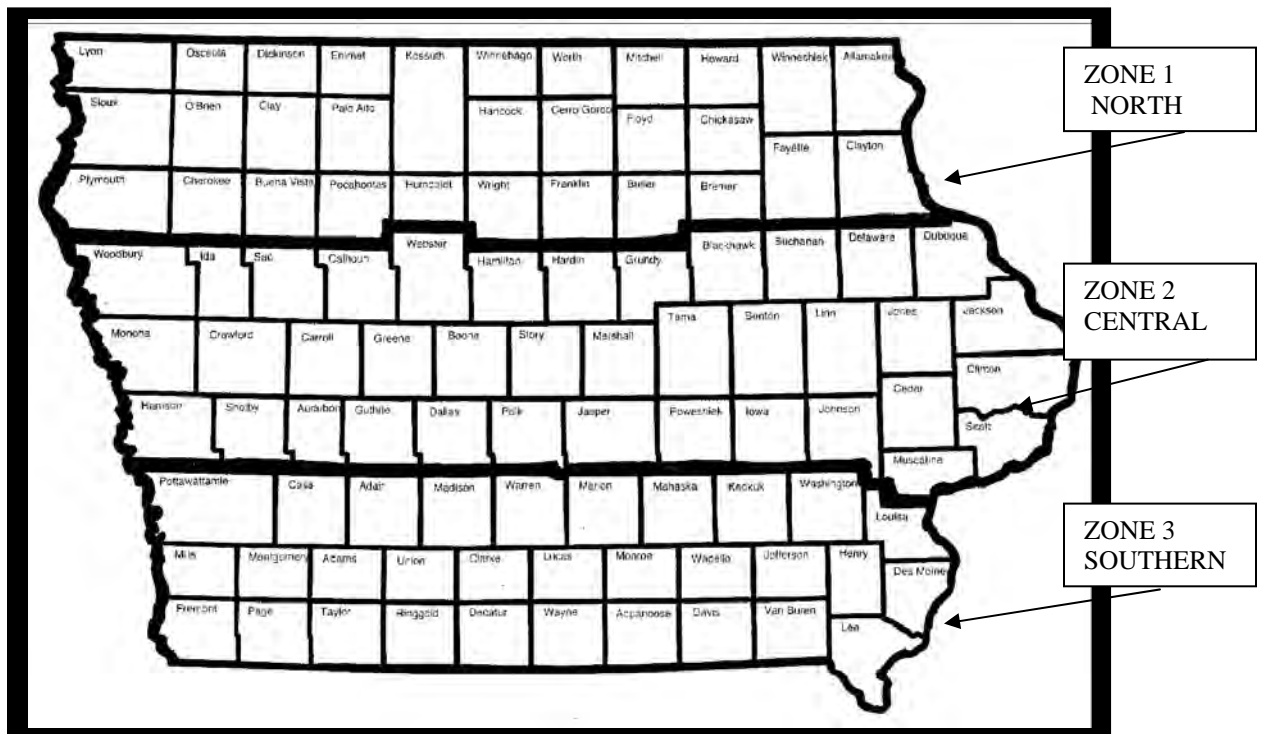
Ecotype Species		Iowa Geographic Zones and Year of Release		
Common Name	Scientific Name	Northern	Central	Southern
Pale Purple Coneflower	<i>Echinacea pallida</i>	2002	2006	2002
Purple Prairie Clover	<i>Dalea purpurea</i>	2003	1998	2008*
Switchgrass	<i>Panicum virgatum</i>	2009*	2003	2009*
Junegrass	<i>Koeleria macanthra</i>	2003	2003	2008*
Horsemint	<i>Monarda fistulosa</i>	2007*	2007*	2003
Rough Blazing Star	<i>Liatris aspera</i>	2003	2003	2003
New England Aster	<i>Aster novae-angliae</i>	2002	2002	2002
Tall Dropseed	<i>Sporobolus compositus</i>	2002	1996	2002
Stiff Goldenrod	<i>Oligoneuron rigidum</i>	1998	2002	2002
Big Bluestem	<i>Andropogon gerardii</i>	2000	1998	2000
Prairie Blazing Star	<i>Liatris pycnostachya</i>	1999	1999	2000
Bushclover	<i>Lespedeza capitata</i>	2000	1996	1997
Little Bluestem	<i>Schizachrium scoparium</i>	1999	1997	1999
Rattlesnake Master	<i>Eryngium yuccifolium</i>	1998	1999	1999
Indiangrass	<i>Sorghastrum nutans</i>	1996	1996	1998
Canada Wild Rye	<i>Elymus canadensis</i>	1995	1995	1997
Oxeye False Sunflower	<i>Heliopsis helianthoides</i>	1996	1995	1997
Sideoats gramma	<i>Bouteloua curtipendula</i>	1995	1995	1995

* Scheduled release year

Study: 29I124G – Native Iowa Ecotypes

TABLE #1

IOWA ECOTYPE ZONE MAP



Study 29I124G-Production of Native Iowa Ecotypes of Grasses and Forbs for Roadside, Critical Areas, and All Other Vegetative Plantings Where Native Grasses and Forbs are Now Being Planted (UNI).						
				Table #2		
Common Name Genus/Species	Zone	Accession Number	Year of Release	Status of Increase Plot	Harvested Seed (Bulk Lbs.) 2005 2006	
Big bluestem	1	9068614	2000	in production	Did Not Harvest	8
<i>Andropogon gerardii</i>	2	9068615	1998	in production	5.00	9.8
	3	9068616	2000	in production	13.90	15.37
Sideoats grama	1	9062278	1995	in production	7.00	11.3
<i>Bouteloua curtipendula</i>	2	9062279	1995	in production	2.30	2.5
	3	9062280	1995	in production	4.00	19
Purple prairie clover	1	9068608	2003	in production	0.80	0.31
<i>Dalea purpurea</i>	2	9068609	1998	in production	1.20	3.73
	3	9068610	2008	in production	4.40	1
Pale purple coneflower	1	9068611	2002	in production	6.50	2.3
<i>Echinacea pallida</i>	2	9068612	2006	in production	7.20	1.9
	3	9068613	2002	in production	225 grams	0.9
Canada wildrye	1	9062275	1995	in production	12.00	33
<i>Elymus canadensis</i>	2	9062276	1995	in production	Did Not Harvest	15.2
	3	9062277	1997	in production	Did Not Harvest	27.18
Rattlesnake master	1	9068602	1998	out of production	3.00	1.4
<i>Eryngium yuccifolium</i>	2	9068603	1999	in production	0.60	0.17
	3	9068604	1999	in production	0.90	2.84
Oxeye false sunflower	1	9068605	1996	in production	12.70	n/a
<i>Heliopsis helianthoides</i>	2	9068606	1995	in production	9.60	2.8
	3	9068607	1997	in production	2.00	2.84
Junegrass	1	9068620	2003	out of production	4.00	out of production
<i>Koeleria macrantha</i>	2	9068621	2003	out of production	5.00	out of production
	3	9068622	2008	in production	1.30	n/a
Round-head bushclover	1	9062281	2000	out of production	6.00	0.52
<i>Lespedeza capitata</i>	2	9062282	1996	out of production	4.00	2.3
	3	9062283	1997	out of production	n/a	0.49
Rough blazing star	1	9068684	2003	out of production	n/a	n/a
<i>Liatis asper</i>	2	9068685	2003	in production	0.30	n/a
	3	9068686	2003	in production	1.40	0.44
Prairie Blazing star	1	9068626	1999	in production	2.00	n/a
<i>Liatis pycnostachya</i>	2	9068627	1999	in production	1.40	0.53
	3	9068628	2000	in production	1.00	n/a

Study 29I124G - Native Iowa Ecotypes			Table #2 - continued			
Common Name Genus/Species	Accession Zone	Year of Release	Status of Increase Plot	Harvested Seed (Bulk Lbs.) 2005 2006		
Horsemint <i>Monarda fistulosa</i>	1 2 3	9068678 9068679 9068680	2007 2007 2003	in production in production in production	206 grams 4.90 418 grams	1.1 3.4 3.04
Little bluestem <i>Schizachyrium scoparium</i>	1 2 3	9062319 9062320 9062321	1999 1997 1999	in production in production in production	3.00 11.70 18.70	11.1 n/a 48.2
Compassplant <i>Silphium laciniatum</i>	1 2 3	9068675 9068676 9068677		out of production out of production out of production	n/a n/a n/a	1.42 0.63 1.01
Stiff goldenrod <i>Solidago rigida</i>	1 2 3	9068617 9068618 9068619	1998 2002 2002	in production in production in production	Did Not Harvest Did Not Harvest Did Not Harvest	n/a n/a 1.2
Indiangrass <i>Sorghastrum nutans</i>	1 2 3	9062316 9062317 9062318	1996 1996 1998	in production in production in production	12.10 12.00 4.30	17.7 46.5 14.7
Tall dropseed <i>Sporobolus compositus</i>	1 2 3	9062313 9062314 9062315	2002 1996 2002	in production in production in production	1.30 50.60 2.10	11 3.79 31.28
New England aster <i>Aster novae angliae</i>	1 2 3	9068681 9068682 9068683	2002 2002 2002	in production in production in production	Did Not Harvest Did Not Harvest Did Not Harvest	n/a 0.82 0.17
Butterfly milkweed <i>Asclepias tuberosa</i>	1 2 3	9068687 9068688 9068689		out of production out of production out of production	n/a n/a n/a	0.03 0.02 0.14
Blue lobelia <i>Lobelia siphilitica</i>	1 2 3	9068696 9068697 9068698		out of production out of production out of production	n/a n/a n/a	out of production out of production out of production
Switchgrass <i>Panicum virgatum</i>	1 2 3	9068705 9068706 9068707	2009 2003 2009	out of production in production in production	n/a n/a n/a	n/a 71 0.57
Golden alexanders <i>Zizia aurea</i>	1 2 3	9068702 9068703 9068703		out of production out of production out of production	n/a n/a n/a	8.9 4.6 2.25

Study: 29A128J

Study Title: *Cornus florida* L., Flowering Dogwood Interagency Study Between Department of Interior, National Parks Service, National Capital Region (NRC) and the Department of Agriculture.

Study Leader: Bruckerhoff, S. B.

Introduction:

Flowering dogwood is probably Missouri's favorite spring flowering tree. It is Missouri's state tree. It is a rather small tree, rarely over 30 feet high and over six to eight inches in diameter; however, in 1867 a dogwood six feet in circumference was reported in Pemiscot County, Missouri. It is commonly an under story tree to many species of oak and hickory in the hardwood forests. Besides being of great value for ornamental purposes, flowering dogwood has special wood characteristic that makes it irreplaceable for certain products. Because of its high resistance to shocks, the wood is being used almost exclusively for weaving shuttles and spool and bobbin heads. It is also being used in golf club and mallet heads and in jeweler's blocks.

Objectives:

- A. Clean (depulp) and condition seed collections and keep accession records on individual ecotypes.
- B. Establish at Elsberry PMC, an area free of dogwood anthranose, 12 to 15 plants from three specified parks for a period of 30 to 40 years.
- C. Provide, upon request, a report on the status of the plants maintained by NRCS.
- D. Provide a study coordinator for all activities performed by NRCS under the terms of the Interagency Agreement.
- E. Provide seed to the NRCS upon request.

Discussion:

1994 - 1999

As of the date this report was written there has only been one accession of flowering dogwood received at the PMC. This accession was planted in Field #11 May 1993. Five of the ten plants are surviving in good vigor. Height ranges from 4.0 feet to 4.5 feet; spread ranges from three to three and a half feet. Vigor is excellent along with its resistance to insects and diseases. There have been no indications of the anthranose disease affecting these plants.

2000

The five remaining plants of accession 9083225 are surviving in good vigor. Height ranges from 4.8 to 5.0 feet and spread ranges from 3.9 feet to 4.1 feet. There have been no signs of insects or diseases associated with this accession.

2001

Only three plants of a total of ten plants are surviving in good vigor. The reason for the decline in the number of plants surviving was due to severe mechanical damage resulting in death of the plants. Height ranges from 5.0 feet to 5.6 feet and spread ranges from 4.1 feet to 4.7 feet. No apparent signs of insects or diseases have been associated with this accession (9083225).

2002-2004

Two plants are surviving out of a total of ten initially planted. Mechanical damage has caused the decline in the number of surviving plants. Evaluations of the surviving plants were made on June 10 and October 22, 2002. The average height of these plants (accession 9083225) was 5.7 feet with an average spread of 5.0 feet. These two plants were again evaluated on October 6, 2003. The average height was 8.0 feet and the average spread was also 8.0 feet. There were no apparent signs of insect, disease, or fruit production in 2002, 2003 and 2004.

2006

This study was terminated.

Study: 29I135J

Study Title: Assembly and Evaluation of Hazelnut, *Corylus americana* Walt.

Study Leader: Cordsiemon, R.

Introduction:

American hazelnut is a shrub or very small tree probably native to every county in Missouri. It commonly occurs in dry or moist thickets, woodland, and borders of woodland, in valleys and upland. It ranges from Maine to Saskatchewan, south to Georgia, Arkansas, and Oklahoma. Leaves are borne simply on bristly stalks, the bristles somewhat glandular. Flowers are separate with male and female flowers on the same tree. Male catkins droop and form the season before opening. Female flowers are enclosed in a scaly bud. They have red stigmas that protrude at the tip of the bud. The fruit is a globe-shape nut enclosed in a large, leaf-like covering. This species flowers March-May with fruit ripening July-September.

Problem:

There is a lack of an available cultivar of American hazelnut specifically for this area. A need for developing a selection, source identified, and sources of hazelnut for use as wildlife habitat and for agroforestry in the three states being served by the Center has been identified by NRCS and other conservation and wildlife agencies.

Objective:

The objective is to assemble, comparatively evaluate, select and release an adapted cultivar of source identified or selected hazelnut.

Discussion

1989-1994

Collections of hazelnut were assembled at the PMC between 1989 and 1992. Thirty-six accessions from Illinois and Missouri were stratified and placed in the greenhouse in 1993. Twenty-one accessions germinated and were grown out in two-gallon containers. These accessions were placed in a randomized complete block with eight replications. The planting was established May 3 and 4, 1989, in Field #11E on the PMC.

The summer of 1994 had several significant dry spells and considerable time was spent irrigating. Many plants were stressed, lost leaves, and resprouted. Four plants in the evaluation block failed to survive in 1994.

1995-1998

The assembly was evaluated in 1995, 1996, 1997 and 1998. Of the original 138 plants being evaluated a total of 11 died. The survival was good but the rate of growth seems to be slow, which seems characteristic of hazelnuts.

The following accessions were selected in 1997 for field plantings: 9057168 and 9057169 (Iroquois County, Illinois), 9057188 and 9068528 (Coles County, Illinois), 9068562 (Adams County, Illinois), and 9068573 and 9068574 both from Chariton County, Missouri. The selection criteria for these accessions are as follows: form, growth, height, width and fruit production and resistance to insect and disease.

1999

The selected accessions continue to be utilized in the plant materials field-planting program throughout the PMC service area. The plants' performance data for 1999 were recorded only for nut production. This information can be found in the following tables.

Nut production for the selected accessions for 1998:

9057168	=	1.75 pounds	9057169	=	1.00 pound
9057188	=	1.90 pounds	9068528	=	1.00 pound
9068562	=	1.67 pounds	9068573	=	1.50 pounds
9068574	=	1.30 pounds			

Nut production for the selected accession for 1999.

9057169	=	1.4 pounds	9068528	=	2.2 pounds
9057188	=	0.5 pound	9068573	=	1.9 pounds
9068562	=	2.7 pounds	9057168	=	1.8 pounds
9068574	=	4.3 pounds			

2000

Nut production is being harvested from those accessions selected for field plantings in the service area of the PMC (Iowa, Illinois and Missouri). One-tenth of the nut production for each

of the selected accessions was left on the shrubs to determine the dates the fruits would fall to the ground. The following chart reflects the selected accessions, fruit production and dates nuts fell to the ground. There were no plant evaluations on the assembly of plants this year.

Accession Numbers	Nut Production With Husks	Date Nut Dropped
9057188	1.4 Pounds	11/27/00
9068562	10.3 Pounds	11/27/00
9068574	4.6 Pounds	11/27/00
9068528	12.2 Pounds	11/27/00
9068573	3.7 Pounds	11/27/00
9057168	3.2 Pounds	11/16/00

2001 - 2002

The following table reflects the performance of those accessions initially selected and placed in the plant materials field planting program in the PMC service area for years 1997 through 2002. As reflected in the PMC Business Plan, releases from these accessions will be made in 2005. One plant out of the following accessions will be moved to a crossing block in Field #6 on the PMC in the February 2003. The progeny from this crossing block will be assigned a separate accession number and only one release (Tested Class) will be made for the PMC service area. These accessions are: 9057168, 9068562, 9068573, 9068574, 9057188, and 9068528. The remaining plants in the assembly will be left until the area is needed for a new study.

2003

The plants selected (six accessions) out of the initial nursery planting were transplanted in Field #6 on March 21, 2003. These plants will be allowed to cross-pollinate and the progeny will be assigned a new accession number, 9083247. These plants will be placed in the field planting program for continued testing.

2004

The selected plants were moved from Field #11 to Field #6 and used the 2004 growing season to establish their root systems. Seed production was very poor due to the transplanting. The seed, if any produced, was very small in size. The selected material is expected to start producing quality seed in 2005 and production from this material will be grown out in bare root seedlings for field plantings.

2005

The selected plants, accession 9083247, produced small quantities of nuts. The seed was propagated in the greenhouse and approximately 30-40 seedlings germinated. These seedlings will be stepped-up into large containers and planted in a production block as first generation material.

2006

Seedlings were propagated in the PMC greenhouse and also at the Forrest Keeling Nursery facility. These seedlings will be used for both field plantings and seed production material. A production block will be established at the PMC in the spring of 2007. The selection of hazelnut, 9083247, is scheduled for release in 2007.

Performance Data 1997 – 2002

Table #1

Acc. Number	Criteria	1997	1998	1999	2000	2001	2002	Averages
9057168	Height (Ft.)	4.3	5.4	5.7	6	6.5	6.8	5.8
	Spread (Ft.)	4.2	7	7.3	7.5	8	8.3	7.05
	Ins/Disease	2	2	2	2	2	2	2
	Form	3	3	3	3	3	3	3
	Nut Prod.		1.8 lbs.	1.3 lbs.	2.0 lbs.	2.3 lbs.	1.5 lbs	1.8 lbs.
9068562	Height	5.2	7	7.4	8	8.2	8.5	7.4
	Spread	6.5	7.4	7.6	8	8.5	8.8	7.8
	Ins/Disease	2	3	2	2	2	2	2.9
	Form	2	2	2	1	2	2	1.8
	Nut Prod.		1.67 lbs.	1.60 lbs.	1.7 lbs.	1.9 lbs.	6.2	2.6 lbs.
9068573	Height	4.6	6.3	6.5	6.7	7.1	7.3	6.4
	Spread	5	6	6.3	6.5	7	7.5	6.4
	Ins/Disease	2	2	2	2	2	2	2
	Form	3	3	3	3	3	3	3
	Nut Prod.		1.5 lbs.	1.9 lbs.	2.6 lbs.	4.3 lbs.	2.6 lbs	2.6 lbs.
9068574	Height	6.8	6.9	7	7.3	7.5	7.9	7.2
	Spread	4.5	5.8	6	6.3	6.5	6.8	6.0
	Ins/Disease	2	3	2	2	2	2	2.2
	Form	3	4	3	3	3	4	3.3
	Nut Prod.		1.3 lbs.	1.8 lbs.	1.3 lbs.	2.1 lbs.	3.5	2.0 lbs.
9057188	Height	5.1	6.4	6.7	6.8	7	7.3	6.6
	Spread	3.7	7	7.5	7.8	8	8.2	7.03
	Ins/Disease	2	2	2	2	2	2	2
	Form	3	3	3	3	3	3	3
	Nut Prod.		1.0 lbs.	0.5 lb.	1.4 lbs.	1.9 lbs.	8.2 lbs.	2.6 lbs.
9068528	Height	3.5	4.3	5.0	6.3	6.7	7.0	54.
	Spread	3.0	4.1	5.5	5.8	6.3	6.8	5.3
	Ins/Disease	2	2	2	2	2	2	2
	Form	5	4	3	3	3	3	3.5
	Nut Prod.	0	1.0 lbs.	2.2 lbs.	12.2 lbs.	4.2 lbs.	6.3 lbs.	4.3 lbs.

Study 29I135J Assembly and Evaluation of Hazelnut, *Corylus americana* Walt.

Table #2 reflects accession information

Table #2

Accession Number	State or Origin	City or County
9057081	Illinois	Coles
9057082	Illinois	Coles
9057087	Illinois	Coles
9057119	Illinois	Whiteside
9057120	Illinois	Carroll
9057167	Illinois	Will
9057168	Illinois	Iroquois
9057169	Illinois	Iroquois
9057184	Illinois	Clark
9057186	Illinois	Coles
9057188	Illinois	Coles
9057192	Illinois	Montgomery
9057195	Illinois	Morgan
9068505	Illinois	Coles
9068507	Illinois	Cumberland
9068508	Illinois	Mercer
9068509	Illinois	Ogle
9068510	Illinois	Iroquois
9068511	Illinois	Effingham
9068512	Illinois	Clay
9068513	Illinois	Pike
9068525	Illinois	Cumberland
9068526	Illinois	Coles
9068527	Illinois	Maultrie
9068528	Illinois	Coles
9068529	Illinois	Vermilion
9068562	Illinois	Adams
9068565	Illinois	Jo Daviess
9068585	Illinois	DeWitt
9068586	Illinois	Vermilion
9068570	Missouri	Lincoln
9068573	Missouri	Chariton
9068574	Missouri	Chariton
9068575	Illinois	Johnson

Tables #3 – #6 reflect the performance data for all accessions included in this study for **1995 – 1999.**

Study 29I135J - Assembly and Evaluation of Hazelnut, <i>Corylus americana</i> , Walt.																										Table #3
													Height in Feet													
1995													1997													
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Tallest	Location	Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Tallest	Location			
9068562	1.2	2.5	1.4	1.3	1.5	1.7	2.9	4.0	2.1	4.0	R8	9068574	4.9	4.3	3.8	3.9	6.8	3.8	3.2	2.2	4.1	6.8	R5			
9057188	2.6	4.0	1.6	3.1	2.6	2.0	2.3	2.2	2.6	4.0	R2	9068562	3.3	5.2	2.7	2.7	3.4	4.6	4.2	4.5	3.8	5.2	R2			
9068573	3.6	2.7	3.2	1.5	3.0	2.2	2.5	3.2	2.7	3.6	R1	9057188	4.0	5.0	2.9	4.2	5.1	3.7	4.7	4.0	4.2	5.1	R5			
9068508	2.0	3.0	2.2	2.3	1.3	1.0	1.6	1.5	1.9	3.0	R2	9057169	5.0	4.1	3.4	3.5	2.3	3.6	3.2	2.8	3.5	5.0	R1			
9068574	1.7	2.0	1.7	3.0	2.3	2.2	1.3	2.0	2.0	3.0	R4	9057168	3.8	1.2	4.6	2.4	4.3	4.1	3.0	2.0	3.2	4.6	R3			
9057169	2.9	1.6	1.4	1.7	0.8	1.0	1.4	1.6	1.6	2.9	R1	9068573	4.2	4.5	4.0	3.4	4.6	3.1	2.5	3.4	3.7	4.6	R4			
9068507	1.7	1.0	2.6	Dead	Dead	2.0	1.3	1.8	1.7	2.6	R 3	9068528	4.5	4.2	Dead	4.0	3.1	3.2	3.0	2.8	3.5	4.5	R1			
9068565	2.3	2.6	2.5	2.0	2.4	2.2	1.6	Dead	2.2	2.6	R2	9068510	3.1	2.0	3.0	4.5	4.3	2.8	2.0	4.0	3.2	4.5	R4			
9068558	1.5	2.2	1.7	1.3	2.0	1.5	2.5	Dead	1.8	2.5	R7	9068558	3.6	Dead	2.4	3.5	2.8	4.3	3.9	Dead	3.4	4.3	R6			
9057168	1.3	1.3	2.1	1.0	1.9	2.2	1.4	0.9	1.5	2.2	R6	9068507	2.3	Dead	3.5	Dead	Dead	4.0	2.0	2.3	2.8	4.0	R6			
9068510	0.6	1.3	2.1	1.7	1.5	1.4	0.6	2.2	1.4	2.2	R8	9068565	2.7	3.3	2.3	3.0	4.0	2.8	1.6	Dead	2.8	4.0	R5			
9068528	1.3	1.2	Dead	2.1	Dead	1.7	2.0	1.4	1.6	2.1	R4	9068525	3.3	2.3	4.0	3.6	Dead	3.1	Dead	3.2	2.8	4.0	R3			
9068586	Dead	Dead	1.2	1.7	2.0	2.0	1.0	1.3	1.5	2.0	R5,6	9068508	3.2	3.6	3.9	3.3	3.4	2.8	3.5	3.3	3.4	3.9	R3			
9068525	1.3	1.2	1.0	1.0	1.0	1.5	Dead	1.7	1.2	1.7	R8	9068586	Dead	Dead	2.9	2.6	3.7	3.0	2.0	3.1	2.9	3.1	R8			
1996													1998													
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Tallest	Location	Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Tallest	Location			
9057188	3.3	4.1	2.6	3.2	4.1	3.2	3.4	2.9	3.4	4.1	R2, 5	9068562	4.7	7.0	4.0	4.6	5.1	4.1	4.6	5.4	4.9	7.0	R2			
9068562	2.0	3.8	1.7	1.0	2.7	2.8	3.2	4.1	2.7	3.8	R2	9068558	4.6	Dead	5.0	4.3	4.1	5.0	6.4	Dead	4.9	6.4	R7			
9068586	Dead	Dead	2.9	2.6	3.7	3.0	2.0	2.0	2.7	3.7	R5	9057188	4.0	5.8	6.0	5.0	6.4	5.8	5.0	5.7	5.5	6.4	R5			
9068573	2.6	3.7	3.4	2.1	3.6	3.0	2.8	3.3	3.1	3.7	R2	9068573	6.3	4.9	5.2	5.0	6.3	5.0	6.0	4.0	5.3	6.3	R5			
9068574	3.2	2.3	2.4	3.7	3.5	2.6	2.7	2.0	2.8	3.5	R5	9068574	5.2	5.3	5.0	4.0	6.3	3.2	3.6	3.0	4.5	6.3	R5			
9068508	2.3	3.4	3.3	2.5	1.7	1.4	2.5	2.3	2.4	3.4	R2	9057169	5.9	5.2	5.0	5.0	3.2	4.4	3.2	3.3	4.4	5.9	R1			
9057168	2.3	1.3	3.3	1.8	3.3	3.0	1.8	1.3	2.3	3.3	R3, 5	9057168	5.0	1.8	5.4	3.8	5.4	5.1	4.2	3.0	4.2	5.4	R5			
9068528	3.0	3.2	Dead	3.3	Dead	2.5	2.5	2.1	2.8	3.3	R4	9068528	5.4	4.4	Dead	4.2	4.0	4.0	4.8	3.2	4.3	5.4	R1			
9068507	2.1	1.3	3.2	Dead	Dead	2.9	2.0	1.5	2.2	3.2	R3	9068510	3.9	4.8	4.0	4.6	5.4	3.0	4.0	4.6	4.3	5.4	R5			
9068558	2.0	Dead	2.1	2.1	2.4	3.2	2.7	Dead	2.4	3.2	R6	9068507	2.3	Dead	4.3	Dead	Dead	5.2	2.8	4.0	3.7	5.2	R6			
9057169	2.9	3.1	2.3	2.7	1.6	2.2	2.1	1.9	2.4	3.1	R2	9068525	4.2	3.5	5.2	4.9	Dead	3.4	Dead	4.6	3.7	5.2	R3			
9068565	2.3	2.9	2.3	2.3	2.6	2.3	1.4	Dead	2.3	2.9	R2	9068586	Dead	Dead	4.2	4.0	5.0	4.6	3.5	4.1	4.2	5.0	R5			
9068510	1.8	2.2	1.7	2.2	2.7	2.3	1.3	2.7	2.1	2.7	R5,8	9068508	3.5	3.8	3.2	4.8	4.7	3.8	4.2	4.0	4.0	4.8	R4			
9068525	2.2	1.6	1.7	2.5	1.6	1.9	Dead	2.5	2.0	2.5	R4,8	9068565	2.9	4.8	3.2	Dead	4.4	4.0	3.4	Dead	3.8	4.8	R2			
Height Measured in Feet																										

Study 29I135J - Assembly and Evaluation of Hazelnut, <i>Corylus americana</i> , Walt.																										Table #4
													Spread in Feet													
1995													1997													
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location	Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location			
9057188	1.0	0.7	0.6	1.2	1.4	0.9	0.9	2.0	1.1	2.0	R8	9068562	3.3	6.5	2.3	2.3	3.8	3.7	3.5	4.2	3.7	6.5	R2			
9068562	0.4	1.4	0.3	0.4	0.4	0.6	0.4	1.5	0.7	1.5	R8	9068573	4.1	3.5	4.3	5.1	5.0	3.6	2.5	2.9	3.9	5.1	R4			
9068573	1.5	0.6	0.8	0.8	1.0	0.7	0.9	0.3	0.8	1.5	R1	9057188	3.6	5.0	4.2	4.7	3.7	4.5	4.0	4.4	4.3	5.0	R2			
9068574	1.5	0.8	1.0	1.0	0.9	0.9	0.6	0.4	0.9	1.5	R1	9057169	3.6	5.0	4.2	4.7	3.7	4.5	4.0	4.4	4.3	5.0	R2			
9068507	0.6	0.3	1.2	Dead	Dead	1.0	0.3	0.3	0.6	1.2	R3	9068574	4.9	4.4	4.6	3.7	4.5	3.2	3.0	2.0	3.8	4.9	R1			
9068510	0.2	1.2	0.6	0.4	0.9	0.6	0.2	0.8	0.6	1.2	R2	9057168	4.4	1.5	4.2	2.0	4.2	3.3	2.5	2.0	3.0	4.4	R1			
9057168	0.7	0.4	1.1	0.4	1.1	0.8	0.7	0.5	0.7	1.1	R3, 5	9068528	3.0	4.4	Dead	3.3	2.9	2.0	3.4	2.3	3.0	4.4	R2			
9068558	0.3	0.3	0.5	0.7	0.9	1.1	0.7	Dead	0.6	1.1	R6	9068508	4.0	Dead	3.2	3.7	3.9	3.0	3.4	3.4	3.5	4.0	R1			
9068586	Dead	Dead	0.4	0.6	1.0	0.9	0.1	0.2	0.5	1.0	R5	9068510	3.0	3.2	3.0	3.3	3.9	2.1	4.0	3.3	3.2	4.0	R7			
9057169	1.0	0.8	0.6	0.4	0.2	0.5	0.7	0.4	0.6	1.0	R1	9068525	4.0	3.3	4.0	3.4	Dead	2.0	Dead	4.0	3.0	4.0	R1, 3, 8			
9068508	0.5	0.4	0.4	0.8	0.6	0.9	0.8	0.8	0.7	0.9	R6	9068586	Dead	Dead	3.7	2.5	3.1	3.5	1.8	2.8	2.9	3.7	R3			
9068565	0.6	0.4	0.9	0.8	0.5	0.7	0.7	Dead	0.7	0.9	R3	9068558	3.2	1.5	3.2	3.0	2.7	3.5	3.3	Dead	2.9	3.5	R6			
9068528	0.8	0.6	Dead	0.6	Dead	0.5	0.6	0.3	0.6	0.8	R1	9068565	2.8	3.5	2.2	2.0	3.1	3.0	1.5	Dead	2.6	3.5	R2			
9068525	0.4	0.4	0.4	0.3	0.3	0.3	Dead	0.6	0.4	0.6	R8	9068507	2.3	Dead	3.0	Dead	Dead	3.2	1.0	1.8	2.3	3.0	R3			
1996													1998													
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location	Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location			
9057188	2.4	2.8	2.4	2.6	2.9	3.3	2.3	3.7	2.8	3.7	R8	9057188	4.6	7.5	5.4	5.4	7.7	7.0	4.8	6.0	6.1	4.6	R1			
9068562	1.8	3.6	1.0	0.9	2.2	2.7	1.8	3.3	2.2	3.6	R2	9068508	4.4	5.8	4.4	5.2	4.8	5.4	4.6	4.9	4.9	4.4	R1, 3, 8			
9068574	2.8	3.1	2.8	2.3	2.5	1.9	3.4	1.1	2.5	3.4	R7	9068573	7.0	5.5	5.4	6.0	6.0	5.4	5.7	4.3	5.7	4.3	R8			
9068573	3.1	2.7	2.3	2.4	3.0	2.2	2.4	1.2	2.4	3.1	R1	9068558	4.0	Dead	5.0	4.4	4.0	5.0	5.2	Dead	4.6	4.0	R1, 5			
9057169	3.1	2.5	3.0	2.4	0.8	2.4	1.3	1.0	2.1	3.1	R1	9068528	4.3	4.6	Dead	4.0	4.4	3.4	3.8	4.0	4.1	3.4	R6			
9057168	2.8	1.0	2.9	1.4	2.8	2.1	2.1	1.2	2.0	2.9	R3	9068525	3.4	4.8	5.7	5.2	Dead	3.4	Dead	4.6	3.9	3.4	R1,6			
9068508	2.0	2.5	2.3	2.2	2.4	1.7	2.8	1.8	2.2	2.8	R7	9068562	4.2	7.4	4.0	3.3	5.0	5.5	5.1	5.8	5.0	3.3	R4			
9068510	1.6	2.7	2.1	1.8	2.6	1.8	1.0	0.6	1.8	2.7	R2	9068510	3.4	3.2	4.0	4.2	4.8	3.5	3.5	4.0	3.8	3.2	R2			
9068586	Dead	Dead	2.6	1.5	1.5	2.0	1.1	1.6	1.7	2.6	R3	9057169	4.8	4.6	5.3	5.2	2.8	4.3	3.5	4.0	4.3	2.8	R5			
9068565	1.0	2.4	1.6	2.0	1.7	2.6	1.0	Dead	1.8	2.6	R6	9057168	4.0	2.6	6.0	3.4	7.0	5.0	4.6	3.2	4.5	2.6	R2			
9068558	1.7	Dead	2.4	2.5	2.0	2.1	2.5	Dead	2.2	2.5	R4,7	9068574	2.4	5.3	5.2	2.6	5.8	3.8	4.5	3.3	4.1	2.4	R1			
9068528	2.2	2.3	Dead	2.2	1.7	2.4	2.4	1.8	2.1	2.4	R6, 7	9068565	4.0	4.6	3.0	Dead	5.0	4.2	2.3	Dead	3.9	2.3	R7			
9068525	1.7	2.2	2.0	2.0	1.4	2.0	Dead	2.3	1.9	2.3	R8	9068586	Dead	Dead	4.9	4.0	3.8	3.5	2.1	4.1	3.7	2.1	R7			
9068507	1.4	0.8	2.1	Dead	Dead	2.3	1.4	0.6	1.4	2.1	R3	9068507	2.7	Dead	5.0	Dead	Dead	6.0	1.3	4.6	3.9	1.3	R7			
Width Measured in Feet																										

Study 29I135J - Assembly and Evaluation of Hazelnut, <i>Corylus americana</i> , Walt.																							Table #5	
														Form										
1995													1997											
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location	Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location	
9057188	3.0	4.0	5.0	5.0	5.0	5.0	5.0	2.0	4.3	2.0	R8	9068562	5.0	3.0	5.0	7.0	7.0	4.0	8.0	3.0	5.3	3.0	R2,8	
9068562	3.0	3.0	3.0	4.0	3.0	5.0	6.0	3.0	3.8	3.0	R1,2,3,5,8	9057168	5.0	8.0	4.0	8.0	3.0	5.0	6.0	7.0	5.8	3.0	R5	
9057168	5.0	8.0	3.0	6.0	4.0	5.0	6.0	7.0	5.5	3.0	R3	9068558	4.0	Dead	5.0	5.0	6.0	5.0	3.0	Dead	4.7	3.0	R7	
9068558	7.0	8.0	5.0	7.0	3.0	4.0	7.0	Dead	5.9	3.0	R5	9068573	7.0	4.0	5.0	5.0	3.0	5.0	5.0	6.0	5.0	3.0	R5	
9068508	5.0	7.0	8.0	5.0	6.0	3.0	5.0	6.0	5.6	3.0	R6	9057188	3.0	4.0	4.0	4.0	3.0	5.0	3.0	4.0	3.8	3.0	R1,5,7	
9068573	3.0	4.0	5.0	5.0	4.0	5.0	4.0	6.0	4.5	3.0	R1	9068565	7.0	3.0	6.0	8.0	5.0	5.0	7.0	Dead	5.9	3.0	R2,8	
9068507	5.0	7.0	4.0	Dead	Dead	5.0	6.0	6.0	5.5	4.0	R3	9068510	7.0	8.0	6.0	5.0	5.0	4.0	6.0	3.0	5.5	3.0	R8	
9057169	4.0	5.0	5.0	8.0	6.0	6.0	6.0	6.0	5.8	4.0	R1	9068574	7.0	6.0	4.0	6.0	3.0	6.0	6.0	6.0	5.5	3.0	R8	
9068510	8.0	5.0	4.0	5.0	8.0	8.0	5.0	6.0	6.1	4.0	R3,4,6	9068507	5.0	Dead	4.0	5.0	Dead	4.0	8.0	6.0	5.3	4.0	R3,6	
9068574	4.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	5.5	4.0	R1	9068586	Dead	Dead	6.0	7.0	4.0	5.0	6.0	5.0	5.5	4.0	R4	
9068565	5.0	6.0	7.0	5.0	6.0	5.0	7.0	Dead	5.9	5.0	R1,4,6	9068508	7.0	5.0	5.0	5.0	7.0	6.0	4.0	5.5	4.0	R8		
9068528	5.0	5.0	Dead	5.0	Dead	6.0	6.0	6.0	5.5	5.0	R1,2,4	9057169	4.0	4.0	6.0	4.0	7.0	5.0	5.0	8.0	5.4	4.0	R1,2,4	
9068525	6.0	6.0	5.0	8.0	6.0	8.0	Dead	6.0	6.4	5.0	R3	9068528	4.0	4.0	Dead	5.0	6.0	4.0	6.0	6.0	5.0	4.0	R1,3,6	
9068586	Dead	Dead	6.0	6.0	7.0	6.0	9.0	8.0	7.0	6.0	R3,4,6	9068525	5.0	6.0	7.0	8.0	Dead	8.0	Dead	5.0	6.4	5.0	R1,8	
1996													1998											
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location	Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location	
9068573	3.0	4.0	4.0	6.0	4.0	4.0	4.0	5.0	4.3	3.0	R1	9068586	5.0	Dead	3.0	6.0	5.0	7.0	7.0	2.0	5.0	2.0	R8	
9057188	3.0	5.0	5.0	4.0	4.0	4.0	4.0	5.0	4.3	3.0	R1	9068562	5.0	2.0	2.0	5.0	3.0	5.0	6.0	2.0	3.8	2.0	R2,3,8	
9057169	3.0	5.0	6.0	5.0	4.0	5.0	5.0	5.0	4.8	3.0	R1	9068558	3.0	5.0	3.0	5.0	3.0	2.0	2.0	Dead	3.3	2.0	R6,7	
9068507	4.0	5.0	4.0	Dead	Dead	4.0	4.0	5.0	4.3	4.0	R1,3,6,7	9068574	5.0	2.0	3.0	6.0	5.0	6.0	3.0	5.0	4.4	2.0	R2	
9068586	Dead	Dead	5.0	7.0	4.0	5.0	5.0	4.0	5.0	4.0	R3,8	9057168	5.0	7.0	5.0	5.0	3.0	5.0	5.0	7.0	5.3	3.0	R5	
9068562	5.0	5.0	4.0	7.0	5.0	4.0	5.0	4.0	4.9	4.0	R6,8	9068573	5.0	5.0	5.0	3.0	3.0	3.0	4.0	5.0	4.1	3.0	R4,5,6	
9057168	6.0	6.0	5.0	6.0	4.0	4.0	6.0	6.0	5.4	4.0	R5,6	9057188	6.0	5.0	3.0	6.0	3.0	3.0	5.0	3.0	4.3	3.0	R3,5,6,8	
9068558	4.0	Dead	6.0	5.0	6.0	5.0	5.0	Dead	5.2	4.0	R1	9068528	3.0	5.0	3.0	5.0	3.0	7.0	5.0	6.0	4.6	3.0	R1,3,5	
9068565	5.0	4.0	6.0	7.0	5.0	6.0	5.0	Dead	5.4	4.0	R2	9068510	5.0	7.0	5.0	3.0	3.0	7.0	7.0	5.0	5.3	3.0	R4,5	
9068528	5.0	4.0	Dead	5.0	5.0	5.0	6.0	5.0	5.0	4.0	R2	9068565	5.0	5.0	7.0	Dead	5.0	5.0	4.0	Dead	5.2	4.0	R7	
9068510	5.0	7.0	6.0	4.0	5.0	4.0	4.0	5.0	5.0	4.0	R4,6,7	9068507	7.0	Dead	5.0	Dead	Dead	5.0	7.0	7.0	6.2	5.0	R3,6	
9068574	5.0	7.0	4.0	5.0	4.0	5.0	5.0	5.0	5.0	4.0	R3,5	9068508	Dead	5.0	7.0	5.0	7.0	5.0	6.0	5.0	5.7	5.0	R2,4,6,8	
9068508	7.0	5.0	5.0	5.0	5.0	7.0	5.0	5.0	5.5	5.0	R2,3,4,5,7,8	9057169	7.0	5.0	7.0	5.0	7.0	5.0	6.0	5.0	5.9	5.0	R2,4,6,8	
9068525	5.0	5.0	5.0	6.0	6.0	6.0	Dead	6.0	5.6	5.0	R1,2,3	9068525	5.0	7.0	5.0	7.0	Dead	7.0	Dead	6.0	6.0	5.0	R1,3,5	
Rating: 1-Excellent, 9=Poor																								

Study 29I135J - Assembly and Evaluation of Hazelnut, <i>Corylus americana</i> , Walt.																							Table #6
																							Fruit Production
1997												1998											
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location	Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9057169	2.0	3.0	9.0	9.0	0.0	0.0	0.0	0.0	5.8	2.0	R1	9068507	5.0	Dead	5.0	Dead	Dead	2.0	0.0	0.0	4.0	2.0	R6
9068562	0.0	7.0	0.0	0.0	0.0	3.0	9.0	7.0	6.5	3.0	R6	9068586	Dead	Dead	7.0	7.0	7.0	7.0	5.0	2.0	5.8	2.0	R8
9057168	9.0	9.0	3.0	0.0	7.0	9.0	0.0	0.0	7.4	3.0	R3	9068562	2.0	2.0	7.0	0.0	7.0	5.0	2.0	2.0	3.9	2.0	R1,2,7,8
9057188	3.0	7.0	Dead	9.0	9.0	9.0	7.0	7.0	7.3	3.0	R1, R7	9057168	7.0	5.0	2.0	0.0	2.0	5.0	7.0	0.0	4.7	2.0	R3,5
9068574	6.0	0.0	0.0	8.0	3.0	0.0	0.0	0.0	5.7	3.0	R5	9068558	2.0	Dead	5.0	2.0	0.0	5.0	5.0	Dead	3.8	2.0	R2,4
9068573	3.0	6.0	9.0	0.0	6.0	0.0	0.0	0.0	6.0	6.0	R2, R5	9068508	5.0	5.0	2.0	5.0	2.0	5.0	2.0	2.0	3.5	2.0	R1,2,3,5,7,8
9068528	9.0	6.0	0.0	9.0	0.0	6.0	8.0	0.0	7.6	6.0	R2,6	9068573	7.0	2.0	2.0	5.0	2.0	7.0	5.0	7.0	4.6	2.0	R2,3,5
9068510	0.0	7.0	0.0	0.0	6.0	0.0	0.0	0.0	6.5	6.0	R5	9068565	7.0	7.0	2.0	7.0	0.0	2.0	5.0	0.0	5.0	2.0	R3,6
9068507	0.0	Dead	7.0	Dead	Dead	0.0	0.0	0.0	7.0	7.0	R3	9057169	7.0	7.0	2.0	7.0	0.0	2.0	5.0	0.0	5.0	2.0	R3,6
9068565	8.0	0.0	9.0	7.0	9.0	9.0	0.0	Dead	8.4	7.0	R4	9068528	2.0	2.0	Dead	5.0	2.0	5.0	5.0	2.0	3.3	2.0	R1,2,5,8
9068508	9.0	Dead	9.0	0.0	9.0	0.0	9.0	8.0	8.8	8.0	R8	9068510	7.0	2.0	7.0	7.0	7.0	5.0	0.0	5.0	5.7	2.0	R2
9068558	9.0	Dead	0.0	0.0	0.0	0.0	9.0	Dead	9.0	9.0	R1, R7	9068574	5.0	7.0	7.0	2.0	2.0	5.0	5.0	0.0	4.7	2.0	R4,5
9068525	0.0	0.0	0.0	0.0	0.0	0.0	Dead	9.0	9.0	9.0	R8	9068525	5.0	5.0	7.0	7.0	2.0	7.0	Dead	2.0	5.0	2.0	R5,8
9068586	Dead	Dead	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	9057188	7.0	7.0	5.0	7.0	5.0	0.0	0.0	Dead	6.2	5.0	R3,5
1=Heavy Fruit Production; 9=Poor Fruit Production												1=Heavy Fruit Production; 9=Poor Fruit Production											
																							Insect/Disease
1997												1998											
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location	Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9068586	Dead	Dead	4.0	3.0	4.0	4.0	5.0	4.0	4.0	2.0	R2	9068507	4.0	Dead	6.0	Dead	Dead	2.0	9.0	3.0	4.8	2.0	R6
9068562	3.0	2.0	4.0	5.0	4.0	2.0	3.0	2.0	3.1	2.0	R2	9068586	Dead	Dead	4.0	3.0	3.0	3.0	4.0	2.0	3.2	2.0	R8
9057168	3.0	4.0	3.0	3.0	2.0	3.0	4.0	4.0	3.3	2.0	R5	9057168	2.0	4.0	3.0	4.0	2.0	2.0	6.0	3.0	3.3	2.0	R1,5,6
9068558	2.0	Dead	3.0	5.0	7.0	3.0	3.0	Dead	3.8	2.0	R1,3,6	9068558	3.0	Dead	4.0	3.0	3.0	2.0	2.0	Dead	2.8	2.0	R6,7
9068508	3.0	3.0	3.0	3.0	2.0	3.0	4.0	5.0	3.3	2.0	R5	9068573	5.0	3.0	2.0	3.0	2.0	3.0	3.0	3.0	3.0	2.0	R5
9068573	8.0	3.0	3.0	2.0	2.0	3.0	3.0	3.0	3.4	2.0	R4, 5	9057188	7.0	3.0	3.0	2.0	3.0	2.0	2.0	4.0	3.3	2.0	R4,6,7
9057188	2.0	2.0	2.0	4.0	2.0	6.0	2.0	2.0	2.8	2.0	R1,2,3,5,7,8	9057169	2.0	4.0	4.0	3.0	2.0	3.0	2.0	3.0	2.9	2.0	R1,5,7
9068565	3.0	2.0	7.0	6.0	3.0	5.0	4.0	5.0	4.4	2.0	R2	9068528	3.0	4.0	Dead	3.0	3.0	3.0	2.0	2.0	2.9	2.0	R7,8
9057169	2.0	2.0	6.0	2.0	3.0	2.0	3.0	7.0	3.4	2.0	R1,2,4,6	9068510	6.0	4.0	3.0	3.0	5.0	3.0	3.0	2.0	3.6	2.0	R8
9068510	4.0	4.0	4.0	3.0	4.0	5.0	2.0	2.0	3.5	2.0	R7,8	9068574	3.0	6.0	4.0	4.0	3.0	2.0	3.0	3.0	3.5	2.0	R6
9068574	3.0	3.0	5.0	4.0	2.0	5.0	3.0	3.0	3.5	2.0	R5	9068562	3.0	3.0	5.0	4.0	3.0	4.0	3.0	3.0	3.5	3.0	R1,2,5,7,8
9068525	2.0	3.0	2.0	7.0	Dead	3.0	Dead	2.0	3.2	2.0	R1,3,8	9068508	4.0	4.0	3.0	3.0	3.0	4.0	3.0	4.0	3.5	3.0	R3,4,5,7
9068507	3.0	Dead	3.0	Dead	Dead	3.0	4.0	4.0	3.4	3.0	R1,3,6	9068565	7.0	3.0	4.0	6.0	3.0	4.0	3.0	Dead	4.3	3.0	R2,5,7
9068528	3.0	3.0	Dead	3.0	3.0	4.0	4.0	4.0	3.4	3.0	R1,2,4,5	9068525	3.0	4.0	3.0	3.0	Dead	3.0	Dead	3.0	3.2	3.0	R1,3,4,6,8
1=No Insect/Disease; 9=Severe Insect/Disease												1=No Insect/Disease; 9=Severe Insect/Disease											

Study: 29I136J

Study Title - Assembly and Evaluation of Wild Plum, *Prunus americana* Marsh.

Study Leader: Cordsiemon, R.

Introduction:

Wild plum is recognized as an excellent wildlife plant that also has some aesthetic value. It is a shrub or small tree with shaggy bark. Leaves are narrowing to wedge-shaped, hairless or nearly so, somewhat long-pointed, sharply and often doubly toothed. Usually no glands are found on leaf-stalks. Twigs are typically hairless. Buds are red-brown, mostly about 1/8 inch in length. Leaf/scars are not abnormally enlarged. Leaves are one to five inches long. Wild plum reaches a height of 15 – 30 feet; with a diameter of five to ten inches. Flowers are white, three - five inch clusters, appearing March - May. Fruits are red and yellow, usually 7/8 - 1 1/4 inches, seed are somewhat flattened and ripen June - October. This species occurs from Massachusetts to Manitoba, New Mexico, Central Texas and southwest Florida.

Problem:

There is a lack of an available cultivar of wild plum specifically for this area. A need for developing a local selection or source identified selected sources of wild plum for use as wildlife food and habitat in the three states being served by the center has been identified by NRCS and other conservation and wildlife agencies.

Objective:

The objective is to assemble, comparatively evaluate, select and release an adapted cultivar selection of wild plum.

Discussion**1990-1993**

Seed was collected from native stands during 1990, 1991, and 1992. A total of 27 collections were made in Missouri, Iowa, and Illinois. The seed was stratified, germinated in the greenhouse and grown out in open bottom milk-carton type containers. Eighteen of the 27 collections germinated.

1994-1998

The plants were transplanted into a randomized complete block with seven replications and one nonrandomized block. The planting was established May 16, 1994 in Field #11e at the PMC. There were several significant dry periods throughout the summer and the plants were under stress several times. The plants were hand watered several times and only four out of 120 plants under evaluation were lost.

The planting was evaluated in 1995, 1996, 1997 and 1998 with very good survival considering the tough establishment year and a very droughty 1998.

The following accessions were selected in 1998 for field plantings: 9062309 (South Dakota), 9057088 (Moultrie County, Illinois), 9068546 (Dallas County, Missouri), 9068545 (Phelps County, Missouri), and 9068580 from Livingston County, Missouri.

1999

The 1999 evaluations of this study took place at different times of the year to capture the purposes for the evaluations: height, spread, fruit production, and form.

Table #2 lists the different accessions included in this assembly along with the locations and collectors' names.

Tables #5, #6, #7, #8, and #9 reflect the plants' performance from 1995 to 1999. These tables can be found in the 1999 Elsberry Technical Report.

2000

There were no plant performance evaluations done on this study in year 2000 other than fruit production and insect and disease resistance evaluations. On April 28, 2000 an infestation of the caterpillar tent worm, *Malacosoma americanum* was noted in the planting. A closer observation revealed a severe infestation of the caterpillar tent worm affecting every plant in the assembly. The pesticide Malathion 57 EC liquid was used following the label recommendations. The control was very effective.

Tables #2, #5, #6, #7, #8, and #9 reflect the plants' locations, collectors and performance for years 1995 to 1999.

The following information (Table #1) pertains to the fruit production harvested from selected accessions in year 2000.

Table #1

Accession Number	Amount of Clean Seed Produced
9062309	4.9 ounces
9068580	11.5 ounces
9068485	5.5 ounces
9057088	1.7 ounces
9068546	11.0 ounces

Table #2 – Accessions, Locations and Collector's Name

<u>Accession</u>	<u>County Location</u>	<u>Collector</u>	<u>Accession</u>	<u>County Location</u>	<u>Collector</u>
9062309	PMC, Bismarck, ND	Dwight Tober	9867516	Livingston, IL	Mark Baron
9057096	Kendall, IL	William D. Glass	9068515	Moniteau, MO	Henry E. Knipker
9057085	Coles, IL	Robert E. Szafoni	9068514	Grundy, IL	William D. Glas
9057088	Moultrie, IL	Robert E. Szafoni	9068546	Dallas, MO	David L. Wright
9057130	Grundy, IL	William D. Glass	9068545	Phelps, MO	Melodie Marshall
9057139	Iroquois, IL	William D. Glass	9068544	Cooper, MO	Linda Young
9057146	Will, IL	William D. Glass	9068543	Kendall, IL	Dayle Saar
9057163	Ogle, IL	Jim R. Heim	9068580	Livingston, MO	Mac Ellis
9057164	Woodbury, IA	Harry A. Minor	9068581	Lincoln, MO	Bruce Schuette
9057165	Kankakee, IL	William D. Glass			
9957166	Woodbury, IA	Harry A. Minor			
9068480	Livingston, IL	William D. Glass			
9068485	Ogle Co, IL	Jim R. Heim			
9057185	Cooper, MO	David M. Skaer			

2001

A similar infestation of the caterpillar tent worm, *Malacosoma americanum*, occurred this year as it did last year. The infestation affected all accessions to some degree and was noted encroaching into the planting during the last week of April 2001. The pesticide Malathion 57 EC liquid was used following the label recommendation. The control was again very effective.

Evaluations made this year included insect and disease resistance and fruit production. The following Table #3 is the summary of plant performance of the selected accessions of wild plum out of the initial assembly.

2002-2003

Plant performance evaluations (1995-2002) were documented on those accessions selected for field plantings in the PMC service area (Iowa, Illinois, and Missouri). A light infestation of the caterpillar tent worm, *Malacosoma americanum*, was noted in this assembly in early spring 2002, however no pesticide was applied. No plants were seriously affected as a result of not applying the pesticide Malathion 57 EC. Table #3 reflects those evaluations. The accessions listed in the following table were allowed to remain and all the rest of the plants will be removed (March 2003). The remaining accessions will be allowed to cross and the progeny will be assigned a separate accession number (9083241) and only one release (Tested Class) will be made for the PMC service area.

Fruit production was harvested from each plant and later combined into a composite of the above mentioned new accession number. Fruit production is reflected from 2000-2002 in Table #4.

2004

In 2004, the selected plants (9083241) produced 4.5 pounds of seed. The seed was stratified and will be grown out in the PMC greenhouse in 2005. The material produced will be allocated as bare root material and used in field plantings for further evaluations. Caterpillar tent worms, *Malacosoma americanum*, were present among the selected plants, but no treatment was applied. Damage to the foliage was also present, but not significant.

Seed harvested in 2003 was used to grow seedlings that will be planted in field plantings. More than 150 plants were produced from this seed.

2005

Seed again was harvested from the selected plants from field #11. Approximately 0.2 pound of seed collected was sent to Forrest Keeling Nursery for propagation and 0.25 pound was propagated at the PMC greenhouse. These seedlings will be used for commercial allocations and field trials.

2006

In fiscal year 2006, accession 9083241 of American plum (*Prunus Americana*) was released as Midwest Premium Germplasm American Plum. (See release notice on following page). The selection plot is made up of 37 trees that in 2006 produced 101 bulk pounds of clean seed. This data is based on an estimate of approximately 70% of the total fruit collected from the selected trees. Also in 2006, a production block was established in field 7 at the PMC for future seed production.

1995-2002 Evaluations

Table #3

Acc. No.	1995	1996	1997	1998	1999	2000	2001	2002	Ave.
9062309									
Height (ft)	2.7	4.7	7.1	8.2	9.4				6.4
Spread (ft)	0.8	3.2	6.9	7.7	10.6				5.8
Ins/Disease	4	4	4	4	4	4	4	4	4.0
Form	4	4	4	4	4	4	4	4	4.0
Fruiting			4	4	5	7	6	9	4.3
9068580									
Height (ft)	3.1	6.1	9.0	9.8	10.4				7.7
Spread (ft)	0.93	4.6	9.3	10.0	11.3				7.3
Ins/Disease	2	2	2	3	3	4	4	4	2.9
Form	4	3	3	3	3	3	3	3	3.1
Fruiting			4	3	4	6	4	6	4.5
9068485									
Height (ft)	2.2	3.9	5.5	6.3	9.1				5.4
Spread (ft)	0.93	4.6	9.2	10.5	11.3				7.3
Ins/Disease	2	2	2	2	2	4	4	4	2.8
Form	4	3	3	2	2	2	2	2	2.5
Fruiting			4	3	4				3.7
9068545									
Height (ft)	2.2	3.9	5.5	6.3	7.8				5.4
Spread (ft)	0.3	3.0	5.6	6.8	8.5				4.8
Ins/Dis	3	3	3	3	3	5	4	4	3.4
Form	5	3	3	3	3	3	3	3	3.3
Fruiting			3	4	4	8	1	1	3.5
9068546									
Height (ft)	2.9	5.2	7.9	16.6	17.3				10.0
Spread (ft)	0.8	4.2	8.1	8.5	10.9				6.5
Ins/Dis	3	2	2	3	3	4	5	5	3.1
Form	4	4	3	3	3	3	3	3	3.3
Fruiting			3	2	2	6	2	3	2.7

Rating for Insect/Disease: 1 = Exc Resistance, 9 = Poor Resistance

Rating for Fruiting: 1 = Heavy Fruit Production, 9 = Poor Fruit Production

Rating for Form: 1 = Excellent, 9 = Poor

Fruit Production Chart for 2000 - 2002

Table #4

Acc. #	2000	2001	2002	Ave
	Lbs/Acc #	Lbs/Acc #	Lbs/Acc #	Lbs/Acc #
9062309	0.31	0.60	12 Seeds	0.30
9068580	0.72	1.50	0.70	0.97
9068485	0.11	3.45	3.00	2.19
9068546	0.69	3.57	1.90	2.05
9057088	0.00	5.86	0.40	2.09

Study 29I136J Assembly and Evaluation of <i>Prunus Americana</i> , Wild Plum																										Table #5
													Height in Feet													
1995													1996													
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location	Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location			
434240	4.50	5.30	3.80	4.30	2.60	Dead	4.10	-	4.10	5.30	R2	9068545	7.70	6.40	6.80	6.20	5.70	Dead	5.40	-	6.37	7.70	R1			
9068580	3.60	5.00	2.60	4.30	1.50	2.00	2.60	3.00	3.08	5.00	R2	434240	7.10	7.30	6.30	6.00	5.10	Dead	6.00	-	6.30	7.30	R2			
9057088	4.30	3.10	3.10	4.80	2.50	2.50	2.60	3.50	3.30	4.80	R4	9057096	5.20	7.00	6.20	Dead	Dead	1.30	Dead	-	4.93	7.00	R2			
9068545	4.50	3.00	3.00	3.20	2.30	Dead	2.00	-	3.00	4.50	R1	9068514	7.00	6.50	5.10	4.50	Dead	4.10	4.50	-	5.28	7.00	R1			
9068546	3.70	4.30	3.60	2.30	2.60	1.80	2.10	2.40	2.85	4.30	R2	9068580	6.90	7.00	6.60	6.80	4.40	4.60	6.00	6.30	6.08	7.00	R2			
9068516	2.50	2.00	Dead	4.00	2.00	Dead	Dead	-	2.63	4.00	R4	9068480	4.70	3.10	5.10	6.80	2.90	Dead	Dead	Dead	4.52	6.80	R4			
9068515	2.50	0.60	3.80	2.70	1.50	2.50	2.30	2.30	2.28	3.80	R3	9057088	6.50	5.70	5.20	4.60	5.60	5.10	5.40	-	5.44	6.50	R1			
9057096	3.60	2.30	1.40	Dead	Dead	1.10	Dead	-	2.10	3.60	R1	9068546	5.50	6.20	6.50	5.60	4.70	3.60	4.40	5.20	5.21	6.50	R3			
9068485	3.30	2.00	2.30	2.70	1.50	Dead	1.20	-	2.17	3.30	R1	9062309	6.30	Dead	3.60	4.80	3.80	4.80	Dead	-	4.66	6.30	R1			
9068514	3.10	1.90	2.60	2.00	Dead	1.80	2.10	-	2.25	3.10	R1	9057165	5.30	5.00	6.20	6.00	5.10	-	-	-	5.52	6.20	R3			
9068480	2.60	3.10	2.40	3.00	1.60	Dead	Dead	Dead	2.54	3.10	R2	9068516	4.90	5.00	Dead	5.10	6.10	Dead	Dead	-	5.28	6.10	R5			
9068478	2.60	2.40	3.00	2.80	1.60	2.60	1.40	-	2.34	3.00	R3	9068543	4.20	6.00	5.30	4.70	Dead	Dead	Dead	-	5.05	6.00	R2			
9062309	2.80	Dead	2.00	3.00	2.60	2.90	Dead	-	2.66	3.00	R4	9068515	5.10	2.40	5.90	5.30	4.30	4.20	4.10	4.80	4.51	5.90	R3			
9057165	1.90	1.80	2.80	2.00	1.40	-	-	-	1.98	2.80	R3	9062308	4.40	5.00	3.10	4.80	Dead	Dead	2.60	Dead	3.98	5.00	R2			
9068543	2.40	2.70	2.50	2.00	Dead	Dead	Dead	-	2.40	2.70	R2	9068478	3.10	4.50	3.40	4.50	4.30	4.30	3.40	-	3.93	4.50	R2,4			
9062308	2.00	2.20	2.30	1.60	Dead	Dead	1.75	Dead	1.97	2.30	R3	9068485	4.10	4.10	4.00	4.50	4.00	Dead	2.60	-	3.88	4.50	R4			
9057146								1.60	1.60	1.60	R8	9057146								4.50	4.50	4.50	R8			
ND-286								Dead		0.00		ND-286								Dead		0.00				
1997													1998													
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location	Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location			
9057088	9.50	6.40	7.40	7.30	8.60	7.00	9.00	10.00	8.15	10.00	R8	9068545	12.10	10.90	7.70	10.40	9.60	Dead	7.90	-	9.77	12.10	R1			
9068545	11.00	9.80	6.60	9.10	8.00	Dead	7.00	-	8.58	10.00	R1	9068580	11.30	11.00	10.90	11.80	9.00	8.80	9.40	-	10.31	11.30	R1			
9068580	10.00	10.00	9.60	10.80	7.20	7.00	8.20	-	8.97	10.00	R1,2	9057088	10.20	7.70	8.30	8.20	9.60	8.00	7.30	11.20	8.81	11.20	R8			
9068546	7.20	9.70	9.00	8.40	7.00	6.00	7.60	8.00	7.86	9.70	R2	434240	10.20	10.00	10.70	8.90	8.60	Dead	8.60	-	9.50	10.70	R3			
434240	9.50	9.00	9.50	7.60	7.30	Dead	8.20	-	8.52	9.50	R1,3	9068515	8.90	5.80	10.30	8.10	6.00	7.00	9.90	7.10	7.89	10.30	R3			
9068515	8.20	4.20	9.10	7.40	5.00	6.00	8.20	6.20	6.79	9.10	R3	9068480	8.80	6.80	10.20	7.70	7.00	Dead	Dead	6.90	7.90	10.20	R3			
9057096	7.30	7.20	8.00	Dead	Dead	2.50	Dead	-	6.25	8.00	R3	9068546	8.70	10.20	10.00	9.90	8.20	67.90	8.20	9.80	16.61	10.20	R2			
9062309	8.00	Dead	7.00	7.20	6.40	7.00	Dead	-	7.12	8.00	R1	9057146								8.90	8.90	8.90	R8			
9068516	7.80	7.20	Dead	6.00	7.20	Dead	Dead	-	7.05	7.80	R1	9062309	8.90	Dead	8.10	8.40	7.10	8.30	Dead	-	8.16	8.90	R1			
9062308	6.40	2.50	5.10	7.60	Dead	Dead	4.00	Dead	5.12	7.60	R4	9068514	8.80	7.30	8.10	7.40	Dead	8.10	7.40	-	7.85	8.80	R1			
9068514	7.60	6.40	7.40	6.30	Dead	7.00	6.60	-	6.88	7.60	R1	9057096	7.90	7.70	8.60	Dead	Dead	4.50	Dead	-	7.18	8.60	R3			
9068543	6.00	5.00	7.20	7.00	Dead	Dead	Dead	-	6.30	7.20	R3	9068516	8.10	8.60	Dead	7.20	8.30	Dead	Dead	-	8.05	8.60	R2			
9057146								7.20	7.20	7.20	R8	9068543	7.00	6.00	8.30	8.10	Dead	Dead	Dead	-	7.35	8.30	R3			
9068480	7.00	5.40	9.00	6.30	6.00	Dead	Dead	6.00	6.62	7.00	R1	9062308	7.30	4.90	6.60	8.00	Dead	Dead	5.00	Dead	6.36	8.00	R4			
9057165	5.30	5.10	6.10	7.00	5.70	-	-	-	5.84	7.00	R4	9057165	6.60	6.80	7.40	8.00	6.80	-	-	-	7.12	8.00	R4			
9068478	3.20	6.50	4.40	6.40	Dead	Dead	4.60	-	5.02	6.80	R6	9068478	4.00	6.90	5.40	7.20	Dead	Dead	5.20	-	5.74	7.20	R4			
9068485	5.70	6.30	5.00	6.80	6.30	Dead	2.70	-	5.47	6.80	R4	9068485	6.10	7.20	6.00	7.40	7.10	Dead	3.80	-	6.27	7.20	R2			
ND-286								Dead		0.00		ND-286										0.00				
Height measured in feet																										

Study 29I136J Assembly and Evaluation of *Prunus Americana*, Wild Plum

Table #5 - continued

												Height in Feet
1999												
Accssion	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location	
9057088	11.00	8.00	11.00	10.00	8.50	6.00	13.00	11.00	13.10	13.00	R7	
9068580	8.00	5.50	0.00	12.00	8.50	11.00	11.00	9.50	8.19	12.00	R4	
9068515	11.00	11.00	9.50	10.50	6.00	10.00	6.00	0.00	9.14	11.00	R1,2	
9068485	8.00	8.00	7.00	8.50	9.00	0.00	6.00	0.00	7.75	11.00	R2,4	
9068545	10.00	11.00	0.00	11.00	8.50	0.00	0.00	0.00	10.13	11.00	R2,4	
9068516	7.50	9.50	0.00	7.00	11.00	0.00	9.00	0.00	8.80	11.00	R5	
9068546	9.00	6.00	10.50	10.50	9.00	8.00	9.50	11.00	9.19	11.00	R8	
9068480	9.00	8.50	0.00	9.00	10.50	0.00	0.00	9.50	9.30	10.50	R5	
9057096	8.50	10.50	10.50	8.50	0.00	0.00	0.00	0.00	9.50	10.50	R2,3	
9062308	9.00	0.00	10.00	8.00	0.00	0.00	7.50	0.00	8.63	10.00	R3	
9068514	9.50	10.00	9.00	8.50	0.00	8.00	8.00	0.00	8.83	10.00	R2	
9062309	11.50	0.00	8.50	9.00	8.00	10.00	0.00	0.00	9.40	10.00	R6	
9068543	9.00	8.50	9.50	8.50	0.00	0.00	0.00	0.00	8.88	9.50	R3	
9068478	8.00	8.00	9.00	0.00	6.50	8.50	8.50	0.00	8.08	9.00	R3	
434240	0.00	9.00	9.00	0.00	0.00	0.00	0.00	0.00	9.00	9.00	R2,3	
9057165	8.00	8.00	9.00	8.00	8.50	0.00	0.00	0.00	8.30	9.00	R3	
9057146								7.50	7.50	7.50	R8	
ND-286								0.00	0.00	0.00		
Height measured in feet												
0 = Dead plant												

Study 291136J Assembly and Evaluation of Prunus Americana, Wild Plum																							Table #6
Spread in Feet																							
1995												1996											
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location	Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9068480	0.60	1.60	0.60	0.40	0.20	Dead	Dead	Dead	0.68	1.60	R2	9068480	3.00	2.60	3.70	3.20	3.50	Dead	Dead	Dead	3.20	3.70	R3
9057096	0.70	0.30	0.20	Dead	Dead	0.20	Dead	-	0.35	0.70	R1	9057096	3.80	4.00	3.40	Dead	Dead	0.60	Dead	-	2.95	4.00	R2
9068478	0.90	0.70	1.00	1.00	0.60	0.80	0.50	-	0.79	1.00	R3,4	9068478	2.40	3.80	1.80	4.70	4.50	4.50	2.50	-	3.46	4.70	R4
9068515	1.00	0.30	0.80	0.60	0.40	0.60	0.40	0.20	0.54	1.00	R1	9068515	3.80	2.60	4.00	4.00	4.50	3.70	3.50	2.60	3.59	4.50	R5
9062308	0.60	0.60	0.30	0.40	Dead	Dead	0.50	Dead	0.48	0.60	R1,2	9062308	3.80	3.00	1.80	3.30	Dead	Dead	3.20	Dead	3.02	3.80	R1
9068485	0.30	0.30	0.50	0.30	0.20	Dead	0.10	-	0.28	0.50	R3	9068485	3.00	3.20	3.40	3.60	2.30	Dead	2.00	-	2.92	3.60	R4
9057088	2.00	1.60	0.80	0.60	0.40	0.60	0.90	0.90	0.98	1.60	R2	9057088	5.50	5.00	5.00	2.80	4.40	4.50	4.30	5.80	4.66	5.80	R8
9068545	2.30	1.50	0.80	1.00	1.00	Dead	0.40	-	1.17	2.30	R1	9068545	7.00	5.00	5.20	5.80	5.00	Dead	2.60	-	5.10	7.00	R1
9068543	0.30	0.20	0.60	0.20	Dead	Dead	Dead	-	0.33	0.60	R3	9068543	3.00	3.50	4.40	3.40	Dead	Dead	Dead	-	3.58	4.40	R3
9068516	1.30	0.20	Dead	0.80	0.60	Dead	Dead	-	0.73	0.60	R3	9068516	3.00	3.00	Dead	3.50	3.50	Dead	1.40	-	2.88	3.50	R4,5
9068514	0.80	0.70	1.00	0.30	Dead	0.40	0.30	-	0.58	1.00	R3	9068514	4.00	3.40	3.30	2.70	Dead	2.80	5.00	-	3.53	5.00	R7
9068580	1.80	2.00	1.10	0.80	0.40	0.50	0.40	0.40	0.93	2.00	R2	9068580	5.40	6.00	4.80	5.60	3.30	3.00	4.50	4.00	4.58	6.00	R2
9057146								0.20		0.20	R8	9057146								3.00	3.00	3.00	R8
9068546	1.30	1.30	1.40	0.90	0.20	0.40	0.50	0.50	0.81	1.40	R3	9068546	4.20	5.00	5.00	4.80	2.60	4.40	3.40	4.00	4.18	5.00	R2,3
434240	2.50	2.50	2.00	1.40	0.60	Dead	1.00	-	1.67	2.50	R1,2	434240	6.40	5.00	5.20	4.80	3.70	Dead	4.90	-	5.00	6.40	R1
ND-286								Dead		0.00		ND-286								Dead	-	0.00	
9062309	0.50	Dead	0.30	0.10	0.40	0.20	Dead	-		0.50	R1	9062309	3.40	Dead	2.70	3.70	3.00	3.30	Dead	-	3.22	3.70	R4
9057165	0.60	0.40	0.50	0.30	0.40	-	-	-	0.44	0.60	R1	9057165	3.50	2.80	4.20	3.70	2.80	-	-	-	3.40	4.20	R3
1997												1998											
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location	Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9068480	7.20	6.00	7.40	6.00	6.20	Dead	Dead	4.30	6.18	7.40	R3	9068480	7.70	6.50	7.90	6.50	6.50	Dead	Dead	4.75	6.64	7.90	R3
9057096	7.60	8.60	7.40	Dead	Dead	3.00	Dead	-	6.65	8.60	R2	9057096	8.00	9.10	7.90	Dead	Dead	4.00	Dead	-	7.25	9.10	R2
9068478	3.00	6.20	4.00	7.30	Dead	7.80	4.60	-	5.48	7.80	R6	9068478	5.00	6.80	5.30	8.10	Dead	8.50	5.70	-	6.57	8.50	R6
9068515	8.30	4.00	7.20	7.50	7.80	6.70	7.40	6.80	6.96	8.30	R1	9068515	9.10	5.30	8.10	8.50	8.70	7.60	8.10	7.20	7.83	8.70	R5
9062308	6.20	2.80	4.30	8.30	Dead	Dead	4.60	Dead	5.24	8.30	R4	9062308	7.70	4.90	5.90	9.20	Dead	Dead	5.90	Dead	6.72	9.20	R4
9068485	5.00	6.20	5.50	7.50	6.00	Dead	3.20	-	5.57	7.50	R4	9068485	6.10	6.90	6.50	8.30	7.10	Dead	5.70	-	6.77	8.30	R4
9057088	10.00	6.50	8.30	8.30	8.50	7.50	8.00	11.00	8.51	11.00	R8	9057088	11.10	7.30	9.20	8.90	9.10	8.20	8.90	11.80	9.31	11.80	R8
9068545	12.80	9.00	9.00	9.30	9.00	Dead	3.90	-	8.83	12.80	R1	9068545	13.20	10.10	10.00	10.80	10.00	Dead	5.30	-	9.90	13.20	R1
9068543	6.60	9.00	6.40	7.70	Dead	Dead	Dead	-	7.43	9.00	R2	9068543	7.40	10.00	7.20	8.10	Dead	Dead	Dead	-	2.03	10.00	R2
9068516	6.80	7.00	Dead	7.40	7.50	Dead	3.60	-	6.46	7.50	R5	9068516	7.20	8.10	Dead	8.80	8.30	Dead	5.10	-	4.44	8.80	R4
9068514	7.20	6.50	7.10	6.50	Dead	6.40	6.50	-	6.70	7.20	R1	9068514	8.10	7.30	8.30	7.00	Dead	7.40	7.40	-	3.63	8.30	R3
9068580	12.00	10.60	10.10	11.30	7.70	6.20	8.00	8.00	9.24	12.00	R1	9068580	13.00	11.90	11.00	12.60	8.60	7.90	9.50	9.40	6.00	13.10	R1
9057146								8.10	8.10	8.10	R8	9057146								9.30	9.30	9.30	R8
9068546	6.00	11.00	8.00	10.00	7.60	6.20	8.00	7.70	8.06	11.00	R2	9068546	7.20	12.10	9.30	11.30	8.70	7.40	9.20	8.50	5.64	11.30	R4
434240	10.30	7.60	10.00	7.40	7.80	Dead	8.00	-	8.52	10.30	R1	434240	10.90	8.30	11.20	8.70	8.90	Dead	9.10	-	4.45	11.20	R3
ND-286								Dead	-	0.00		ND-286								Dead	Dead	0.00	
9062309	8.20	Dead	6.60	7.00	6.40	6.50	Dead	-	6.94	8.20	R1	9062309	8.90	Dead	7.30	7.90	7.00	7.20	Dead	-	4.42	8.90	R1
9057165	6.20	6.40	7.10	7.30	6.00	-	-	-	6.60	7.10	R4	9057165	7.10	7.20	8.30	8.30	7.40	-	-	-	3.14	8.30	R3,4
Width measured in feet.																							

Study 291136J Assembly and Evaluation of Prunus Americana, Wild Plum

Table #6 - continued

											Spread in Feet		
1999													
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location		
9068480	9.00	8.50	10.50	5.00	8.50	0.00	0.00	9.00	8.42	10.50	R3		
9057096	8.50	9.50	10.50	0.00	0.00	0.00	0.00	0.00	9.50	10.50	R3		
9068478	5.00	8.00	8.00	0.00	8.00	11.50	11.00	0.00	8.58	11.50	R6		
9068515	10.00	7.50	7.00	12.00	9.00	11.00	9.00	0.00	9.36	12.00	R4		
9062308	9.00	0.00	7.00	10.00	0.00	0.00	10.00	0.00	9.00	10.00	R4		
9068485	8.30	8.50	7.00	12.00	10.00	0.00	5.00	0.00	8.47	12.00	R4		
9057088	12.50	10.00	12.50	11.00	14.00	9.00	13.00	13.00	11.88	14.00	R5		
9068545	14.50	12.00	0.00	11.00	14.00	0.00	0.00	0.00	12.88	14.50	R1		
9068543	8.50	10.00	12.00	10.00	0.00	0.00	0.00	0.00	10.13	12.00	R3		
9068516	10.00	11.00	0.00	11.00	11.00	0.00	9.00	0.00	10.40	11.00	R2,4,5		
9068514	9.50	9.00	9.00	9.00	0.00	10.00	8.00	0.00	9.08	10.00	R6		
9068580	11.00	10.00	0.00	13.00	11.00	11.00	10.00	13.00	11.29	13.00	R4,8		
9057146								10.00	10.00	10.00	R8		
9068546	10.00	5.00	13.00	11.50	11.00	12.00	14.00	11.00	10.94	14.00	R7		
434240	0.00	11.00	11.00	11.00	0.00	0.00	0.00	0.00	0.00	11.00	R2,3,4		
ND-286									0.00	0.00			
9062309	11.50	0.00	8.50	11.00	11.00	11.00	0.00	0.00	10.60	11.50	R1		
9057165	8.00	9.00	11.00	10.00	8.50	0.00	0.00	0.00	9.30	11.00	R3		
Spread Measured in Feet													
0 = Dead plant													

Study 29I136J Assembly and Evaluation of <i>Prunus Americana</i> , Wild Plum																							Table #7	
											Form													
1995											1996													
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location	Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location	
ND-286								Dead	-	0.00		ND-286								Dead	-	0.00		
434240	1.00	2.00	2.00	2.00	4.00	Dead	5.00	-	2.67	1.00	R1	9068478	3.00	4.00	2.00	6.00	6.00	4.00	3.00	-	4.00	2.00	R3	
9057088	2.00	4.00	5.00	4.00	4.00	4.00	2.00	4.00	3.63	2.00	R1, 7	9068515	2.00	5.00	3.00	3.00	4.00	6.00	3.00	6.00	4.00	2.00	R1	
9068545	2.00	3.00	3.00	5.00	2.00	Dead	6.00	-	3.50	2.00	R1, 5	9068514	2.00	5.00	4.00	5.00	Dead	5.00	8.00	-	4.83	2.00	R1	
9068516	2.00	8.00	Dead	7.00	2.00	Dead	Dead	-	4.75	2.00	R1, 5	9068546	2.00	6.00	2.00	3.00	4.00	5.00	7.00	3.00	4.00	2.00	R1, 3	
9068478	4.00	7.00	4.00	3.00	5.00	4.00	4.00	-	4.43	3.00	R3	9068480	8.00	4.00	5.00	3.00	6.00	Dead	Dead	Dead	5.20	3.00	R4	
9068515	4.00	6.00	5.00	5.00	7.00	3.00	5.00	6.00	5.13	3.00	R6	9057096	4.00	3.00	3.00	Dead	Dead	6.00	Dead	-	4.00	3.00	R2, 3	
9062308	5.00	3.00	6.00	6.00	Dead	Dead	6.00	Dead	5.20	3.00	R2	9062308	3.00	5.00	3.00	5.00	Dead	Dead	6.00	Dead	4.40	3.00	R1, 3	
9068580	5.00	3.00	5.00	3.00	5.00	5.00	5.00	5.00	4.50	3.00	R2, 4	9068485	5.00	3.00	3.00	3.00	4.00	Dead	3.00	-	3.50	3.00	R2,3,4,7	
9068546	4.00	5.00	3.00	5.00	7.00	5.00	5.00	5.00	4.88	3.00	R3	9057088	3.00	6.00	4.00	6.00	4.00	4.00	3.00	4.00	4.25	3.00	R1, 7	
9068480	4.00	8.00	5.00	7.00	6.00	Dead	Dead	Dead	6.00	4.00	R1	9068545	5.00	4.00	3.00	5.00	4.00	Dead	7.00	-	4.67	3.00	R3	
9068514	4.00	7.00	7.00	8.00	Dead	4.00	5.00	-	5.83	4.00	R1, 6	9068516	4.00	4.00	Dead	5.00	3.00	Dead	5.00	-	4.20	3.00	R5	
9057165	4.00	5.00	8.00	8.00	8.00	-	-	-	6.60	4.00	R1	9068580	5.00	5.00	3.00	3.00	3.00	3.00	4.00	3.00	3.63	3.00	R3,4,5,6,8	
9068485	7.00	7.00	8.00	7.00	5.00	Dead	8.00	-	7.00	5.00	R5	9057146								3.00	3.00	3.00	R8	
9068543	5.00	8.00	5.00	8.00	Dead	Dead	Dead	-	6.50	5.00	R1, 3	434240	3.00	3.00	4.00	7.00	4.00	Dead	3.00	-	4.00	3.00	R1,2, 7	
9062309	5.00	Dead	6.00	6.00	6.00	7.00	Dead	-	6.00	5.00	R1	9062309	3.00	Dead	5.00	3.00	4.00	4.00	Dead	-	3.80	3.00	R1, 4	
9057096	6.00	7.00	6.00	Dead	Dead	8.00	Dead	-	6.75	6.00	R1, 3	9068543	5.00	4.00	5.00	4.00	Dead	Dead	Dead	-	4.50	4.00	R2, 4	
9057146								7.00	7.00	7.00	R8	9057165	5.00	4.00	5.00	5.00	6.00	-	-	-	5.00	4.00	R2	
											Form													
1997											1998													
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location	Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location	
ND-286								Dead		0.00		ND-286								Dead	-	0.00		
9068545	1.00	3.00	8.00	7.00	7.00	Dead	5.00	-	5.17	1.00	R1	9057088	1.00	6.00	5.00	7.00	5.00	Dead	4.00	-	4.67	1.00	R1	
9068580	1.00	3.00	7.00	2.00	5.00	6.00	2.00	2.00	3.50	1.00	R1	9068580	1.00	3.00	5.00	2.00	5.00	5.00	2.00	2.00	3.13	1.00	R1	
434240	1.00	5.00	6.00	8.00	5.00	Dead	3.00	-	4.67	1.00	R1	434240	1.00	4.00	6.00	8.00	4.00	Dead	3.00	-	4.33	1.00	R1	
9057088	1.00	7.00	6.00	8.00	5.00	4.00	3.00	2.00	4.50	2.00	R8	9068545	1.00	2.00	6.00	5.00	6.00	3.00	3.00	-	3.71	2.00	R8	
9068546	5.00	3.00	2.00	2.00	5.00	5.00	3.00	5.00	3.75	2.00	R3,4	9068514	6.00	8.00	5.00	Dead	6.00	7.00	2.00	-	5.67	2.00	R7	
9068515	3.00	6.00	5.00	5.00	7.00	5.00	3.00	5.00	4.88	3.00	R1, 7	9068546	5.00	3.00	2.00	2.00	4.00	4.00	3.00	4.00	3.38	2.00	R3,4,8	
9068516	3.00	7.00	Dead	8.00	5.00	Dead	4.00	-	5.40	3.00	R1	9068515	3.00	5.00	4.00	4.00	7.00	5.00	3.00	4.00	4.38	3.00	R1,7	
9068514	6.00	8.00	5.00	Dead	6.00	8.00	3.00	-	6.00	3.00	R1	9068516	3.00	6.00	Dead	8.00	5.00	Dead	4.00	-	5.20	3.00	R1	
9068480	4.00	5.00	8.00	5.00	6.00	Dead	3.00	6.00	5.29	4.00	R1	9068480	4.00	6.00	7.00	4.00	6.00	Dead	3.00	6.00	5.14	4.00	R1,4	
9062308	4.00	9.00	7.00	8.00	Dead	Dead	7.00	-	5.83	4.00	R4	9068478	8.00	6.00	7.00	6.00	Dead	4.00	6.00	-	6.17	4.00	R6	
9057096	6.00	7.00	7.00	5.00	Dead	8.00	Dead	-	6.60	5.00	R4	9062308	4.00	8.00	7.00	8.00	Dead	Dead	7.00	-	6.80	4.00	R1	
9068478	8.00	6.00	7.00	7.00	Dead	5.00	6.00	-	6.50	5.00	R6	9057096	5.00	6.00	6.00	5.00	Dead	8.00	Dead	-	6.00	5.00	R1,4	
9068485	6.00	6.00	6.00	7.00	5.00	Dead	6.00	-	6.00	5.00	R5	9068485	6.00	6.00	5.00	6.00	5.00	Dead	6.00	-	5.67	5.00	R3,5	
9068543	6.00	7.00	5.00	5.00	Dead	Dead	Dead	-	5.75	5.00	R3,4	9068543	6.00	6.00	5.00	5.00	Dead	Dead	Dead	-	5.50	5.00	R3,4	
9057146								5.00	5.00	5.00	R8	9057146								5.00	5.00	5.00	R8	
9062309	5.00	Dead	6.00	5.00	8.00	6.00	Dead	-	6.00	5.00	R1,4	9062309	5.00	Dead	5.00	5.00	7.00	6.00	Dead	-	5.60	5.00	R1,3,4	
9057165	7.00	7.00	6.00	6.00	6.00	-	-	-	6.40	6.00	R4,5,6	9057165	7.00	6.00	6.00	5.00	6.00	-	-	-	6.00	5.00	R4	
Rating: 1= Excellent, 9=Poor											0=Dead Plant													

Study 29I136J Assembly and Evaluation of *Prunus Americana*, Wild Plum

Table #7 - continued

1999											Form
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location
ND-286									0.00	0.00	0.00
9057088	1.00	4.00	4.00	6.00	5.00	3.00	4.00	3.00	3.75	1.00	R1
9068545	1.00	2.00	0.00	5.00	5.00	0.00	0.00	0.00	3.25	1.00	R1
9068580	1.00	3.00	0.00	2.00	3.00	3.00	3.00	2.00	2.43	1.00	R1
9068514	6.00	8.00	5.00	4.00	0.00	6.00	2.00	0.00	5.17	2.00	R7
9068546	5.00	3.00	2.00	2.00	4.00	4.00	3.00	4.00	3.38	2.00	R3,4
9068478	8.00	6.00	6.00	0.00	7.00	5.00	3.00	0.00	5.83	3.00	R7
9068515	3.00	5.00	4.00	4.00	7.00	5.00	3.00	0.00	4.43	3.00	R1,7
9062308	3.00	0.00	7.00	7.00	0.00	0.00	7.00	0.00	6.00	3.00	R1
9068516	3.00	6.00	0.00	8.00	5.00	0.00	4.00	0.00	5.20	3.00	R1
9062309	3.00	0.00	4.00	4.00	5.00	5.00	0.00	0.00	4.20	3.00	R1
9068480	4.00	7.00	4.00	5.00	7.00	0.00	0.00	7.00	5.67	4.00	R1
434240	0.00	4.00	6.00	0.00	0.00	0.00	0.00	0.00	5.00	4.00	R2
9057096	5.00	6.00	6.00	0.00	0.00	0.00	0.00	0.00	5.67	5.00	R1
9068485	6.00	6.00	5.00	6.00	5.00	0.00	6.00	0.00	5.67	5.00	R3,5
9068543	6.00	6.00	5.00	5.00	0.00	0.00	0.00	0.00	5.50	5.00	R3,4
9057146								5.00	5.00	5.00	R8
9057165	7.00	6.00	6.00	5.00	6.00	0.00	0.00	0.00	6.00	5.00	R4
Rating: 1= Excellent, 9=Poor			0=Dead Plant								

Study 29I136J Assembly and Evaluation of <i>Prunus Americana</i> , Wild Plum													Table #8												
													Fruit Production												
1997													1998												
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location	Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location		
ND-286											Dead											Dead	Dead	0.00	
9068515	4.00	6.00	6.00	0.00	5.00	1.00	6.00	1.00	3.63	1.00	R6,8	9068515	5.00	7.00	0.00	7.00	1.00	6.00	1.00	7.00	4.86	1.00	R5,7		
9057088	0.00	6.00	5.00	0.00	0.00	1.00	7.00	1.00	2.50	1.00	R6,8	9057088	0.00	6.00	6.00	0.00	0.00	1.00	Dead	1.00	3.50	1.00	R6,8		
9068545	2.00	2.00	2.00	4.00	1.00	Dead	0.00	-	1.83	1.00	R5	9068545	1.00	1.00	1.00	4.00	1.00	Dead	Dead	-	1.60	1.00	R1,2,3,5		
9057165	2.00	7.00	7.00	1.00	7.00	-	-	-	4.80	1.00	R4	9068516	1.00	6.00	Dead	4.00	6.00	Dead	0.00	-	4.25	1.00	R1		
9068516	2.00	7.00	Dead	5.00	6.00	Dead	0.00	-	4.00	2.00	R1	9068580	5.00	4.00	4.00	1.00	6.00	1.00	4.00	-	3.57	1.00	R4,6		
9068580	6.00	5.00	4.00	2.00	7.00	2.00	4.00	-	4.29	2.00	R4,6	9068546	3.00	1.00	1.00	3.00	4.00	4.00	1.00	Dead	2.43	1.00	R2,3,7		
9068546	3.00	2.00	2.00	3.00	4.00	5.00	2.00	4.00	3.13	2.00	R2,3,7	9057165	1.00	6.00	7.00	1.00	6.00	-	-	-	4.20	1.00	R1,4		
434240	0.00	0.00	0.00	8.00	0.00	Dead	0.00	-	8.00	3.00	R4	9057096	2.00	7.00	0.00	Dead	Dead	Dead	Dead	-	4.50	2.00	R1		
9068485	4.00	4.00	5.00	4.00	4.00	Dead	0.00	-	3.50	4.00	R1,2,4,5	9068485	4.00	5.00	5.00	3.00	4.00	Dead	0.00	-	4.20	3.00	R4		
9062309	4.00	Dead	5.00	4.00	6.00	4.00	Dead	-	4.60	4.00	R1,4,6	9062309	3.00	Dead	5.00	5.00	6.00	3.00	Dead	-	4.40	3.00	R1,6		
9068480	0.00	6.00	6.00	6.00	5.00	Dead	Dead	7.00	5.00	5.00	R5	9068543	4.00	6.00	0.00	6.00	Dead	Dead	Dead	-	5.33	4.00	R1		
9057096	3.00	7.00	0.00	Dead	Dead	7.00	Dead	-	4.25	5.00	R1	9068514	6.00	7.00	6.00	6.00	Dead	4.00	4.00	-	5.50	4.00	R6,7		
9068543	5.00	5.00	0.00	5.00	Dead	Dead	Dead	-	3.75	5.00	R1,2,4	9062308	0.00	0.00	6.00	7.00	Dead	Dead	0.00	Dead	6.50	6.00	R3		
9068478	0.00	6.00	0.00	6.00	Dead	Dead	0.00	-	2.40	6.00	R2,4	9068480	0.00	7.00	7.00	7.00	7.00	Dead	Dead	7.00	7.00	7.00	R2,3,4,5,8		
9062308	0.00	0.00	5.00	6.00	Dead	Dead	0.00	Dead	2.20	6.00	R3	9068478	0.00	7.00	0.00	7.00	0.00	0.00	-	7.00	7.00	7.00	R2,4		
9068514	6.00	7.00	6.00	7.00	Dead	7.00	7.00	-	6.67	6.00	R1,3	9057146								7.00	7.00	7.00	R8		
9057146								8.00	8.00	8.00	R8	434240	0.00	0.00	0.00	7.00	0.00	Dead	0.00	-	7.00	7.00	R4		
1999																									
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location														
ND-286									0.00	0.00	0.00														
9068480	7.00	0.00	4.00	0.00	2.00	0.00	0.00	7.00	5.00	1.00	R5														
9068515	1.00	0.00	0.00	0.00	0.00	0.00	7.00	0.00	4.00	1.00	R1														
9062308	7.00	0.00	5.00	1.00	0.00	0.00	7.00	0.00	5.00	1.00	R4														
9068485	7.00	1.00	7.00	1.00	4.00	0.00	0.00	0.00	4.00	1.00	R2,4														
9057088	0.00	7.00	0.00	7.00	1.00	1.00	0.00	7.00	4.60	1.00	R5,6														
9068545	1.00	1.00	0.00	1.00	1.00	1.00	7.00	0.00	2.00	1.00	R1,2,4,5,6														
9068543	7.00	1.00	0.00	7.00	0.00	0.00	0.00	0.00	5.00	1.00	R2														
9068516	5.00	7.00	0.00	1.00	7.00	0.00	0.00	0.00	5.00	1.00	R4														
9068580	7.00	0.00	0.00	1.00	6.00	1.00	6.00	0.00	4.20	1.00	R4,6														
9057146								1.00	1.00	1.00	R8														
9068546	4.00	0.00	1.00	2.00	4.00	1.00	1.00	0.00	2.17	1.00	R3,4,6,7														
9057165	6.00	4.00	0.00	1.00	0.00	0.00	0.00	0.00	3.67	1.00	R4														
434240	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	2.00	2.00	R4														
9062309	6.00	0.00	7.00	2.00	7.00	6.00	0.00	0.00	5.60	2.00	R4														
9068514	6.00	7.00	7.00	4.00	0.00	5.00	0.00	0.00	5.80	5.00	R4,6														
9057096	7.00	7.00	7.00	0.00	0.00	0.00	0.00	0.00	7.00	7.00	R1,2,3														
9068478	0.00	7.00	0.00	0.00	0.00	0.00	9.00	0.00	8.00	7.00	R2														

Rating: 1=Exc, 9=Poor, 0=No production or dead plant.

Study 291136J Assembly and Evaluation of <i>Prunus Americana</i> , Wild Plum												Table #9
Insect/Disease Resistance												
1999												
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location	
ND-286	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
9068480	4.00	4.50	4.50	1.00	4.50	0.00	0.00	1.50	3.33	1.00	R4, 8	
9068478	4.00	2.50	1.50	0.00	1.00	1.00	1.00	0.00	1.69	1.00	R3,5,6,7	
9068515	2.50	3.50	5.50	1.00	4.50	3.00	3.00	0.00	3.29	1.00	R4	
9057088	1.50	2.00	1.50	1.00	1.50	1.00	1.00	1.00	1.31	1.00	R1,3,4,5,6,7,8	
9068545	2.00	1.00	0.00	2.00	1.50	0.00	0.00	0.00	1.63	1.00	R1,2,5	
9068580	2.50	1.00	0.00	1.00	3.00	1.00	1.50	1.50	1.64	1.00	R2,4,6,7,8	
9068546	6.00	1.00	1.00	1.00	1.00	1.00	1.00	1.50	1.69	1.00	R2,7,8	
9057096	5.50	3.00	1.50	0.00	0.00	0.00	0.00	0.00	3.33	1.50	R3	
9062308	6.00	0.00	3.50	1.50	0.00	0.00	2.00	1.50	2.90	1.50	R4,7,8	
9068485	5.50	5.50	4.00	1.50	1.50	0.00	3.00	0.00	3.50	1.50	R4,5	
9068516	2.50	4.00	0.00	2.50	3.50	0.00	2.00	0.50	2.73	1.50	R4,7,8	
9057146	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	1.50	1.50	R8	
9062309	3.50	0.00	3.50	1.50	3.50	2.50	0.00	0.00	2.90	1.50	R4,6,7,8	
9068543	2.50	4.50	2.00	2.50	0.00	0.00	0.00	0.00	2.88	2.00	R1,3,4	
9068514	3.00	3.00	2.00	2.00	0.00	2.50	2.00	0.00	2.42	2.00	R3,4,6,7	
9057165	6.00	4.50	2.50	3.00	3.00	0.00	0.00	0.00	3.80	2.00	R3,5	
434240	0.00	5.50	5.00	0.00	0.00	0.00	0.00	0.00	5.25	3.00	R2,5	
Disease Resistance Rating:				1-Excellent resistance								
				9-Poor resistance								
				0=Dead plant								

Study: 29A1370

Study Title: Wetland/Riparian Propagation, Establishment, and Demonstration

Study Leader: Cordsiemon, R.; J. Kaiser

Introduction:

There is a growing interest in wetland restoration throughout the conservation community. Government programs, such as USDA-Wetland Reserve Program, the USFWS Partners for Wildlife, Wetland Restoration Program, the Missouri Department of Conservation (MDC) Private Lands Wetland Program, and private programs sponsored by Ducks Unlimited and Waterfowl USA have all focused on the need for a suitable supply of plants in wetland restoration efforts.

The increasing use of wetlands as filters in agricultural waste management and the control of non-point source pollution also indicate the need for a greater knowledge base for proper plant selection.

Understanding wetland ecosystems will require improved and increased quality of information on wetland plants and ecosystems. Innovative approaches to field management and additional training of personnel in wetland conservation and management will also be needed. Intra- and interagency coordination and information exchange among state and federal agencies will help standardize monitoring and management strategies.

Problem:

Information is largely unavailable related to the propagation, adaptation, and potential use of many of the wetland species found in the Midwest. Wetland plants of interest often have multi-use potential providing wildlife benefits, shoreline stabilization, water quality improvement, and/or aesthetic benefits. They are also needed to fulfill conservation needs resulting from increased demands in wetland development and water treatment. The ability to document this information or to observe the interaction of selected species is restricted by the availability of plants and plant communities especially under controlled conditions. Proper use of species to address conservation problems is limited by specific knowledge and technology for using these plants.

Objectives:

The objectives of the Elsberry PMC wetland study are to:

1. Provide a demonstration of various plant materials for wetland conservation and aesthetic values.
2. Provide an area for interagency research on the biology of selected wetland plants.

Discussion:**1994 – 1999**

A large wetland was constructed in Field #4 on the Plant Materials Center in July 1994. Selected plant materials were planted with the intent of evaluating these plants for flood tolerance. The PMC has been working with a flood tolerant switchgrass since 1991. As a result, it was placed in this wetland for further testing along with six accessions of eastern gamagrass which were found growing in wet conditions: accessions 9078842, 9078844 and 9078843 were collected in Atchison County, Missouri, 9078845 collected in Holt County, Missouri, 9078840 collected in Chariton County, Missouri and 9078846 was collected in Clinton County, Missouri. Local

collections of bermudagrass and swamp milkweed were planted in the spring of 1998. Two collections of prairie cordgrass (Cuivre Island and Lost Creek) were also planted in this wetland. The switchgrass, eastern gamagrass and the prairie cordgrass were planted in 1997. All plants in this wetland were given time to establish prior to the beginning of the flooding operation which took place in October 1999. The wetland was flooded to a depth of 40 inches. This water remained in the wetland until early spring of 2000. Once the water is drained out of the wetland and enough time elapses for plant regrowth, evaluations on survival will take place.

The following Tables #1, #2, #3 and #4 reflect the plants' performance.

2000

Water was drained out of the wetland in segments because the drainpipe was not functioning properly. This operation started on March 21, 2000 and ended on March 30, 2000. The prairie cordgrass were the first plants to begin green up (March 30) followed by the bermudagrass planting. 'Cave-In-Rock' switchgrass sod (23 plugs) was planted on the west side of the flood tolerant switchgrass (sod) for comparison with other plant species in the wetland. On June 1, 2000, flood tolerant switchgrass was seeded in a plot 50 feet long and three feet wide. On August 9 an evaluation of the seeded flood tolerant switchgrass revealed no germination had taken place in the plot seeded on June 1. Poor germination has been experienced with this selection since 1998. There was no flooding of the wetland this fall to allow the Cave-In-Rock to get fully established. The following is a listing of percent survival of plants included in this study. The best performing plants in this study are Cuivre Island and Lost Creek collection of *Spartina pectinata*, *Tripsacum dactyloides* accessions 9078843, 9078845, and 'Pete'; and *Cynodon dactylon*. The following tables reflect the different plants' performance before and after a flooding event.

2001

The objective of the flooding was to parallel flood events that were occurring on the Mississippi River during that same time event. Began pumping turbid water into wetland on April 24, 2001 to flood the wetland to a depth of approximately 32 inches of water, which was achieved by April 27, 2001. The water was allowed to remain in the wetland for seven days. Water was then allowed to drain out of the wetland starting on April 30, 2001. All the water was drained out of the wetland by May 1, 2001. On May 8 evaluations were conducted to document re-growth after flooding. Again on June 11 a quick flooding scenario was conducted in the wetland to simulate a flash flooding event, similar to what was occurring on the Mississippi River. Thirty-four inches of turbid water was pumped into the wetland. The PMC began draining the water out of the wetland on June 15. The process of draining the water out of the wetland was completed on June 19.

The following is a listing of plant vigor ratings for each accession/variety included in this study. Plant evaluations for vigor were taken on June 21 and 26, 2001.

2002-2003

Plant performance evaluations were performed on April 24, 2002 and May 27, 2003. The wetland was not burned in 2002; however it was burned in 2003 and in previous years to remove accumulated vegetation. Flooding of the wetland began on April 29, 2002 and June 10, 2003. A total of 45 inches of water was pumped into the wetland (2002) and 42 inches in 2003 before the de-watering process began. All water was drained out of the wetland by May 17, 2002 and July 7, 2003. The plants were under water for 17 days in 2002 and 22 days in 2003. Once all the water was drained out of the wetland, follow-up evaluations took place on June 2002 and

August 2003. The flood event in 2003 was to inundate the site for more than 20 days to test the switchgrass, *Panicum virgatum*. Table #4 reflects the plant performances during 2003 before and after the flood event. Previous years' plant performances can be found on Tables #1 - #3.

2003-2004

Switchgrass, *Panicum virgatum*, accessions 9062193, 9062235, 9083170 were compared to Cave-In-Rock. The percent was 76%, 77%, and 78% survival compared to Cave-In-Rock at 65%. The composite 9083170 Flood Tolerant switchgrass is the next generation of the three accessions 9062193, 9062235, and 9083170 which did perform from seed that was planted in 2000. Vigor was slow with only 20% stand the first growing season. Flood events occurred in 2001, 2002, and 2003 with the stand increasing in density to 85% by spring of 2004.

Prairie cordgrass, *Spartina pectina*, accessions 9083166 Cuivre Island and 9083167 Lost Creek planted on the 3'X 3' grid was a solid block in two growing seasons. The cordgrass planted on the 10'x 10' grid was a solid block in six growing seasons. The vegetative spread averaged 1.5 feet during a growing season. The flooding events did enhance the plants' ability to flourish and produce seed that spread seedlings in the wetland cell.

Virginia wildrye, *Elymus virginicus*, accession 9083169 Cuivre River was vegetatively transplanted in 2001. In the flood event of early spring 2002 there was 100% survival of the plants; however the flood event of 2003 late spring to early summer did result in a decline in the plants with 47% survival by spring 2004. Many seedlings were observed that came from seed in the soil that developed fall 2003 and spring 2004.

2004

The wetland cell was not burned and there was no flooding in 2004. A new block was added to the wetland for evaluation. The block contained 16 plants of low growing switchgrass, *Panicum virgatum*, erect big bluestem, and short growing big bluestem, *Andropogon gerardii*. 'Cave-In-Rock' switchgrass was added to the block as a check. The plants were transplanted from plugs grown in the greenhouse in order to get good established plants. They were evaluated for survival in October and only the low growing and 'Cave-in-Rock' switchgrasses were needed; three and four plants respectfully. The block will be flooded in late April to June of 2005 and the entire wetland planting will be evaluated.

2005

In 2005 there was no activity with this study. The warm season grasses, erect big bluestem, 9083274 and short-growing known as Refuge, 9078832, and low growing switchgrass, 9083172, and Cave-in-Rock, 469228, were allowed to establish. Then control of broadleaf weeds was addressed. The flooding sequences are again planned for 2006, but with lack of help may be put off indefinitely.

2006

A re-evaluation of this study was done and a determination was made to evaluate the warm season grasses and other plants in the wetland cell if time and labor is available. A survival evaluation was done on the warm season grasses (bluestems and switchgrasses). Those plants that have died were replaced.

Study 29A1370 - Wetland Species in Wetland at Elsberry PMC								Table #1
Plugs Planted 5-2-97 (Eastern Gamagrass)								
2002 Data	Began Flooding on 4/24/02							
2003 Data	Began Flooding on 6-10-03							
	Total #	Active	Weed	Disease/	Developed			
	Planted	Growing	Comp.	Insect	Seed Head	Vigor	Ave. Ht.	
Eastern Gamagrass 9078840 Chariton, Missouri. 5' spacing, planted 5/2/97.								
							25 plants planted	
Dates Evaluated								
7/9/1998	20	20	severe	moderate	yes	good	2'5"	
9/29/1999	20	20	moderate	light rust	yes	good/exc	3'5"	
5/11/2000	19	17	moderate	moderate	none	poor	6"	
9/19/2000	13	13	mod/sev	light rust	none	good	2'5"	
6/26/2001	20	20	light	none	yes	good	3'4"	
4/24/02 (BFE)	18	18	light	none	none	good	8"	
6/17/02 (AFE)	15	15	light	none	yes	exc	2'	
5/27/03 (BFE)	15	15	light	none	yes	exc.	2'	
8/5/03 (AFE)	*							
Percent surviving as of 6/17/02 was 75%								
Eastern Gamagrass 9078844 Atchison, Missouri. 7' spacing, planted 5/2/97.								
							18 plants planted	
Dates Evaluated								
7/9/1998	12	12	severe	moderate rust	yes	poor	2'5"	
9/29/1999	12	12	moderate	moderate rust	yes	fair	2'5"	
5/11/2000	12	10	moderate	moderate	none	poor	6"	
9/19/2000	12	13	severe	light rust	Yes	fair	2'	
6/26/2001	12	9	light	light rust	yes	fair	2'10"	
4/24/02 (BFE)	9	9	light	none	none	fair	7"	
6/17/02 (AFE)	9	9	light	none	none	exc.	2'	
5/27/03 (BFE)	*							
8/5/03 (AFE)	*							
Percent surviving as of 6/17/02 was 75%								
Eastern Gamagrass 9078842 Atchison, Missouri. 15' spacing, planted 5/2/97.								
							9 plants planted	
Dates Evaluated								
7/9/1998	5	5	severe	none	yes	fair	2'	
9/29/1999	5	5	severe	none	yes	fair	2'5"	
5/11/2000	5	3		none		0 poor	6"	
9/19/2000	5	4	severe	none	none	fair	1'8"	
6/26/2001	3	3	light	none	yes	fair	2'2"	
4/24/02 (BFE)	4	4	light	none	none	fair	7"	
6/17/02 (AFE)	4	4	light	none	none	exc.	2'	
5/27/03 (BFE)	*							
8/5/03 (AFE)	*							
Percent surviving as of 6/17/02 was 44%								
Rating for Vigor: 1=Excellent; 9=Poor								
Rating for Weed Competition and Dis/Insect: 1=Excellent; 9=Severe								
* = Cannot determine rows of plants								

Study 29A1370 - Wetland Species in Wetland at Elsberry PMC							Table #1-continued	
Total # Planted	Active Growing	Weed Comp.	Disease/ Insect	Developed Seed Head	Vigor	Ave. Ht.		
Eastern Gamagrass 9078846 Clinton, Missouri. 8' spacing, total planted 5/2/97.							16 plants planted	
Dates Evaluated								
7/9/1998	11	11	severe	none	yes	good	2'	
9/29/1999	11	11	moderate	none	yes	good	2'5"	
5/11/2000	8	8	moderate	none	none	poor	7"	
9/19/2000	10	10	severe	light rust	none	fair	2'	
6/26/2001	8	8	light	light rust	yes	good	3'2"	
4/24/02 (BFE)	10	10	light	none	none	good	8"	
6/17/02 (AFE)	10	10	light	none	yes	exc.	2'6"	
5/27/03 (BFE)	*							
8/5/03 (AFE)	*							
Percent surviving as of 6/17/02 was 63%								
Eastern Gamagrass 9078843 Atchison, Missouri. 15' spacing, planted 5/2/97.							9 plants planted	
Dates Evaluated								
7/9/1998	13	13	severe	none	yes	poor	2'5"	
9/29/1999	13	13	moderate	none	yes	moderate	3'	
5/11/2000	5	5		none	none	poor	7"	
9/19/2000	10	10	severe	slight rust	none	fair	2'	
6/26/2001	4	4	light	light	none	fair	2'6"	
4/24/02 (BFE)	4	4	light	light	none	fair	8"	
6/17/02 (AFE)	4	4	light	light	none	good	2'	
5/27/03 (BFE)	*							
8/5/03 (AFE)	*							
Percent surviving as of 6/17/02 was 44%								
Eastern Gamagrass 9078845 Holt, Missouri. 8' spacing, planted 5/2/97.							16 plants planted	
Dates Evaluated								
7/9/1998	12	12	severe	none	yes	good	3'5"	
9/29/1999	12	12	severe	none	yes	good	3'	
5/22/2000	12	9	severe	none	none		8"	
9/19/2000	16	16	severe	slight rust	yes	good	2'5"	
6/26/2001	10	10	light	none	yes	good	3'2"	
4/24/02 (BFE)	10	10	light	none	none	good	8"	
6/17/02 (AFE)	10	10	light	none	none	exc.	2'6"	
5/27/03 (BFE)	*							
8/5/03 (AFE)	*							
Percent surviving as of 6/17/02 was 63%								
Rating for Vigor: 1=Excellent; 9=Poor								
Rating for Weed Competition and Dis/Insect: 1=Excellent; 9=Severe								
BFE - Before Flooding Event								
AFE - After Flooding Event								
* = Cannot determine rows of plants								

Study 29A1370 - Wetland Species in Wetland at Elsberry PMC							Table #2
Plugs Planted 6-24-97 (Flood Tolerant Switchgrass)							
2002 Data: Flood Event from 4/29/02 to 5/17/02							
2003 Data: Flooding began 6/10/03							
% Cover/ Plant #	Active Growing	Weed Comp.	Disease/ Insect	Developed Seed Head	Vigor	Ave. Ht.	
Switchgrass 9062213 3' spacing, 41 total planted (plugs) 6/24/97.							
Dates Evaluated							
7/9/1998	35 plants	moderate	none	all plants	poor/fair	2'	
9/29/1999	35 plants	moderate	none	all plants	fair	2' 5"	
4/26/2000	35 plants	moderate	none	none	exc.	5" regrowth	
9/19/2000	85% row	35 plants	moderate	none	all plants	exc. 4'5"	
6/26/2001	33 plants	light	none	none	exc.	3' 4"	
4/24/02 (BFE)	31 plants	light	none	none	good	6"	
6/17/02 (AFE)	31 plants	light	none	none	exc.	2' 6"	
5/27/03 (BFE)	32 plants	light	none	none	exc.	1' 7"	
8/5/03 (AFE)	32 plants	light	none	none	good	2' 5"	
Percent surviving as of 6/17/02 was 76%							
Switchgrass 9062235 4' spacing, 31 total planted (plugs) 6/24/97.							
Dates Evaluated							
7/9/1998	22 plants	moderate	none	all plants	poor/fair	5' 5"	
9/29/1999	22 plants	moderate	none	all plants	fair	5'	
4/26/2000	26 plants	moderate	none	none	exc.	6' 5"	
9/19/2000	26 plants	moderate	none	All plants	exc.	4' 5"	
6/26/2001	24 plants	light	none	none	exc.	2' 9"	
4/24/02 (BFE)	20 plants	light	none	none	good	6"	
6/17/02 (AFE)	20 plants	light	none	none	good	2'	
5/27/03 (BFE)	23 plants	light	none	none	exc.	1' 8"	
8/5/03 (AFE)	23 plants	light	none	none	good	2' 9"	
Percent surviving as of 6/17/02 was 65%							
Switchgrass 9062193 5' spacing; 25 total planted (plugs) 6/24/97.							
Dates Evaluated							
7/9/1998	17 plants	moderate	none	all plants	fair	3' 5"	
9/29/1999	17 plants	moderate	none	all plants	good	4' 5"	
4/26/2000	21 plants	moderate	none	all plants	exc.	6' 5"	
9/19/2000	21 plants	moderate	none	all plants	exc.	5'	
6/26/2001	20 plants	light	none	none	exc.	3' 6"	
4/24/02 (BFE)	16 plants	light	none	none	good	5"	
6/17/02 (AFE)	14 plants	light	none	none	exc.	2' 6"	
5/27/03 (BFE)	19 plants	light	none	none	exc.	1' 5"	
8/5/03 (AFE)	19 plants	light	none	none	good	2' 8"	
Percent surviving as of 6/17/02 was 56%							
BFE - Before Flooding Event							
AFE - After Flooding Event							
* = Cannot determine rows of plants							

Study 29A1370 - Wetland Species in Wetland at Elsberry PMC						Table #2 - continued	
% Cover/ Plant #	Active Growing	Weed Comp.	Disease/ Insect	Developed Seed Head	Vigor	Ave. Ht.	
Evaluation Dates:		4/24/02 & 6/17/02					
Cave-In-Rock Switchgrass 23 plants planted.							
Dates Evaluation							
4/18/2000	23	23	severe	none	none	good	5"
9/19/2000	9	growing weak	severe	none	yes	poor	2'
6/21/2001	21	21	light	light	none	good	2' 6"
4/24/02 (BFE)	10	10	light	none	none	good	8"
6/17/02 (AFE)	12	12	light	light	none	good	2' 6"
5/27/03 (BFE)	16	16	light	light	none	good	1' 5"
8/5/03 (AFE)	16	16	light	light	none	fair	2' 6"
Percent surviving as of 6/17/02 was 52%							
Flood Tolerant Switchgrass, seeded 50' row plus 3' wide.							
Dates Evaluated							
Seeded 6/1/00 50' x 40" plot - .0038 ac. Rate 6# PLS/ac.							
9/19/2000	15%- 20% of 50' row	fair	moderate	none	6/5 5%	good	8"
6/21/2001	22	22	light	none	none	exc.	3'
4/24/02 (BFE)	16	16	light	none	none	good	5"
6/17/02 (AFE)	33	33	light	none	none	good	1' 6"
5/27/03 (BFE)	45%	45%	light	none	none	good	1' 6"
8/5/03 (AFE)	45%	45%	light	none	none	good	2' 5"
Flood tolerant switchgrass plugs block, 63 plants planted 5/25/99.							
Dates Evaluated							
4/26/2000	92%	58 plants	none	none	6/5 100%	exc.	6' 5"
9/19/2000	95%	95%	none	none	6/5 100%	exc.	4' 5"
6/21/2001	80%	66 plants	light	none	none	exc.	3'
4/24/02 (BFE)	85%	66 plants	light	none	none	good	6"
6/17/02 (AFE)	85%	66 plants	light	none	none	good	2'
5/27/03 (BFE)	85%	66 plants	light	none	none	good	1' 3"
8/5/03 (AFE)	85%	66 plants	light	none	none	fair	2' 2"
Bermudagrass block plugs, planted 5/25/99.							
Dates Evaluated							
9/28/1999	35%	100%	light	none	50%	exc.	3"
4/26/2000		100%	light	none	none	exc.	3-5"
9/19/2000	100%	100%	light	none	100%	exc.	9"
6/21/2001	100%	100%	none	none	none	exc.	6"
4/24/02 (BFE)	100%	50%	none	none	none	good	2"
6/17/02 (AFE)	90%	90%	none	none	none	good	3"
5/27/03 (BFE)	100%	100%	none	none	none	fair	1"
8/5/03 (AFE)	100%	100%	none	none	none	fair	1"
BFE = Before Flood Event							
AFE = After Flood Event							

Study 29A1370 - Wetland Species in Wetland at Elsberry PMC							Table #3		
Prairie Cordgrass									
2002 Data: Flood Event from 4/29/02 to 5/17/02									
2003 Data: Flooding Began 6/10/03									
Active							Ave. Ht.	Average	
Total #	Growing	Weed	Disease/	Developed			Seed	Forage	
Planted	Spreading	Comp.	Insect	Seed Head	Vigor		Head	Height	
							10' x 10'		
Prairie Cordgrass Collection, planted 9/29/97							3 2 1		
East →							6 5 4		
							9 8 7		
7/9/1998	9	6" average	severe	none	NA	exc.	-	-	
8/1/1999	9	30" average	moderate	none	9/9	good	-	-	
9/19/2000	9	4.5" ave.	none	none	9/9	exc.	6'.5"	5'.0 forage	
6/21/2001	9	6'	light	none	none	exc.	6'	45"	
4/24/02 (BFE)	9	7.5'	light	none	none	exc.	none	17"	
6/17/02 (AFE)	9	8'	light	none	none	exc.	none	36"	
5/27/03 (BFE)	9	8.5'	light	none	none	exc.	none	30"	
8/5/03 (AFE)	9	8.5'	light	none	none	exc.	6.5'	40"	
Percent surviving as of 6/17/02 was 100%									
Cuivre Island Prairie Cordgrass Collection, planted 5/15/98							3' x 3'		
							4 3 2 1		
North ↑							8 7 6 5		
7/9/1998	8	5.5"	severe	none	6 plants	good/exc.	4'.0"	4'.0"	
5/25/1999	8	1'.5" each	moderate	none	none	exc.	none		
Lost Creek Prairie Cordgrass Collection, planted 5/15/98							3'x3'		
							12 11 10 9		
							16 15 14 13		
7/9/1998	8	6"	severe	none	4 plants	good/exc.	4'.0"	4'.0"	
5/25/1999	8	1'.5" each	moderate	none	none	exc.	none		
9/19/2000									
Total block for both collections			none	none	35%	exc.	6' 0"	5' 0"	
9/19/2000									
14' x 13'5" total spread of blocks			none	none	35%	exc.	6'.0"	More lodging Cuivre Island collection	
9/19/2000									
3' x 3' block is filled in total prairie cordgrass			none	none	35%	exc.	6'.0"	More lodging Cuivre Island collection	
6/26/2001		solid	none	none	none	exc.	6'.0"	50"	
4/24/02 (BFE)		80%	none	none	none	exc,	15"		
6/17/02 (AFE)		solid block	none	none	none	exc.	48"		
5/27/03 (BFE)		solid block	none	none	none	exc.	none	29"	
8/5/03 (AFE)		solid block	none	none	none	exc.	6.5'	42"	
BFE - Before Flooding Event									
AFE - After Flooding Event									

Study: 29A1370 - Wetland/Riparian Propagation, Establishment, and Demonstration

Table #4

Genus/Species	Common Name	Accession No.	Vigor Rating		Date of Rating	
			BFE	AFE	BFE	AFE
<i>Tripsacum dactyloides</i>	Eastern gamagrass	9098840	*	*	5/27/03	8/5/03
<i>Tripsacum dactyloides</i>	Eastern gamagrass	9078844	*	*	5/27/03	8/5/03
<i>Tripsacum dactyloides</i>	Eastern gamagrass	9078842	*	*	5/27/03	8/5/03
<i>Tripsacum dactyloides</i>	Eastern gamagrass	9078846	*	*	5/27/03	8/5/03
<i>Tripsacum dactyloides</i>	Eastern gamagrass	9078843	*	*	5/27/03	8/5/03
<i>Tripsacum dactyloides</i>	Eastern gamagrass	9078845	*	*	5/27/03	8/5/03
<i>Tripsacum dactyloides</i>	Eastern gamagrass	Pete	*	*	5/27/03	8/5/03
<i>Panicum virgatum</i>	Switchgrass	9062193	Exc.	Good	5/27/03	8/5/03
<i>Panicum virgatum</i>	Switchgrass	9062235	Exc.	Good	5/27/03	8/5/03
<i>Panicum virgatum</i>	Switchgrass	9062213	Exc.	Good	5/27/03	8/5/03
<i>Panicum virgatum</i>	Switchgrass	C-I-R	Good	Fair	5/27/03	8/5/03
<i>Panicum virgatum</i>	Switchgrass Direct Seeded 2001	9083170 Flood-Tolerant	Exc.	Good	5/27/03	8/5/03
<i>Spartina pectinata</i>	Prairie cordgrass	Cuivre Island	Exc.	Exc.	5/27/03	7/5/03
<i>Spartina pectinata</i>	Prairie cordgrass	Lost Creek	Exc.	Exc.	5/27/03	7/5/03
<i>Cynodon dactylon</i>	Bermuda grass	Elsberry	Fair	Fair	5/27/03	7/5/03
<i>Asclepias incarnata</i>	Swamp milkweed	Iowa	Good	Fair	5/27/03	7/5/03
<i>Lobelia cardinalis</i>	Cardinal flower	Forrest Keeling	Good	Poor		7/5/03
<i>Carex scoparia</i>	Broomsedge	MDC	Died			7/5/03
<i>Elymus virginicus</i>	Virginia Wildrye	Cuivre River	Fair	Top Growth Died	5/27/03	7/5/03
<i>Spartina pectinata</i>	Prairie cordgrass Seedlings		Exc.	Exc.	5/27/03	7/5/03
<i>Panicum virgatum</i>	Plugs of switchgrass	9062213 9062235 9062193	Good	Fair	5/27/03	7/5/03

BFE = Before Flood Event

AFE = After Flood Event

- = Cannot determine rows from plants/seed that germinated

Study: 29I141G

Study Title: Assembly and Evaluation of Little Bluestem, *Schizachyrium scoparium*, Nichx.

Study Leader: Bruckerhoff, S. B.

Introduction:

Little bluestem is a native warm season prairie grass. It was a major component making up as much as 50 percent of the tall grass prairie that was native to much of the Elsberry PMC service area. It can also be a major component of glade areas and mixed grass prairies. Little bluestem can be found in prairies, open woods, dry hills, and fields, from Quebec and Maine to Alberta and Idaho, south to Florida and Arizona.

Problem:

There are no current varieties of little bluestem on the market that have an origin within the three-state service area. Available varieties do not always perform as well as expected. There is a need for an adapted and improved variety of little bluestem for pasture and range seedings, surface mine reclamation, critical area planting, wildlife plantings, recreational area development and other conservation uses in Missouri, Iowa, and Illinois.

Objective:

The objective is to assemble, evaluate, develop and cooperatively release an adapted variety and/or varieties of tested class of little bluestem for conservation use in Missouri, Iowa, and Illinois.

Procedure:

Vegetative material from native ecotypes was collected throughout the states of Missouri, Iowa, and Illinois. A minimum of three collections per Major Land Resource Area/state was requested. (Approximately 60 collections total.) Field selection of collected plant material was based on forage quantity and plant vigor.

Each collection (accession) was one individual plant. A collection was made up of more than one plant if they were in the same immediate area (within five feet) and appeared to be clones of each other.

Discussion:**1996**

The study was approved in July 1996. Collection instructions were sent out and plants were dug in October and November. The samples were picked up shortly after collection and stored in the packing shed at the Plant Materials Center. At this time we received 113 collections from the three-state area. There are a few additional collections expected.

1997 - 1998

The collections were vegetatively propagated in containers in January and grown out in the greenhouse until April. These plants were then transplanted in Field #1 on the PMC April 22-24, 1997 in a randomized complete block with four replications (see Table #2 for map of plot layout). Thirteen additional collections were made in the summer of 1997 and planted into the replications August 14-15, 1997. This brought the total accessions represented to 130: 79 from Missouri, 20 from Illinois, 27 from Iowa, and four standards of comparison. A list of collectors

can be seen in Table #1. First year evaluation consisted of survival. The second year evaluations consisted of survival, height, late dormancy, and form.

1999

The assembly was evaluated in 1999 for forage amount and vigor (Tables #3 and #4). The higher rated plants will have forage quality samples taken in 2000.

2000

The assembly was evaluated for mid season forage production, quality and vigor on June 27, 2000. The entire planting was then clipped to a height of six inches on June 28, 2000. The assembly was evaluated for amount of regrowth and vigor on July 25, 2000 and forage quality samples were taken on August 1, 2000. The assembly was clipped the second time on August 2, 2000 and evaluations for regrowth amount and vigor were taken October 24, 2000.

2001

Evaluations from previous years were correlated and the best plants from the top 10-20 percent of the total accessions were propagated in the greenhouse from clonal material from each individual plant. Plants were then isolated in two locations. A northern region was established containing plants from Iowa, northern Missouri, and northern Illinois. A southern region was established containing plants from southern Missouri and central and southern Illinois. These isolation blocks will receive additional evaluation to remove unwanted plants and the remaining plants will be allowed to produce seed. Plants from this seed will be selected for the next evaluation nursery. After further evaluation, plants from the nursery planted in 2003 will be used as a breeder's block for improved selections. Plants selected for each region can be found in Table #5.

2002

The south region crossing block did very well in 2002. Very few plants were rouged out and seed was harvested from each accession in the block. This seed will be used to establish the next evaluation nursery scheduled for 2003.

The north region crossing block did not do well in 2002. Weed control became a problem and many of the plants were reestablished and did not make seed. Filling in additional plants is scheduled for 2002 and also seed production from this crossing block.

2003

Seed from the south region crossing block was evaluated for quick establishment and plants were grown in the greenhouse for establishment of the recurrent selection evaluation nursery. Approximately 500 plants were transplanted on three foot centers in this evaluation block.

The plants will be allowed to develop and be evaluated for forage. Plants in the north region crossing block were not all equally matured and no seed was harvested from this block.

2004

The plants in the southern region evaluation block were given 2004 to develop and mature. Evaluation of this block will begin in 2005.

Seed was harvested from the northern region crossing block, cleaned, and planted in the greenhouse. These plants were evaluated for quick establishment and seedling vigor. Selected plants will be transplanted into an evaluation nursery.

2005

The plants in the southern region nursery were evaluated based on vigor, amount of forage production, leafiness, drought resistance, disease and insect resistance, and late maturity. Of

312 plants 195 plants were selected (62.5%) and allowed to cross pollinate. Seed was collected from the selected plants to establish a foundation field next year. This south region selection was given the accession number 9083271.

Greenhouse plants selected for seedling vigor from seed harvested from the northern crossing block were transplanted into an evaluation nursery.

2006

A .75 acre foundation field (G1) of southern region selection (accession 9083271) was planted in field #12 on the PMC. Establishment was good but no seed was harvested the first year. Some plants did produce seed but there was not enough to justify a harvest.

The northern region crossing block was evaluated for survival and missing plants were reestablished with greenhouse plants selected for seedling vigor. This evaluation nursery had no further evaluation or selection.

Study 29I141G - Assembly and Evaluation of Little Bluestem, <i>Schizachyrium scoparium</i>, Nichx.					
Little Bluestem					Table #1
REFERENCE					
ACCESSION	NUMBER	COLLECTOR	MLRA	COUNTY	STATE
9078894	MO-1	Robert S. Crowder	M115	Chariton	Missouri
9078951	MO-2	Robert J. Crowder/ George L. Pollard	109	Chariton	Missouri
9078895	MO-3	Joe Tousignant	N116B	Cape Girardeau	Missouri
9078896	MO-4	Douglas Rainey	M115	Clark	Missouri
9078897	MO-5	David S. Mackey	113	Knox	Missouri
9078898	MO-6	Larry R. Brewer	M109	Putnam	Missouri
9078899	MO-7	Tommy Robins/ Jim Hoefler	116	Ripley	Missouri
9078900	MO-8	Grant P. Butler	N116B	Jefferson	Missouri
9078901	MO-9			Iron	Missouri
9078902	MO-10	Tommy Robins/ Jim Hoefler	116	Carter	Missouri
9078903	MO-11	Arch J. Mueller	M115	Ste. Genevieve	Missouri
9078904	MO-12			St. Francois	Missouri
9078905	MO-13	J. Mark Mitchell		Butler	Missouri
9078906	MO-14	Randy C. Miller	N116A	Shannon	Missouri
9078907	MO-15	Tom Johnson	N116B	Bollinger	Missouri
9078908	MO-16	Tom Johnson	N116A	Bollinger	Missouri
9078909	MO-17	Randy C. Miller	N116B	Reynolds	Missouri
9078910	MO-18			Franklin	Missouri
9078911	MO-19	Tom Johnson	N116A	Wayne	Missouri
9078912	MO-20	Mark E. Nussbaum	N116B	Cape Girardeau	Missouri
9078913	MO-21	Frank Oberle	115	Adair	Missouri
9078914	MO-22	David S. Mackey	113	Knox	Missouri
9078915	MO-23	Claude F. Peifer	116B	Perry	Missouri
9078916	MO-24	Grant P. Butler/ Bryan L. Westfall	N116A	Washington	Missouri
9078917	MO-25	John E. Turner	113/115	Monroe	Missouri
9078918	MO-26	David S. Mackey	113	Knox	Missouri
9078919	MO-27	Douglas Rainey	M115	Clark	Missouri
9078920	MO-28	Frank Oberle	115	Adair	Missouri
9078921	MO-29		M115	Montgomery	Missouri
9078922	MO-30	David S. Mackey	113	Knox	Missouri
9078923	MO-31	Curtis W. Walker	109	Clinton	Missouri
9078924	MO-32	James A. Mayberry	109	Carroll	Missouri
9078925	MO-33	Gary J. Barker	M109	Gentry	Missouri
9078926	MO-34			Vernon	Missouri
9078927	MO-35	Louis Byford		Atchison	Missouri
9078928	MO-36	Todd E. Mason	M109	Worth	Missouri
9078929	MO-37	Louis Byford		Atchison	Missouri
9078930	MO-38	Louis Byford		Atchison	Missouri
9078931	MO-39	Ronald L. Musick	M109	Harrison	Missouri

Study 29I141G - Little Bluestem				Table #1 - continued	
REFERENCE					
ACCESSION	NUMBER	COLLECTOR	MLRA	COUNTY	STATE
9078932	MO-40	Gary J. Barker	M109	Gentry	Missouri
9078933	MO-41	Curtis Walker	109	Gentry	Missouri
9078934	MO-42	Curtis Walker	107	Buchanan	Missouri
9078935	MO-43	Louis Byford		Atchison	Missouri
9078936	MO-44	Ronald L. Musick	M109	Harrison	Missouri
9078937	MO-45	Louis Byford		Atchison	Missouri
9078938	MO-46	Louis Byford		Atchison	Missouri
9078939	MO-47	Bob Sipec		Holt	Missouri
9078940	MO-48	Bib Sipec		Holt	Missouri
9078941	MO-49	Bob Sipec		Holt	Missouri
9078942	MO-50	Ian S. Kurtz	116A	Taney	Missouri
9078943	MO-52	Dennis Shirk/ Ed Gillmore	115	Gasconade	Missouri
9078944	MO-53	Dennis Shirk/ Ed Gillmore	116	Osage	Missouri
9078945	MO-54	Raleigh Redman	112	Henry	Missouri
9078946	MO-55	Dennis Shirk/ Ed Gillmore	116	Maries	Missouri
9078947	MO-56	Jerry Cloyed	M112	Barton	Missouri
9078948	MO-57	Ian S. Kurtz	116A	Taney	Missouri
9078949	MO-58	Ben A. Reed	M112	Barton	Missouri
9078950	MO-59	Jerry Cloyed	M112	Barton	Missouri
9078952	MO-60	M. Denise Brown	N116A	Miller	Missouri
9078953	MO-61	M. Denise Brown	N116B	Miller	Missouri
9078954	MO-62	Howard L. Coambes	N116B	Cedar	Missouri
9078955	MO-63	Howard L. Coambes	N116B	Cedar	Missouri
9078956	MO-64	Douglas G. Newman		Shannon	Missouri
9078957	MO-65	Tom E. Toney		Wayne	Missouri
9078958	MO-66	Rod Doolen		Wayne	Missouri
9078959	MO-67	Rod Doolen		Wayne	Missouri
9078960	MO-68	Kenneth L. Dalrymple		Pike	Missouri
9078963	MO-69	Maurice Davis/ Steve Clubine		Pettis	Missouri
	MO-70	Maurice Davis/ Steve Clubine		Benton	Missouri
	MO-71	Maurice Davis/ Steve Clubine		St. Clair	Missouri
	MO-72	Maurice Davis/ Steve Clubine		Benton	Missouri
9078964	MO-73	Maurice Davis/ Steve Clubine		Pettis	Missouri
9078965	MO-74	Maurice Davis/ Steve Clubine		Pettis	Missouri

Study 29I141G - Little Bluestem				Table #1 - continued	
REFERENCE					
ACCESSION	NUMBER	COLLECTOR	MLRA	COUNTY	STATE
	MO-75	Maurice Davis/ Steve Clubine		Pettis	Missouri
	MO-76	Maurice Davis/ Steve Clubine		Benton	Missouri
9078966	MO-77	Maurice Davis/ Steve Clubine		Maries	Missouri
9078967	MO-78	Dennis Shirk		Maries	Missouri
9078968	MO-79	Steve Clubine		Maries	Missouri
9078969	MO-80	Maurice Davis		Maries	Missouri
9078970	MO-81			Lawrence	Missouri
9078961	IA-27	Robert R. Bryant/ Shawn Dettman	108	Scott	Iowa
9078847	IA-1	Curt Donohue	109	Clarke	Iowa
9078848	IA-2	Curt Donohue	109	Clarke	Iowa
9078849	IA-3	Janet M. Thomas/ John P. Vogel	107	Cherokee	Iowa
9078850	IA-4	John P. Vogel	107	Woodbury	Iowa
9078851	IA-5	Henry D. Tordoff	107	West Pottawattamie	Iowa Iowa
9078852	IA-6	Henry D. Tordoff/ Galen Barrett	107	West Pottawattamie	Iowa Iowa
9078853	IA-7	John P. Vogel	107	Woodbury	Iowa
9078854	IA-8	Henry D. Tordoff	107	West Pottawattamie	Iowa Iowa
9078855	IA-9	John P. Vogel	107	Plymouth	Iowa
9078856	IA-10	Henry D. Tordoff	107	West Pottawattamie	Iowa Iowa
9078857	IA-11	Julie K. Watkins/ Charlie E. Kiepe	108	Franklin	Iowa
9078858	IA-12	Brad Harrison	103	Dallas	Iowa
9078859	IA-13	Shawn A. Dettman	108	Muscatine	Iowa
9078860	IA-14	Jim Ranum	105	Allamakee	Iowa
9078861	IA-15	Rick Cordes	104	Howard	Iowa
9078862	IA-16	James Ranum	105	Allamakee	Iowa
9078863	IA-17	Jay E. Ford	107	Crawford	Iowa
9078864	IA-18	Steve Maternack	103	Polk	Iowa
9078865	IA-19	Jay E. Ford	107	Crawford	Iowa
9078866	IA-20	Jay E. Ford	107	Crawford	Iowa
9078867	IA-21	Al Ehley	104	Cerro Gordo	Iowa
9078868	IA-22	Al Ehley	104	Cerro Gordo	Iowa
9078869	IA-23	John P. Vogel	102	Lyon	Iowa
9078870	IA-24	Jay E. Ford	107	Crawford	Iowa

Study 29I141G - Little Bluestem				Table #1 - continued	
REFERENCE					
ACCESSION	NUMBER	COLLECTOR	MLRA	COUNTY	STATE
9078871	IA-25	Jay E. Ford	107	Crawford	Iowa
9078872	IA-26	John Vogel	102	Lyon	Iowa
9078962	IA-28		105		Minnesota
9078873	IL-1	Barbara Sheffer	95B	Kane	Illinois
9078874	IL-2	David J. Harrison/ Mark Kaiser	105	Whiteside	Illinois
9078875	IL-3	Barbara Sheffer	95B	Kane	Illinois
9078876	IL-4	Timothy Dring	115	Pike	Illinois
9078877	IL-5	Jim Ritterbusch		Stephenson	Illinois
9078878	IL-6	Jim Ritterbusch		Stephenson	Illinois
9078879	IL-7	Dennis D. Clancy	113	Jasper	Illinois
9078880	IL-8	Bob Jankowski/ Steve Hollister	110	Will	Illinois
9078881	IL-9	Barbara Sheffer	95B	Kane	Illinois
9078882	IL-10	Timothy P. Dring	108	Henderson	Illinois
9078883	IL-11	John D. Lundquist	105	Carroll	Illinois
9078884	IL-12	Bill Kleiman		Lee	Illinois
9078885	IL-13	Laura S. Dufford	105	Jo Daviess	Illinois
9078886	IL-14	David J. Harrison/ Mark Kaiser	108	Whiteside	Illinois
9078887	IL-15	Timothy P. Dring	108	Mason	Illinois
9078888	IL-16	W. Burke Davies	113	Marion	Illinois
9078889	IL-17	Michael Stanfill/ Marty Kemper	115	Monroe	Illinois
9078890	IL-18	Kenton L. Macy	114	Cumberland	Illinois
9078891	IL-19	Martha E. Sheppard	115	Calhoun	Illinois
9078892	IL-20	Michael Stanfill/ Marty Kemper	113	Washington	Illinois
9078893	IL-21	Remington T. Irwin	114	Wayne	Illinois

Study 29141G																									Table #2				
Little Bluestem																													
															Plot Layout Map														
															Randomized Complete Block														
															Four Replications														
																									Field #1				
																									North ↑				
PLT #	1	2 3 4	5 - 28	29 30 31	32 33 34	35 - 58	59 60 61	62 63 64	65 - 76	77	78	79 - 90	91 92 93	94 95 96	97 - 120	121 122 123	124												
TIER #																													
I																													
II																													
III																													
IV																													
V																													
VI	REP 1					REP 2					REP 3					REP 3					REP 4								
VII																													
VIII																													
IX																													
X																													
XI																													
XII																													
XIII																													
XIV																													
XV																													
																									ROADWAY				
																									Highway JJ				

Study 29I141G			Forage Rating: 8/9/99										Table #3			
Little Bluestem																
			1 = High					9 = Low								
Local Number	Rep 1			Rep 2			Rep 3			Rep 4			Percent Survival	Ave. Living Plants	Best Plant	Location/s
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12				
MO-7	2	3	1	3	3	2	2	1	2	5	1	3	100	2.33	1	P 1, 8, 11
MO-12	1	2	1	3	2	2	3	2	2	1	1	1	100	1.75	1	P 1, 3, 12, 11, 12
MO-21	1	2	2	6	2	3	4	3	3	4	4	5	100	3.25	1	P 1
MO-74	3	3	5	4	4	4	5	5	4	1	2	1	100	3.42	1	P 10, 12
MO-80	3	3	x	4	5	5	4	4	2	1	4	3	92	3.45	1	P 10
MO-4	x	5	5	4	8	2	3	4	4	6	x	x	83	4.10	2	P 6
MO-9	4	4	4	3	4	4	3	4	3	2	3	3	100	3.42	2	P 10
MO-14	4	4	3	4	4	4	5	2	2	4	4	3	100	3.58	2	P 8, 9
MO-15	3	2	3	5	4	3	6	4	5	4	3	5	100	3.92	2	P 2
MO-22	4	5	5	3	4	2	5	5	6	x	8	x	83	4.70	2	P 6
MO-23	3	5	6	2	6	8	5	4	5	8	8	3	100	5.73	2	P 4
MO-24	3	x	2	x	4	4	3	4	3	3	4	5	83	3.18	2	P 3
MO-32	4	x	8	6	7	3	3	4	5	2	5	6	92	4.82	2	P 10
MO-34	4	4	4	3	4	3	x	x	4	2	x	5	75	3.00	2	P 10
MO-37	2	4	3	7	5	4	x	5	4	3	4	3	92	3.67	2	P 1
MO-42	5	5	6	4	5	2	4	4	4	5	5	7	100	4.67	2	P 6
MO-50	3	3	4	2	2	2	3	4	6	2	3	4	100	3.17	2	P 4, 5, 6, 10
MO-51	3	3	3	3	4	4	4	6	3	4	3	2	100	3.50	2	P 12
MO-53	4	4	5	5	5	5	2	4	5	5	6	7	100	4.75	2	P 7
MO-56	3	3	2	2	5	4	5	3	3	3	3	3	100	3.25	2	P 3, 4
MO-58	3	3	3	5	4	5	5	5	5	2	2	4	100	3.83	2	P 10, 11
MO-59	2	3	4	4	4	5	3	3	3	3	4	4	100	3.50	2	P 1
MO-66	3	3	x	3	3	3	3	2	4	4	5	5	92	3.45	2	P 8
MO-73	7	4	4	3	3	2	4	5	5	7	8	6	100	4.83	2	P 6
MO-79	2	3	2	5	3	5	3	8	5	4	4	3	100	3.92	2	P 1, 3
MO-2	4	5	3	5	5	5	5	3	3	3	4	3	100	4.00	3	P 3, 8, 9, 10, 12
MO-5	7	3	3	5	5	5	6	8	4	4	5	4	100	4.92	3	P 2, 3
MO-8	6	x	5	5	4	5	7	4	8	3	3	4	92	4.91	3	P 10, 11
MO-10	4	5	5	3	3	5	5	5	5	7	5	4	100	4.67	3	P 4, 12
MO-11	x	7	x	4	5	6	6	6	5	3	3	6	83	4.25	3	P 10, 11
MO-13	5	8	5	5	x	5	4	4	3	6	4	6	100	4.58	3	P 9
MO-16	4	3	8	6	6	5	5	6	4	4	5	100	75	3.00	3	P 2
MO-17	4	4	3	4	3	7	8	6	5	4	5	5	100	4.83	3	P 3, 5
MO-18	3	4	3	7	7	8	x	x	x	5	5	5	75	3.92	3	P 1, 3
MO-19	3	5	5	3	4	3	4	6	5	3	5	4	100	4.17	3	P 1, 4, 6, 10
MO-20	8	7	6	7	6	5	3	4	5	4	8	3	100	6.60	3	P 7, 12
MO-25	3	3	x	5	5	5	5	4	6	5	5	6	92	4.33	3	P 1, 2
MO-26	3	4	4	5	x	4	3	4	4	3	4	5	92	4.30	3	P 1, 7, 10
MO-27	5	6	3	4	5	4	6	5	4	5	5	7	100	5.36	3	P 3
MO-29	4	3	x	4	5	4	4	6	3	3	5	8	92	4.45	3	P 2, 9, 10
MO-30	3	4	5	7	7	x	4	4	7	4	3	4	92	4.73	3	P 1, 11
MO-31	7	3	4	4	4	6	7	8	x	5	5	5	92	5.27	3	P 2

Study 29I141G			Forage Rating: 8/9/99										Table #3 - continued			
Little Bluestem																
			1 = High					9 = Low								
Local Number	Rep 1			Rep 2			Rep 3			Rep 4			Percent Survival	Ave. Living Plants	Best Plant	Location/s
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12				
MO-33	3	x	3	5	5	3	4	5	5	8	8	4	92	5.89	3	P 1, 3, 6
MO-35	4	7	8	5	6	7	5	3	6	5	4	x	92	5.45	3	P 8
MO-38	6	6	5	3	3	4	4	6	7	3	3	4	100	5.40	3	P 4, 5, 10, 11
MO-41	5	6	5	4	4	7	6	x	4	3	x	5	83	4.90	3	P 10
MO-43	4	4	x	5	5	5	5	6	5	4	3	4	92	4.55	3	P 11
MO-46	4	x	4	4	3	3	3	5	5	4	4	4	92	3.91	3	P 5, 6, 7
MO-47	5	6	6	6	5	4	3	4	5	5	8	4	100	5.08	3	P 7
MO-48	3	7	8	5	5	6	4	4	6	4	5	5	100	5.17	3	P 1
MO-52	3	3	3	4	3	3	4	5	4	4	3	4	100	3.58	3	P 1, 2, 3, 5, 6, 11
MO-54	x	x	x	5	5	5	4	5	5	6	4	3	75	4.67	3	P 12
MO-57	4	4	x	3	5	x	4	4	x	5	4	3	92	3.27	3	P 4, 12
MO-60	7	4	6	4	6	3	6	4	6	5	5	4	100	5.00	3	P 6
MO-61	5	8	6	x	4	5	x	8	8	3	7	5	83	5.90	3	P 10
MO-65	4	5	6	7	x	x	4	5	3	4	6	6	83	5.00	3	P 9
MO-67	3	3	3	3	3	3	6	5	x	3	3	3	92	3.45	3	P 1, 2, 3, 4, 5, 6, 10, 11, 12
MO-69	4	5	4	3	3	5	4	5	4	7	4	5	100	4.42	3	P 3, 4
MO-71	x	5	5	4	3	5	4	4	5	4	5	3	92	4.27	3	P 5, 12
MO-77	6	x	6	4	6	4	3	4	5	6	6	5	92	5.00	3	P 7
MO-78	5	6	5	5	3	5	3	5	6	4	3	3	100	4.42	3	P 5, 7, 11, 12
MO-1	4	5	4	4	4	6	4	7	5	4	5	5	100	4.75	4	
MO-3	4	7	4	5	4	4	4	4	4	5	4	5	100	4.50	4	
MO-6	7	7	7	7	7	5	x	8	7	4	4	4	92	6.09	4	
MO-28	6	5	6	6	7	5	4	7	7	4	x	x	83	4.75	4	
MO-36	4	4	5	6	6	6	x	5	5	5	6	5	92	5.18	4	
MO-39	4	6	7	4	6	4	6	5	x	6	5	x	83	5.89	4	
MO-40	7	6	7	5	4	4	x	6	5	5	5	5	92	5.36	4	
MO-44	7	4	5	5	6	7	7	x	6	5	4	6	92	5.64	4	
MO-45	4	4	4	5	6	6	5	6	5	4	4	4	100	4.75	4	
MO-49	6	5	6	6	5	x	5	5	4	7	5	6	92	5.45	4	
MO-55	x	6	x	4	4	5	4	5	x	8	x	5	67	5.13	4	
MO-62	4	4	5	5	4	5	5	7	6	5	5	6	100	5.08	4	
MO-63	5	6	5	5	4	4	8	4	6	4	5	5	100	5.08	4	
MO-68	7	6	6	6	8	4	5	6	5	4	4	4	100	5.42	4	
MO-72	5	6	5	5	6	5	4	6	6	5	4	4	100	5.08	4	
MO-81	x	4	5	5	4	6	x	x	x	6	x	8	58	5.43	4	
MO-64	x	7	6	7	6	6	6	5	8	x	7	5	92	5.73	5	
MO-70																
MO-75																
MO-76																

Study 29I141G				Forage Rating: 8/9/99												Table #3 - continued			
Little Bluestem																			
				1 = High						9 = Low									
Local Number	Rep 1			Rep 2			Rep 3			Rep 4			Percent Survival	Ave. Living Plants	Best Plant	Location/s			
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12							
IA-16	x	x	4	3	6	5	3	x	1	x	5	5	75	3.56	1	P 9			
IA-27	1	1	3	3	4	5	5	5	4	5	4	2	100	3.50	1	P 1, 2			
IA-6	4	5	6	5	2	4	3	4	3	7	4	5	100	4.33	2	P 5, 6			
IA-8	5	6	3	5	3	5	5	5	5	5	3	2	100	4.33	2	P 12			
IA-12	7	5	7	x	4	5	4	3	2	4	5	5	92	4.64	2	P 9			
IA-15	5	4	5	x	x	x	2	x	5	5	5	6	67	4.63	2	P 7			
IA-23	6	5	5	8	8	6	5	4	x	2	4	6	92	5.36	2	P 10			
IA-1	8	5	5	5	4	4	4	5	x	3	7	3	92	4.82	3	P 10, 12			
IA-2	4	4	4	3	4	4	6	5	5	4	x	6	92	4.45	3	P 4			
IA-3	x	x	8	x	3	3	4	5	4	4	5	4	75	4.44	3	P 5, 6			
IA-4	5	8	4	3	x	3	4	7	5	4	7	5	92	5.00	3	P 4, 6			
IA-5	4	5	4	3	6	8	6	4	4	3	5	x	92	4.73	3	P 4, 10			
IA-7	5	3	3	5	5	5	4	4	6	5	5	5	100	4.58	3	P 2, 3			
IA-9	4	6	7	6	6	6	8	6	6	4	3	4	100	5.50	3	P 11			
IA-11	6	5	6	5	7	3	5	5	6	4	x	5	92	5.18	3	P 6			
IA-13	4	4	6	4	7	x	5	4	x	3	4	3	83	4.40	3	P 10, 12			
IA-17	3	7	4	5	x	4	6	x	6	4	6	5	83	5.00	3	P 1			
IA-19	6	x	x	6	3	3	x	4	4	x	x	x	50	4.33	3	P 5, 6			
IA-20	x	4	x	7	5	5	4	x	4	6	7	3	75	5.00	3	P 12			
IA-24	4	5	3	5	4	4	4	4	5	5	5	4	100	4.33	3	P 3			
IA-25	4	5	6	6	5	6	6	4	5	3	5	3	100	4.83	3	P 10, 12			
IA-26	x	3	4	3	3	6	x	x	4	5	6	x	67	4.25	3	P 2, 4, 5			
IA-10	6	7	7	4	5	5	5	6	7	6	4	x	92	5.64	4				
IA-14	4	6	4	5	5	6	4	5	5	5	7	5	100	5.08	4				
IA-18	5	6	5	6	5	6	5	4	5	4	5	5	100	5.08	4				
IA-21	4	5	4	4	x	6	x	x	6	-	4	5	67	4.75	4				
IA-22	x	x	x	7	x	x	7	6	6	5	8	8	58	6.71	5				
IL-12	8	7	5	3	8	4	5	5	4	4	2	x	92	5.00	2	P 11			
IL-17	3	4	3	2	3	5	3	4	2	2	3	3	100	3.08	2	P 4, 9, 10			
IL-18	5	4	6	3	3	3	5	6	4	3	2	4	100	4.00	2	P 11			
IL-2	6	6	6	4	5	6	5	3	5	4	5	3	100		3	P 8			
IL-5	6	5	7	4	8	3	4	5	5	5	4	5	100	5.08	3	P 6			
IL-7	4	4	3	4	7	6	8	6	8	6	8	8	100	6.00	3	P 3			
IL-8	x	x	5	4	x	8	x	6	4	x	4	3	58	4.86	3	P 12			
IL-11	x	x	3	x	4	x	5	x	6	x	x	x	33	4.50	3	P 3			
IL-14	4	5	x	3	5	x	6	4	7	6	5	6	83	5.10	3	P 4			
IL-16	5	5	4	4	3	3	4	x	3	7	6	4	92	4.36	3	P 5, 6, 9			
IL-19	5	6	7	3	3	3	4	3	4	3	4	3	100	4.00	3	P 4, 5, 6, 8, 12			

Study 29I141G			Forage Rating: 8/9/99										Table #3 - continued			
Little Bluestem																
			1 = High					9 = Low								
Local Number	Rep 1			Rep 2			Rep 3			Rep 4			Percent Survival	Ave. Living Best		Location/s
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12		Plants	Plant	
IL-20	5	3	3	x	6	5	4	4	4	3	5	3	92	4.09	3	P 2, 3, 10, 12
IL-21	5	5	4	3	4	4	5	4	4	5	4	4	100	4.25	3	P 4
IL-1	4	x	4	6	7	6	4	7	7	5	6	5	92	5.55	4	
IL-6	7	7	4	6	5	7	x	x	x	6	5	5	75	5.78	4	
IL-9	6	x	6	x	5	7	6	5	4	4	4	7	83	5.40	4	
IL-10	x	x	x	4	6	7	x	x	7	x	5	7	50	6.00	4	
IL-13	x	7	x	5	7	4	6	6	7	x	8	6	83	5.60	4	
IL-15	8	8	x	x	7	6	4	5	5	5	4	5	83	5.70	4	
IL-3	5	4	x	7	x	x	8	7	6	5	x	x	58	6.00	5	
IL-4	6	7	4	4	6	5	6	5	5	5	5	5	100	5.25	5	
IL-22																
Aldous	2	3	3	3	3	3	5	4	5	3	2	2	100	3.17	2	P 1, 11, 12
Cimieron	2	3	2	4	2	3	3	2	5	3	5	3	100	3.08	2	P 1, 3, 5, 8
Camper	3	4	5	4	5	6	5	4	5	x	3	5	92	4.45	3	P 1, 11, 12
Pastura	x	x	5	6	x	6	6	6	x	3	3	x	58	5.00	3	P 10, 11

Study 29I141G			Vigor Rating: 8/9/99											Table #4		
Little Bluestem			1 = High			9 = Low										
Local Number	Rep 1			Rep 2			Rep 3			Rep 4			Percent Survival	Living Plants Ave.	Best Plant Location/s	
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12				
MO-4	x	3	4	4	6	2	4	5	5	3	x	x	75	4.00	2	P 6
MO-7	2	3	2	3	3	3	5	2	2	5	2	2	100	2.83	2	P 1, 3, 8, 9, 11, 12
MO-12	3	3	3	4	2	2	4	4	3	3	3	3	100	3.08	2	P 5, 6
MO-16	3	2	6	6	4	3	4	5	6	4	5	3	100	4.25	2	P 2
MO-24	5	x	5	x	5	3	5	5	5	2	4	6	83	4.50	2	P 10
MO-25	2	3	x	5	4	3	5	4	4	5	6	6	92	4.27	2	P 1
MO-32	3	x	6	5	5	3	4	6	4	2	4	6	92	4.36	2	P 10
MO-35	2	6	7	2	4	5	6	6	3	5	4	x	92	4.55	2	P 1, 4
MO-42	5	4	5	3	4	2	4	4	6	4	5	6	100	4.33	2	P 6
MO-47	4	5	6	4	5	4	2	2	3	4	6	3	100	4.00	2	P 7, 8
MO-56	3	4	3	3	3	2	4	4	4	4	3	3	100	3.33	2	P 6
MO-61	5	5	4	x	3	4	x	7	7	2	5	4	83	4.60	2	P 10
MO-67	3	3	3	2	3	3	5	4	x	4	5	5	92	3.64	2	P 4
MO-69	4	5	6	3	3	4	2	3	5	8	4	5	100	4.33	2	P 7
MO-79	2	3	3	3	3	4	5	6	4	5	4	3	100	3.75	2	P 1
MO-1	3	4	3	4	3	5	5	5	5	3	5	4	100	4.08	3	P 1, 3, 5, 10
MO-3	3	4	4	5	4	3	4	5	5	4	3	4	100	4.00	3	P 1, 6, 11
MO-5	5	3	3	5	4	6	5	7	4	5	6	4	100	4.75	3	P 2, 3
MO-6	3	7	6	6	5	5	x	5	5	5	5	3	92	5.00	3	P 1, 12
MO-8	5	x	4	6	3	3	6	6	5	6	5	7	92	5.09	3	P 5, 6
MO-9	5	5	6	3	3	3	4	4	4	5	5	5	100	4.33	3	P 3, 4, 5
MO-11	x	5	x	5	6	6	7	5	3	5	4	6	83	5.20	3	P 9
MO-13	5	7	6	6	x	5	5	6	3	6	5	7	92	5.55	3	P 9
MO-14	4	4	3	5	5	5	4	6	6	4	5	4	100	4.58	3	P 3
MO-15	3	3	3	4	3	3	5	4	4	4	4	4	100	3.67	3	P 1, 2, 3, 5, 6
MO-17	5	5	5	4	4	7	7	5	4	3	4	5	100	4.83	3	P 10
MO-19	3	3	3	4	4	4	4	5	5	4	4	4	100	3.92	3	P 1, 2, 3, 5, 6
MO-21	3	3	3	6	4	4	5	4	4	6	6	6	100	4.50	3	P 1, 2, 3
MO-22	4	3	3	3	3	3	5	5	4	x	7	x	83	4.00	3	P 2, 3, 4, 5, 6
MO-23	5	5	3	4	5	7	5	5	6	5	7	5	100	5.17	3	P 3
MO-26	4	4	4	3	x	3	6	5	5	4	5	5	92	4.36	3	P 4, 6
MO-27	3	5	3	3	4	3	6	6	5	3	4	6	100	4.25	3	P 1, 3, 4, 6, 10
MO-29	4	3	x	6	5	5	5	5	3	5	5	6	92	4.73	3	P 2, 9
MO-31	6	3	3	3	3	4	5	5	x	6	4	5	92	4.27	3	P 2, 3, 4, 5
MO-33	4	x	6	4	4	3	4	4	4	6	6	5	92	4.55	3	P 6
MO-34	4	3	3	3	3	4	x	x	4	4	x	3	75	3.44	3	P 2, 3, 4, 5, 12
MO-36	4	3	3	6	5	5	x	4	5	3	5	5	92	4.36	3	P 2, 3, 10
MO-37	3	3	3	4	3	4	x	5	5	4	4	4	92	3.82	3	P 1, 2, 3, 5
MO-38	4	4	3	5	4	4	3	5	5	3	3	4	100	3.92	3	P 7, 10, 11
MO-39	5	6	7	4	3	3	5	3	x	5	7	x	83	4.80	3	P 5, 6, 8
MO-40	3	8	8	4	5	3	x	5	4	8	8	7	100	5.25	3	P 1, 6, 11

Study 29I141G			Vigor Rating: 8/9/99											Table #4 - continued			
Little Bluestem			1 = High			9 = Low											
Local Number	Rep 1			Rep 2			Rep 3			Rep 4			Percent Survival	Living Plants	Best Plant	Location/s	
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12					
MO-43	6	3	4	4	4	4	5	6	5	4	5	3	100	4.42	3	P 2, 12	
MO-45	4	4	3	3	4	3	4	5	3	3	4	4	100	3.67	3	P 3, 4, 6, 9, 10	
MO-46	3	x	3	3	3	4	5	5	3	5	3	4	92	3.73	3	P 1, 3, 4, 5, 9, 11	
MO-48	4	5	5	3	4	4	5	3	5	4	6	6	100	4.50	3	P 4, 8	
MO-51	4	5	4	3	3	3	4	5	4	4	4	4	100	3.92	3	P 3, 4, 5	
MO-52	5	4	5	5	3	4	5	6	5	5	4	5	100	4.67	3	P 5	
MO-53	5	5	6	4	5	6	3	4	4	5	5	6	100	4.83	3	P 7	
MO-54	x	x	x	5	7	3	6	7	7	6	3	4	75	5.33	3	P 11	
MO-60	4	4	4	3	4	3	5	3	5	5	6	6	100	4.33	3	P 4, 6, 8	
MO-62	4	4	4	3	4	5	4	4	4	5	6	7	100	4.50	3	P 4	
MO-63	4	4	4	3	3	3	5	5	4	4	6	4	100	4.08	3	P 4, 5, 6	
MO-65	3	4	4	6	x	x	5	6	5	5	7	6	83	5.10	3	P 1	
MO-66	5	5	x	4	3	3	6	6	5	6	7	7	92	5.18	3	P 5, 6	
MO-71	x	3	5	5	3	4	5	4	5	3	4	4	92	4.09	3	P 2, 5, 10	
MO-72	3	3	3	3	5	4	3	4	5	5	4	3	100	3.75	3	P 1, 2, 3, 4, 7, 12	
MO-73	6	5	3	3	3	3	5	7	4	6	7	6	100	4.83	3	P 3, 4, 5, 6	
MO-77	6	x	6	5	3	5	3	4	5	6	6	6	92	5.00	3	P 5, 7	
MO-78	6	4	4	4	6	4	4	5	3	4	4	3	100	4.25	3	P 9, 12	
MO-80	4	3	x	3	3	3	6	6	5	3	6	6	92	4.36	3	P 2, 4, 5, 6, 10	
MO-81	x	3	5	5	4	4	x	x	x	6	x	5	58	4.57	3	P 2	
MO-2	4	5	5	4	5	6	4	4	5	4	4	4	100	4.50	4		
MO-18	4	6	4	4	5	7	x	x	x	6	4	6	75	5.11	4	P 1, 3, 4, 11	
MO-20	4	6	6	6	5	5	6	5	5	4	6	4	100	5.17	4		
MO-28	6	4	5	4	6	5	5	6	5	4	x	x	83	5.00	4		
MO-30	4	5	5	4	4	x	5	5	6	5	4	4	92	4.64	4		
MO-41	4	7	4	5	5	4	6	x	5	4	x	4	83	4.80	4		
MO-44	6	4	4	5	5	5	7	x	6	5	4	6	92	5.18	4		
MO-49	8	8	8	8	8	x	7	7	6	6	4	4	92	6.73	4		
MO-50	5	5	5	4	4	4	6	6	4	5	5	5	100	4.83	4		
MO-55	x	5	x	4	6	5	5	4	x	6	x	4	67	4.88	4		
MO-57	4	5	x	5	4	x	6	5	x	5	6	5	75	3.75	4		
MO-58	6	5	4	6	5	6	7	7	7	4	4	5	100	5.50	4		
MO-59	7	6	5	5	4	4	7	6	7	6	6	5	100	5.67	4		
MO-68	5	5	5	4	5	5	5	4	4	6	4	5	100	4.75	4		
MO-74	5	6	6	4	4	5	5	5	5	5	5	4	100	4.92	4		
MO-10	6	7	7	5	5	5	5	6	6	7	6	4	100	5.75	5		
MO-64	x	7	7	5	7	7	6	6	6	x	7	5	83	6.30	5		
MO-70																	
MO-75																	
MO-76																	

Study 29I141G			Vigor Rating: 8/9/99												Table #4 - continued		
Little Bluestem																	
			1 = High			9 = Low											
Local Number	Rep 1			Rep 2			Rep 3			Rep 4			Percent Survival	Living Plants	Best Plant	Location/s	
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12					
IA-3	x	x	5	x	3	2	6	6	7	7	5	5	75	5.11	2	P 6	
IA-4	4	5	3	4	x	3	4	6	4	2	5	5	92	4.09	2	P 10	
IA-5	6	6	6	4	5	6	6	5	6	2	5	x	92	5.18	2	P 10	
IA-9	4	4	4	4	4	5	6	5	5	3	2	5	100	4.25	2	P 11	
IA-10	3	4	5	3	4	4	5	5	5	6	2	x	92	4.18	2	P 11	
IA-13	2	3	4	3	5	x	5	4	x	4	5	3	92	3.45	2	P 1	
IA-15	5	4	4	x	x	x	2	x	6	4	4	5	67	4.25	2	P 7	
IA-27	2	2	2	2	3	3	5	6	5	4	3	3	100	3.33	2	P 1, 2, 3, 4	
IA-1	6	3	3	5	5	4	4	4	x	4	7	4	92	4.45	3	P 2, 3	
IA-2	3	3	3	4	5	5	6	5	5	5	x	6	92	4.55	3	P 1, 2, 3	
IA-6	6	4	4	4	3	3	5	4	4	7	3	5	100	4.33	3	P 5, 6, 11	
IA-7	3	3	4	3	3	3	3	4	6	4	4	4	100	3.67	3	P 1, 2, 4, 5, 6, 7	
IA-8	5	6	3	3	3	4	5	6	5	4	3	4	100	4.25	3	P 3, 4, 5, 11	
IA-12	4	5	6	x	5	4	3	5	4	3	3	3	92	4.09	3	P 7, 10, 11, 12	
IA-14	6	5	5	3	3	3	5	7	7	4	6	5	100	4.92	3	P 4, 5, 6	
IA-16	x	x	4	3	5	4	3	x	5	x	5	6	67	4.38	3	P 4, 7	
IA-17	4	6	5	4	x	4	5	x	4	3	5	3	83	4.30	3	P 10, 12	
IA-18	5	6	5	5	4	5	4	4	5	3	3	4	100	4.42	3	P 10, 11	
IA-23	4	4	4	5	6	6	5	5	x	3	3	4	100	4.08	3	P 10	
IA-25	5	5	5	5	4	4	4	5	5	4	4	3	100	4.42	3	P 12	
IA-26	x	6	4	3	4	5	x	x	4	4	6	x	67	4.50	3	P 4	
IA-11	7	6	7	4	5	4	6	6	7	5	x	5	92	5.64	4		
IA-19	6	x	x	5	4	4	x	4	4	x	x	x	50	4.50	4		
IA-20	x	4	x	7	5	5	5	x	6	5	6	5	75	5.33	4		
IA-21	4	4	5	4	x	5	x	x	4	x	5	4	67	4.38	4		
IA-22	x	x	x	5	x	x	5	4	4	6	8	8	58	5.71	4		
IA-24	5	5	4	6	6	6	7	7	7	6	5	5	100	5.75	5		
IL-8	x	x	6	4	x	5	x	2	3	x	5	3	58	4.00	2	P 8	
IL-12	6	6	2	3	5	3	4	4	3	3	2	x	92	3.73	2	P 3, 11	
IL-1	7	x	3	5	7	6	5	6	8	6	5	5	92	5.73	3	P 3	
IL-2	3	3	4	4	5	3	4	5	5	5	4	4	100	4.08	3	P 1, 2, 6	
IL-3	3	7	3	5	x	x	6	7	6	5	x	x	67	5.25	3	P 1, 3	
IL-5	5	5	6	5	3	4	5	6	5	5	4	5	100	4.83	3	P 5	
IL-6	7	5	4	8	3	5	x	x	x	5	4	7	75	5.33	3	P 5	
IL-9	5	x	3	x	4	5	5	3	3	5	4	6	92	3.91	3	P 3, 8, 9	
IL-10	4	4	5	5	4	3	x	x	8	x	6	6	100	3.75	3	P 6	
IL-11	x	x	3	x	4	x	3	x	5	x	x	x	33	3.75	3	P 3, 7	
IL-13	x	5	x	4	5	5	6	6	7	x	6	3	75	5.22	3	P 12	
IL-14	5	4	x	3	4	x	5	3	5	5	4	5	83	4.30	3	P 4, 8	
IL-15	5	7	x	x	5	4	6	6	5	4	4	3	83	4.90	3	P 12	

Study 29I141G				Vigor Rating: 8/9/99										Table #4 - continued		
Little Bluestem				1 = High			9 = Low									
Local Number	Rep 1			Rep 2			Rep 3			Rep 4			Percent Survival	Living Plants	Best Plant	Location/s
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12				
IL-16	3	3	4	4	4	5	5	x	6	7	5	4	92	4.55	3	P 1, 2, 6
IL-17	4	4	3	3	3	3	3	3	3	3	3	3	100	3.17	3	P 3, 4, 5, 6, 7, 8, 9, 10,,11, 12
IL-18	4	3	5	4	4	3	5	6	4	4	5	4	100	4.25	3	P 2, 6
IL-19	4	4	6	3	3	3	5	3	4	4	3	4	100	3.83	3	P 4, 5, 6, 8, 11
IL-20	4	5	4	x	3	4	4	3	4	4	6	3	92	4.00	3	P 5, 8, 12
IL-21	7	7	7	3	5	4	6	5	5	5	5	5	100	5.33	3	P 4
IL-4	6	5	5	4	4	4	5	5	5	6	6	5	100	5.00	4	
IL-7	4	4	5	4	5	6	6	5	6	6	7	6	100	5.33	4	
IL-22																
Cimieron	2	2	2	2	3	2	3	5	4	3	4	3	100	2.92	2	P 1, 2, 3, 4, 6
Aldous	4	3	4	3	3	3	5	5	4	3	3	3	100	3.58	3	P 2, 4, 5, 6, 10, 11, 12
Camper	3	3	3	4	5	5	5	5	6	x	5	5	92	4.45	3	P 1, 2, 3
Pastura	x	x	5	5	x	7	5	7	x	3	4	x	58	5.14	3	P 10

Study 29I141G - Assembly and Evaluation of Little Bluestem, <i>Schizachyrium scoparium</i> Michx.					
Selected accessions for each region					Table #5
Northern Region					
IA - All					
MO - North of Missouri River					
IL - Northern 2/3rds of the state					
REFERENCE					
ACCESSION	NUMBER	COLLECTOR	MLRA	COUNTY	STATE
9078896	MO-4	Douglas Rainey	115	Clark	Missouri
9078913	MO-21	Frank Oberle	115	Adair	Missouri
9078914	MO-22	David S. Mackey	113	Knox	Missouri
9078924	MO-32	James A. Mayberry	109	Carroll	Missouri
9078934	MO-42	Curtis Walker	107	Buchanan	Missouri
9078849	IA-3	Janet M. Thomas/ John P. Vogel	107	Cherokee	Iowa
9078854	IA-8	Henry D. Tordoff	107	West Pottawattamie	Iowa Iowa
9078861	IA-15	Rick Cordes	104	Howard	Iowa
9078862	IA-16	James Ranum	105	Allamakee	Iowa
9078884	IL-12	Bill Kleiman		Lee	Illinois
9078891	IL-19	Martha E. Sheppard	115	Calhoun	Illinois
Southern Region					
MO - South of Missouri River					
IL - Southern 1/3 of state					
REFERENCE					
ACCESSION	NUMBER	COLLECTOR	MLRA	COUNTY	STATE
9078895	MO-3	Joe Tousignant	N116B	Cape Girardeau	Missouri
9078899	MO-7	Tommy Robins/ Jim Hofer	116	Ripley	Missouri
9078915	MO-23	Claude F. Peifer	116B	Perry	Missouri
9078942	MO-51	Ian S. Kurtz	116A	Taney	Missouri
9078950	MO-59	Jerry Cloyed	M112	Barton	Missouri
9078952	MO-60	M. Denise Brown	N116A	Miller	Missouri
9078964	MO-73	Maurice Davis/ Steve Clubine		Pettis	Missouri
9078965	MO-74	Maurice Davis/ Steve Clubine		Pettis	Missouri
9078968	MO-79	Steve Clubine		Marries	Missouri
9078969	MO-80	Maurice Davis/			Missouri
9078893	IL-21	Remington T. Irwin	114	Wayne	Illinois

Study 291141G				Little Bluestem								Field #1				Table #2 - continued																		
PLT #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		Rep #1	
TIER #																																		
I	j	V	V	X	X	j	X	X	X	X	j	X	X	j	X	X	X	j	X	X	X	W	W	W	W	W	W	W	W	W	W	W	I	NORTH
II	V	MO-9	IA-11	MO-30	MO-45	MO-31	MO-78	MO-47	IL-8	IA-25	MO-63																							
III	V	MO-55	IL-21	MO-10	IL-13	MO-6	MO-60	MO-28	MO-36	MO-24	IL-15																							
IV	V	IA-12	MO-74	MO-51	MO-40	MO-27	MO-57	MO-58	MO-15	IA-17	MO-1																							
V	V	MO-42	IA-26	IL-3	MO-77	MO-67	ALDOUS	IA-15	MO-28	MO-50	IA-19																							
VI	V	IA-7	MO-52	MO-39	MO-35	IL-4	IA-5	MO-23	IA-16	MO-21	MO-33																							
VII	i	MO-14	IL-17	MO-13	IA-3	IA-23	MO-65	IA-18	MO-61	IA-24	MO-48																							
VIII	V	MO-56	MO-26	MO-69	IL-5	MO-46	IL-20	MO-80	MO-5	MO-7	IL-10																							
IX	i	MO-34	PASTURA	IL-11	MO-4	IL-16	MO-16	MO-37	MO-32	MO-59	IA-22																							
X	V	IL-2	MO-8	MO-29	MO-49	MO-81	IA-1	IL-7	IA-27	MO-25	CAMPER																							
XI	i	IA-10	MO-64	MO-20	MO-66	IA-4	MO-12	MO-22	IL-1	IA-2	MO-54																							
XII	V	MO-71	MO-17	IL-14	MO-73	MO-44	CIMMERON	MO-18	MO-53	MO-79	MO-72																							
XIII	V	IL-12	MO-41	IA-8	IL-19	IA-20	MO-62	IA-6	MO-68	MO-11	IA-21																							
XIV	T	MO-38	IA-13	MO-43	IA-9	IL-9	IL-6	MO-19	MO-3	IA-14	IL-18																							
XV	T	TT	j	j	TT	TT	TT	T	jj	TTY	YYY	YYY	YYY	YYY	YYY	YYY	YYY	YYY	YYY	YYY	YYY	YYY	YYY	YYY	YYY	YYY	YYY	YYY	YYY	YYY	YYY	YYY	YYY	XV
MO-57 ONLY ONE PLANT								3 PLANTS/PLOT (MO-9)																										
IL-8 ONLY ONE PLANT								LETTERS (V, j, ETC.,) ARE SINGLE PLANT BORDER ROWS																										

PLT #	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61		Rep #2	
TIER #																																	
I	?	?	?	W	W	W	W	W	W	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	R	R	R	R	R	R	R	I
II	MO-34	IL-18	IA-7	MO-31	MO-6	MO-53	MO-2	IA-18	MO-22	MO-48																							
III	MO-71	MO-24	MO-35	IA-14	IA-23	IA-2	MO-74	MO-28	CAMPER	MO-57																							
IV	MO-8	MO-42	MO-67	IL-1	MO-60	MO-33	MO-37	MO-26	IL-21	IL-7																							
V	IA-13	IA-3	MO-9	MO-39	IL-16	IA-8	MO-15	MO-69	MO-14	MO-25																							
VI	MO-50	CIMMERON	IL-4	MO-59	MO-52	MO-40	MO-51	IA-27	MO-81	IA-16																							
VII	IA-17	MO-63	MO-66	IL-20	MO-72	IL-19	MO-19	MO-23	IL-11	IL-10																							
VIII	MO-32	IA-6	MO-4	IA-11	IL-2	MO-54	IA-26	IL-8	MO-41	IA-4																							
IX	IA-10	MO-77	IL-5	MO-46	MO-56	MO-64	MO-1	MO-21	MO-65	MO-10																							
X	IL-14	MO-38	MO-49	MO-27	IL-12	MO-79	IA-19	MO-68	IA-1	ALDOUS																							
XI	MO-61	IA-9	MO-55	IL-15	IA-25	MO-17	MO-7	IA-5	IL-9	IL-3																							
XII	IA-24	MO-47	MO-78	MO-43	PASTURA	MO-20	MO-73	MO-12	IA-20	MO-13																							
XIII	MO-30	MO-18	MO-11	IL-6	MO-3	IL-13	IA-12	IA-22	MO-29	MO-44																							
XIV	MO-45	MO-62	MO-58	MO-5	IL-17	IA-21	MO-80	MO-16	MO-36	IA-15																							
XV	Y	Y	S	i	S	S	S	S	S	S	S	S	S	S	S	S	S	S	h	S	S	Y	h	Y	Y	Y	Y	Y	Y	Y	Y	Y	XV

Study 291141G			Little Bluestem											Table #2 - continued					Rep #3
PLT #	62 63 64	65 66 67	68 69 70	71 72 73	74 75 76	77	78	79 80 81	82 83 84	85 86 87	88 89 90	91 92 93	North ↑						
TIER #																			
I	R R R	R R R	R c c	c c c	c c c	c	a	a a a	a b b	j b b	j j j	R R R	I						
II	MO-45	IL-6	MO-71	IA-13	MO-31	B	a	IL-4	MO-63	MO-11	IL-8	IL-11	II						
III	MO-61	MO-19	MO-43	MO-50	MO-40	B	R a	IA-21	IL-13	IL-17	MO-68	MO-29	III						
IV	IA-9	MO-51	MO-58	IA-17	MO-55	E	o a	MO-47	MO-56	MO-2	MO-13	IL-11	IV						
V	MO-35	MO-1	MO-23	IA-24	MO-24	E	A a	IL-5	CAMPER	MO-69	IL-12	MO-25	V						
VI	MO-39	MO-28	MO-36	MO-42	MO-53	E	D a	MO-54	IA-26	IA-14	IA-5	IA-15	VI						
VII	MO-77	IA-19	CIMMERON	IA-18	MO-64	C	w a	MO-6	MO-33	MO-73	MO-16	IL-3	VII						
VIII	MO-9	MO-7	IA-23	IL-20	IA-4	C	A i	MO-32	IA-26	MO-52	MO-22	MO-44	VIII						
IX	IA-6	MO-80	IL-2	IA-10	MO-5	G	Y a	IA-7	MO-20	IL-16	MO-48	IA-16	IX						
X	MO-8	IA-12	MO-78	MO-30	IA-25	G	a	MO-79	MO-17	MO-59	MO-14	IL-7	X						
XI	MO-34	MO-12	MO-46	IA-8	MO-18	I	a	IA-11	IL-21	MO-72	IA-22	PASTURA	XI						
XII	IL-14	MO-26	MO-4	IL-19	MO-38	I	a	MO-74	MO-33	MO-21	MO-65	IL-9	XII						
XIII	IL-18	IA-27	MO-66	ALDOUS	MO-67	O	a	IA-3	MO-27	MO-81	MO-41	IA-20	XIII						
XIV	MO-60	MO-10	MO-37	MO-15	MO-62	O	a	MO-49	IL-15	MO-57	IA-1	IL-10	XIV						
XV	H H A	A K K	F F D	D L L	M M N	N	a	a c c	c c c	c c c	c c c	h c c	XV						
PLT #	94 95 96	97 98 99	100 101 102	103 104 105	106 107 108	109	110	111	112 113 114	115 116 117	118 119 120	121 122 123	124	Rep #4					
TIER #																			
I	R i R	a a a	X X X	X X U	i U U	U U U		U U U	W W W	W W W	W W W		d	I					
II	IA-9	IL-18	MO-8	MO-74	MO-40	IA-25		MO-5	MO-42	IA-4	IA-20		d	II					
III	MO-58	IA-19	MO-28	IL-17	MO-53	IL-8		PASTURA	MO-37	IL-10	MO-77		d	III					
IV	ALDOUS	MO-80	IA-21	MO-2	IA-8	MO-26		IA-26	MO-68	MO-14	MO-52		d	IV					
V	MO-51	IA-18	MO-20	MO-46	IL-1	MO-1		MO-62	MO-44	MO-9	MO-34		d	V					
VI	IA-17	IA-10	MO-33	IA-24	MO-43	IL-12		IA-5	MO-81	CIMMERON	MO-19		d	VI					
VII	MO-64	IA-10	CAMPER	MO-3	MO-69	MO-61		IA-16	IL-4	MO-35	MO-21		d	VII					
VIII	IA-27	MO-39	IL-19	MO-57	IL-6	MO-38		MO-67	MO-25	MO-48	IL-14		e	VIII					
IX	MO-60	MO-15	MO-63	IA-7	MO-36	IL-15		MO-49	IA-13	MO-29	MO-30		e	IX					
X	MO-12	MO-41	MO-32	MO-55	IA-12	MO-47		IA-26	IL-21	MO-65	IL-9		e	X					
XI	IL-20	IA-23	IA-11	MO-46	MO-17	IL-2		IL-13	MO-45	IL-11	IA-22		f	XI					
XII	MO-50	MO-6	MO-59	IA-14	MO-31	MO-54		MO-79	IA-3	MO-16	IL-7		f	XII					
XIII	MO-71	MO-78	MO-27	MO-73	MO-18	IA-15		MO-66	MO-72	MO-22	MO-10		f	XIII					
XIV	MO-7	MO-11	IL-16	MO-23	IA-1	IL-5		IA-6	MO-13	IL-3	MO-56		f	XIV					
XV	c R R	MO-24	R h R	R S h	h S S	S S T		h h h	T V V	V h g	g g g		g	XV					

Study No. 29I142G

Study Title: Production of Native Missouri Ecotypes of Grasses, Legumes and Forbs for Roadsides, Critical Areas, and All Other Vegetative Plantings Where Native Plants are Now Being Planted.

Study Leader: Cordsiemon, R.C.

Study Coordinator: Erickson, R., Missouri Department of Conservation

Introduction:

Well-adapted native grass, legume and forb plantings offer many advantages as a low cost sustainable vegetative cover for management of soil and water resources. Native plant communities resist noxious weed invasion, provide excellent erosion control, and generally require relatively low maintenance.

These characteristics make native plants an excellent selection for use in roadside plantings, wildlife habitat enhancement, long-term land retirement programs, public land and all other vegetative plantings where mono-cultures of grasses are presently being planted. This is especially true along public transportation corridors that constitute a major land resource and management problem in the state of Missouri. Based on 1987 National Resource Inventory (NRI) data, over one million acres of Missouri land are devoted to rural transportation. Other federal and state agencies also own a significant land base in Missouri.

Proper vegetation management along these corridors is an important element in controlling soil loss and unwanted weedy plant species. Many of these acres are now seeded to introduce cool-season grass and legume species which are often invaded by noxious weeds requiring extensive mowing or herbicide treatment programs. These management techniques are expensive and can also result in additional water quality problems where herbicides are used extensively.

Managing or reseeding these acres to promote native grasses and forbs offers a low cost environmentally sound approach to roadside vegetation management. Herbicide use, soil erosion, and most mowing can be reduced significantly where a vigorous native grass and forb mixture dominates a roadside right-of-way. In addition, these goals are consistent with on-going NRCS programs designed to improve ground and surface water quality, reduce soil loss and increase wildlife habitat.

Problem:

Many adapted forb, legume and grass species of native origin are either currently not commercially available or available only in very limited quantities, which makes them very expensive. Species that are available are often varietal releases that have undergone an evaluation and selection process or a plant-breeding program. Most varieties are designed for high forage production and are highly vigorous plants. They are generally excellent for pasture and hay production but can be too domineering for diversified mixtures. Their origins are often not from within the state in which they are being planted. There is a need for additional native species for use on public lands and other types of conservation plantings with origins close to where they are being planted.

Objective:

The objective of this study is to accelerate the availability of selected native grass, legume and forb species.

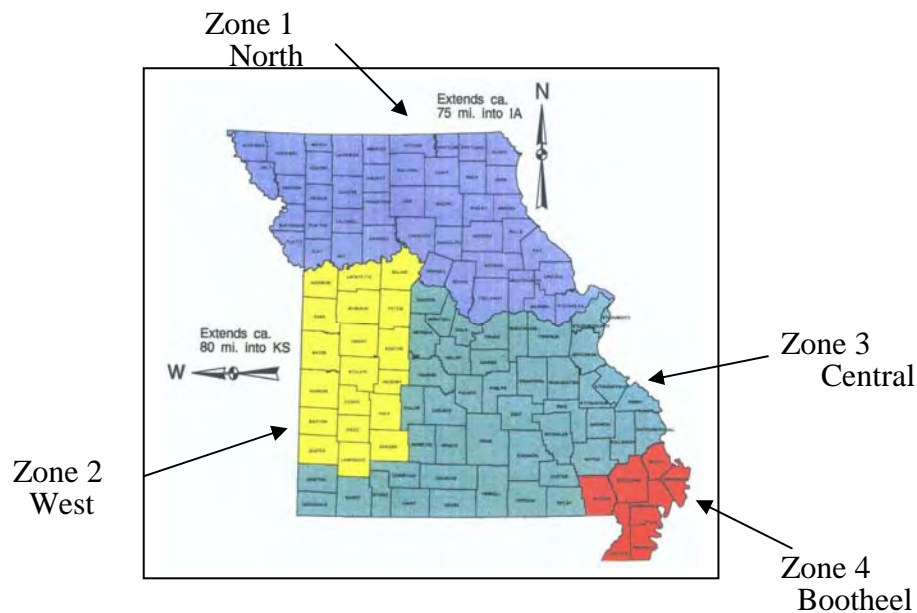
Cooperators:

The Missouri Department of Conservation (MDC), USDA Natural Resources Conservation Service (NRCS), Plant Materials Center (PMC), the University of Missouri at Columbia, Missouri (UMC), and the National Audubon Society-Audubon Missouri (NAS).

Procedures:

The state of Missouri was divided into four zones: Northern Glaciated Plains, Zone #1; Western Prairie, Zone #2; Ozarks, Zone #3; and the Bootheel Region, Zone #4 (See Table #1). Plant materials were collected as seed by the study coordinator, selected personnel from USDA-NRCS, MDC, UMC, and other knowledgeable interested persons. Collections were made from prairie remnants throughout each zone striving for a relatively equal and representative sample. Large collections from one site were not allowed to dominate the mixture from throughout the zone. Seed from each collection site was inventoried by location. Seed collected from within each zone was kept separate from the other zones. Increase plots were and will be established, as seed becomes available. Each species will be released as ‘Source Identified’ germplasm from the zone in which it was collected. Evaluation and selection or plant breeding procedures has not improved ‘Source Identified’ seed.

Table #1



Discussion:

1997

The Missouri Ecotype Enhancement Program was officially started as a plant materials study with the signing of the study plan in December of 1997. This plan is an agreement between cooperators and funded by a grant from the MDC. Several meetings preceded the document signing that included MDC, NRCS, UMC, Department of Transportation, Missouri Department of Natural Resources, and other interested individuals.

The initial grant from MDC to UMC was received July 1997 and a program coordinator was hired by UMC in September 1997 to work at the Elsberry Plant Materials Center.

1998

A grant was given to UMC once again by MDC that would fund the program through August of 1999. Goals were established for 1998 collections. Some species from 1997 were recollected and new species were added.

1999

The Missouri Ecotype program continued during 1999 and the species released listed in Table #2. Beginning in September, the Lincoln County Soil and Water Conservation District took over as the administrator for the Missouri Ecotype Program replacing UMC. MDC funded the program for the 1999-2000 fiscal year.

2000

The Missouri Ecotype program continued through August until funding was depleted. The program was continued under direction of Missouri Audubon Society and MDC in cooperation with the NRCS Plant Materials Center.

2001

The Missouri Ecotype program is growing increase plots at Elsberry and also at the Charles Green Conservation area near Ashland, Missouri.

2002

MDC took over as administrator of this study and is currently still funding the program with the aid of grants. The Missouri Ecotype program is continuing to increase plots at the Elsberry PMC and Green Conservation Area. New collections are being made of both old and new species.

2003

MDC is continuing to administrate the Missouri Ecotype program. All plots are still in production and seed is being allocated. The PMC is planning to increase plots for seed production in 2004.

2004

In the spring of 2004, the plots of zones 1 and 2 sideoats gramma, *Bouteloua curtipendula*, and zone 1 river oats, *Chasmanthium latifolium*, were increased for seed production. There were no new releases from the Missouri Ecotype Program in 2004 and there are no releases scheduled for

2005. Plans are to increase river oats-zone 1 again in 2005. Becky Erickson, Missouri Ecotype Program Coordinator, has several production plots located at the Green Conservation Area in Ashland, Missouri. The number of plots on the Green Area has increased over the past year and now sustains almost 35 different ecotypes. Plans for both the Plant Materials Center and the plots at the Green Conservation Area are to sustain the plots already established and increase the plots that display good seed production and survival. This will allow for potential releases as early as 2006.

2005

Chasmanthium latifolium, river oats from the northern zone were increased in the late summer of 2005. Plans are to increase several other better seed producing species in the spring of 2006, such as the big bluestem (northern zone), little bluestem (northern zone), sideoats gramma (northern and western zones), tall dropseed (northern and western zones), pale purple coneflower (northern and western zones), grayhead coneflower (northern zone), and Virginia wild rye (northern zone).

2006

Supplemental funding for the Missouri Ecotype Program was not extended past the agreement date of June 2007. Plans are to continue growing the species that have been previously released or have potential for high use in the commercial market. The PMC planted production plots of big bluestem (northern zone), little bluestem (northern zone), sideoats gramma (northern and western zones), tall dropseed (northern and western zones), pale purple coneflower (northern and western zones), and grayhead coneflower (northern zone) in the spring of 2006. A fall planting of Virginia wild rye (northern zone) was also planted. The plots were increased to provide more seed production and averaged ¼ to two acres in size.

Study 29I142G - Missouri Ecotype Releases						Table #2
Missouri Ecotype Releases from the Elsberry Plant Materials Center						
Scientific Name	Release Name	Common Name	Accession Number	Cooperating Agency(ies)	Type of Release	Year of Release
<i>Elymus virginicus</i> L.	Northern MO	Virginia wildrye	9079044	MOPMC,UMC,MDC,MODOT	N	1999
<i>Sorghastrum nutans</i> (L) Nash.	Northern MO	Indiangrass	9079036	MOPMC,UMC,MDC,MODOT	N	1999
<i>Sorghastrum nutans</i> (L) Nash.	Western MO	Indiangrass	9079037	MOPMC,UMC,MDC,MODOT	N	1999
<i>Andropogon gerardii</i> Vitman	Northern MO	big bluestem	9079000	MOPMC,UMC,MDC,MODOT	N	1999
<i>Schizachyrium scoparium</i> , Michx.	Northern MO	little bluestem	9079004	MOPMC,UMC,MDC,MODOT	N	1999
<i>Sporobolus compositus</i> var. <i>compositus</i>	Northern MO	tall dropseed	9079040	MOPMC, MDC, NAS	N	2001
<i>Coreopsis palmata</i>	Northern MO	prairie coreopsis	9079028	MOPMC, MDC, NAS	N	2001
<i>Coreopsis palmata</i>	Western MO	prairie coreopsis	9079029	MOPMC, MDC, NAS	N	2001
<i>Echinacea pallida</i>	Northern MO	pale purple coneflower	9079032	MOPMC, MDC, NAS	N	2001
<i>Echinacea pallida</i>	Western MO	pale purple coneflower	9079033	MOPMC, MDC, NAS	N	2001
<i>Liatris pycnostachya</i>	Northern MO	prairie blazing star	9079020	MOPMC, MDC, NAS	N	2001
<i>Liatris pycnostachya</i>	Western MO	prairie blazing star	9079021	MOPMC, MDC, NAS	N	2001
<i>Schizachyrium scoparium</i> , Michx.	Southern MO	little bluestem	9079006	MOPMC, MDC	N	2004
<i>Ratibida pinnata</i>	Northern MO	grayhead coneflower	9079060	MOPMC, MDC	N	2004
Cooperating Agencies: MOPMC=Missouri Plant Materials Center; UMC=University of Missouri at Columbia; MDC=Missouri Department of Conservation; MODOT=Missouri Department of Transportation; NAS=National Audubon Society-Audubon Missouri; Grow Native.						
N= native releases; collected within the USA, occurring naturally in the USA. Generally refers to a plant which occurs naturally in a particular region, state ecosystem or habitat without direct or indirect human activity.						
Nat.=naturalized releases; collected from a population within the USA, but were originally introduced to the USA sometime in the past.						
I=introduced; means that the original collection from which the release was made was not from within the USA.						

Study ID Code: MOPMC-P-0001-WO, WL, WE

Study Title: Assembly, Evaluation and Selection of Bur Oak, *Quercus macrocarpa* Michx.

Study Leader: Cordsiemon, R.

Description:

Bur oak is a large-size tree 60-80 feet tall and 2-3 feet in diameter (max. 170 by 7 feet); crown rounded with large, heavy branches. Leaves are deciduous, oblong to ovate; 6-12 inches long; characteristically 5-9 lobed, with rounded lobes. Fruit matures in one year; acorns are 3/5-2 inches long, ellipsoidal, brown, enclosed for 1/3 to all of its length in a characteristic fringe-margined cup. Twigs are stout; yellow-brown to gray, often with characteristic corky wings. Winter buds; 1/8-1/4 inch long, hairy. Bur oak is one of the largest American Oaks. Commonly distributed throughout Missouri, Iowa and Illinois, bur oak are is important bottomland tree, frequently found in moist flats, wetlands, and undulating flood plains. Important associates of bur oak include red maple, American elm, silver maple, swamp white oak, sycamore and eastern cottonwood.

Objective:

The objective of this study is to select a local source, fast growing, and high nut producing bur oak.

Materials and Methods:

Field collections were assembled, accessioned, and held in storage until the collection period ended. The assemblage of collections began at the PMC in October 2000 and ended mid-December 2000. After the collection period was over the seed was stratified and planted in the greenhouse using the Root Pruning Method (RPM) containers. The plants will be transplanted in Field #7 on the PMC in mid to late April 2002. The design will be a randomized complete block with one plant per plot: one block for the Iowa collections, one for the Illinois collections and one block for the Missouri collections.

Discussion

2000

A total of 24 collections were made from the PMC three state service area: seven from Iowa, two from Illinois and 15 from Missouri. As these collections arrived at the PMC they were given accession numbers and placed in stratification for 120 days (cool moist storage 38 degrees Fahrenheit). At the time this report was being developed, these collections were being germinated in the greenhouse.

2001

The 24 collections of bur oaks were taken out of the germination trays and placed in containers (3 5/8" x 6") and allowed to grow to approximately one foot tall. These plants were later transplanted into one-gallon size containers and placed in the portable greenhouse. In early December 2001 the plants were transported to the root cellar for over wintering. The scheduled

planting date is April 2002. The plantings will be randomized complete block designs with one block for Iowa's collections, one block for Illinois' collections and one block for Missouri's collections. Refer to Table #1 for collection information.

2002

Three assemblies of bur oaks were planted in April 2002 representing each state's collections, Iowa, Illinois and Missouri. Iowa's collections were planted in Field #6 on April 18, 2002, Illinois' collections were planted in Field #12 on April 17, 2002, and Missouri's collections were planted in Field #7 on April 18 – 19, 2002. These collections were evaluated for height, spread, vigor, and insect and disease resistance. The evaluation data was not documented in this year's report but will be in the 2003 Annual Technical Report. Table #1 reflects collection information.

2003

The three assemblies of bur oak representing the Missouri, Illinois, and Iowa collections were evaluated in October 2003. Performance characteristics evaluated were height, spread, vigor, and insect/disease resistance. The plant performance summaries can be found in Tables #2 to #4 and plot layout maps are Tables #11 to #13.

2004

All three plantings, Missouri, Iowa, and Illinois, were evaluated again for height, spread, vigor, and insect/disease resistance. Evaluation data for 2004 can be found in Tables #5, #6, and #7. The Iowa and Missouri plantings originally were planted with two trees of each collection in each replication. Not all collections had enough material to allow for two trees in each replication, but most did. In 2004, the lesser dominant tree was removed to allow the dominant tree to grow without competition. There are some replications that had trees die and the extra (non-dominant) trees were, in some cases, used to replace trees that died. The 2005 evaluations will reflect the replacement trees. Fertilizer, 13-13-13, was added to the three plantings to encourage growth and healthier plants.

2005

Evaluations were taken in September for height, spread, vigor, and insect/disease resistance on the three plantings. Fertilizer, 13-13-13, again was added to each tree. Acorns were produced on a few trees in the Missouri accession in field #7. Evaluation data for 2005 can be found in Tables # 8, #9, and #10.

2006

In early spring, all three plots of bur oaks were sprayed with an ounce per acre rate of Oust to control grass and weed competition. There was good control through mid-summer. Late summer broadleaf weeds and grasses encroached back around the tree. Fertilizer, 13-13-13, was also added at a rate of 8 oz. per tree. An evaluation for acorn production was done on all three plots (five year old trees); Missouri plot (Rep. 3, tree MO-11) produced several acorns and in the Iowa plot (Rep. 3, tree IA-5; Rep. 6, tree IA-6; and Rep. 7, tree IA-5) all produced significant amounts of acorns. There were no height, spread, and insect/disease resistant evaluations taken this year.

Table # 1**Study Title:** Assembly, Evaluation and Selection of Bur Oak *Quercus macrocarpa* Michx.

Temporary No.	State	County	MLRA	Collector
MO-1	Missouri	Calloway	115	Thomas L. Wekenborg
MO-2	Missouri	Chariton	NA	Charles Lewis
MO-3	Missouri	Shannon	053	Randy Misser
MO-4	Missouri	Lincoln	115	Jimmy Henry
MO-5	Missouri	Lincoln	115	Jimmy Henry
MO-6	Missouri	Lincoln		Wayne Lovelace
MO-7	Missouri			
MO-8	Missouri	Pike		Keith Jackson
MO-9	Missouri	Pike		Keith Jackson
MO-10	Missouri	Pike		Keith Jackson
MO-11	Missouri	Pike		Keith Jackson
MO-12	Missouri	Howard	N/A	Robert D. Dewitt
MO-13	Missouri	Boone	N/A	Robert D. Dewitt
MO-14	Missouri	St. Charles	115	Dan Crigler
MO-15	Missouri	Moniteau	115	Douglas Wallace
IL-1	Illinois	Clark	N/a	David E. Hiatt
IL-1	Illinois	Jasper	113	Dennis D. Clency
IA-1	Iowa	Dickinson	103	Tim K. Moran
IA-2	Iowa	Dickinson	103	Tim K. Moran
IA-3	Iowa	Dickinson	103	Tim K. Moran
IA-4	Iowa	Wayne	N/A	Duane Bedford
IA-5	Iowa	Decatur	109	Kevin Reynolds
IA-6	Iowa	Bremer	104	Richard J. Cornes
IA-7	Iowa	Black	104	Rick Cordes

2003 Evaluation

Summary of Iowa Collections, Located in Field #6

Summary of Height (Inches)

Acc. No.	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Rep 11	Rep 12	Avg.
IA-1	13	4.5	10	13	15.5	7	10	12	9.5	12	14	14	11.21
IA-2	8	10	9	9	14.5	12.5	15	10	10	10	13	16	11.42
IA-3	9	8	9.5	13	11	8	7	9	11	12	10.5	9	9.75
IA-4	16	15.5	14.5	9.5	10	11.5		11	16	13	11		12.80
IA-5	13	15	15.5	8	15.5	14	24.5	23	12	17	20	10	15.63
IA-6	10	8.5	12	13	12.5	12.5	5	3	6.5	13	7	8	9.25
IA-7	13	16	9.5	12	21	12.5	10	5.5	6	20	11	19	12.96

Summary of Spread (Inches)

Acc. No.	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Rep 11	Rep 12	Avg.
IA-1	-	3.5	2.5	2	0.5	-	-	1	2	1	2.5	3	2.00
IA-2	-	3	-	1.5	2.5	2.5	1	2.5	1.5	0.5	0.5	2	1.75
IA-3	-	-	1.5	2.5	1	0.5	0.5	0.5	0.5	1	1.5	0.5	1.00
IA-4	-	2.5	1	1.5	1.5	-		1.5	1	2.5	2	-	1.69
IA-5	-	3	1.5	1.5	3	1	1	3.5	0.5	0.5	0.5	1.5	1.59
IA-6	-	-	-	2.5	2.5	1.5	-	0.5	1	2	0.5	2	1.56
IA-7	2	3	1.5	-	1	1	1.5	0.5	1	1.5	0.5	0.5	1.27

Summary of Vigor (1-9 Rating) 1=Very Good 9=Poor

Acc. No.	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Rep 11	Rep 12	Avg.
IA-1	4	5	4	3	4	6	4	4	6	4	4	4	4.33
IA-2	4	4	4	4	3	4	6	4	5	5	4	3	4.17
IA-3	dead	4	3	3	4	4	6	6	4	4	5	6	4.45
IA-4	3	3	3	4	4	4	-	4	3	4	4	-	3.60
IA-5	3	3	3	4	3	3	2	2	6	3	3	3	3.17
IA-6	4	4	3	3	4	4		9	7	4	6	6	4.91
IA-7	3	3	4	3	2	4	4	7	7	3	4	3	3.92

Summary of Insect and Disease Resistance (1-9 Rating) 1=Very Good 9=Poor

Acc. No.	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Rep 11	Rep 12	Avg.
IA-1	3	3	2	2	2	2	5	4	3	2	3	2	2.73
IA-2	2	2	2	2	3	2	3	5	4	4	3	2	2.91
IA-3	2	3	3	3	2	3	3	3	2	4	3	3	2.91
IA-4	2	2	3	2	2		4	4	3	2	3		2.78
IA-5	3	2	3	3	3	2	2	2	4	2	2	2	2.45
IA-6	2	2	2	2	3	2	4	3	4	3	4	3	2.91
IA-7	3	3	2	2	2	3	2	3	3	3	4	3	2.73

2003 Evaluation

Summary of Missouri Collections, Located in Field #7

Summary of Height (Inches)

Acc. No.	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Average
MO-1	25	14	25	18.5	16	19.5	20.5	21	20.5	19.5	20.0
MO-2	20	24.5	19	26	17.5	9	7.5	7	8.5	13.5	15.3
MO-3	17	13	7	5	9.5	15	23	24	17	24.5	15.5
MO-4	10	15.5	20	23	25.5	8	18.5	16	18.5	14	16.9
MO-5	18	13	15.5	13	14	16.5	7	19.5	13.5	16.5	14.7
MO-6	19					24	12	24	20.5	22.5	20.6
MO-7	21	21	19	21	18	dead	12	12	15.5	16.5	17.3
MO-8	13.5	8.5	14	6	13	25	19	22.5	25	19	16.6
MO-9	21	17	19	27	11.5	18.5	17.5	25	17	20.5	19.4
MO-10	24	18	28	27.5	19	10	18.5	15.5	18	15	19.4
MO-11	14.5	23.5	24	24	10.5	7.5	18	21.5	26	18.5	18.8
MO-12	24.5	23	20.5	13	10	15	18	18.5	23.5	18	18.4
MO-13	plt mow	25.5	20.5	25	18	25.5	25.5	19.5	24.5	17	22.3
MO-14	21	21.5	27	20	13	15.5	14	18.5	20	17	18.8
MO-15			14.5	16.5	19.5						16.8

Summary of Spread (Inches)

Acc. No.	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Average
MO-1	1.5	2	2.5	0.5	0.5	2	5.5	4	4	2.5	2.6
MO-2	5	2	2	3	5	1.5	1.5	2.5	0.5	5	2.6
MO-3	1	0.5	0.5	0.5	1	2	0.5	0.5	0.5	1.5	0.8
MO-4	1.5	1.5	1	0.5	1	1	2	1.5	0.5	1	1.1
MO-5	1.5	1.5	1.5	0.5	1	2	2.5	1.5	3	1	1.6
MO-6	2								1	3	2
MO-7	2.5	1	1.5	2.5	3	dead	0.5	3	1	2	1.8
MO-8	4	2	3.5	1	3	4	1	2	1	1	2.1
MO-9	3	1.5	2	3	1	3.5	1	3	0.5	3	2.1
MO-10	4	2.5	2	1.5	1	0.5	4.5	2.5	1	0.5	1.8
MO-11	1.5	2	2	1.5	0.5	1	1.5	1	1	3.5	1.6
MO-12	4	3.5	4	2	1.5	0.5	2	2	4	1	2.5
MO-13	plt mow	0.5	1.5	2.5	1	3.5	1	1.5	4	2	1.9
MO-14	2	2	2	3	5	2	0.3	0.5	4	2	2.3
MO-15			1.5	1	1.5						1.3

2003 Evaluation

Table #3 - continued

Summary of Missouri Collections, Located in Field #7

Summary of Vigor (1-9 Rating) 1=Very Good 9=Poor

Acc. No.	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Average
MO-1	1	4	1	3	4	2	4	2	2	3	2.6
MO-2	1	1	3	1	3	7	7	8	8	5	4.4
MO-3	3	4	8	8	5	4	7	1	4	5	4.9
MO-4	3	3	2	1	1	7	3	5	3	4	3.2
MO-5	3	4	4	4	4	4	8	3	4	4	4.2
MO-6	3					2	5	1	2	1	2.2
MO-7	2	7	3	2	3	dead	6	5	4	4	4.0
MO-8	2	7	4	8	4	1	3	1	1	3	3.4
MO-9	2	4	3	1	5	6	3	1	4	2	3.1
MO-10	1	4	1	1	3	6	3	4	2	6	3.1
MO-11	4	1	1	1	5	8	3	2	1	4	3.0
MO-12	1	1	1	1	4	4	3	3	1	4	2.3
MO-13	plt mow	1	2	1	3	1	1	3	1	4	1.9
MO-14	2	1	8	2	4	4	4	3	2	4	3.4
MO-15		3		4	3						3.3

Summary of Insect and Disease Resistance (1-9 Rating) 1=Very Good 9=Poor

Acc. No.	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Average
MO-1	2	3	2	3	4	2	5	3	2	3	2.9
MO-2	2	2	4	2	3	4	4	4	5	2	3.2
MO-3	3	3	4	4	4	5	3	2	4	2	3.4
MO-4	2	3	4	2	2	4	4	3	5	2	3.1
MO-5	3	4	3	4	3	2	3	4	4	3	3.3
MO-6	4					2	3	2	3	2	2.4
MO-7	2	3	3	4	4	dead	3	2	4	3	3.1
MO-8	2	4	4	5	3	2	4	3	2	2	3.1
MO-9	3	3	3	2	3	3	4	2	2	3	2.8
MO-10	2	2	2	2	2	4	2	5	3	4	2.8
MO-11	4	2	3	3	3	5	3	3	2	3	3.1
MO-12	2	2	2	4	3	4	2	2	4	2	2.7
MO-13	plt mow	2	2	4	2	2	2	3	2	3	2.4
MO-14	3	2	3	3	2	4	3	2	3	3	2.8
MO-15		4	4	3	3						3.5

R = Tree was originally MO-6 accession, but was replaced with MO-15 accession

Summary of Illinois Collections Located in Field #12				Table #4
2003 Evaluation (Averages)				
Collection	Height (Inches)	Spread (Inches)	Insect/Disease	Vigor
IL-1	12.5	2.8	2.0	3.0
IL-2	13.3	3.0	2.3	3.9

There were only 2 collections from Illinois so they were put into 1 replication and the accessions were averaged. Height and spread are measured in feet and insect and disease resistance and plant vigor have been given a rating of 1-9; 1 is very good and 9 is poor.

2004 Evaluation

Summary of Iowa Collections, Located in Field #6

Summary of Height (Feet)

Acc. No.	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Rep 11	Rep 12	Avg.
IA-1	2.2	4.0	2.8	2.9	2.6	2.4	2.2	2.3	3.7	3.6	3.6	3.5	3.0
IA-2	2.9	3.1	2.4	2.7	2.9	3.1	2.4	3.6	3.5	3.4	3.7	3.8	3.1
IA-3	3.7	2.3	2.5	3.0	2.7	3.2	2.4	dead	3.6	2.5	3.3	3.4	3.0
IA-4	3.0	4.0	3.4	4.1	3.2	3.1	3.8	3.1	4.4	3.8	4.1	4.3	3.7
IA-5	4.3	3.7	4.9	3.7	3.5	3.2	3.2	3.2	3.5	dead	3.2	2.6	3.5
IA-6	2.3	3.0	2.4	2.4	3.6	3.5	dead	dead	3.4	3.1	2.2	3.5	2.9
IA-7	3.5	3.2	3.2	3.2	3.7	3.6	3.2	4.1	2.4	3.4	3.8	4.1	3.5

Summary of Spread (Feet)

Acc. No.	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Rep 11	Rep 12	Avg.
IA-1	2	3.6	2.5	3.2	2.9	2.5	3	2	3.8	3.7	3	3.2	3.0
IA-2	2.7	2.7	2.4	2.1	2.2	2.8	3	3	2.6	3	2.9	2.6	2.7
IA-3	3.7	2.1	2.8	2.7	2.4	3.3	1.5	dead	3.3	3.1	2.2	3.6	2.8
IA-4	3	2.6	3.1	3.4	3	3.4	5	3.7	3	3.1	3.4	3.4	3.3
IA-5	4.4	3.2	3.3	4.1	3.8	2.5	2	3.4	2.9	dead	3.1	2.4	3.2
IA-6	2	3.6	2.2	2.4	3.4	3.4	dead	dead	3.8	3.2	2.6	2.5	2.9
IA-7	2.8	2.6	2.3	2.4	3.5	3.2	3.3	3.5	2.2	3.7	3	3.4	3.0

Summary of Vigor (1-9 Rating) 1=Very Good 9=Poor

Acc. No.	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Rep 11	Rep 12	Avg.
IA-1	5	3	5	3	4	5	4	5	3	3	3	4	3.9
IA-2	4	3	5	5	4	4	5	3	4	4	3	4	4.0
IA-3	2	5	4	3	5	4	6	dead	3	4	5	3	4.0
IA-4	3	3	2	2	3	3	2	3	2	2	3	2	2.5
IA-5	1	3	1	2	2	4	5	3	4	dead	4	5	3.1
IA-6	5	3	5	4	3	3	dead	dead	3	3	5	4	3.8
IA-7	3	4	3	3	2	3	4	4	4	3	3	3	3.3

Summary of Insect and Disease Resistance (1-9 Rating) 1=Very Good 9=Poor

Acc. No.	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Rep 11	Rep 12	Avg.
IA-1	2	3	3	3	1	4	2	3	2	2	2	2	2.4
IA-2	1	2	2	1	2	2	4	2	2	2	3	2	2.1
IA-3	2	2	3	3	2	3	2	dead	2	2	2	2	2.3
IA-4	2	3	2	2	3	2	3	2	3	2	2	1	2.3
IA-5	2	2	2	2	1	3	3	3	3	dead	5	2	2.5
IA-6	2	2	2	2	2	1	dead	dead	1	1	1	2	1.6
IA-7	2	3	2	1	2	2	2	2	2	2	4	2	2.2

2004 Evaluation

Summary of Missouri Collections, Located in Field #7

Summary of Height (Feet)

Acc. No.	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Average
MO-1	3.0	3.2	3.2	2.8	3.7	2.4	3.9	dead	dead	2.4	3.1
MO-2	2.8	3.4	dead	3.1	3.6	dead	dead	dead	dead	2.6	3.1
MO-3	3.8	3.4	3.3	3.1	2.8	2.1	2.8	2.7	1.7	2.4	2.8
MO-4	3.6	3.1	2.9	3.3	3.0	1.3	3.1	3.1	3.2	2.8	2.9
MO-5	1.9	2.8	3.1	3.8	3.3	2.8	dead	2.8	2.9	3.3	3.0
MO-6	3.4	R	R	R	R	2.2	3.0	3.0	1.5	3.0	2.7
MO-7	3.9	dead	2.5	2.8	2.1	dead	dead	2.6	dead	3.6	2.9
MO-8	3.2	2.1	3.0	2.2	2.6	2.4	3.0	3.6	2.7	3.2	2.8
MO-9	4.3	2.8	4.2	2.6	2.4	2.5	1.3	4.2	1.6	3.4	2.9
MO-10	3.2	3.4	3.3	2.7	2.2	2.6	2.3	2.5	2.2	dead	2.7
MO-11	2.6	3.1	2.5	2.1	1.7	2.8	2.4	2.4	2.7	3.0	2.5
MO-12	2.4	2.4	3.0	2.0	2.2	2.0	2.7	2.6	2.4	3.2	2.5
MO-13	3.8	3.8	2.8	3.6	2.9	3.1	2.9	2.4	3.2	1.7	3.0
MO-14	3.5	3.3	2.6	2.8	1.7	2.1	dead	2.1	2.9	2.6	2.6
MO-15		3.9	3.1	3.0	3.1						3.3

Summary of Spread (Feet)

Acc. No.	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Average
MO-1	2.4	3.5	3.2	2.5	3.7	2.7	3.8	dead	dead	2.2	3.0
MO-2	3.2	3	dead	3.1	2.3	dead	dead	dead	dead	3	2.9
MO-3	3	2.6	3.5	2.9	2.6	2.3	2.3	2.7	1.7	3	2.7
MO-4	2.6	2.8	2.5	2.6	2.3	1.1	2.9	2.4	3	3	2.5
MO-5	1.8	3	2.3	3.4	3.3	2.5	dead	2.5	2.6	2.6	2.7
MO-6	2.6	R	R	R	R	2	2.1	2.6	1.2	2.4	2.2
MO-7	3.3	dead	2.6	3.5	2.1	dead	dead	2.8	dead	4	3.1
MO-8	2.9	1.9	3.3	1.8	2.2	2.6	2.4	3.1	2.7	3.1	2.6
MO-9	4.2	2.7	3.2	2.3	2.4	2.1	1.3	4.3	1.5	2.9	2.7
MO-10	2.9	2.8	2.7	3	2.2	2.2	2.1	2	2.7	dead	2.5
MO-11	2.6	2.8	2.6	1.8	1.9	2.4	2	2.6	3.4	3.3	2.5
MO-12	1.5	2.8	2.7	2	2.3	2.4	2.7	3	3	4.2	2.7
MO-13	3.4	3.1	2.9	3.6	3	2.9	2.6	2.3	3.2	1.2	2.8
MO-14	2.1	4.4	2.3	3.4	2.1	2.1	dead	2.7	2.5	3.1	2.7
MO-15		3.3	3.3	2.7	3.1						3.1

2004 Evaluation
 Summary of Missouri Collections, Located in Field #7

Table #6 - continued

Summary of Vigor (1-9 Rating) 1=Very Good 9=Poor

Acc. No.	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Average
MO-1	4	4	3	5	2	4	1	dead	dead	5	3.5
MO-2	5	4	dead	3	5	dead	dead	dead	dead	4	4.2
MO-3	3	4	3	4	4	5	4	4	7	4	4.2
MO-4	3	4	4	4	4	8	3	4	3	4	4.1
MO-5	6	5	4	1	3	4	dead	4	4	4	3.9
MO-6	4	R	R	R	R	5	4	4	8	4	4.8
MO-7	3	dead	5	3	6	dead	dead	5	dead	1	3.8
MO-8	3	6	3	6	5	4	4	2	4	3	4.0
MO-9	1	5	3	4	4	5	7	1	7	4	4.1
MO-10	4	4	3	3	4	5	4	6	5	dead	4.2
MO-11	4	4	5	6	6	4	5	4	3	3	4.4
MO-12	6	5	4	6	5	5	3	4	4	2	4.4
MO-13	3	3	4	2	3	3	4	6	4	7	3.9
MO-14	4	4	5	3	6	5	dead	4	4	4	4.3
MO-15		2	3	3	3						2.8

Summary of Insect and Disease Resistance (1-9 Rating) 1=Very Good 9=Poor

Acc. No.	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Average
MO-1	3	5	3	2	4	1	2	dead	dead	3	2.9
MO-2	4	2	dead	2	4	dead	dead	dead	dead	2	2.8
MO-3	3	4	3	3	2	2	2	2	3	2	2.6
MO-4	2	2	3	3	2	1	2	2	2	1	2.0
MO-5	1	3	2	2	2	1	dead	2	2	2	1.9
MO-6	4	R	R	R	R	2	2	2	1	2	2.2
MO-7	3	dead	2	2	2	dead	dead	2	dead	1	2.0
MO-8	4	3	3	4	3	1	3	2	3	2	2.8
MO-9	2	2	3	2	1	3	1	3	2	2	2.1
MO-10	3	4	2	2	1	2	1	3	2	dead	2.2
MO-11	3	3	3	2	3	2	2	2	2	2	2.4
MO-12	2	2	4	4	2	3	1	1	3	1	2.3
MO-13	5	2	3	1	2	2	3	2	4	3	2.7
MO-14	6	3	2	3	2	2	dead	2	3	3	2.9
MO-15		2	3	3	1						2.3

R = Tree was originally MO-6 accession, but was replaced with MO-15 accession

Study MOPMC-P-0001-WE, WL
Assembly, Evaluation and Selection of Bur Oak, *Quercus macrocarpa*, Michx.

Table #7

2004 Evaluation
Summary of Illinois Collections, Located in Field #12

2004 Evaluation (AVERAGES)
Summary of Illinois Collections, Located in Field #12

Accession No.	Height (Feet)	Spread (Feet)	Insect/Disease	Vigor
IL-1	1.9	1.8	3.0	5.5
IL-2	1.7	1.6	2.8	6.1

There were only 2 collections from Illinois so they were put into 1 replication and the accessions were averaged. Height and spread are measured in feet and insect and disease resistance and plant vigor have been given a rating of 1-9; 1 is very good and 9 is poor.

Study MOPMC-P-0001-WE, WL											Table #8		
Assembly, Evaluation and Selection of Bur Oak, <i>Quercus macrocarpa</i> , Michx.													
2005 Evaluation													
Summary of Iowa Collections, Located in Field #6													
Summary of Height (feet)													
Acc. No.	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Rep 11	Rep 12	Avg.
IA-1	3.6	4.5	4.3	4.6	5.1	3.5	4.7	3.9	5.3	5	4.9	5.4	4.6
IA-2	4.3	4.6	3.8	3.8	4.5	4.9	3.6	4.4	4.6	4.9	5.2	5	4.5
IA-3	6.3	4	4	5.6	3.7	5.2	4	Dead	6	4.5	5.2	4.3	4.8
IA-4	5.2	5.4	4.8	6	4.6	5.1	5.8	5.2	6.2	5.4	6.3	6	5.5
IA-5	5.8	5.6	6.3	5.3	5.2	4.6	4.6	5	5.2	Dead	5	2.9	5
IA-6	3.5	5.2	4.2	4.5	5	4.5	Dead	Dead	4.3	5.1	3.2	4.4	4.4
IA-7	4.5	Dead	5.8	5.2	5.5	5	4.7	4.6	Dead	4.7	4.9	5.7	5.1
Summary of Spread (feet)													
Acc. No.	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Rep 11	Rep 12	Avg.
IA-1	2.6	3	2.3	3.6	5.1	3.4	3.8	3.6	3.7	4	4.2	3.3	3.6
IA-2	2.6	3.2	2.6	3.6	3	3.5	3.6	3.6	3.6	3.2	3.6	3.1	3.3
IA-3	4.2	2.6	3	4	2	3	2.6	Dead	4.9	3	2.4	4.3	3.3
IA-4	4	3	3.5	5	3.6	4	4.7	4	3.4	4	3.4	4.4	3.9
IA-5	4.3	3.4	4.5	4	3.6	5	3.7	4	3.2	Dead	3	3.4	3.8
IA-6	2.2	4	2.5	3.5	2.5	4	Dead	Dead	3.6	4.2	2.4	2.6	3.2
IA-7	2.8	Dead	2.3	3.4	3.5	3.5	4.2	3.9	Dead	3	4	4	3.5

Summary of Vigor (1-9 Rating) 1=Very Good 9=Poor													
Acc. No.	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Rep 11	Rep 12	Avg.
IA-1	6	3	5	3	1	5	4	5	3	2	3	3	3.6
IA-2	5	4	5	5	5	3	6	3	3	3	3	3	4
IA-3	2	5	4	5	5	4	5	Dead	2	4	4	3	3.9
IA-4	3	3	3	1	3	3	1	2	2	3	2	2	2.3
IA-5	1	3	1	2	2	2	3	2	3	Dead	4	6	2.6
IA-6	6	3	5	3	3	3	Dead	Dead	3	3	6	4	3.9
IA-7	9	Dead	5	4	2	3	3	3	Dead	5	3	2	3.9
Summary of Insect/Disease Resistance (1-9 Rating) 1=Very Good 9=Poor													
Acc. No.	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Rep 11	Rep 12	Avg.
IA-1	3	2	2	2	2	4	2	2	3	3	2	2	2.4
IA-2	2	2	3	3	4	1	3	2	3	3	3	2	2.6
IA-3	3	4	2	7	3	2	1	Dead	1	3	2	2	2.7
IA-4	1	2	1	1	1	2	1	1	1	2	1	1	1.3
IA-5	2	3	2	2	3	1	1	3	1	Dead	2	2	2
IA-6	2	3	1	2	3	3	Dead	Dead	2	2	2	4	2.4
IA-7	9	Dead	5	3	2	2	1	3	Dead	2	2	2	3.1

Study MOPMC-P-0001-WE, WL											Table #9
Assembly, Evaluation and Selection of Bur Oak, <i>Quercus macrocarpa</i> , Michx.											
2005 Evaluation											
Summary of Missouri Collections, Located in Field #7											
Summary of Height (Feet)											
Acc. No.	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Average
MO-1	4.5	4.0	6.5	3.3		3.6	4.6	Dead	Dead	4.0	4.4
MO-2	3.6	4.5	Dead	4.4		Dead	Dead	Dead	Dead	5.3	4.5
MO-3	5.0	5.0	4.3	4.3		1.9	3.6	3.8	Dead	2.9	3.9
MO-4	4.9	4.4	4.3	4.6		1.0	4.3	4.4	5.3	4.5	4.2
MO-5	3.7	5.0	4.3	4.3		3.8	Dead	3.8	5.8	3.2	4.2
MO-6	6.4	R	R	R		1.0	3.9	4.0	Dead	3.5	3.8
MO-7	6.1	Dead	3.9	3.3		Dead	Dead	3.5	Dead	6.0	4.6
MO-8	6.2	4.0	3.4	3.9		Dead	Dead	4.6	4.8	4.7	4.5
MO-9	6.1	3.7	5.0	3.0		3.2	Dead	5.0	Dead	3.9	4.3
MO-10	4.0	4.2	Dead	3.2		Dead	3.6	3.0	4.0	Dead	3.7
MO-11	3.7	4.0	3.8	Dead		3.2	3.3	3.7	4.7	4.4	3.9
MO-12	3.2	6.7	3.4	3.1		Dead	4.1	4.0	3.8	4.6	4.1
MO-13	4.3	4.2	4.0	4.7		3.6	3.7	3.4	5.0	Dead	4.1
MO-14	4.0	5.0	Dead	4.0		2.8	Dead	4.8	4.0	4.0	4.1
MO-15		5.2	4.3	4.7							4.7
Summary of Spread (Feet)											
Acc. No.	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Average
MO-1	3.5	4.0	5.0	2.0		3.0	3.3	Dead	Dead	3.5	3.5
MO-2	3.2	3.6	Dead	3.6		Dead	Dead	Dead	Dead	4.0	3.6
MO-3	3.0	3.7	3.6	3.0		1.0	2.9	2.8	Dead	2.5	2.8
MO-4	3.3	3.1	2.7	3.0		1.0	2.8	2.3	4.0	2.9	2.8
MO-5	2.3	3.6	3.0	3.0		2.4	Dead	3.2	1.8	3.0	2.8
MO-6	3.7	R	R	R		1.0	3.0	3.0	Dead	2.9	2.7
MO-7	4.3	Dead	2.6	3.7		Dead	Dead	3.0	Dead	4.4	3.6
MO-8	4.0	3.0	2.8	2.0		Dead	Dead	2.5	3.2	2.7	2.9
MO-9	6.0	3.0	2.4	1.4		1.8	Dead	4.0	Dead	1.5	2.9
MO-10	3.0	3.7	Dead	3.0		Dead	2.7	2.5	2.0	Dead	2.8
MO-11	3.0	3.0	2.5	Dead		2.2	2.6	2.6	3.7	3.0	2.8
MO-12	1.2	3.3	2.5	2.5		Dead	3.0	3.2	3.0	4.0	2.8
MO-13	3.0	3.0	3.0	3.3		2.8	2.8	2.0	4.6	Dead	3.1
MO-14	3.0	2.2	Dead	3.6		2.3	Dead	3.2	2.5	4.0	3.0
MO-15		4.8	3.4	3.3							3.8

2005 Evaluation										Table #9 - continued	
Summary of Missouri Collections, Located in Field #7											
Summary of Vigor (1-9 Rating) 1=Very Good 9=Poor											
Acc. No.	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Average
MO-1	3	3	1	6		6	3	Dead	Dead	4	3.7
MO-2	4	2	Dead	4		Dead	Dead	Dead	Dead	3	3.3
MO-3	3	2	3	4		8	4	4	Dead	6	4.3
MO-4	4	4	7	4		8	3	5	2	5	4.7
MO-5	7	3	5	3		5	Dead	4	3	6	4.5
MO-6	2	R	R	R		8	5	5	Dead	5.0	5.0
MO-7	2	Dead	7	5		Dead	Dead	5	Dead	1	4.0
MO-8	2	4	7	7		Dead	Dead	3	2	3	4.0
MO-9	1	2	5	8		6	Dead	1	Dead	8	4.4
MO-10	5	4	Dead	6		Dead	6	6	6	Dead	5.5
MO-11	6	4	6	Dead		6	6	4	2	4	4.8
MO-12	8	2	6	7		Dead	5	5	4	3	5.0
MO-13	5	2	5	4		5	3	6	2	Dead	4.0
MO-14	5	3	Dead	5		7	Dead	4	6	3	4.7
MO-15		1	4	5							3.3
Summary of Insect and Disease Resistance (1-9 Rating) 1=Very Good 9=Poor											
Acc. No.	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Average
MO-1	2	4	2	2		2	4	Dead	Dead	3	2.7
MO-2	3	2	Dead	2		Dead	Dead	Dead	Dead	2	2.3
MO-3	4	3	2	1		1	2	1	Dead	1	1.9
MO-4	3	5	4	2		8	2	3	2	2	3.4
MO-5	5	4	4	3		2	Dead	1	2	2	2.9
MO-6	3	R	R	R		8	2	2	Dead	1	3.2
MO-7	5	Dead	4	2		Dead	Dead	1	Dead	1	2.6
MO-8	3	3	3	4		Dead	Dead	3	3	2	3.0
MO-9	2	2	2	6		4	Dead	3	Dead	8	3.9
MO-10	5	5	Dead	4		Dead	3	1	2	Dead	3.3
MO-11	4	4	1	Dead		3	2	2	3	3	2.8
MO-12	5	2	3	1		Dead	3	3	1	4	2.8
MO-13	4	1	5	4		2	2	1	3	Dead	2.8
MO-14	4	3	Dead	3		1	Dead	4	2	1	2.6
MO-15		3	4	2							3.0
R = Tree was originally MO-6 accession, but was replaced with MO-15 accession											
Replication #5 was removed and used in another study offsite of the PMC											

Study MOPMC-P-0001-WE, WL
Assembly, Evaluation and Selection of Bur Oak, *Quercus macrocarpa*, Michx.

Table #10

2005 Evaluation
Summary of Illinois Collections, Located in Field #12

2005 Evaluation (AVERAGES)
Summary of Illinois Collections, Located in Field #12

Accession No.	Height (Feet)	Spread (Feet)	Insect/Disease	Vigor
IL-1	2.8	2	4.0	6.0
IL-2	2.5	1.6	4.4	6.7

There were only 2 collections from Illinois so they were put into 1 replication and the accessions were averaged. Height and spread are measured in feet and insect and disease resistance and plant vigor have been given a rating of 1-9; 1 is very good and 9 is poor.

Study MOPMC-P-001 Assembly, Evaluation and Selection of Bur Oak, *Quercus macrocarpa*, Michx.

Plot Layout: 5-11-02

Field 7 - Missouri Collections

		2 ROWS		Table #11		
		↙		↘		
Reps	12	Border Plant	accessions	Border Plant	3	Reps
		14	←	1		NORTH
		13	"	2		
		12	"	3		
		11	"	4		
		10	"	5		
		9	"	6		
10		8	"	7		1
		7	"	8		
		6	"	9		
		5	"	10		
		4	"	11		
		3	"	12		
		2	"	13		
		1	"	14		
		14	←	1		
		13	"	2		
		12	"	3		
		11	"	4		
		10	"	5		
		9	"	15		
9		8	"	7		2
		7	"	8		
		6	"	9		
		5	"	10		
		4	"	11		
		3	"	12		
		2	"	13		
		1	"	14		
		Repeat	←	Repeat		
8		14	←	1 to 14		3
		to 1		replacing 6 with 15		
		Repeat	←	Repeat		
7		14	←	1 to 14		4
		to 1		replacing 6 with 15		
		Repeat	←	Repeat		
6		14	←	1 to 14		5
		to 1		replacing 6 with 15		
		13	Border Plant	Border Plant	1	

**FOURTEEN ACCESSIONS PER REPLICATION. FIVE REPLICATIONS PER ROW.
TWO ROWS TOTALING 10 REPLICATIONS AND 70 PLANTS.**

Study MOPMC-P-001 Assembly, Evaluation and Selection of Bur Oak, <i>Quercus macrocarpa</i> , Michx.						
Plot Layout: 5-30-02				Table # 12		
Two plants planted per location			BP=Border Plant (only one plant planted)			
FIELD 6 - Iowa Collections						
		2 ROWS				
REPS	3 (BP)		3 (BP)		REPS	NORTH
12	2		6		1	
	5		2			
	6		7			
	4		1			
	7		3			
11	1		5		2	
	3		4			
	4		5			
	7		3			
	5		7			
10	1		2		3	
	3		6			
	2		1			
	6		4			
	4		1			
9	7		3		4	
	3		1			
	1		4			
	2		6			
	6		5			
8	1		4		5	
	6		2			
	5		5			
	3		3			
	7		1			
7	4		6		6	
	2		7			
	1		2			
	6*		5			
	4		7			
	2		1			
	7		3			
	3		6*			
	5		4			
	2 (BP)		1 (BP)			
*ONLY ONE OF PLANT 6 PLANTED IN THESE LOCATIONS. RAN OUT OF PLANT 6. (BP=Border Plant)						

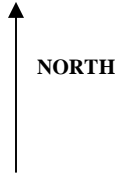
STUDY MOPMC-P-0001-WO

Assembly, Evaluation and Selection of Bur Oak, *Quercus macrocarpa*, Michx.

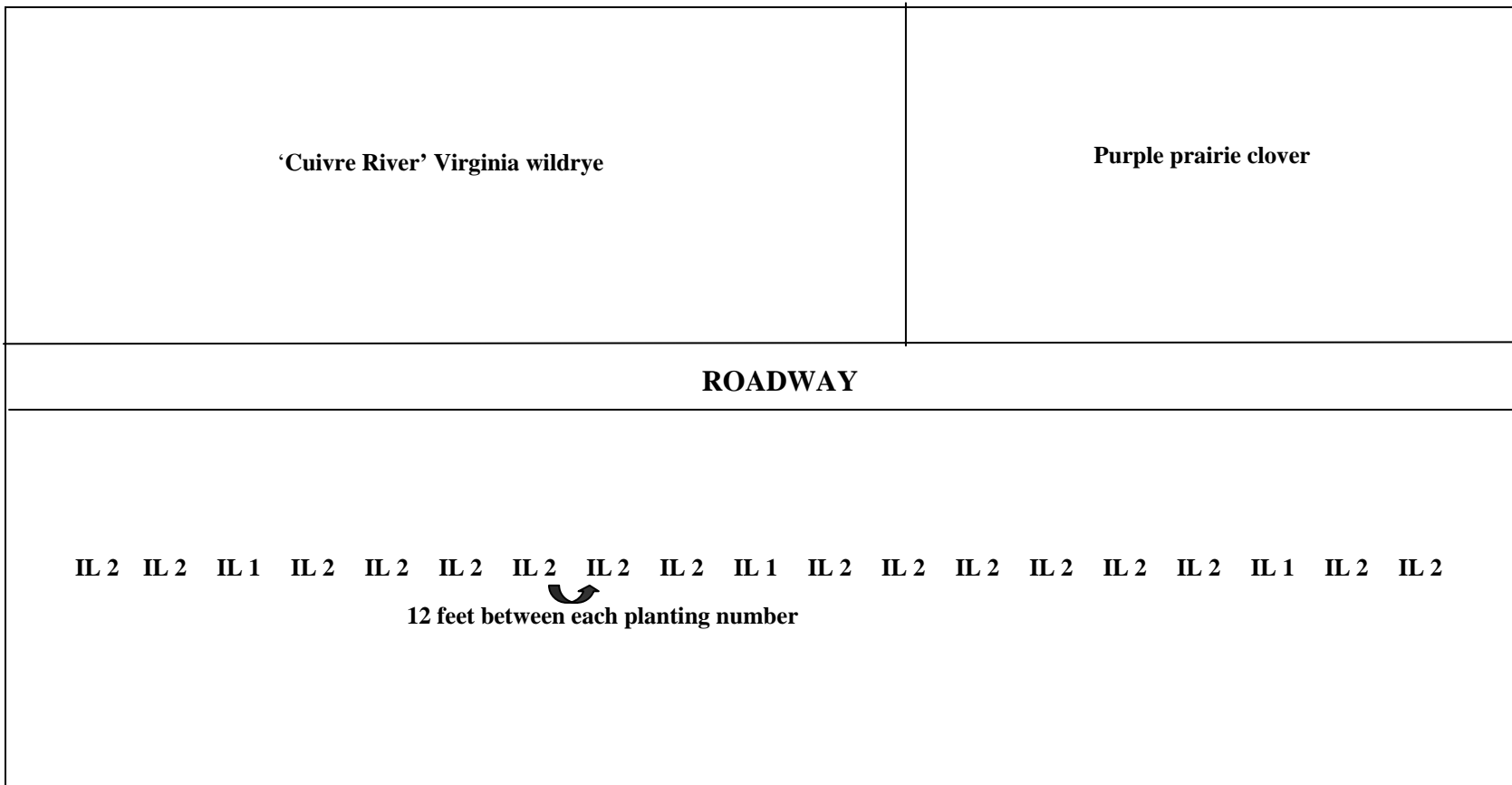
Table #13

Illinois bur oak assembly

Planted 4/17/02



FIELD #12



Study ID Code: MOPMC-P-0002-WE, WL

Study Title: Assembly, Evaluation and Selection of False Indigo Bush, *Amorpha fruticosa*, L.

Study Leader: Cordsiemon, R.

Description:

False indigo bush, *Amorpha fruticosa* L., is a medium sized shrub up to ten feet in height. The general shape is an open canopy with the bulk of foliage and twigs in the upper 1/3 of the crown. The leaves are alternate, pinnately compound. Each leaflet is up to two inches long and just over one inch wide with a small, bristly like point at the rounded tip. The flowers are in dense spikes on the upper part of the plant, often several spikes clustered together. Each flower has dark indigo-purple petals with yellow tipped stamens. Flowering time: late spring to midsummer. Twigs are rigid, glabrous, red-brown or gray, often with an insect caused, long swelling near the tip. The fruit is a small, warty kidney shaped pod (1/2 inch long), with large glandular dots, in a crowded cylindrical cluster. The fruit persist on the shrub through winter. Found in more open areas along lakes and streams. May be found in upland areas where additional moisture is received.

Objective:

The objective of this study is to select a local source, fast growing, high seed producing false indigo bush.

Materials and Methods:

Field collections were assembled, accessioned and held in storage until the collection period ended. The assemblage of collections began at the PMC in November 2000. After the collection period was over, the seed was planted in the greenhouse using the Root Pruning Method (RPM) containers. The plants will be transplanted in a selected field on the PMC (preferably bottomland site). The design will be a randomized complete block with three plants per plot: one block for the Iowa collections, one for the Illinois collections and one for the Missouri collections.

Discussion:

2000

A total of 32 collections were made from the PMC three state service area including North Dakota: 19 from Iowa, eight from Missouri, four from Illinois and one from North Dakota. On February 15, 2000, these collections were given accession numbers and placed in the PMC greenhouse for germination. At the time this report was written these collections were continuing germination in the greenhouse. During the period April-May 2001 these collections will be planted in Fields #6, #7 and #10 on the PMC. Collections from each state will be planted in separate fields on the PMC. The planting design will be a randomized complete block with three plants per plot. Refer to Table #1 for collection information.

Study MOPMC-P-0002-WE, WL – False Indigo

Table #1

Temporary No.	State	County	MLRA	Collector
MO-1	Missouri	Audrain	N/A	Mack Ellis
MO-2	Missouri	Knox	N/A	John Keith Doug Rainey
MO-3	Missouri	Marion	N/A	Mack Ellis Jay Lingwall
MO-4	Missouri		N/A	Maurice Davis
MO-5	Missouri		N/A	Maurice Davis
MO-6	Missouri	Lincoln	115	Jerry Kaiser
MO-7	Missouri	Pike	115	Keith Jackson
MO-8	Missouri	Pettis	116B	Shannon Zezula
IL-1	Illinois	Champaign	111	Kenton Macy
IL-2	Illinois	Champaign	110	Graciela Moreno
IL-3	Illinois	Piatt	108	Kenton Macy
IL-4	Illinois	Lawrence	114	Kenton Macy
IA-1	Iowa	Monona	107	Drew Delang
IA-2	Iowa	Adams	108	Mark Palmquist
IA-3	Iowa	Jones	105	Joe Wagner
IA-4	Iowa	Decatur	109	Kevin Reynolds
IA-5	Iowa	Dickinson	103	Carroll Oskvig
IA-6	Iowa	Dickinson	103	Carroll Oskvig
IA-7	Iowa	Dickinson	103	Carroll Oskvig
IA-8	Iowa	Dickinson	103	Carroll Oskvig
IA-9	Iowa	Dickinson	103	Carroll Oskvig
IA-10	Iowa	Dickinson	103	Carroll Oskvig
IA-11	Iowa	Dickinson	103	Carroll Oskvig
IA-12	Iowa	Dickinson	103	Carroll Oskvig
IA-13	Iowa	Dickinson	103	Carroll Oskvig
IA-14	Iowa	Dickinson	103	Carroll-Oskvig
IA-15	Iowa	Iowa	108	Timothy Meyer
IA-16	Iowa	Decatur	109	Melvin Moe
IA-17	Iowa	Henry	108C	Dova Ensminger
IA-18	Iowa	Jefferson	N/A	Shawn Dettmann
IA-19	Iowa	Louisa	108C	Shawn Dettmann

2001

Three separate plantings were established in the month of June 2001: Iowa's collections of false indigo bush were planted in Field #10 on the PMC on June 21, Illinois collections were planted in Field # 6 on June 20 and Missouri's collections were planted in Field # 7 on June 21. Each planting reflected a randomized complete block design with four plants per plot. Survival evaluations were conducted in October 2001.

2002

The three separate plantings representing Iowa, Illinois and Missouri collections were evaluated on several occasions in 2002 to document vigor, height, spread, insect and disease resistance and seed production. Table #1 contains collection information. The evaluation data was not documented in this year's report but will be in the 2003 Annual Technical Report.

2003

Seed was harvested from the evaluation plantings of each of the states in October 2003. The seed from these plantings was allocated to the respective states for use in field plantings.

2004

Seed was harvested from the three state plantings in October 2004. Evaluation data from the past year was compiled and is noted in Tables #2, #3, and #4. Galls formed on a few branches of each plant causing some concern as to how this might effect seed production. These galls are possibly caused by a caterpillar that has laid eggs in the branch. The branch dies at the location where the gall forms. Each gall will be hand clipped off and burned to eliminate any further infestation in the winter of 2004-05. Also each plant will be sprayed around the base with a non-selective herbicide while the plant is dormant. The intention is to eliminate competition and allow for an application of the insecticide, Merit. Merit is a systemic insecticide that will help eliminate any further insect damage. Seed production has declined slightly and seed germination has declined significantly. The galls may have resulted in poor seed production, but they are not totally responsible for poor seed germination. The seed have been examined and there may be evidence of another insect affecting the plant or the possibility of seed not filling. The false indigo plantings seemed to have flowered just fine and moisture was not a problem with the abundance of rainfall in 2004. Another insect does seem likely and other nurseries have experienced seed damage of a weevil burrowing into the seeds. This has not been identified yet at the PMC, but will be closely monitored in the next year. Each planting will be evaluated again in 2005 for height, spread, vigor, and insect and disease resistance. The data collected will be noted in the 2005 report. Selections were made and each is scheduled for release in 2005.

2005

All 3 state (IA, IL, and MO) collections were released as selected class releases. Missouri Covey Germplasm, Iowa Covey Germplasm, and Illinois Covey Germplasm are available at the Elsberry PMC in bareroot stock. Seed may be available depending on seed on-hand and yearly production. It was determined that the need to evaluate all three plantings again was not necessary. The plantings were again evaluated for gall damage. Again the galls were present and the insecticide, Merit, did little to prevent the galls from forming. According to collection data these galls may not affect seed production as originally thought, although it may affect seed germination.

Merit will again be applied to the plots to help control any insects that may be affecting seed germination and production. It may be noted that commercial growers have reported unpredictable seed production from this species.

2006

Seed production from the three production plots was again unpredictable. The Illinois plot has been a steady seed producer failed to produce any collectable seed. The Iowa plot dropped again, but the Missouri plot increased its production and had its best year of harvest to date. The soil type and dry weather are believed to be main factors affecting seed production. The next generation plots that were established from these plots did not produce any collectable seed in 2006. Plans are to produce seedling bareroot stock and continue with seed production from both generation 0 and 1 plots from all 3 states.

State	Size in Acres	2004 Production	2005 Production	2006 Production
Illinois	0.30	23.5	64.1	0.0
Missouri	0.49	4.2	2.5	9.8
Iowa	1.26	12.9	6.2	0.5

State	2003 %Viability	2004 %Viability	2005 %Viability	2006%Viability
Illinois	62	39	58	n/a
Missouri	81	23	n/a	47
Iowa	61	22	1	n/a

Study MOPMC-P-0002, WE, WL - Assembly, Evaluation and Selection of False Indigo Bush, <i>Amorpha fruticosa</i> , L.																				Field 6	
																				Table #2	
		Rep 1	Rep 1	Rep 1	Rep 1	Avg.	Rep 2	Rep 2	Rep 2	Rep 2	Avg.	Rep 3	Rep 3	Rep 3	Rep 3	Avg.	Rep 4	Rep 4	Rep 4	Rep 4	Avg.
IL-1	height	3.4	3.4	3.2	n/a	3.33	2.5	3.7	1.7	3.9	2.95	3.2	2.3	3.4	2.5	2.85	3.4	2.7	4.7	2.1	3.23
	spread	4.6	4.2	2.9	n/a	3.90	2.3	2.7	1.8	4.8	2.90	1.5	2.4	3.8	3.2	2.73	2.6	3.0	5.2	1.2	3.00
	vigor	3	3	7	n/a	4.33	7	5	8	5	6.25	7	6	5	5	5.75	6	5	2	8	5.25
	seed prod.	3	4	8	n/a	5.00	0	4	0	3	1.75	0	0	5	5	2.50	5	3	2	0	2.50
IL-2	height	2.7	3.0	3.8	3.0	3.13	n/a	3.0	3.6	4.0	3.53	3.2	3.9	3.2	2.9	3.30	2.1	3.3	3.2	2.2	2.70
	spread	3.3	4.8	2.6	3.8	3.63	n/a	3.2	3.7	4.9	3.93	3.0	3.5	2.9	3.0	3.10	1.7	3.7	2.6	0.8	2.20
	vigor	4	4	4	4	4.00	n/a	7	4	3	4.67	4	4	6	5	4.75	8	4	7	8	6.75
	seed prod.	7	3	4	4	4.50	n/a	8	4	3	5.00	4	4	4	5	4.25	0	3	6	0	2.25
IL-3	height	4.4	4.4	3.4	n/a	4.07	2.3	3.4	4.2	4.3	3.55	3.2	3.9	3.2	2.9	3.30	3.1	2.4	3.5	2.2	2.80
	spread	4.9	3.9	4.9	n/a	4.57	2.4	4.7	4.2	3.1	3.60	3.0	3.5	2.9	3.0	3.10	3.2	1.7	4.5	2.1	2.88
	vigor	4	6	4	n/a	4.67	7	4	2	4	4.25	4	4	6	5	4.75	3	7	4	7	5.25
	seed prod.	2	5	3	n/a	3.33	7	3	2	5	4.25	4	4	4	5	4.25	3	0	3	6	3.00
IL-4	height	3.3	n/a	4.4	3.0	3.57	1.7	3.6	3.0	4.1	3.10	5.6	4.1	3.2	2.2	3.78	2.1	2.8	4.0	3.3	3.05
	spread	2.9	n/a	4.2	2.8	3.30	1.6	4.0	3.0	5.9	3.63	5.1	3.9	4.9	1.7	3.90	0.7	2.0	3.9	3.2	2.45
	vigor	5	n/a	3	5	4.33	8	4	6	3	5.25	1	4	5	0	2.50	8	7	3	5	5.75
	seed prod.	6	n/a	2	4	4.00	0	0	4	2	1.50	2	3	3	0	2.00	8	6	3	5	5.50

Study MOPMC-P-0002, WE, WL - Assembly, Evaluation and Selection of False Indigo Bush, <i>Amorpha fruticosa</i> , L.																				Field 7	
Table #3																					
		Rep 1	Rep 1	Rep 1	Rep 1	Ave.	Rep 2	Rep 2	Rep 2	Rep 1	Ave.	Rep 3	Rep 3	Rep 3	Rep 3	Ave.	Rep 4	Rep 4	Rep 4	Rep 4	Ave.
MO-1	height	2.8	3.4	3.0	3.5	3.18	3.5	4.1	3.6	N/A	2.80	4.2	3.2	2.9	4.1	3.60	1.9	0.9	1.8	2.2	1.70
	spread	3.1	3.6	2.6	3.6	3.23	2.3	4.8	3.0	N/A	2.53	4.0	4.9	1.4	4.7	3.75	1.3	0.6	0.9	1.1	0.98
	vigor	7	7	7	5	6.50	6	5	6	N/A	4.25	5	5	7	5	5.50	9	9	9	8	8.75
	seed prod.	8	8	8	6	7.50	0	5	6	N/A	2.75	8	0	0	0	2.00	0	0	0	0	0.00
MO-3	height	3.6	2.7	2.1	2.6	2.75	2.4	2.8	4.0	2.4	2.90	2.6	3.1	2.7	3.2	2.90	2.8	1.8	3.0	2.8	2.60
	spread	5.7	3.3	2.2	3.0	3.55	4.4	2.9	4.6	2.2	3.53	5.0	4.3	3.6	3.9	4.20	3.9	0.9	4.2	4.0	3.25
	vigor	5	7	8	7	6.75	6	7	5	8	6.50	7	6	7	6	6.50	7	8	6	6	6.75
	seed prod.	7	0	0	7	3.50	9	6	7	0	5.50	7	6	6	6	6.25	7	0	7	6	5.00
MO-4	height	4.9	4.4	3.9	3.7	4.23	4.3	3.9	1.7	3.8	3.43	3.0	3.9	2.8	3.2	3.23	4.0	4.1	2.0	4.9	3.75
	spread	5.3	3.4	2.4	3.6	3.68	2.4	2.2	0.9	3.2	2.18	2.6	3.0	2.2	1.2	2.25	3.5	6.3	1.3	5.2	4.08
	vigor	3	5	6	5	4.75	5	6	8	5	6.00	6	6	7	8	6.75	5	5	8	4	5.50
	seed prod.	7	6	9	5	6.75	0	0	0	8	2.00	8	0	0	0	2.00	7	6	0	7	5.00
MO-5	height	5.3	4.0	2.2	4.0	3.88	1.6	3.8	4.9	3.7	3.50	3.3	3.4	3.6	3.7	3.50	4.0	4.0	2.6	5.5	4.03
	spread	6.2	3.6	2.5	2.3	3.65	0.8	4.5	4.7	3.2	3.30	3.3	3.2	3.5	2.6	3.15	2.9	3.2	2.0	4.7	3.20
	vigor	4.0	5.0	7.0	6.0	5.50	9.0	5.0	4.0	5.0	5.75	5.0	5.0	5.0	5.0	5.00	6.0	5.0	7.0	3.0	5.25
	seed prod.	0.0	8.0	0.0	8.0	4.00	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.0	4.0	1.00
MO-6	height	0.7	2.3	4.4	3.7	2.78	3.0	3.3	4.0	4.0	3.58	4.2	3.1	2.6	2.0	2.98	2.0	2.4	3.0	3.5	2.73
	spread	1.7	1.3	3.0	4.4	2.60	2.0	3.8	2.1	2.6	2.63	4.3	2.2	1.2	0.7	2.10	1.2	1.5	2.3	3.0	2.00
	vigor	9.0	9.0	6.0	5.0	7.25	7.0	6.0	6.0	6.0	6.25	5.0	6.0	8.0	8.0	6.75	8.0	8.0	7.0	6.0	7.25
	seed prod.	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.00	8.0	0.0	0.0	0.0	2.00	0.0	0.0	0.0	9.0	2.25
MO-7	height	3.9	4.4	1.9	3.9	3.53	4.4	4.2	3.8	2.8	3.80	2.6	4.2	4.1	3.1	3.50	4.7	2.4	3.8	3.8	3.68
	spread	4.2	3.9	0.7	3.5	3.08	2.6	3.2	1.8	1.7	2.33	2.0	4.2	3.5	2.5	3.05	4.0	1.4	3.0	4.7	3.28
	vigor	6.0	6.0	9.0	7.0	7.00	5.0	5.0	6.0	8.0	6.00	7.0	5.0	5.0	7.0	6.00	5.0	7.0	5.0	5.0	5.50
	seed prod.	0.0	8.0	0.0	9.0	4.25	8.0	7.0	9.0	0.0	6.00	0.0	0.0	0.0	0.0	0.00	5.0	0.0	6.0	5.0	4.00
MO-8	height	3.2	3.3	2.2	3.0	2.93	2.6	2.0	2.4	3.5	2.63	3.0	2.8	3.2	2.4	2.85	2.9	3.6	3.0	3.2	3.18
	spread	6.2	3.6	2.5	4.3	4.15	1.6	2.3	1.8	3.9	2.40	3.6	2.0	3.0	1.3	2.48	3.9	4.4	3.9	4.0	4.05
	vigor	6.0	6.0	7.0	5.0	6.00	7.0	7.0	7.0	5.0	6.50	6.0	6.0	5.0	8.0	6.25	5.0	5.0	5.0	5.0	5.00
	seed prod.	8.0	8.0	0.0	7.0	5.75	0.0	0.0	0.0	7.0	1.75	8.0	0.0	0.0	0.0	2.00	8.0	6.0	4.0	8.0	6.50

Study MOPMC-P-0002, WE, WL - Assembly, Evaluation and Selection of False Indigo Bush, <i>Amorpha fruticosa</i> , L.																				Field 10	
		Table #4																			
		Rep 1	Rep 1	Rep 1	Rep 1	Avg.	Rep 2	Rep 2	Rep 2	Rep 2	Avg.	Rep 3	Rep 3	Rep 3	Rep 3	Avg.	Rep 4	Rep 4	Rep 4	Rep 4	Avg.
IA-1	height	n/a	n/a	n/a	n/a	x	n/a	n/a	n/a	n/a	x	n/a	n/a	n/a	n/a	x	n/a	n/a	n/a	n/a	x
	spread	n/a	n/a	n/a	n/a	x	n/a	n/a	n/a	n/a	x	n/a	n/a	n/a	n/a	x	n/a	n/a	n/a	n/a	x
	vigor	n/a	n/a	n/a	n/a	x	n/a	n/a	n/a	n/a	x	n/a	n/a	n/a	n/a	x	n/a	n/a	n/a	n/a	x
	seed prod.	n/a	n/a	n/a	n/a	x	n/a	n/a	n/a	n/a	x	n/a	n/a	n/a	n/a	x	n/a	n/a	n/a	n/a	x
IA-2	height	5.2	3.3	4.0	3.3	3.95	3.9	4.2	3.5	3.6	3.80	3.8	4.9	3.3	4.5	4.13	3.2	4.1	3.8	4.0	3.78
	spread	6.4	2.7	5.0	4.3	4.60	6.0	5.8	5.2	4.2	5.30	4.8	4.3	4.6	5.3	4.75	5.0	5.9	4.3	6.6	5.45
	vigor	3	6	4	5	4.50	4	4	6	6	5.00	4	4	5	4	4.25	5	4	5	4	4.50
	seed prod.	3	7	5	5	5.00	9	6	3	6	6.00	3	5	4	5	4.25	6	3	4	3	4.00
IA-3	height	2.7	3.9	2.8	3.4	3.20	3.2	3.7	4.0	3.9	3.70	4.0	3.7	3.0	3.1	3.45	3.2	3.6	4.0	4.6	3.85
	spread	2.3	7.3	4.0	5.3	4.73	3.6	3.3	3.6	4.2	3.68	5.7	5.3	4.4	4.2	4.90	5.0	4.8	3.7	4.6	4.53
	vigor	8	4	5	5	5.50	8	7	3	4	5.50	4	5	6	5	5.00	6	5	5	4	5.00
	seed prod.	9	3	6	4	5.50	5	6	4	5	5.00	4	7	0	6	4.25	4	4	5	3	4.00
IA-4	height	4.9	5.1	4.5	5.6	5.03	5.0	5.0	4.6	4.4	4.75	5.2	5.5	5.5	5.2	5.35	5.2	4.4	4.5	5.3	4.85
	spread	4.3	5.4	5.7	5.6	5.25	7.7	4.8	5.2	5.7	5.85	5.6	6.0	6.0	6.5	6.03	6.3	4.5	6.8	6.9	6.13
	vigor	3	2	3	2	2.50	3	3	3	3	3.00	3	3	3	3	3.00	5	6	5	3	4.75
	seed prod.	3	2	2	2	2.25	3	3	2	3	2.75	3	5	4	3	3.75	4	6	4	3	4.25
IA-5	height	5.0	4.7	4.5	4.2	4.60	4.6	4.0	4.4	4.7	4.43	4.9	4.0	4.3	4.1	4.33	4.0	3.1	3.9	4.5	3.88
	spread	6.0	6.5	5.5	3.4	5.35	7.6	6.8	4.8	5.7	6.23	6.5	4.0	4.8	6.8	5.53	5.2	4.0	5.6	7.4	5.55
	vigor	3	3	2	6	3.50	4	5	5	4	4.50	4	5	4	3	4.00	5	6	4	4	4.75
	seed prod.	3	4	2	9	4.50	4	5	8	6	5.75	7	9	4	8	7.00	6	7	3	7	5.75
IA-6	height	4.6	5.4	4.8	4.0	4.70	4.8	3.5	4.9	5.2	4.60	1.7	4.5	4.6	3.9	3.68	3.6	4.1	3.8	5.3	4.20
	spread	5.4	5.9	5.0	3.6	4.98	4.0	3.8	4.5	4.4	4.18	1.0	6.7	4.8	4.7	4.30	6.0	5.0	5.0	6.4	5.60
	vigor	4	3	3	5	3.75	4	5	3	3	3.75	9	4	4	5	5.50	4	4	4	3	3.75
	seed prod.	6	8	3	9	6.50	6	9	4	6	6.25	0	9	0	0	2.25	6	8	9	2	6.25
IA-7	height	5.4	4.7	5.0	4.4	4.88	5.2	4.5	4.2	4.9	4.70	4.4	3.5	4.1	4.6	4.15	4.6	5.4	4.6	4.4	4.75
	spread	6.7	4.8	5.7	4.3	5.38	5.9	6.6	3.8	5.8	5.53	4.0	2.0	5.3	4.0	3.83	5.6	6.0	5.8	7.3	6.18
	vigor	3	3	3	4	3.25	4	3	6	3	4.00	4	7	4	5	5.00	4	4	4	3	3.75
	seed prod.	4	3	4	3	3.50	3	2	7	3	3.75	4	8	5	6	5.75	4	3	3	3	3.25

Study MOPMC-P-0002, WE, WL - Assembly, Evaluation and Selection of False Indigo Bush, <i>Amorpha fruticosa</i> , L.																				Field 10	
cont.																					
		Rep 1	Rep 1	Rep 1	Rep 1	Avg.	Rep 2	Rep 2	Rep 2	Rep 2	Avg.	Rep 3	Rep 3	Rep 3	Rep 3	Avg.	Rep 4	Rep 4	Rep 4	Rep 4	Avg.
IA-8	height	4.5	7.5	6.4	6.1	6.13	3.7	6.2	5.5	5.7	5.28	4.9	4.5	5.3	4.8	4.88	4.9	7.3	5.3	5.7	5.80
	spread	3.6	3.2	6.2	7.7	5.18	3.8	5.7	6.0	5.6	5.28	5.6	3.0	4.8	6.7	5.03	5.0	5.0	7.4	9.0	6.60
	vigor	4	2	2	2	2.50	6	3	3	3	3.75	5	6	5	4	5.00	3	2	4	3	3.00
	seed prod.	0	5	4	6	3.75	7	5	7	2	5.25	6	9	6	7	7.00	3	9	5	6	5.75
IA-9	height	4.6	5.8	5.2	4.4	5.00	2.2	4.3	3.7	4.3	3.63	3.8	4.5	4.3	4.2	4.20	3.0	4.3	4.4	4.0	3.93
	spread	5.7	6.6	3.0	7.1	5.60	1.7	6.1	5.6	6.8	5.05	5.4	7.4	5.8	5.3	5.98	3.0	5.3	6.4	6.5	5.30
	vigor	3	2	3	3	2.75	7	6	4	4	5.25	5	4	4	4	4.25	7	4	4	4	4.75
	seed prod.	2	3	7	7	4.75	0	0	3	4	1.75	7	4	6	6	5.75	0	8	6	6	5.00
IA-10	height	4.9	4.5	4.9	4.4	4.68	5.1	4.2	3.9	4.4	4.40	6.1	5.0	3.8	5.1	5.00	4.5	4.4	4.8	4.8	4.63
	spread	7.5	7.1	5.9	4.4	6.23	3.8	4.8	4.7	5.5	4.70	4.8	5.6	5.5	4.0	4.98	5.7	6.8	5.6	5.5	5.90
	vigor	3	3	4	6	4.00	3	0	4	3	2.50	4	4	6	5	4.75	4	3	4	4	3.75
	seed prod.	3	6	3	0	3.00	8	4	5	3	5.00	5	0	0	9	3.50	3	2	0	0	1.25
IA-11	height	4.9	4.3	5.5	5.5	5.05	4.2	4.3	4.0	4.9	4.35	3.7	4.5	3.5	4.1	3.95	4.3	3.6	4.5	5.0	4.35
	spread	5.5	5.6	9.8	4.5	6.35	4.9	4.8	3.7	5.9	4.83	4.8	5.0	4.0	3.0	4.20	3.9	2.8	3.4	7.0	4.28
	vigor	4	3	2	3	3.00	6	7	6	4	5.75	4	3	4	4	3.75	4	7	7	3	5.25
	seed prod.	6	7	7	0	5.00	4	0	6	4	3.50	6	4	7	0	4.25	7	9	4	3	5.75
IA-12	height	4.7	5.2	5.0	5.3	5.05	4.3	3.8	5.4	3.8	4.33	4.6	4.5	3.6	3.7	4.10	4.9	4.5	4.3	4.3	4.50
	spread	4.0	5.6	4.0	7.0	5.15	6.8	3.8	6.3	4.5	5.35	4.1	3.3	4.1	3.5	3.75	5.6	3.9	4.0	4.2	4.43
	vigor	4	4	4	3	3.75	3	5	3	5	4.00	4	5	7	6	5.50	3	5	4	5	4.25
	seed prod.	7	0	8	2	4.25	6	5	4	8	5.75	5	9	5	6	6.25	2	7	0	0	2.25
IA-13	height	4.6	3.7	4.7	4.3	4.33	4.3	4.3	3.7	4.9	4.30	3.7	4.3	4.3	5.1	4.35	3.8	3.4	3.5	4.5	3.80
	spread	5.8	5.4	6.3	6.9	6.10	6.9	4.2	6.5	5.3	5.73	4.5	4.8	3.7	5.3	4.58	5.1	4.1	4.6	4.9	4.68
	vigor	5	4	2	4	3.75	4	5	5	4	4.50	5	4	4	6	4.75	3	6	5	4	4.50
	seed prod.	6	4	2	4	4.00	5	5	5	4	4.75	4	3	4	9	5.00	4	4	5	5	4.50
IA-14	height	4.1	4.4	3.9	4.1	4.13	3.5	4.4	4.4	4.3	4.15	3.8	5.4	4.5	4.0	4.43	4.5	4.6	3.8	4.3	4.30
	spread	5.0	6.6	5.0	5.3	5.48	3.5	7.1	5.4	4.8	5.20	4.0	5.0	3.4	4.0	4.10	6.7	4.5	5.8	5.0	5.50
	vigor	4	3	3	4	3.50	6	4	3	4	4.25	6	3	4	4	4.25	3	7	6	6	5.50
	seed prod.	0	0	3	4	1.75	6	3	3	3	3.75	0	9	8	7	6.00	7	0	3	7	4.25

Study MOPMC-P-0002, WE, WL - Assembly, Evaluation and Selection of False Indigo Bush, <i>Amorpha fruticosa</i> , L.																			Field 10		
cont.																					
		Rep 1	Rep 1	Rep 1	Rep 1	Avg.	Rep 2	Rep 2	Rep 2	Rep 2	Avg.	Rep 3	Rep 3	Rep 3	Rep 3	Avg.	Rep 4	Rep 4	Rep 4	Rep 4	Avg.
IA-15	height	4.0	4.0	3.4	3.7	3.78	4.6	4.3	4.0	4.5	4.35	4.9	4.5	5.3	4.8	4.88	3.4	3.7	4.0	4.1	3.80
	spread	5.9	3.9	4.0	5.9	4.93	4.8	6.7	6.5	6.7	6.18	5.6	3.0	4.8	6.7	5.03	3.4	4.5	3.4	4.1	3.85
	vigor	4	6	7	5	5.50	3	3	4	4	3.50	5	6	5	4	5.00	6	4	4	4	4.50
	seed prod.	4	8	6	6	6.00	3	3	4	4	3.50	6	9	6	7	7.00	0	4	5	4	3.25
IA-16	height	4.1	5.1	4.4	n/a	4.53	4.9	5.2	4.7	4.4	4.80	4.3	5.2	4.3	3.7	4.38	3.7	4.4	4.0	4.1	4.05
	spread	6.6	7.5	6.7	n/a	6.93	8.2	6.2	5.0	6.4	6.45	5.5	6.5	5.3	7.5	6.20	5.3	4.3	5.3	5.5	5.10
	vigor	2	3	3	n/a	2.67	3	4	4	4	3.75	4	3	4	5	4.00	5	4	3	4	4.00
	seed prod.	2	3	4	n/a	3.00	2	4	4	3	3.25	4	4	0	6	3.50	4	7	4	4	4.75
ND-1	height	3.3	3.6	2.5	2.9	3.08	3.9	3.6	3.8	3.0	3.58	0.4	3.1	n/a	n/a	1.75	n/a	n/a	n/a	n/a	0.00
	spread	5.8	3.7	2.0	1.9	3.35	6.5	5.7	6.0	4.7	5.73	0.4	2.7	n/a	n/a	1.55	n/a	n/a	n/a	n/a	0.00
	vigor	5	8	9	9	7.75	4	5	5	7	5.25	9	8	n/a	n/a	8.50	n/a	n/a	n/a	n/a	0.00
	seed prod.	6	9	0	0	3.75	5	5	5	8	5.75	0	0	n/a	n/a	0.00	n/a	n/a	n/a	n/a	0.00
IA-18	height	4.8	3.0	4.0	3.0	3.70	4.9	3.3	3.7	3.8	3.93	3.2	4.1	3.8	3.8	3.73	n/a	2.6	3.1	2.3	2.67
	spread	4.9	3.3	4.0	4.5	4.18	4.7	3.0	4.0	5.4	4.28	4.3	7.0	5.8	5.3	5.60	n/a	3.0	3.7	2.1	2.93
	vigor	6	7	6	5	6.00	4	6	5	4	4.75	5	5	4	4	4.50	n/a	8	8	8	8.00
	seed prod.	7	9	7	4	6.75	3	7	7	5	5.50	4	4	4	5	4.25	n/a	0	9	0	3.00
IA-19	height	4.0	5.5	4.3	dead	4.60	4.3	4.1	4.7	4.4	4.38	4.0	5.3	4.3	5.0	4.65	4.3	4.4	3.8	4.0	4.13
	spread	5.6	6.2	5.6	dead	5.80	6.3	5.4	5.5	5.1	5.58	4.4	6.6	5.2	5.2	5.35	4.8	6.7	4.6	5.0	5.28
	vigor	4	3	5	dead	4.00	4	4	3	4	3.75	5	2	3	3	3.25	6	5	5	5	5.25
	seed prod.	4	4	7	dead	5.00	5	4	3	5	4.25	8	3	2	3	4.00	6	5	6	0	4.25

Study ID Code: MOPMC-P-0003-PA,WL

Study Title - Evaluation and Release of Eastern Gamagrass, *Tripsacum dactyloides*, L.

Study Leader: Bruckerhoff, S. B.

Introduction:

Eastern gamagrass, *Tripsacum dactyloides* L., is a tall warm season perennial grass found from Florida to Texas and Mexico, north and west to Massachusetts, New York, Michigan, Illinois, Missouri, Iowa and Nebraska. Eastern gamagrass grows in large clumps with thick rhizomes, broad flat leaves, the staminate and pistillate flowers in separate parts of the same many-flowered spikes. The pistillate spikelets are solitary and occur in hollowed portions on opposite sides of the thickened hard joints of the lower part of the rachis; this pistillate portion breaks up at maturity into several one-seeded joints. The staminate spikelets are two-flowered and in pairs on one side of a continuous rachis. Eastern gamagrass occurs on prairies, open limestone slopes, borders of woods and thickets, fields, and along roadsides and railroads. Eastern gamagrass is considered by many to be the ice-cream grass of the prairie. It is high in forage production and quality.

Problem:

The variety most commonly used in the PMC service area is Pete and it performs well although its origin is Oklahoma and Kansas. This species is common in the PMC service area and a more adapted and improved variety should be able to be developed from native collections.

Objectives:

To evaluate and compare the variety Pete with the best accessions from PMC Study 29I107G and accessions developed at Woodward, Oklahoma.

Release an adapted variety and or varieties of eastern gamagrass for forage production and conservation uses in Missouri, Iowa, Illinois, Indiana and Ohio.

Cooperators:

Agriculture Research Service (ARS) Southern Plains Range Research Station, Woodward, Oklahoma.

Procedure:

Accessions selected from previous work (Study 29I107G) at the Elsberry PMC and the Southern Plains Range Research Station at Woodward, Oklahoma will be assembled in 2000. Plants will be started in the greenhouse and planted in a randomized complete block with four replications. Plot size is nine feet by 18 feet consisting of three rows of plants, six plants per row with three-foot spacing. The accessions will be tested for forage quality and production twice a year for three years.

Study MOPMC-P-0003-PA, WL Evaluation of Eastern Gamagrass																Table #2	
Yield Pounds/Acre		Density				1 Plant/9Sq. Ft.											
	Year 2001					Year 2002					Year 2003					3 Year	
Cultivar	Rep 1	Rep 2	Rep 3	Rep 4	Ave.	Rep 1	Rep 2	Rep 3	Rep 4	Ave.	Rep 1	Rep 2	Rep 3	Rep 4	Ave.	Ave.	
FTII	8478	9871	10140	8771	9315	6638	8598	7214	10948	8350	6538	7159	9236	7574	7627	8430	
9083214	4940	6643	12981	11871	9109	7105	7619	8038	11111	8468	7487	6716	6357	8477	7259	8279	
FTIV	6460	6590	7174	7600	6956	8915	7383	10206	9233	8934	5307	5704	8018	5926	6239	7376	
Pete	5894	7236	5866	7280	6569	5691	7932	8951	10927	8375	7011	5228	7244	7785	6817	7254	
FGT I	4617	2703	6488	4852	4665	5959	4918	6818	4455	5538	5607	5965	5511	3684	5192	5131	
9061924	5518	4498	7985	4259	5565	4869	4674	7102	5023	5417	4324	4017	5745	3169	4314	5099	
9061911	4363	4561	5229	4928	4770	5048	6615	5000	5613	5569	3969	4276	4302	3644	4048	4796	
FT94-8	48	0	5104	0	2576	0	0	0	0	0	0	0	0	0	0	859	
Weighted Crude Protein																	
	Year 2001					Year 2002					Year 2003					3 Year	
Cultivar	Rep 1	Rep 2	Rep 3	Rep 4	Ave.	Rep 1	Rep 2	Rep 3	Rep 4	Ave.	Rep 1	Rep 2	Rep 3	Rep 4	Ave.	Ave.	
9061911	9.80	11.03	12.45	11.43	11.18	13.12	11.90	14.91	11.48	12.85	13.62	13.02	15.26	14.69	14.15	12.73	
9061924	9.98	10.05	11.62	12.11	10.94	11.97	12.60	11.44	9.65	11.42	13.60	15.10	13.68	14.99	14.34	12.23	
FGT I	10.22	11.34	9.98	11.74	10.82	9.88	12.82	8.90	9.70	10.33	12.38	14.91	14.50	15.03	14.21	11.78	
FT 94-8	13.57		8.33		10.95											10.95	
9083214	9.84	9.92	10.04	10.84	10.16	8.27	7.85	9.66	8.80	8.645	13.42	14.80	13.56	11.99	13.44	10.75	
Pete	10.17	9.75	10.20	9.87	10.00	9.18	7.73	7.82	9.02	8.438	10.14	12.06	13.36	14.50	12.52	10.32	
FT IV	8.86	10.47	9.42	9.55	9.58	8.33	7.99	8.67	7.57	8.14	11.56	11.35	13.44	11.38	11.93	9.88	
FT II	9.59	9.34	8.14	10.00	9.27	9.58	6.04	8.43	7.82	7.968	11.46	10.61	14.09	12.91	12.27	9.83	

Discussion:

2000

Plants arrived from Oklahoma in May and the study was planted in Field #9, pipeline D and E, June 28, 2000 and July 12, 2000. The plants from Elsberry were not as old so they were allowed to catch up. Plot map can be seen in Table #1.

2001

The plants established well in 2000 and only a few border row plants were replaced in 2001. Evaluations were taken on the interior four plants of each plot. Three forage harvests were taken during 2001 to compare yield and quality. Samples were sent to Woodward, Oklahoma for analysis. Evaluations will continue for three years.

2002

Forage harvests were taken twice in 2002 instead of three times as in 2001 because of the extremely dry summer. The first harvest was June 21, 2002 and the second harvest was delayed until August 6, 2002. These samples were sent to Woodward, Oklahoma for analysis. Evaluations will continue through 2003.

2003/2004

Forage harvests were made three times in 2003; June 19, July 30, and September 24. These samples were again sent to Woodward, Oklahoma for quality analysis. Forage yield and quality data for all three years can be seen in Table #2. The MOPMC accession 9083214 looked very good in comparison to the other accessions. This accession is a normal diploid plant. Seed production for this accession was again very low in 2004 and tested poorly for seed quality.

The Oklahoma accession FTII is a fertile triploid that has compared highly in evaluations at other PMC's also and is scheduled for release in 2005.

2005

The Oklahoma accession FTII, a fertile triploid, was given the name Verl and cooperatively released in 2005. This was a cooperative release with the ARS research station at Woodward, Oklahoma, being the prime agency and several NRCS Plant Materials Centers being secondary, which included Elsberry.

The MOPMC accession 9083214 produced poor quality seed in 2005 and the increase plot will be managed for seed production again in 2006.

2006

The release of 'Verl' eastern gamagrass gives our service area another cultivar for consideration. Verl has been planted as far North in our service area as Cedar Falls, Iowa and has survived and thrived under no pressure. The PMC will put the development of other Eastern gamagrass selections on hold at this time.

MOPMC-P-0003-PA,WL

Table #1

Elsberry PMC Field #9

Pipeline D and E

Rep 4		9061911	FTIV	FTII	9083214		
		FT94-8	9061924	FTG1	Pete	X	X
Rep 3		FTII	9061911	Pete	FTIV	P E	F T
		FTG1	9083214	FO94-8	9061924	T E	I I
Rep 2		Pete	FTIV	FTII	FT94-8	X X X	X X X
		9083214	9061924	9061911	FTG1	X 6	X F
Rep 1		9061911+C34	FT94-8 \1	FTIV \1	9061924	1 9 2	T G 1
		FTII	Pete	9083214	FTG1	4 X	 X

\2 \2

Plot Size: 9' x 18'

Planted 6/28/00, 7/12/00

3 rows of plants	X X X X X X
6 plants per row	X X X X X X
3 foot spacing	X X X X X X

\1 Southeast plant in plot was substituted with Pete because proper accession was not available.

\2 Above plots consisted of ten plants each for seed production information.

FTIV – Fertile Triploid OK accession	9061911 – Diploid MO accession
FT II – Fertile Triploid OK accession	9061924 – Diploid MO (North) accession
FGT I – Fertile Gynomonecious Triploid OK accn.	9083214 – Diploid Cross MO accession
FT 94-8 Fertile Triploid OK accession	'Pete' varietal release (Check)

Study ID Code: MOPMC-T-0105, PA

Study Title – Compatibility Study Using Native Warm Season and Cool Season Grasses with Native Legumes and Forbs

Study Leader: Bruckerhoff, S. B.

Introduction:

Herbaceous plantings using native species are often a single grass species or a mixture of grasses with few legumes or forbs. These types of plantings are typical for forage, conservation cover or even wildlife plantings. Many native forbs and legumes are compatible with native grass species in a native prairie. In a planting using native species it is important to know which ones are most likely to compete with the grasses during the establishment period. Forb and legume seed are more expensive than the grass seed and most plantings lack diversity.

Problem:

There is little to no documented information regarding the compatibility of native warm and cool season grasses with native legumes and forbs in a pasture or range seeding. As a result of the lack of this needed information, the PMC Advisory Committee has directed the PMC to initiate this study.

Objective:

The objective of this study is to determine which native forbs and legumes will establish the easiest and persist the longest with specific native grasses.

Procedure:

Secure seed of the following native cool and warm season grasses, forbs, and legumes.

- **Cool Season Grasses:** Virginia wildrye, Western wheatgrass, Junegrass, and Porcupinegrass.
- **Warm Season Grasses:** Eastern gamagrass, Little bluestem, Big bluestem, Indiangrass, and Switchgrass.
- **Forbs:** Oxeye daisy, Prairie coreopsis, and Grayhead coneflower.
- **Legumes:** Bush clover, Showy tick trefoil, Purple prairie clover, White prairie clover, Illinois bundleflower, Goat's rue, Wild senna, and Lead plant.

Plots of a native warm season grass mixture, native cool season grass mixture and warm and cool season grass mixture will be established in four replications. Native legumes and forb mixtures will be planted with the grass mixtures. Plots will be planted in the spring and also as winter dormant plantings. All species will also be planted at the same time in the spring and winter except one warm and cool season grass mixture.

Plots will be mowed for weed control during the establishment year. The forage will be removed two to three times a year from half the plot the following years to assimilate rotational grazing.

Discussion:

2001

A site was prepared on the PMC using glyphosate to kill existing vegetation that consisted of mostly annual weedy species. The area was then plowed, disked and planted to an annual covercrop of 80% oats and 20% wheat. Plot composition of species can be seen in Table #1. Seeding rates are 40 pure live seed per square foot with 60% being the grass component and 40% being the forb and legume component.

2002

The winter dormant plots were planted January 8 and 9, 2002 using a plot planter. Seeding depth was one fourth inch for all species except the eastern gamagrass which was planted three fourths to one inch deep. The spring plots were planted May 20 and 21. All seed was planted at a depth of one fourth to one half inch with the exception of eastern gamagrass which again was planted at a depth of three fourths to one inch. All species that required treatment were stratified and/or scarified and inoculated. The plot map of the winter dormant planting is Table #2 and the spring planting is Table #3.

Mowing throughout the summer was the weed control method used. The plots were mowed when vegetation reached six to eight inches. Mowing height was three to four inches.

All plots were evaluated toward the end of the growing season for species composition. Most of the grasses were represented in the plots but in very low densities. Only sideoats gramma and Virginia wildrye appeared in plots in densities in the moderate range. The only legumes/forbs that were identified even at low densities were winter dormant planting Illinois bundleflower, grayhead coneflower, and prairie coreopsis. Spring planting was Illinois bundleflower and wild senna.

2003/2004

The plots were evaluated for specie density during 2003 and 2004 (see Tables 4 and 5). A winter burn was conducted on all plots in early 2004.

Most species that were planted were identified in the plots although some in very low densities. The specie in the legume/forb mixture showing up in the highest concentration is grayhead coneflower. Others most consistently found were showy tick trefoil, oxeye daisy, Illinois bundleflower(spring seeding only), and purple prairie clover (spring seeding only).

Most of the grass components of the plots established well but were not very thick stands. The sideoats gramma was high density and the plots with western wheatgrass, Junegrass, and porcupine grass were very poor or none at all.

2005/2006

The plots were again evaluated in 2005 and 2006 (see Tables 4 and 5). The only maintenance to the plots during this period was a burn in March of 2005.

Most of the species planted could be found in the 2006 evaluation although most of the legumes and forbs were in very low densities. Evaluations were visual estimates on a one to nine scale with plants to square feet estimates on the scale. The 2006 evaluation was done by the visual estimate method and also actual counts of three, random one square foot samples per plot. The table below is actual counts. In comparing the evaluation methods it showed the visual estimates

somewhat under estimated the grass species, especially when the densities were high; and over estimated some of the very low densities. Visual estimates were above zero when a few scattered plants could be seen in a plot, but when only three actual counts of one square foot each were made, several had counts of zero.

Species density (stems/sq ft) five years after planting (planted 2002, density at end of 2006)

Winter Dormant Seeding (1/8/2002)				Spring Planting (5/26/2002)			
Grasses	St/sq ft	Legumes	St/sq ft	Grasses	St/sq ft	Legumes	St/sqft
Eastern gamagrass (Plot #8)	13.3	Grayheaded coneflower	2.575	Switchgrass (Plot #4)	24.2	Grayheaded coneflower	1.338
Virginia wildrye (Plot #6)	8.6	Oxeye false sunflower	0.250	Siedoats grama	18.2	Bush clover	0.325
Switchgrass (Plot #1)	7.3	Wild senna	0.113	Virginia wildrye (Plot #1)	15.1	Desmodium Showy tick trefoil	0.275
Eastern gamagrass (Plot #3)	5.8	Desmodium	0.100	Switchgrass (Plot #11)	13.4	Oxeye false sunflower	0.125
Indiangrass	5.5	Illinois bundleflower	0.013	Indiangrass	11.7	Purple prairie clover	0.113
Virginia wildrye (Plot #5)	5.0	Bush clover	0.013	Eastern gamagrass (Plot #3)	11.2	Illinois bundleflower	0.050
Little bluestem	3.9	Purple prairie clover	0	Eastern gamagrass (Plot #8)	8.3	White prairie clover	0
Switchgrass (Plot #4)	2.7	White prairie clover	0	Virginia wildrye (Plot #5)	2.1	Goat's rue	0
Sideoats grama	2.3	Goat's rue	0	Big bluestem	1.4	Lead plant	0
Big bluestem	0.3	Lead plant	0	Little bluestem	0	Prairie coreopsis	0
Western wheatgrass	0	Prairie coreopsis	0	Western wheatgrass	0	Wild senna	0 not planted
Porcupine grass	0			Porcupine grass	0		
Junegrass	0			Junegrass	0		
Total stems/sq ft In 8 plots	54.7		3.064		105.6		2.226

Total stem counts for grass species were higher in the spring planting than the winter dormant planting with 105.6 compared to 54.7. Total stem counts of the forb legume mix were higher in the winter dormant planting with 3.064 compared to 2.226 even though the seed was stratified.

Study MOPMC-PA-0105 Compatibility Study										Table #1						
										8/16/01						
Spring planting Randomized complete block 4 Replications																
Winter dormant planting Randomized complete block 4 Replications \1																
Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7		Plot 8		Plot 9
BB , SG	8'	LB , SO	8'	EG		T , SG		VW , IG		VW , WW		JG , PG		EG		Check
Legume		Legume		Legume		Legume		Legume		Legume		Legume				
Forb		Forb		Forb		Forb		Forb		Forb		Forb		Kura		
Mixture		Mixture		Mixture		Mixture		Mixture		Mixture		Mixture		clover		
WS grass components		CS grass components			Legume components			Forb components								
big bluestem (BB)		Virginia wildrye (VW)			bush clover			oxeye daisy								
little bluestem (LB)		western wheatgrass (WW)			purple prairie clover			grayhead coneflower								
switchgrass (SG)		junegrass (JG)			white prairie clover			prairie coreopsis								
sideoats gramma (SO)		porcupine grass (PG)			desmodium											
eastern gamagrass (EG)					goat's rue											
indiangrass (IG)		timothy (T)			wild senna											
					Illinois bundleflower											
					lead plant											
Fall planted oats covercrop on winter dormancy plantings																
plot size 10' X 20'					Kura clover											
\1 This plot will not have a winter dormant planting but rather a late summer planting.																

STUDY MOPMC-T-0105 Native Grass/Legume/Forb Compatibility Study										Field #1		Table #2					
										Eastside							
										Dormant planting							
												North					
										← Terrace →							
REP #1	1	2	3	4	5	9	7	8	← Terrace →								
REP #2	4	7	9	1	6	8	3	2	Rep 1	Rep 2	Rep 3	Rep 4					
REP #3	6	1	4	2	9	3	8	5	2	4	5	9	8	1	6	3	Rep 4
										← Roadway →							
Plot #1	Big bluestem, switchgrass, Legume and Forb Mixture																
Plot #2	Little bluestem, sideoats gramma, Legume and Forb Mixture																
Plot #3	Eastern gamagrass, Legume and Forb Mixture																
Plot #4	Timothy, switchgrass, Legume and Forb Mixture																
Plot #5	Virginia wildrye, Indiangrass, Legume and Forb Mixture																
Plot #6	Virginia wildrye, western wheatgrass, Legume and Forb Mixture																
Plot #7	Junegrass, porcupine grass, Legume and Forb Mixture																
Plot #8	Eastern gamagrass, Kura clover																
Plot #9	Check Legume Mixture Only																

STUDY MOPMC-T-0105 Native Grass/Legume/Forb Compatibility Study										Field #1		Table #3							
										West side									
										spring planting									
										planted 5/20-21/02									
												North							
← Terrace →												↓							
REP #2	7	3	8	1	6	9	4	5	2	4	7	3	8	6	1	5	9	2	REP #4
REP #1	1	7	9	1	6	8	3	2	9	3	8	1	6	4	9	2	5	7	REP #3
← Roadway →																			
Plot #1	Big bluestem, switchgrass, Legume and Forb Mixture																		
Plot #2	Little bluestem, sideoats gramma, Legume and Forb Mixture																		
Plot #3	Eastern gamagrass, Legume and Forb Mixture																		
Plot #4	Timothy, switchgrass, Legume and Forb Mixture																		
Plot #5	Virginia wildrye, Indiangrass, Legume and Forb Mixture																		
Plot #6	Virginia wildrye, western wheatgrass, Legume and Forb Mixture																		
Plot #7	Junegrass, porcupine grass, Legume and Forb Mixture																		
Plot #8	Eastern gamagrass, Kura clover																		
Plot #9	Check Legume Mixture Only																		

Study MOPMC-PA-0105 Compatability Study																	Table #4			
																	planted 1/8/02			
Winter Planted Plots					Stems/square ft per plot															
Plot #1					Plot #2				Plot #3				Plot #4				Plot #5			
2003	2004	2005	2006		2003	2004	2005	2006	2003	2004	2005	2006	2003	2004	2005	2006	2003	2004	2005	2006
WS grass components																				
big bluestem (BB)	0.75	1.25	3.00	0.30			0.10										0.13			
little bluestem (LB)					0.50	0.38	0.40	3.90												
switchgrass (SG)	1.75	1.75	6.80	7.30									0.50	0.50	0.90	2.70				
sideoats gramma (SO)					1.00	0.38	2.20	2.30												
eastern gamagrass (EG)									3.00	2.25	9.50	5.80								
indiangrass (IG)							0.10										1.75	1.00	9.40	5.50
CS grass components																				
Virginia wildrye (VW)																	0.50	1.75	1.60	5.00
western wheatgrass (WW)																				
junegrass (JG)																				
porcupine grass (PG)																				
timothy (T)													0.25	1.75						
Legume components																				
bush clover	0.13	0.13	0.10	0.00	0.13	0.25	0.10		0.13	0.25	0.30			0.13	0.10			0.50	0.10	
purple prairie clover	0.13								0.13											
white prairie clover																				
desmodium	0.38	0.38	0.10	0.00	0.25	0.50	0.10		0.25	0.50	0.10	0.20	0.13	0.13	0.10		0.13	0.38	0.10	
goat's rue																				
wild senna	0.38	0.25	0.10	0.10	0.38	0.50	0.10		0.38	0.50	0.10		0.25	0.50	0.10	0.10	0.25	0.38	0.10	
Illinois bundleflower								0.10					0.13					0.13		
lead plant																				
kura clover																				
Forb components																				
oxeye daisy	0.50	0.50	0.20	0.10	0.50	0.50	0.30	0.10	0.50	0.50	0.20	0.20	0.50	0.50	0.20	0.30	0.50	0.50	0.10	
grayhead coneflower	0.50	2.00	2.00	0.30	0.50	2.00	4.00	0.60	0.50	2.50	3.80	1.90	0.50	2.00	0.50	4.50	0.50	2.25	2.40	1.40
prairie coreopsis	0.13					0.50				0.13				0.25				0.25		
2003, 2004, 2005 estimated on 1-9 scale																				
2006 actual plant count - 3 counts/plot were averaged																				

Study MOPMC-PA-0105 Compatability Study														Table #4			
continued														planted 1/8/02			
Stems/square ft per plot																	
Plot #6					Plot #7				Plot #8				Plot #9				
2003	2004	2005	2006		2003	2004	2005	2006		2003	2004	2005	2006	2003	2004	2005	2006
WS grass components																	
big bluestem (BB)	0.25		0.10		0.13									0.25			
little bluestem (LB)			0.10											0.13		0.10	
switchgrass (SG)			0.10		1.25												
sideoats gramma (SO)																	
eastern gamagrass (EG)										3.50	6.75	18.00	13.30				
indiangrass (IG)			0.10							0.13				0.25		0.10	
CS grass components																	
Virginia wildrye (VW)	0.50	0.50	1.70	8.60													
western wheatgrass (WW)			0.10														
junegrass (JG)																	
porcupine grass (PG)																	
timothy (T)																	
Legume components																	
bush clover	0.25	0.50	0.10		0.25	0.25	0.10							0.13	0.13	0.10	0.10
purple prairie clover																0.10	
white prairie clover																	
desmodium	0.38	0.38	0.10	0.60	0.25	0.50	0.10							0.38	0.50	0.10	
goat's rue	0.13				0.25	0.13									0.25		
wild senna	0.25	0.38	0.20	0.30	0.25	0.38	0.10							0.38	0.13	0.10	0.40
Illinois bundleflower														0.13			
lead plant					0.13									0.13			
kura clover											0.25						
Forb components																	
oxeye daisy	0.50	0.50	0.30	0.70	0.38	0.50	0.20	0.60	0.13					0.50	0.50	0.30	
grayhead coneflower	0.50	2.75	5.00	3.60		2.25	4.00	1.90						0.50	3.00	4.00	6.40
prairie coreopsis	0.13	0.25			0.38	0.25									0.38		

Study MOPMC-PA-0105 Compatability Study																Table #5									
																planted 5/20/02									
Spring planted plots								Stems/square ft per plot																	
Plot #1					Plot #2				Plot #3				Plot #4				Plot #5								
2003	2004	2005	2006		2003	2004	2005	2006		2003	2004	2005	2006		2003	2004	2005	2006		2003	2004	2005	2006		
WS grass components																									
big bluestem (BB)	0.50	1.25	3.30	1.40				0.10																	
little bluestem (LB)					0.75	0.38	0.50																		
switchgrass (SG)	4.25	6.00	12.40	13.40			0.10							5.75	20.63	26.30	24.20								
sideoats gramma (SO)					30.00	26.25	30.00	18.20																	
eastern gamagrass (EG)										1.75	6.38	24.40	11.20												
indiangrass (IG)							0.10													2.75	5.00	15.00	11.70		
CS grass components																									
Virginia wildrye (VW)																				0.75	4.75	3.30	2.10		
western wheatgrass (WW)																									
junegrass (JG)																									
porcupine grass (PG)																									
timothy (T)																									
Legume components																									
bush clover	0.13	0.50	0.20	0.30	0.50	0.38	0.50	0.60		0.38	0.70	0.40		0.38	0.40				0.13	0.38	0.30	0.30			
purple prairie clover	0.38	0.50	0.10		0.50	0.50	0.40	0.30	0.38	0.50	0.20	0.50	0.25	0.50	0.10				0.38	0.50	0.20				
white prairie clover		0.13				0.25	0.10			0.38				0.50						0.13	0.10				
desmodium	0.38	0.50	0.10	0.10	0.38	0.50	0.20	0.30	0.50	0.50	0.20		0.38	0.50					0.38	0.50	0.30	0.80			
goat's rue		0.38			0.13	0.25				0.50				0.38					0.00	0.25					
wild senna																			0.13						
Illinois bundleflower	0.38	0.50		0.10	0.25	0.25	0.10		0.38	0.38			0.50	0.50					0.38	0.38					
lead plant	0.38				0.38				0.13				0.13						0.25						
kura clover																									
Forb components																									
oxeye daisy	0.50	0.50	0.10	0.50	0.50	0.50	0.10		0.38	0.50	0.20		0.50	0.50	0.20				0.50	0.50	0.20				
grayhead coneflower	0.50	1.00	0.30	0.60	0.38	0.50		0.70	0.38	0.50	0.80	0.50	0.38	0.75	1.10	1.10			0.38	0.75	0.80				
prairie coreopsis							1.10														0.13				

Study MOPMC-PA-0105 Compatability Study																
continued																
Spring planted plots								Stems/square ft per plot								
Plot #6				Plot #7				Plot #8				Plot #9				
2003	2004	2005	2006	2003	2004	2005	2006	2003	2004	2005	2006	2003	2004	2005	2006	
WS grass components																
big bluestem (BB)																
little bluestem (LB)																
switchgrass (SG)																
sideoats gramma (SO)																
eastern gamagrass (EG)																
indiangrass (IG)																
CS grass components																
Virginia wildrye (VW)																
western wheatgrass (WW)																
junegrass (JG)																
porcupine grass (PG)																
timothy (T)																
Legume components																
bush clover																
purple prairie clover																
white prairie clover																
desmodium																
goat's rue																
wild senna																
Illinois bundleflower																
lead plant																
kura clover																
Forb components																
oxeye daisy																
grayhead coneflower																
prairie coreopsis																

Study ID Code: MOPMC-T-0106, BU

Study Title: Collection and Evaluation of Native Cool Season Grasses and Sedges for Filter Strips

Study Leader: Cordsiemon, R.

Description:

A need has developed out of a three-state technical review committee and approved by the State Conservationists Advisory Committee to evaluate different native cool season grasses and sedges for filter strips.

Grasses and sedges to be considered are Virginia wildrye, *Elymus canadensis*; Canada wildrye, *Elymus canadensis*; Junegrass, *Koeleria cristata*; bluejoint, *Calamagrostis canadensis*; sweet woodreed, *Cinna arundinacea*; river oats, *Uniola latifolia*; longhair sedge, *Carex cosmosa*; Frank sedge, *Carex frankii*; shoreline sedge, *Carex hyalinolepis*; wheat sedge, *Carex atherodes*; raven's foot sedge, *Carex crus-corvi* Shuttlew.; short sedge, *Carex shortina*; hop sedge, *Carex lupulina* Muhl.; crested sedge, *Carex cristatella* Britton; bristle bract sedge, *Carex tribuloides*; and greater straw sedge, *Carex normalis*.

Objective:

There is little to no documented information regarding native cool season grasses and sedges being used in filter strip situations. In an attempt to respond to this lack of information, the PMC has been directed to initiate this study. Depending upon the performance of selected native cool season grasses and sedges in filter strip situations, previous recommendations may change to include those native cool season grasses and sedges performing excellently in this situation.

Discussion:

2001

The study plan for this study was initiated and approved by the State Conservationists' Advisory Committee in August of 2001. Selected field offices in the PMC service area will be contacted in the spring of 2002 requesting their participation in this collection, however everyone is welcomed to participate. One to three collections per state per species are being requested, both seeds and plants. The plants will be grown in the PMC greenhouse and later transplanted in randomized complete blocks. Each block will be one foot wide and five feet long with approximately 30 plants per plot. The spacing of the plants in the blocks will be six inches x six inches.

2002-2003

Collections of native sedges and cool season grasses began on July 2, 2002. The following chart reflects a listing of the collections made as of the time this report was developed. The collection period was extended one more year to make collections of those species that have not been made or those species needing more collections. Fourteen additional collections were made in the state of Missouri and eleven were made in Iowa during 2003. Samples of seed from each different species were planted in the greenhouse to determine the germination percentage. The results will be documented in

the 2004 Annual Technical Report. Field #10 on the PMC has been selected as the site for this study because of the access to water. Two collections of river oats were planted (vegetatively) on September 9, 2002. Both collections were performing with fair to good vigor.

2004

The planting site for this project was changed from Field #10 to Field #7. There is still available water and space. There were two separate wetland cells constructed by using a landscaper in order to simulate a wetland environment. The wetland cells measure 20 feet x 200 feet and are made up of several different individual blocks. The blocks themselves measure 5 feet x 20 feet (refer to Table #2 for map). Collections that did well in the greenhouse were stepped up in plug containers. They were planted in Field #7 on May 3 and were evaluated for percent stand, percent cover, lodging, and survival in late June (refer to Table #3). The west cell contains 17 blocks that include 100 plants per block of a particular species. The east cell contains 27 different collections consolidated into 11 different blocks. These collections were added together because they did not contain 100 plants. All blocks were planted on one foot by one foot spacing. Each collection will be evaluated three times in 2005, (late winter, summer, and fall) for percent stand and cover, lodging, and survival. The cells will be kept fairly damp throughout the growing season and will be treated with a pre-emergent grass herbicide in the sedge plots to help control annual grasses.

2005

Two evaluations were completed (refer to Table # 5) in 2005. Six species were selected based on evaluations for increase plantings. The species selected for increase are larger straw sedge (*Carex normalis*), Crested Sedge (*Carex cristella*), Fox Sedge (*Carex vulpinoidea*), Crowfoot Sedge (*Carex crus-corvi*), Franks Sedge (*Carex frankii*), and Green Bulrush (*Scirpus atrovirens*). The increase plantings are scheduled for January 2006.

2006

On February 15, 2006 the six selected species were planted into production blocks. The blocks were 0.25 acre in size. The plots were planted to cereal rye the season prior to planting and mowed in the fall, plowed in January 2005, disked and rolled prior to planting. Plots were planted in 8" rows with the plot planter on the surface to 1/4" deep. All six species (larger straw sedge (*Carex normalis*), Crested Sedge (*Carex cristella*), Fox Sedge (*Carex vulpinoidea*), Crowfoot Sedge (*Carex crus-corvi*), Franks Sedge (*Carex frankii*), and Green Bulrush (*Scirpus atrovirens*)) were planted at an estimated rate of 40 pure live seed per square foot. See figure 1 for production plantings in field 7A. Plots were sprayed with both Poast (grass herbicide) and 2,4-D (broadleaf herbicide). When the plots were sprayed no sedges were present, weed competition was extreme with white clover dominating the plots. The plots were evaluated several times throughout the growing season, but the selected sedges were not observed. Plans are to replant the same plots with the same species at a later date (April) in 2007. The selected species will be put in the germinator to check germination percent.

Table #1

**Study MOPMC-T-0106, BU - Collection and Evaluation of Native Cool Season
Grasses and Sedges for Filter Strips**

Scientific Name	Common Name	Collector	City, State	Temp. Acc. No
<i>Carex crus-corvi</i>	Ravens foot sedge	Dennis Shirk	Vienna, MO	MO-1
<i>Carex grayii</i>	Gray sedge	Dennis Shirk	Vienna, MO	MO-2
<i>Carex atherodes</i>	Slough Sedge	Dennis Shirk	Vienna, MO	MO-3
<i>Carex vulpinoidea</i> Michx.	Fox sedge	Dennis Shirk	Vienna, MO	MO-4
<i>Carex vulpinoidea</i> Michx.	Fox sedge	Kaiser & Henry	Elsberry, MO	MO-5
<i>Carex hyalinolepis</i> Steud.	Thinscale scale	Kaiser & Henry	Elsberry, MO	MO-6
<i>Carex crus-corvi</i> Shuttlew	Crowfoot sedge	Kaiser & Henry	Elsberry, MO	MO-7
<i>Carex hyalinolepis</i> Steud.	Thinscale sedge	Paul Freese	Albany, MO	MO-8
<i>Carex vulpinoidea</i> Michx	Fox sedge	Kaiser & Henry	Elsberry, MO	MO-9
<i>Scirpus atrovirens</i>	Green bulrush	Kaiser & Henry	Elsberry, MO	MO-10
<i>Scirpus atrovirens</i>	Green bulrush	Kaiser & Henry	Elsberry, MO	MO-11
<i>Carex frankii</i> Kunth.	Franks sedge	Paul Freese	Albany, MO	MO-12
<i>Carex lupulina</i> Muhl.	Hop sedge	Raleigh Redman	Warrensburg, MO	MO-13
<i>Carex grayii</i>	Gray's sedge	Raleigh Redman	Warrensburg, MO	MO-14
<i>Carex hyalinolepis</i> Steud.	Thinscale sedged.	Raleigh Redman	Warrensburg, MO	MO-15
<i>Carex frankii</i> Kunth	Frank's sedge	Lingwall & Ellis	Ralls Co., MO	MO-17
<i>Carex crus-corvi</i>	Crowfoot sedge	Lingwall & Ellis	Ralls Co., MO	MO-18
<i>Carex hyalinolepis</i> Stued.	Thinscale sedge	Lingwall & Ellis	Ralls Co., MO	MO-19
<i>Carex frankii</i> Kunth	Frank's sedge	Raleigh Redman	Warrensburg, MO	MO-20
<i>Chasmanthium latifolium</i>	River oats	J. Kaiser	Troy, MO	MO-21

Table # 1-Study MOPMC-T-0106, BU - cont.

Scientific Name	Common Name	Collector	City, State	Temp. Acc. No
<i>Chasmanthium latifolium</i>	River oats	Travis Dinsdale	Springfield, MO	MO-22
<i>Chasmanthium latifolium</i>	River oats	Rodney Doolen	Puxico, MO	MO-23
<i>Chasmanthium latifolium</i>	River oats	J. Kaiser	Troy, MO	MO-24
<i>Chasmanthium Latifolium</i>	River oats	William Brouk	Benton, MO	MO-25
<i>Carex crus-corvi Shuttlew</i>	Ravensfoot sedge	J. Kaiser J. Henry	BK Leach Wildlife Area	MO-26
<i>Carex shartina</i>	Short sedge	J. Kaiser J. Henry	BK Leach Wildlife Area	MO-27
<i>Carex</i>	Shoreline sedge	J. Kaiser J. Henry	BK Leach Wildlife Area	MO-28
<i>Carex hyalinoepis</i>	Thinscale sedge	J. Kaiser J. Henry	BK Leach Wildlife Area	MO-29
<i>Carex vulpinoidea Michx.</i>	Fox sedge	J. Kaiser J. Henry	BK Leach Wildlife Area	MO-30
<i>Carex crus-corvi Shuttlew</i>	Ravensfoot sedge	J. Kaiser J. Henry	BK Leach Wildlife Area	MO-31
<i>Carex vulpinoides Michx</i>	Fox sedge	J. Kaiser J. Henry	BK Leach Wildlife Area	MO-32
<i>Scirpus atrovirens</i>	Green bulrush	Aaron Jeffries	Howard Co, MO	MO-33
<i>Carex frankii</i>	Frank's sedge	Aaron Jeffries	Howard Co, MO	MO-34
<i>Carex lupulina</i>	Hop sedge	Aaron Jeffries	Howard Co, MO	MO-35
<i>Carex shortina</i>	Short sedge	Aaron Jeffries	Howard Co, MO	MO-36
<i>Scirpus acutus</i>	Hard-stemmed bulrush	Aaron Jeffries	Howard Co, MO	MO-37
<i>Scirpus atrovirens</i>	Green bulrush	Paul Frese	Gentry Co, MO	MO-38
<i>Chasmanthium latifolium</i>	River oats	Travis Dinsdale	Webster Co, MO	MO-39
<i>Carex hyalinoepis Steud.</i>	Thinscale sedge	Dave Hiatt	Martinsville, IL	IL-1

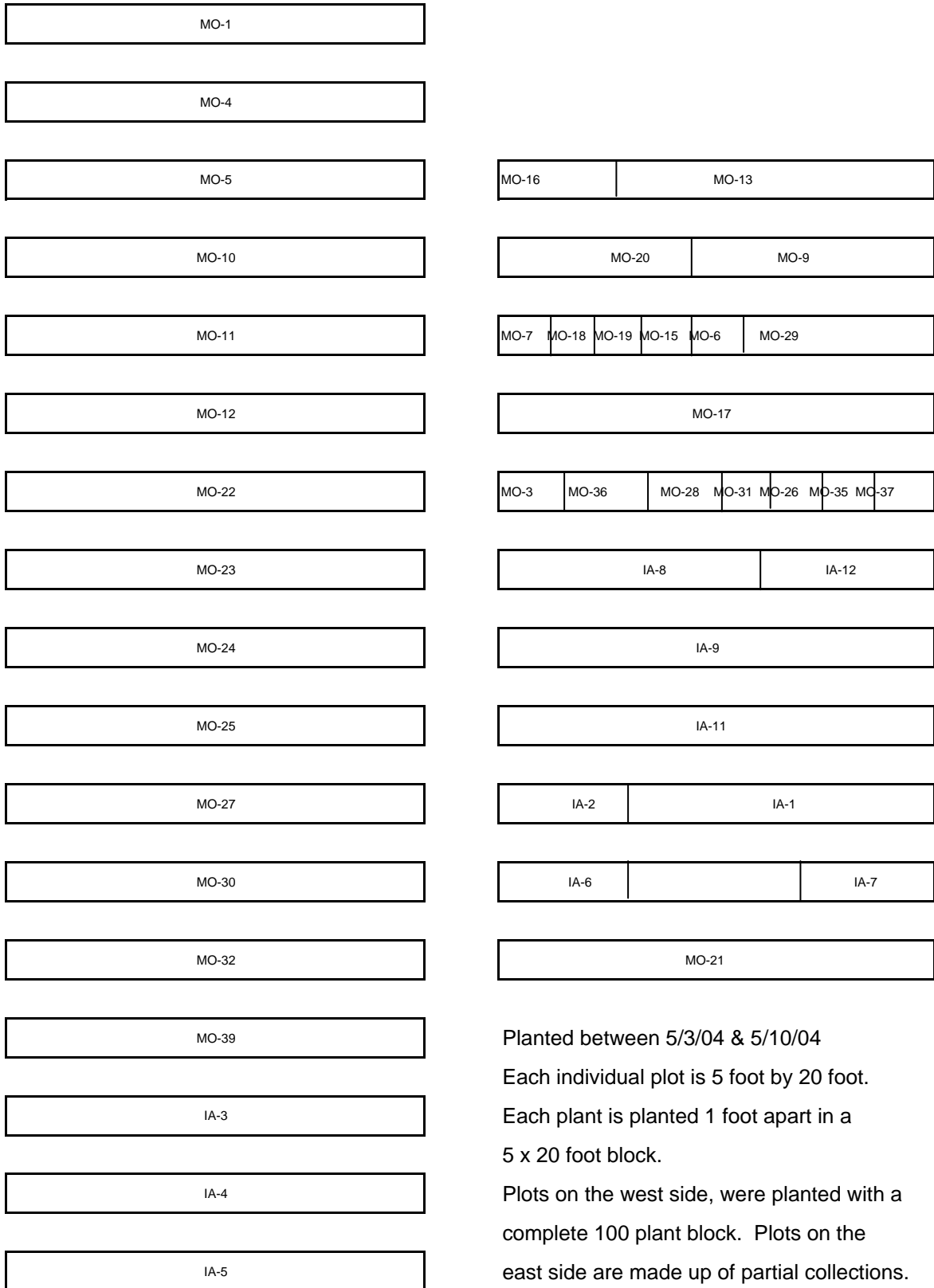
Table 1-Study MOPMC-T-0106, BU - cont.

Scientific Name	Common Name	Collector	City, State	Temp. Acc. No
<i>Carex lupulina</i> Muhl.	Hop sedge	Christine Talige	Fairfield, IA	IA-1
<i>Carex cristatella</i> Britton	Crested sedge	Tim Meyer	Williamsburg, IA	IA-2
<i>Carex cristatella</i> Britton	Crested sedge	Tim Meyer	Williamsburg, IA	IA-3
<i>Carex vulpineidea</i>	Fox sedge	Tim Meyer	Williamsburg, IA	IA-4
<i>Scirpus atrovirens</i>	Green bulrush	Tim Meyer	Williamsburg, IA	IA-5
<i>Juncus interior</i> Weigand	Inland rush	Tim Meyer	Williamsburg, IA	IA-6
<i>Calamagrostis Canadensis</i>	Bluejoint	Tim Meyer	Williamsburg, IA	IA-7
<i>Scirpus atrovirens</i>	Green bulrush	Tim Meyer	Williamsburg, IA	IA-8
<i>Carex normalis</i>	Larger straw sedge	Tom Hurford	Atlantic, IA	IA-9
<i>Carex tribuloides</i>	Bristle bract sedge	Tom Hurford	Atlantic, IA	IA-10
<i>Carex normalis</i>	Larger straw sedge	Tom Hurford	Atlantic, IA	IA-11
<i>Scirpus atrovirens</i>	Green bulrush	Tom Hurford	Atlantic, IA	IA-12

Sedge, Rush, and Cool Season Grass Plot - Field #7

Table #2

North



Planted between 5/3/04 & 5/10/04
 Each individual plot is 5 foot by 20 foot.
 Each plant is planted 1 foot apart in a 5 x 20 foot block.
 Plots on the west side, were planted with a complete 100 plant block. Plots on the east side are made up of partial collections.

Study ID Code: MOPMC-T-0106, BU			Table #3
Collection and Evaluation of Native Cool Season Grasses and Sedges for Filter Strips			
MISSOURI COLLECTIONS			
Collection	Common Name	Scientific Name	# of Plants
MO-1	Crowfoot Sedge	Carex crus-corvi	100 Plants
MO-3	Slough Sedge	Carex obnupta	7 plants
MO-4	Fox Sedge	Carex vulpinoidea	100 Plants
MO-5	Fox Sedge	Carex vulpinoidea	100 Plants
MO-6	Thinscale Sedge	Carex hyalinolepis	8 Plants
MO-7	Crowfoot Sedge	Carex crus-corvi	47 Plants
MO-9	Franks Sedge	Carex frankii	45 Plants
MO-10	Green Bulrush	Scirpus atrovirens	100 Plants
MO-11	Green Bulrush	Scirpus atrovirens	100 Plants
MO-12	Franks Sedge	Carex frankii	100 Plants
MO-13	Hop Sedge	Carex lupulina	25 Plants
MO-15	Thinscale Sedge	Carex hyalinolepis	3 Plants
MO-16	Franks Sedge	Carex frankii	75 Plants
MO-17	Franks Sedge	Carex frankii	76 Plants
MO-18	Crowfoot Sedge	Carex crus-corvi	11 Plants
MO-19	Thinscale Sedge	Carex hyalinolepis	3 Plants
MO-20	Franks Sedge	Carex frankii	54 Plants
MO-21	River Oats	Chasmathium latifolium	76 Plants
MO-22	River Oats	Chasmathium latifolium	100 Plants
MO-23	River Oats	Chasmathium latifolium	100 Plants
MO-24	River Oats	Chasmathium latifolium	100 Plants
MO-25	River Oats	Chasmathium latifolium	100 Plants
MO-26	Crowfoot Sedge	Carex crus-corvi	6 Plants
MO-27	Bottlebrush Sedge	Carex comosa	100 Plants
MO-28	Thinscale Sedge	Carex hyalinolepis	9 Plants
MO-29	Thinscale Sedge	Carex hyalinolepis	13 Plants
MO-30	Fox Sedge	Carex vulpinoidea	100 Plants
MO-31	Crowfoot Sedge	Carex crus-corvi	11 Plants
MO-32	Fox Sedge	Carex vulpinoidea	100 Plants
MO-35	Hop Sedge	Carex lupulina	19 Plants
MO-36	Squarrose Sedge	Carex squarrosa	6 Plants
MO-37	Hard-stemmed Sedge	(hard-stemmed bulrush) Schoenoplectus acutus	18 Plants
MO-39	River Oats	Chasmathium latifolium	100 Plants

Table 3 - continued			
	<u>IOWA COLLECTIONS</u>		
<u>Collection</u>	<u>Common Name</u>	<u>Scientific name</u>	<u># of Plants</u>
IA-1	Hop Sedge	Carex lupulina	23 Plants
IA-2	Crested Sedge	Carex cristatella	52 Plants
IA-3	Crested Sedge	Carex cristatella	100 Plants
IA-4	Fox Sedge	Carex vulpinoidea	100 Plants
IA-5	Green Bulrush	Scirpus atrovirens	100 Plants
IA-6	Inland Rush	Juncus interior	17 Plants
IA-7	Bluejoint	Calamagrostis canadensis	23 Plants
IA-9	Larger Straw Sedge	Carex normalis	76 Plants
IA-8	Green Bulrush	Scirpus atrovirens	38 Plants
IA-11	Larger Straw Sedge	Carex normalis	76 Plants
IA-12	Green Bulrush	Scirpus atrovirens	60 Plants
Shoreline sedge is the same as thinscale sedge			
Crowfoot sedge is the same as ravenfoot sedge			

Collection and Evaluation of Native Cool Season Grasses and Sedges for Filter Strips

Sedge, Cool Season Grass, and Bulrush Evaluation

DATE: 6/22/04

Collection #	Name	Number of Plants	Percent Stand	Percent Cover	Lodging (1-9 Rating)	Notes
MO-1	Crowfoot Sedge	100	100	20	1	
MO-4	Fox Sedge	100	100	20	1	
MO-5	Fox Sedge	100	100	20	1	
MO-10	Green Bulrush	100	100	15	1	
MO-11	Green Bulrush	100	100	15	1	
MO-12	Franks Sedge	100	100	25	1	
MO-22	River Oats	100	80	5	1	
MO-23	River Oats	100	100	5	1	
MO-24	River Oats	100	95	5	1	
MO-25	River Oats	100	95	5	1	
MO-27	Bottlebrush Sedge	100	100	20	1	
MO-30	Fox Sedge	100	100	15	1	
MO-32	Fox Sedge	100	100	15	1	
MO-39	River Oats	100	80	5	1	
IA-3	Crested Sedge	100	100	30	1	
IA-4	Fox Sedge	100	100	15	1	
IA-5	Green Bulrush	100	100	20	1	
MO-13	Hop Sedge	25	100	25	1	
MO-16	Franks Sedge	75	100	25	1	
MO-9	Franks Sedge	45	100	25	1	
MO-20	Franks Sedge	54	100	20	1	
MO-29	Thinscale Sedge	13	100	15	1	
MO-6	Thinscale Sedge	8	100	20	1	
MO-15	Thinscale Sedge	3	66	15	1	
MO-19	Thinscale Sedge	3	33	15	1	
MO-18	Crowfoot Sedge	11	100	15	2	
MO-7	Crowfoot Sedge	47	100	20	2	
MO-17	Franks Sedge	76	100	10	1	
MO-37	Hard-stemmed Sedge	18	100	10	1	
MO-35	Hop Sedge	20	100	20	1	
MO-26	Crowfoot Sedge	6	100	10	2	
MO-31	Crowfoot Sedge	11	100	25	1	
MO-28	Thinscale Sedge	9	100	10	1	
MO-36	Squarrose Sedge	6	85	15	1	
MO-3	Slough Sedge	7	100	15	1	
IA-12	Green Bulrush	60	100	10	1	

Table #4 - continued

Collection #	Name	Number of Plants	Percent Stand	Percent Cover	Lodging (1-9 Rating)	Notes
IA-8	Green Bulrush	38	100	10	1	
IA-9	Larger Straw Sedge	76	100	20	1	
IA-11	Larger Straw Sedge	76	100	10	1	
IA-1	Hop Sedge	23	100	15	1	
IA-2	Crested Sedge	52	100	25	1	
IA-7	Bluejoint	21	92	15	1	
IA-6	Inland Rush	16	96	15	1	
MO-21	River Oats	76	95	5	1	

1-9 Rating 1 = No Lodging 9 = Severe Lodging

Study MOPMC-T-0106, BU - Collection and Evaluation of Native Cool Season Grasses and Sedges

Table #5

2005 Evaluation Averages For Each Species

Name	Collection #	% Stand	% Cover	Lodging	Vigor
Bluejoint	IA-7	62.5	47.5	4	6
Bottlebrush Sedge	MO-27	100	82.5	4	6
Crested Sedge	IA-2	100	54.5	5	1
Crested Sedge	IA-3	100	85	5.5	1
Crowfoot Sedge	MO-1	100	90	3	1
Crowfoot Sedge	MO-7	100	95	4.5	2
Crowfoot Sedge	MO-18	100	90	4	2
Crowfoot Sedge	MO-26	100	90	5	3
Crowfoot Sedge	MO-31	100	95	7	2
Fox Sedge	IA-4	100	72.5	4.5	3
Fox Sedge	MO-4	99	95	5	2
Fox Sedge	MO-5	100	87.5	5	2
Fox Sedge	MO-30	100	87.5	5.5	3
Fox Sedge	MO-32	100	80	4.5	4
Franks Sedge	MO-9	100	90	3	3
Franks Sedge	MO-12	100	85	2.5	1
Franks Sedge	MO-16	100	92.5	3	3
Franks Sedge	MO-17	98.5	75	3	5
Franks Sedge	MO-20	100	85	3	3
Green Bulrush	IA-5	100	57.5	4.5	4
Green Bulrush	IA-8	100	87.5	5	4
Green Bulrush	IA-12	100	72.5	4.5	4
Green Bulrush	MO-10	99.5	52.5	3	5
Green Bulrush	MO-11	100	50	3	6
Hop Sedge	IA-1	100	92.5	7	2
Hop Sedge	MO-13	100	85	2	3
Hop Sedge	MO-35	100	90	3	2
Inland Rush	IA-6	95		3.5	4
Larger Straw Sedge	IA-9	100	95	5.5	2
Larger Straw Sedge	IA-11	100	92.5	5	1
River Oats	MO-21				9
River Oats	MO-22	70	15	1	9
River Oats	MO-23	97	25	1	9
River Oats	MO-24	95	20	1	9
River Oats	MO-25	90	20	1	9
River Oats	MO-39	85	15	1	9
Slough Sedge	MO-3	100	62.5	3.5	5

Study MOPMC-T-0106, BU - Collection and Evaluation of Native Cool Season Grasses and Sedges

Table #5 - continued

2005 Evaluation Averages For Each Species

Name	Collection #	% Stand	% Cover	Lodging	Vigor
Squarrose Sedge	MO-36	100	50	5	5
Thinscale Sedge	MO-6	100	80	4.5	1
Thinscale Sedge	MO-15	100	75	2	2
Thinscale Sedge	MO-19	100	65	2	5
Thinscale Sedge	MO-28	100	70	2	4
Thinscale Sedge	MO-29	100	77.5	1.5	2

Lodging

1 = No Lodging Severe Lodging

Vigor

1= Highly Vigorous 9= Low Vigor

Study ID Code: MOPMC-T-0208-PA

Study Title: Testing Warm Season Grasses for Forage Quality

Study Leader: Bruckerhoff, S.

Description:

Warm season grass species have limited information available in regards to forage quality. Confidence exists in their forage production abilities in relation to beef production. Comparative information on forage quality throughout the growing season is often questioned with little available information to back it up.

Objective:

There is information in regards to forage quality of warm season species but usually it is for a specific variety and generally not throughout the growing season. The objective of this study is to make information available on forage quality throughout the growing season of selected warm season grass species. This information can be used to compare the quality of warm season grass species during the growing season and also at different vegetative stages.

Materials and Methods:

Commercially available cultivars/selections and accessions in advanced testing of a wide variety of warm season grasses will be assembled for testing. Plants of each accession will be started in the greenhouse from seed and transplanted into an evaluation nursery.

Species/cultivars/accessions to be tested

‘Rountree’ big bluestem	‘Rumsey’ Indiangrass
9078831 big bluestem	9083214 eastern gamagrass
‘Cave-In-Rock’ switchgrass	‘Pete’ eastern gamagrass
9062244 switchgrass	‘El Reno’ sideoats gramma
‘Aldous’ little bluestem	‘Osarka’ bermudagrass

The experimental design is a randomized complete block with four replications. The plants will be clipped. Original growth and regrowth dry matter will be analyzed for forage quality.

Testing times are as follows:

<u>Original Growth Material</u>	<u>Regrowth Material</u>
Mid-May	
Late-June	Mid May-late June taken late June
Mid-August	Late June-Mid Aug taken Mid Aug
Late-September	Mid Aug-Late Sept taken Late Sept

Discussion:

2002

The plants listed previously will be propagated in the greenhouse and transplanted into an evaluation nursery the spring of 2003.

2003-2004

The evaluation nursery was planted in 2003 but did not establish well so missing plants were replanted and all plants were allowed to mature and develop during 2004. Sampling will begin in 2005.

Forage quality of warm season native grasses is generally lower than cool season forages when using wet chemistry lab procedures. True representation of forage quality is questionable when determining percent crude protein and digestibility. Fecal sampling analysis is another method of determining forage quality of plant material that has been processed (eaten and digested) by a cow. The PMC conducted a comparison between the two testing methods. Forage samples were green chopped and fed to weaned calves for four days. Replicated fecal samples were taken after the fourth day and sent for testing. Forage samples were also sent to the lab. This comparison test was not described in the original procedure but is supporting documentation.

Data taken for this comparison is in tables 1 and 2. Table 1 is analysis from samples of cool and warm season species taken April 28, 2004 and May 28, 2004. Table 2 is analysis from samples of warm season species, both primary growth and regrowth, taken 7/15/04. There are three replications and an average for each. This data was averaged and statistically analyzed as shown in Tables 3, 4, and 5. There was a significant difference in each analysis between wet lab and fecal procedures. Wet lab was higher in cool season and lower in warm season species. This does not prove that wet lab forage quality analysis underestimates warm season forage quality but does support that indication. This data supports that wet lab forage quality analysis does not analyze warm and cool season species equally. The tests may over estimate cool season quality or underestimate warm season quality. This study would need to be repeated to draw better conclusions.

2005-2006

Vegetative samples were taken from the species/cultivars/accessions listed earlier in Materials and Methods. These samples were taken May 16, 2005, June 30, 2005, August 10, 2005 and September 20, 2005 for primary (original) growth and June 30, 2005, August 10, 2005 and September 20, 2005 for regrowth. Regrowth samples consisted of approximately 45 days of regrowth materials prior to sample date. The

vegetative samples were analyzed for forage quality (see tables 6 and 7). At the time of sampling, the plants were also evaluated for stage of growth, forage height, and an estimate of amount of forage produced (see table 8).

Percent crude protein (table 6) was very good for samples taken May 16, 2005 except for tall fescue F A (field area) which was not part of the evaluation block. This was an old stand of unimproved tall fescue with no fertility and could be similar to many unimproved fescue pastures. Paradoxa fescue was also sampled from an adjacent area and not part of the evaluation block. The evaluation block was fertilized with 40-0-25 in late winter (fescue) and early spring (warm seasons).

Samples taken June 30, 2005 indicated an expected decline in every species and especially the unfertilized fescue F A and Caucasian bluestem. Analysis of regrowth material showed little difference from the primary growth except for the tall fescue.

Samples taken August 10, 2005 showed percent crude protein declining again which was expected. The analysis of the regrowth samples showed considerably higher crude protein levels which reinforces the importance of management to keep forage quality at higher levels no matter what the species is. The tall fescue analysis was considerably higher than the warm seasons, but keep in mind the comparison between sampling methods which showed the wet lab analysis underestimating percent crude protein by 24-98 percent or overestimating the cool season species.

Samples taken September 20, 2005 were similar to August 10, 2005 in that the regrowth material was much better quality than the primary growth. The tall fescue F A (old field) had good quality for primary growth probably due to fall growth and the regrowth material was very good, again showing how management is important to these old stands.

Table 8 shows a measurement of forage height in feet, growth stage, and an estimate of drymatter growth/regrowth at the time of sampling. The most interest in grazing warm season species is during the summer slump period of July and August but forage is available for use much earlier as indicated by the amount of growth and height as shown in table 8 and attachment 1.

Conclusion

Warm season grass species provide adequate to excellent quality forage. Management is important in maintaining quality for the time period of greatest need which is the summer slump. Quality declined considerably between June 30, 2005 and August 10, 2005 for primary growth so producers should switch to utilizing regrowth material somewhere between these dates. In order to have regrowth material available for mid summer use, primary growth may need to be utilized earlier in the grazing season. Warm season species have the potential of being used for a much longer period than just the summer slump.

Forage Quality Comparison Testing										Table #1	
4/28/2004		Fecal Samples				Wet Lab Samples					
Virginia Wildrye	R1	R2	R3	Ave		R1	R2	R3	Ave		
% C P	14.93	15.26	16.35	15.5		21.1	19	18.8	19.5		
Digestibility	69.67	69.1	70.21	69.7		61.8	62	61.9	61.7		
Tall Fescue	R1	R2	R3	Ave		R1	R2	R3	Ave		
% C P	12.55	12.5	11.6	12.2		12.8	12	12.9	12.7		
Digestibility	61.37	61.42	61.03	61.3		57.7	57	61.9	57		
5/28/2004		Fecal Samples				Wet Lab Samples					
										% difference	
Big Bluestem	R1	R2	R3	Ave		R1	R2	R3	Ave		
% C P	13.3	11.84	12.01	12.4		9.9	10	10.1	10	24.00%	
Digestibility	62.1	62.39	62.67	62.4		52.7	54	53.7	53.3	17.10%	
Eastern Gama	R1	R2	R3	Ave		R1	R2	R3	Ave		
% C P	12.79	11.78	11.72	12.1		8.3	9	9.2	8.8	37.50%	
Digestibility	60.6	60.3	60.37	60.4		51.2	51	52.5	51.4	17.51%	
Forage Quality	%CP	Digestibility									
Prime	>19	>65									
1	17-19	62-65									
2	14-16	58-61									
3	11-13	56-57									
4	8-10	53-55									
5	<8	<53									

Forage Quality Comparitive Testing					Table #2					
7/15/2004		Fecal Samples			Wet Lab Samples					
<u>original growth</u>										% difference
Big Bluestem	R1	R2	R3	Ave	R1	R2	R3	Ave		
% C P	10.01	10.15	10.82	10.3	5.6	5.2	4.9	5.2		98.08%
Digestibility	62.41	62.43	62.32	62.39	55.3	54.3	53.5	54.37		14.76%
Eastern Gama	R1	R2	R3	Ave	R1	R2	R3	Ave		
% C P	7.48	6.99	5.37	6.6	4.6	4.9	5.1	4.9		34.70%
Digestibility	58.56	59.61	59.61	59.3	57.4	55.1	54	55.5		6.85%
7/15/2004		Fecal Samples			Wet Lab Samples					
<u>regrowth 5/28-7/15</u>										
Big Bluestem	R1	R2	R3	Ave	R1	R2	R3	Ave		
% C P	10.45	9.04	11.5	10.3	6.1	6.2	6.5	6.3		63.49%
Digestibility	64.06	63.89	64.02	64	53.8	56	55.6	55.1		16.15%
Eastern Gama	R1	R2	R3	Ave	R1	R2	R3	Ave		
% C P	10.47	9.78	11.24	10.5	7	7	6.7	6.9		52.17%
Digestibility	61	60.67	61.14	60.9	55.6	59	54.9	56.5		7.79%
Forage Quality	%CP	Digestibility								
Prime	>19	>65								
1	17-19	62-65								
2	14-16	58-61								
3	11-13	56-57								
4	8-10	53-55								
5	<8	<53								

Table #3. Comparison of wet chemistry and fecal analysis on crude protein and digestibility of Virginia wildrye and tall fescue harvested April 28, 2004, USDA-NRCS, Elsberry, MO.

Species ^{1/}	Crude Protein		Digestibility	
	Wet	Fecal	Wet	Fecal
	-----%-----			
Virginia Wildrye	20	16	62	69
Tall Fescue	13	12	59	61
Mean	16a^{1/}	14b	60a	65b

1/ Means in crude protein and digestibility columns followed by different letters are statistically different as determined by Tukey's HSD at P<0.05.

Table #4. Comparison of wet chemistry and fecal analysis on crude protein and digestibility of big bluestem and eastern gamagrass harvested May 28, 2004 and July 15, 2004 (regrowth), USDA-NRCS, Elsberry, MO.

28 May 2004

15 July 2004 (Regrowth)

Species ^{1/}	Crude Protein		Digestibility		Crude Protein		Digestibility	
	Wet	Fecal	Wet	Fecal	Wet	Fecal	Wet	Fecal
	-----%-----							
Big Bluestem	12	12	53	62	6	10	55	64
Eastern gamagrass	9	12	51	60	7	11	58	61
Mean	10.5 a^{1/}	12b	52 a	61b	6.5a	10.5b	57a	63b

1/ Means in crude protein and digestibility columns by harvest date followed by different letters are statistically different as determined by Tukey's HSD at P<0.05.

Table #5. Comparison of wet chemistry and fecal analysis on crude protein and digestibility of big bluestem and eastern gamagrass harvested July 15, 2004 (post anthesis), USDA -NRCS, Elsberry, MO.

Species ^{1/}	Crude Protein		Digestibility	
	Wet	Fecal	Wet	Fecal
	-----%-----		-----%-----	
Big Bluestem	5	7	54	62
Eastern gamagrass	5	10	56	59
Mean	5 a^{1/}	8.5b	55a	61b

1/ Means in crude protein and digestibility columns followed by different letters are statistically different as determined by Tukey's HSD at P<0.05.

MOPMC-T-0208-PA Testing Warm Season Grasses for Forage Quality							Table #6	
Forage Analyses	% Crude Protein							
	5/16/2005	6/30/2005		8/10/2005		9/20/2005		
	Primary	Primary	Regrowth \1	Primary	Regrowth \2	Primary	Regrowth \3	
Little Bluestem	14.6	8.6	9.3	4.6	6.4	4.1	10.1	
Sideoats Grama	16.0	9.4	9.6	6.1	8.5	5.8	10.3	
Rumsey Indiangrass	16.7	10.5	10.2	5.3	9.3	4.5	10.6	
Cave-In-Rock Switchgrass	17.6	12.4	11.0	5.6	11.5	4.6	9.5	
2244 Switchgrass	19.3	12.4	11.3	6.1	9.4	4.0	14.2	
Caucasian Bluestem	15.5	7.9	9.18	4.6	8.4	4.9	9.6	
Pete Eastern Gamagrass	18.1	12.3	12.0	6.2	11.3	7.3	13.0	
Rountree Big Bluestem	13.7	8.6	9.4	4.1	8.2	3.6	10.6	
OZ-70 Big Bluestem	17.0	11.2	10.9	5.9	9.1	3.7	10.9	
9083214 Eastern Gamagrass	19.0	13.1	13.1	7.4	11.2	7.6	13.0	
Ozarka Bermudagrass	24.1	11.2	10.9	8.7	10.5	9.2	11.2	
Tall Fescue	14.2	13.1	17	11.8	15.3	12.1	17.3	
Tall Fescue F A	9.1	7.8	9.8	6.9	14.1	11.3	16.1	
Paradoxa Fescue	13.1							
\1 Regrowth Between May 16 and June 30								
\2 Regrowth Between June 30 and August 10								
\3 Regrowth Between August 10 and September 20								

MOPMC-T-0208-PA Testing Warm Season Grasses for Forage Quality						Table #7	
Forage Analyses	5/16/2005	6/30/2005		8/10/2005		9/20/2005	
	Primary	Primary	Regrowth \1	Primary	Regrowth \2	Primary	Regrowth \3
Little Bluestem							
% ADF	29.3	34.0	34.1	39.4	38.6	41.5	35.7
% NDF	54.3	60.5	60.3	65.9	65.3	66.2	60.6
% TDN	56.3	52.6	52.6	48.4	49.1	46.8	51.3
Sideoats Grama							
% ADF	27.6	35.3	34.9	40.2	36.4	42.4	34.5
% NDF	55.8	64.1	62.8	67.4	65.1	68.5	62.4
% TDN	57.6	51.6	51.9	47.9	50.8	46.1	52.3
Rumsey Indiangrass							
% ADF	25.0	33.9	34.5	39.0	37.1	39.1	36.0
% NDF	46.4	59.0	59.3	64.6	63.4	62.4	57.7
% TDN	59.7	52.7	52.3	48.8	50.2	48.7	51.1
Cave-In-Rock Switchgrass							
% ADF	24.1	32.5	34.6	37.5	33.0	36.9	32.0
% NDF	49.2	59.7	60.7	63.9	61.9	60.6	59.0
% TDN	60.4	53.8	52.2	49.9	53.4	50.4	54.2
2244 Switchgrass							
% ADF	24.0	30.5	32.8	36.9	33.1	38.6	29.4
% NDF	49.7	58.2	60.8	65.7	61.5	64.3	57.8
% TDN	60.4	55.4	53.6	50.4	53.3	49.1	55.0
Caucasian Bluestem							
% ADF	29.1	40.0	39.0	42.7	37.9	43.2	38.6
% NDF	50.6	64.6	63.1	68.8	61.2	68.1	62.2
% TDN	56.5	48.0	48.8	45.9	49.6	45.5	49.1
Pete Eastern Gamagrass							
% ADF	27.7	31.8	33.3	37.1	33.2	35.8	31.1
% NDF	56.3	59.6	61.5	65.8	62.4	65.3	54.1
% TDN	57.6	54.4	53.2	50.2	53.3	51.2	54.9
Rountree Big Bluestem							
% ADF	32.2	34.4	34.1	41.8	38.5	42.1	33.0
% NDF	51.1	60.9	60.7	68.2	63.8	68.0	57.9
% TDN	54.0	52.4	52.6	46.6	49.2	46.3	53.4
OZ-70 Big Bluestem							
% ADF	27.2	31.9	32.8	36.1	36.4	40.8	32.0
% NDF	52.1	57.9	58.8	63.4	62.2	67.2	58.5
% TDN	44.7	54.3	53.6	51.0	50.8	47.3	54.2

Forage Analyses	5/16/2005		6/30/2005		8/10/2005		9/20/2005	
	Primary		Primary	Regrowth \1	Primary	Regrowth \2	Primary	Regrowth \3
9083214 Eastern Gamagrass								
% ADF	26.3		31.2	33.8	35.3	33.6	41.2	31.5
% NDF	55.5		57.4	60.5	59.4	62.3	62.7	60.9
% TDN	58.7		54.9	52.8	51.6	53.0	47.1	54.6
Ozarka Big Bluestem								
% ADF	23.8		30.2	31.6	32.2	32.8	33.5	32.3
% NDF	48.2		59.4	61.1	63.6	63.0	62.6	62.2
% TDN	60.6		55.6	54.5	54.1	53.6	53.1	54.0
Tall Fescue								
% ADF	26.4		31.5	26.1	34.8	30.2	37.3	26.5
% NDF	42.6		52.5	46.9	57.6	52.8	59.7	47.2
% TDN	58.6		54.6	58.8	52.0	55.6	50.0	58.5
Tall Fescue F A								
% ADF	30.8		34.7	34.2	42.3	33.1	35.4	26.6
% NDF	51.9		62.0	58.4	67.1	57.0	56.0	46.7
% TDN	55.1		52.1	52.5	46.2	53.4	51.6	58.4
Paradoxa fescue								
% ADF	24.8							
% NDF	46.8							
% TDN	59.9							
\1 Regrowth Between May 16 and June 30								
\2 Regrowth Between June 30 and August 10								
\3 Regrowth Between August 10 and September 20								

AMOUNT OF GROWTH ON 5/16/2006 Attachment #1



83214 Eastern Gamagrass



'Cave-In-Rock' Switchgrass



'Rumsey' Indiangrass



FY31 Tall Fescue

Study: MOPMC-T-0208-PA Testing Warm Season Grasses for Forage Quality **Table #8**

Forage Height in Feet										
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	5/16/2005 Primary Ave	6/30/2005 Primary Ave	6/30/2005 Regrowth Ave	8/10/2005 Primary Ave	8/10/2005 Regrowth Ave	9/20/2005 Primary Ave	9/20/2005 Regrowth Ave
Species							

Little bluestem	0.7	1.9	1.5	3.2	2.6	2.7	1.4
Sideoats grama	0.7	1.6	1.4	1.9	1.7	2.1	1.0
Rumsey Indian	1.5	3.4	3.2	4.3	2.9	3.9	2.0
Cave-In-Rock S	1.8	4.5	4.1	4.9	2.5	3.9	2.4
2244 Switch	1.1	2.8	2.7	3.1	1.9	3.1	1.8
Caucasian blue	0.5	2.4	2.1	3.0	2.2	3.0	1.8
Pete E. gama	2.1	4.3	4.0	4.2	3.0	3.4	2.3
Rountree B B	1.0	3.4	3.0	5.1	3.4	4.5	2.1
OZ-70 B B	1.1	2.9	2.7	4.3	3.4	4.5	2.3
9083214 E Gam	2.3	4.7	4.5	4.9	3.1	4.4	3.0
Ozarka Bermuda	1.0	1.9	1.9	2.0	1.8	2.3	1.9
Tall Fescue	1.3	1.4	1.4	1.5	1.4	1.4	1.3
Tall Fescue F A	2.1	1.5	1.1	1.2	0.7		
Paradoxa fescue	1.8	1.7	0.8				

Growth Stage									Table #8 Cont				
5/16/2005		6/30/2005		6/30/2005		8/10/2005		8/10/2005		9/20/2005		9/20/2005	
Species	Ave	Original Ave	Regrowth Ave	Original Ave	Regrowth Ave	Original Ave	Regrowth Ave	Original Ave	Regrowth Ave	Original Ave	Regrowth Ave		
Little bluestem	1.0	3.3	2.8	5.8	4.3	8.0	2.8						
Sideoats grama	1.0	6.0	5.8	7.5	6.8	7.8	6.0						
Rumsey Indian	1.0	3.0	3.0	3.3	2.5	7.0	5.5						
Cave-In-Rock S	2.3	5.3	5.0	6.8	4.8	8.0	4.8						
2244 Switch	1.5	4.0	3.5	6.0	4.8	7.5	4.5						
Caucasian B	1.0	5.0	6.0	8.0	7.3	7.8	6.0						
Pete E. gama	2.3	6.0	6.0	8.0	3.0	8.0	3.8						
Rountree B B	1.3	3.5	3.3	7.0	6.0	8.0	4.8						
OZ-70 B B	1.3	3.0	2.8	5.8	4.0	7.5	4.5						
9083214 E Gam	1.8	5.3	5.0	8.0	2.5	8.0	2.8						
Ozarka Bermuda	1.0	4.3	4.3	5.3	4.0	5.3	3.8						
Tall Fescue	4.8	6.0	4.8	7.0	6.0	8.0	2.0						
Tall Fescue F A	6.0	7.0	2.0	6.8	2.0								
Paradoxa fescue	3.8	7.0	1.0	2.3									
Growth Stage:													
1=Early vegetative				5=Early seedhead 50%									
2=Late				6=Late seed head 100%									
3=Early Boot 50% booted				7=Seed starting to mature									
4=Late boot all booted, few seed heads				8=All seed mature									

Amount Growth / Regrowth								Table #8 cont					
5/16/2005		6/30/2005		6/30/2005		8/10/2005		8/10/2005		9/20/2005		9/20/2005	
Species	Ave	Original Ave	Regrowth Ave	Original Ave	Regrowth Ave	Original Ave	Regrowth Ave	Original Ave	Regrowth Ave	Original Ave	Regrowth Ave	Original Ave	Regrowth Ave
Little bluestem	7.3	4.8	5.8	4.0	5.0	3.3	5.3						
Sideoats grama	7.8	6.5	7.3	5.5	6.0	5.0	5.8						
Rumsey Indian	5.8	3.0	3.5	3.0	4.0	2.5	4.0						
Cave-In-Rock S	5.5	3.0	3.3	3.0	4.3	2.8	4.5						
2244 Switch	6.5	4.5	4.3	3.5	4.8	3.0	4.0						
Caucasian B	7.5	3.5	4.0	3.0	3.8	3.0	4.3						
Pete E. gama	4.0	2.5	2.5	2.3	3.5	2.5	3.3						
Rountree B B	7.3	4.3	4.5	3.0	4.5	3.5	4.8						
OZ-70 B B	7.0	4.0	4.0	3.0	4.0	3.3	4.0						
9083214 E Gam	4.0	2.0	2.0	2.0	3.0	2.3	3.0						
Ozarka Bermuda	5.3	3.3	3.3	3.0	3.5	2.8	3.3						
Tall Fescue	7.3	5.3	5.8	5.5	7.3	5.5	6.0						
Tall Fescue F A	4.0	4.0	7.0	5.0	7.0								
Paradoxa fescue	4.0	6.0	8.0										
Amount of Growth in #/Acre		(Visual estimates)											
1=More than 7,000#/ac													
2=5,000-7,000#/ac													
3=3,000-5,000#/ac													
4=2,000-3,000#/ac													
5=1500-2000#/ac													
6=1,000-1,500#/ac													
6=500-1,000#/ac													
8=lessthan 500#/ac													
9=no growth													

Study ID Code: MOPMC-T-0310-PA,WL

Study Title – Incorporating Native Warm Season Grasses into Cool Season Pasture with Grazing Management

Study Leader: Bruckerhoff, S. B.

Introduction:

The need exists for providing quality forage during the summer dormancy period of cool season grasses. Warm season grasses can help provide this forage but loss of production during the establishment period has slowed the utilization of these species.

Problem:

The establishment period for warm season grasses is typically longer than for cool season grasses. Warm season grasses generally are not grazed the year of establishment and sometimes do not provide full production until the third growing season.

Objectives:

The objective is to evaluate alternative methods of warm season grass establishment and also pasture management of cool season and warm season species growing together. Alternative establishment methods being evaluated will decrease or eliminate the loss of production during the warm season grass establishment period.

Cooperators: Local landowners with intensive managed grazing systems.

Procedure:

Close graze the fescue pasture for one grazing season prior to seeding the species listed below. Seeding will be completed during the winter dormant period and spring using the treatments listed below.

Broadcast - winter dormant planting

Drilled - spring planting

Strip tilled - spring planting

Randomized complete block design with 4 replications.

Cultivars/selections of warm season grasses will be assembled and planted into cool season grass pastures. Rotational grazing will be used as a control method to set back the cool season grass and allow the warm season grass a chance to become established. Rotational grazing will also be used to balance the warm and cool season grasses to utilize production from both.

Rotational grazing with a high stocking rate will be used during the establishment year and subsequent years to enhance the development of the planted species and also utilize the forage of the original pasture.

Species composition of treatments will be determined by transecting the plots.

Measure forage utilization (growth height) of species before and after grazing management.

Species/cultivars to be tested:

'Rountree' Big Bluestem

'Cave-in-Rock' Switchgrass

'Aldous' Little Bluestem

'Rumsey' Indiangrass

'Pete' Eastern Gamagrass

Discussion:

2003

Fescue pasture was intensively grazed during 2002. The pasture was marked with 30' by 50' plots including five species and a check plot, three treatments, and four replications. The broadcast treatment was planted 2/13/03. The no-till treatment was planted 5/6/03 with eastern gama and switchgrass and 5/21/03 with big bluestem, little bluestem and indiangrass. The strip-till treatment plots were 50% tilled (30" wide strips) and planted the same as the no-till treatment.

The summer of 2003 had more than adequate rainfall to keep the fescue from going dormant and cattle did not keep it grazed close so all the plots were mowed twice during the summer to help control competition from the fescue. Warm season grass seedlings germinated on the tilled portion of the strip-till plots but none were found in the fescue sod. All plots were rotationally grazed until mid August and then again after November 1.

2004

The pasture was again utilized with rotational grazing but again the summer was cooler and wetter than average and the fescue expressed very little dormant period. Very few seedlings were found in any plots. This site will continue to be monitored. Another trial is scheduled for 2005.

2005

There was very little warm season grass establish in any plot of the first trial.

A second trial (trial 2) was established at a site close to Highway W. This trial used the same planting scheme as the first trial but the grazing system had more paddocks (eight) and they were smaller with fewer cattle. Low populations (0.5 – 3.0% cover) of each species established in the strip tilled plots, but nothing was found in the other plots the establishment year.

2006

Trial 1 reverted back to primarily tall fescue with little to no warm season that was planted surviving. This was probably due to several factors. The summer of the establishment year (2003) was wetter and cooler than normal and the fescue out competed the new seedlings and the cattle and mowing did not keep the competition controlled.

Trial 2 had some plants of each species exist but mostly in the plots that were strip tilled. The plots were grazed from 3 to 7 days depending on available forage with intervals varying between 5 to 7 weeks. The plots were grazed heavy until mid April. There was no grazing between mid August and mid October.

Study ID Code: MOPMC-T-0311-RI, BU

Study Title: Control of Reed Canarygrass in Riparian Buffer Plantings

Study Leader: Cordsiemon, R.

Description:

The presence of reed canarygrass in areas being planted to CRP, EQIP, and WHIP riparian forest buffers affects the long term survival and growth of seedling trees. Effective control methods for reed canarygrass are needed to obtain sufficient survival and growth of planted trees to meet program objectives.

Objective:

The objective of this study is to determine the most effective control methods for reed canarygrass in riparian buffer plantings.

Materials and Methods:

Obtain plants for open sun site (PMC) of bur oak, native pecan, and silver maple (seedlings). Obtain plants for shaded area (Illinois) of common button bush, gray dogwood, Pagoda dogwood, American hazelnut, American witch hazel and hazel alder.

2003

Discussion:

An area for this study is located on the PMC in Field #3. Half of the area (west half) was treated with two quarts of Roundup per acre and the other half (east half) was treated with one quart of Roundup per acre in September 2002. The plots were laid out (randomized and replicated four times) in early April 2003. The following herbicides and rates were applied on April 14, 2003, Plateau-8.0 ounces per acre, OutRider-2.0 ounces per acre, Oust-5.0 ounces per acre, and Roundup-1.5 quarts per acre. There were also check plots, plots having weed barrier mats installed around the plants, and plots where the plants were mowed around as the treatment.

Three species of bare root seedlings (bur oak, native pecan, and silver maple) were obtained from the Iowa Department of Natural Resources (DNR) on April 28, 2003. These seedlings were planted on May 2, 2003. An evaluation of the herbicides for controlling reed canarygrass was made on June 9, 2003. The following is the results of that evaluation: Roundup exhibited the best control (90%), followed by Oust (70%), Plateau (40%), and OutRider (20%). The check plots were very weedy (0%), the plots which were mowed exhibited good to excellent control of the reed canarygrass (80%), and the plots with the weed barrier mats exhibited good to excellent control (80%).

The plots were again evaluated for effectiveness of herbicide in controlling of reed canarygrass in July and August 2003. The following is the results of the August evaluations. Roundup

exhibited 33%, Oust exhibited 13%, Plateau exhibited 16% and OutRider exhibited 47% control of the reed canarygrass. The check exhibited 0%, mat exhibited 65% and the mowing around the plants exhibited 70% control of the reed canarygrass. There were some plots having a greater control of reed canarygrass in the earlier evaluations; obviously the reed canarygrass reinfested these plots.

An evaluation was also made on the survivability of the seedlings planted in areas where the herbicides were applied. There were some concerns that certain herbicides may have a detrimental affect on newly planted seedlings. The following is the results of that evaluation made on August 14, 2003. Plants in the Roundup plots exhibited 100% survival, plants in the Oust plots exhibited 83% survival, plants in the Plateau plots also exhibited 83% survival, and plants in the OutRider plots exhibited 66% survival. The check plots exhibited 100% plant survival, the survival of plants where the mats were installed exhibited 66%, and the plants where mowing was used for control of the reed canarygrass exhibited 66% survival.

The duration of this study is 2003-2006. Table #1 reflects the plot layout.

2004

The plots were evaluated for survival, height, and vigor on May 11. (Refer to tables #3 and #4) After a discussion with the Missouri NRCS state forester, Doug Wallace, it was determined that the application rate for Oust should be lowered from 5oz. /acre to 1oz. /acre; all other herbicide rates would remain the same. Plots were sprayed for the second year on May 24 and will be evaluated again in the late spring of 2005 for survival, height, and vigor. Table #4 refers to both 2003 and 2004 evaluations and compares the survival rates of each tree and each canarygrass control method used.

2005

A final evaluation was done to evaluate tree growth (height) and infestation of canarygrass back into the plots. Tables #4 and #5 refer to survival and tree growth. A visual evaluation of canarygrass infestation was taken and all plots were 85% to 100% canarygrass. Other weeds, such as marestail and smartweed, were present, but did not significantly change the percent of canarygrass in the plots.

2006

Based on the data collected a final report shows no statistically evident herbicide capable of completely eradicating reed canarygrass. The data shows best control was achieved when using Oust, but it would need follow-up applications to completely eradicate the canarygrass, and even that has not been proven. The area being tested is the large wetland area in field #4 at the Elsberry PMC, which is a well established stand of reed canarygrass. It was not determined if the canarygrass that came back after the initial chemical “burn-down” was from seed or roots regenerating. Also the data tends to show that maple is not susceptible to the herbicides used in this study or the competition of reed canarygrass. It could not be determined whether or not the pecan and bur oak trees that died were from tolerance to the herbicides used or the competition of reed canarygrass.

Study: MOPMC-T-0311 - RI, BU, Controls of Reeds Canarygrass in Riparian Buffer Plantings									Table #1
Date Seedlings were Planted: 5/2/03									↑
←————— Rep 1 —————→									
Rows	Row/Plant	Row/Plant	Row/Plant	Row/Plant		Row/Plant	Row/Plant	Row/Plant	North
Ft.	A	B	C	D		E	F	G	
Apart	Roundup	Oust	Outrider	Plateau		Check	Mat	Mow	
10	M	P	B	P		B	P	M	
10	B	M	P	M		P	M	B	Plants: M=Maple
10	P	B	M	B		M	B	P	
Reps are 20' apart ↑↓									B=Bur Oak P=Pecan
←————— Rep 2 —————→									
Rows	Row/Plant	Row/Plant	Row/Plant	Row/Plant		Row/Plant	Row/Plant	Row/Plant	
Ft.	C	A	D	B		F	G	E	
Apart	Outrider	Roundup	Plateau	Oust		Mat	Mow	Check	
10	B	P	M	P		P	M	B	
10	M	B	B	B		B	B	P	
10	P	M	P	M		M	P	M	
Reps are 20' apart ↑↓									
←————— Rep 3 —————→									
Rows	Row/Plant	Row/Plant	Row/Plant	Row/Plant		Row/Plant	Row/Plant	Row/Plant	
Ft.	B	D	A	C		G	F	E	
Apart	Oust	Plateau	Roundup	Outrider		Mow	Mat	Check	
10	P	B	M	P		M	B	P	
10	B	P	P	M		B	P	B	
10	M	M	B	B		P	M	M	
Reps are 20' apart ↑↓									
←————— Rep 4 —————→									
Rows	Row/Plant	Row/Plant	Row/Plant	Row/Plant		Row/Plant	Row/Plant	Row/Plant	
Ft.	D	A	B	C		E	G	F	
Apart	Plateau	Roundup	Oust	Outrider		Check	Mow	Mat	
10	M	P	B	B		P	M	B	
10	P	B	M	P		B	B	P	
10	B	M	P	M		M	P	M	

Evaluation of Trees Planted Within Canarygrass Using Different Control Methods
7/29/03 Evaluation

Table #2

		Roundup		Oust		Outrider		Plateau		Check		Mat		Mow	
		height	vigor	height	vigor	height	vigor	height	vigor	height	vigor	height	vigor	height	vigor
Rep 1	Pecan	2.5	4	2.4	4	1.4	7	2.3	3	1.7	9	1.4	4	1.5	7
	Bur Oak	2.1	7	2.8	9	2.7	8	2.3	8	2	1	2.1	3	2.6	4
	Maple	3.3	5	1.5	1	1.6	2	1.7	2	1.6	2	1.9	1	1.5	4
Rep 2	Pecan	2.4	9	2.6	9	1.9	5	2	5	0.8	7	2	9	2.4	3
	Bur Oak	2.2	9	2.3	5	2.1	5	x	x	2.2	9	x	x	2.3	8
	Maple	1.7	5	2	3	1.9	3	1.5	4	1.6	2	2.1	1	1.6	5
Rep 3	Pecan	1.3	3	x	x	1.8	4	2.7	3	x	x	2.3	9	3.4	8
	Bur Oak	1.4	7	2.8	5	2	9	2.2	8	1.9	9	2.7	8	2.6	8
	Maple	2	2	1.6	6	1.5	2	1.2	2	1.7	4	x	x	1.2	7
Rep 4	Pecan	1.4	7	1.1	9	1.5	7	1.4	5	x	x	x	x	1.8	9
	Bur Oak	1.7	7	1.5	5	x	x	2.4	5	2	7	2.5	4	1.9	9
	Maple	1.6	3	1.7	4	2	3	1.9	3	1.5	3	2.2	2	1.6	7
Averages		height	vigor	height	vigor	height	vigor	height	vigor	height	vigor	height	vigor	height	vigor
Pecan		1.9	5.8	2.0	7.3	1.7	5.8	2.1	4.0	1.3	8.0	1.9	7.3	2.3	6.8
Bur Oak		1.9	7.5	2.4	6.0	2.3	7.3	2.3	7.0	2.0	6.5	2.4	5.0	2.4	7.3
Maple		2.2	3.8	1.7	3.5	1.8	2.5	1.6	2.8	1.6	2.8	2.1	1.3	1.5	5.8

x = indicates the plant has died

MOPMC-T-0311

**Evaluation of control of canarygrass within the plot
7/29/03 Evaluation**

	Rep 1	Rep 2	Rep 3	Rep 4	Average
Oust	1	1	1	1	1
Roundup	9	5	3	5	5.5
Plateau	5	5	3	5	4.5
Outrider	9	5	5	3	5.5
Mat	1	1	1	1	1
Mowed	1	1	1	1	1
Check	9	9	9	9	9

The plots were given a visual rating based on the amount of canarygrass present within the plot

1= Excellent Control

3= Good Control

5= Fair Control

9= Poor Control

Evaluation of trees planted within canygrass using different control methods
5/11/04 Evaluation

Table #3

		Roundup		Oust		Outrider		Plateau		Check		Mat		Mow	
		height	vigor	height	vigor	height	vigor	height	vigor	height	vigor	height	vigor	height	vigor
Rep 1	Pecan	2.2	3	2.4	6	x	x	x	x	x	x	x	x	x	x
	Bur Oak	x	x	x	x	x	x	x	x	2.4	4	2	3	x	x
	Maple	2.3	4	1.7	3	2.1	2	2.4	3	1.8	3	2.1	4	1.6	3
Rep 2	Pecan	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Bur Oak	x	x	2.4	3	2	6	x	x	x	x	x	x	x	x
	Maple	1.7	7	2.1	3	2.3	3	2	3	x	x	1.8	3	1.2	7
Rep 3	Pecan	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Bur Oak	2.7	2	2.8	3	x	x	1.6	4	x	x	x	x	x	x
	Maple	1.8	3	2.1	2	2	3	2	2	2	3	x	x	1.3	3
Rep 4	Pecan	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Bur Oak	1.5	3	x	x	x	x	2.4	2	x	x	2.3	4	x	x
	Maple	1.5	7	2.1	3	2	3	2.1	2	1.5	3	2.8	3	1.5	2
Averages		height	vigor	height	vigor	height	vigor	height	vigor	height	vigor	height	vigor	height	vigor
Pecan		2.2	3.0	2.4	6.0	x	x	x	x	x	x	x	x	x	x
Bur Oak		2.1	2.5	2.6	3.0	2.0	6.0	2.0	3.0	2.4	4.0	2.2	3.5	x	x
Maple		1.8	5.3	2.0	2.8	2.1	2.8	2.1	2.5	1.8	3.0	2.2	3.3	1.4	3.8

x = indicates the plant has died

MOPMC-T-0311

Evaluation of canarygrass control within the plot
5/11/04 Evaluation

	Rep 1	Rep 2	Rep 3	Rep 4	Average
Oust	2	1	1	1	1.25
Roundup	2	2	5	2	2.75
Plateau	7	5	2	5	4.75
Outrider	7	4	4	2	4.25
Mat	8	8	8	9	8.25
Mowed	5	7	9	9	7.50
Check	9	9	9	9	9.00

The plots were given a visual rating based on the amount of canarygrass present within the plot

1= Excellent Control

3= Good Control

5= Fair Control

9= Poor Control

Table #4

7/29/2003 Evaluation

		Roundup	Oust	Outrider	Plateau	Check	Mat	Mow
Rep 1	Pecan	Alive	Alive	Alive	Alive	Alive	Alive	Alive
	Bur Oak	Alive	Alive	Alive	Alive	Alive	Alive	Alive
	Maple	Alive	Alive	Alive	Alive	Alive	Alive	Alive
Rep 2	Pecan	Alive	Alive	Alive	Alive	Alive	Alive	Alive
	Bur Oak	Alive	Alive	Alive	DEAD	Alive	DEAD	Alive
	Maple	Alive	Alive	Alive	Alive	Alive	Alive	Alive
Rep 3	Pecan	Alive	DEAD	Alive	Alive	DEAD	Alive	Alive
	Bur Oak	Alive	Alive	Alive	Alive	Alive	Alive	Alive
	Maple	Alive	Alive	Alive	Alive	Alive	DEAD	Alive
Rep 4	Pecan	Alive	Alive	Alive	Alive	DEAD	DEAD	Alive
	Bur Oak	Alive	Alive	DEAD	Alive	Alive	Alive	Alive
	Maple	Alive	Alive	Alive	Alive	Alive	Alive	Alive

Percent Survival 7/29/2003 Evaluation

Averages	Roundup	Oust	Outrider	Plateau	Check	Mat	Mow	Total
Pecan	100%	75%	100%	100%	50%	75%	100%	86%
Bur Oak	100%	100%	75%	75%	100%	75%	100%	89%
Maple	100%	100%	100%	100%	100%	75%	100%	96%

5/11/2004 Evaluation

		Roundup	Oust	Outrider	Plateau	Check	Mat	Mow
Rep 1	Pecan	Alive	Alive	DEAD	DEAD	DEAD	DEAD	DEAD
	Bur Oak	DEAD	DEAD	DEAD	DEAD	Alive	Alive	DEAD
	Maple	Alive	Alive	Alive	Alive	Alive	Alive	Alive
Rep 2	Pecan	DEAD	DEAD	DEAD	DEAD	DEAD	DEAD	DEAD
	Bur Oak	DEAD	Alive	Alive	DEAD	DEAD	DEAD	DEAD
	Maple	Alive	Alive	Alive	Alive	DEAD	Alive	Alive
Rep 3	Pecan	DEAD	DEAD	DEAD	DEAD	DEAD	DEAD	DEAD
	Bur Oak	Alive	Alive	DEAD	Alive	DEAD	DEAD	DEAD
	Maple	Alive	Alive	Alive	Alive	Alive	DEAD	Alive
Rep 4	Pecan	DEAD	DEAD	DEAD	DEAD	DEAD	DEAD	DEAD
	Bur Oak	Alive	DEAD	DEAD	Alive	DEAD	Alive	DEAD
	Maple	Alive	Alive	Alive	Alive	Alive	Alive	Alive

Percent Survival of 5/11/2004 Evaluation

Averages	Roundup	Oust	Outrider	Plateau	Check	Mat	Mow	Total
Pecan	25%	25%	0%	0%	0%	0%	0%	7%
Bur Oak	50%	50%	25%	50%	25%	50%	0%	36%
Maple	100%	100%	100%	100%	75%	75%	100%	93%

6/26/2006 Evaluation of Survival

Table # 4 cont'd.

		Roundup	Oust	Outrider	Plateau	Check	Mat	Mow
Rep 1	Pecan	Alive	DEAD	Alive	DEAD	DEAD	DEAD	DEAD
	Bur Oak	DEAD	DEAD	DEAD	DEAD	Alive	Alive	DEAD
	Maple	Alive	Alive	Alive	Alive	Alive	Alive	DEAD
Rep 2	Pecan	DEAD	DEAD	DEAD	DEAD	DEAD	Alive	DEAD
	Bur Oak	DEAD	DEAD	DEAD	Alive	DEAD	DEAD	Alive
	Maple	Alive	Alive	Alive	Alive	Alive	Alive	Alive
Rep 3	Pecan	DEAD	DEAD	DEAD	DEAD	DEAD	Alive	DEAD
	Bur Oak	Alive	DEAD	Alive	DEAD	DEAD	DEAD	DEAD
	Maple	Alive	Alive	Alive	Alive	Alive	DEAD	Alive
Rep 4	Pecan	DEAD	Alive	DEAD	DEAD	DEAD	DEAD	DEAD
	Bur Oak	Alive	DEAD	DEAD	DEAD	DEAD	DEAD	DEAD
	Maple	Alive	Alive	Alive	Alive	Alive	Alive	Alive

Percent Survival of 5/11/2004 Evaluation

Averages	Roundup	Oust	Outrider	Plateau	Check	Mat	Mow	Total
Pecan	25%	25%	25%	0%	0%	50%	0%	18%
Bur Oak	50%	0%	25%	25%	25%	25%	25%	25%
Maple	100%	100%	100%	100%	100%	75%	75%	93%

Note : A few trees previously recorded as "DEAD" have resprout and may be considered "Alive"

MOPMC-T-0311 - RI, BU - Control of Reed Canarygrass in Riparian Buffer Plantings														
6/26/2006 Evaluation of Survival/ Height										Table #5				
	Roundup		Oust		Outrider		Plateau		Check		Mat		Mow	
	Species	Height	Species	Height	Species	Height	Species	Height	Species	Height	Species	Height	Species	Height
Rep 1	M	4.7	P	D	B	D	P	D	B	2.6	P	D	M	D
	B	D	M	3.9	P	2.1	M	3.6	P	D	M	3.5	B	D
	P	3.0	B	D	M	3.0	B	D	M	2.1	B	2.5	P	D
	Outrider		Roundup		Plateau		Oust		Mat		Mow		Check	
Rep 2	B	D	P	D	M	2.9	P	D	P	D	M	3.2	B	2.2
	M	4.1	B	D	B	D	B	3.2	B	D	B	D	P	D
	P	D	M	2.2	P	D	M	2.3	M	4.9	P	3.3	M	3.4
	Oust		Plateau		Roundup		Outrider		Mow		Mat		Check	
Rep 3	P	D	B	D	M	3.2	P	D	M	3.7	B	D	P	D
	M	4.5	P	D	P	D	M	3.0	B	D	P	1.0	B	D
	B	2.2	M	3.2	B	1.8	B	D	P	D	M	D	M	3.2
	Plateau		Roundup		Oust		Outrider		Check		Mow		Mat	
Rep 4	M	3.1	P	1.4	B	D	B	D	P	D	M	3.3	B	D
	P	D	B	D	M	2.7	P	D	B	D	B	D	P	D
	B	3.0	M	3.0	P	D	M	5.7	M	3.8	P	D	M	4.1
	Roundup		Oust		Outrider		Plateau		Check		Mat		Mow	
Averages	Maple	3.28	Maple	3.35	Maple	3.95	Maple	3.20	Maple	3.13	Maple	4.17	Maple	4.50
	Bur Oak	1.80	Bur Oak	2.70	Bur Oak	D	Bur Oak	3.00	Bur Oak	2.40	Bur Oak	2.50	Bur Oak	D
	Pecan	3.10	Pecan	D	Pecan	2.10	Pecan	D	Pecan	D	Pecan	1.00	Pecan	3.30
D=Dead, M=Maple, B=Bur Oak, P= Pecan														

Study ID Code: MOPMC-T-0412- WE, WL, RI

Study Title – Testing Selected Trees for Tolerance to the Herbicide Outrider

Study Leader: Bruckerhoff, S. B.

Introduction:

The Monsanto herbicide “Outrider”, Sulfosulfuron, is a selective herbicide for control of annual and perennial grasses and broadleaf weeds in noncrop areas. It is very effective in the control of Johnsongrass and is also effective in the control of tall fescue at higher rates. Outrider is used to control Johnsongrass on roadsides. It is also labeled for use on some warm season grasses.

Problem:

Weed control during the establishment period of woody plantings is critical. Although several options are available, timing is very important for adequate control. Additional options are needed, especially in the control of Johnsongrass and reed canarygrass while establishing woody plantings.

Objectives:

The objectives are to test the tolerance of woody plant material to the herbicide Outrider, and also apply the same rates to reed canarygrass to determine its effectiveness of control.

Procedure:

Commercially available species of woody plants typically used for wetland, wildlife and riparian plantings will be assembled at the PMC and tested for tolerance to the herbicide Outrider, Sulfosulfuron. One and two year old container trees will be obtained from Forrest Keeling Nursery.

Outrider has been observed to be somewhat effective in controlling reed canarygrass using split applications. Outrider will also be applied on reed canarygrass plots and tested for control at the same timing and rates as the trees.

Container trees (see list below) were planted in a randomized complete block with four replications. Trees were one or two year old container stock. Trees were watered as needed. A replication consisted of one tree each from the list below. Four replications were sprayed over the top of the trees with each of the following treatments:

1. Spring split application of Outrider (1 1/3 oz each), May/June, five to eight weeks apart
2. Summer application of Outrider (2.0 oz) late June to early July
3. Fall/spring split application of Outrider (1 1/3 oz each) September/May
This treatment was changed to Roundup, see discussion below.

Trees were evaluated for seedling height and overall condition (vigor, survival, resistance to herbicide application, etc.) prior to treatment and again after treatment.

Silver Maple
Pin Oak
Pecan
Green Ash
Blackhaw
False Indigo Bush

Sycamore
Bur Oak
Cottonwood
Roughleaf Dogwood
Hazelnut
Buttonbush

Swamp Oak
Walnut
Bald Cypress
American Plum
Chokecherry

Cooperators:

Jim Graham, Monsanto Company, Doug Posch, Monsanto Company, St. Louis, Missouri and Wayne Lovelace, Forrest Keeling Nursery, Elsberry, Missouri.

Discussion:

2004

The evaluation block was planted April 6, 2004, using a randomized complete block design with 3 replications. Three chemical treatments were used; treatment #1, a split application of 1.33 quarts of Outrider herbicide was sprayed directly over the top of all tree species on May 11, 2004 and again on June 29, 2004. Treatment #2 was a maximum single application rate of 2.0 quarts of Outrider herbicide again sprayed directly over the top of the second block of trees on June 29, 2004. Treatment #3 was intended to be another split application of Outrider herbicide applied in September, 2004 and May, 2005. This was changed to a 2 quart rate of Roundup that was applied over the top of the trees on November, 5, 2004.

The treatments applied to the trees were also applied to reed canarygrass at the same time and rates. By mid-summer it was apparent that Outrider would only suppress reed canarygrass and not kill it. Treatment #3 was changed to Roundup to help define the window of opportunity for controlling reed canarygrass and not damaging the trees.

The trees were evaluated for overall condition (vigor, survival, resistance to disease, insects, chemical damage, stress, etc.) on a scale of 1 = excellent and 9 = dead. The trees were also measured for height in feet.

Evaluations were compared between treated plots and untreated checks before and after treatment. RC (rating of condition) and RH (rating of height) can be seen in table #1. These ratings were calculated as the difference in treated plots minus the difference in check plots or $RC/RH = (T2-T1) - (CK2-CK1)$

Where:

RC = Rating of condition of the tree

RH = Rating of height of the tree

T2 = Evaluation of the overall condition (1 = Excellent, 9 = dead), after treatment of the tree getting chemical treatment.

T1 = Evaluation of the overall condition (1 = Excellent, 9 = dead), before treatment of the tree getting chemical treatment.

CK2 = Evaluation of the overall condition (1 = Excellent, 9 = dead), after treatment date of the untreated tree (Check)

CK1 = Evaluation of the overall condition (1 = Excellent, 9 = dead), before treatment date of the untreated tree (Check).

The scale for the comparison of ratings is at the bottom of the charts in table #1.

Summary of results

Most trees experienced little to no damage from the chemical application treatments and almost no stunting when compared to the untreated checks.

Trees that were not as resistant to the chemical treatments and degree of damage by each treatment are listed below.

Damage to trees from application of Outrider or Roundup (treatment #3) herbicides:

	Treatment #1	Treatment #2	Treatment #3
Extensive damage			Bald cypress
Moderate damage		Hazelnut	False indigo
		Roughleaf dogwood	
		Silver maple	

This information helped support the supplemental label for outrider that allows safe use on some woody vegetation (See attachment #1).

Notes:

The species that had moderate damage from the Outrider herbicide had very good recovery with later observation.

Walnut at the time of evaluation looked in poor condition but later observation did not indicate damage, so it was not listed above.

2003-2006

Additional testing was continued with applications to reed canarygrass but total control was not achieved. Testing on seedling warm season native species and also established Eastern gamagrass were conducted through the cooperation of Monsanto.

SUPPLEMENTAL LABELING

READ THE ENTIRE LABEL FOR OUTRIDER® HERBICIDE BEFORE PROCEEDING WITH THE USE DIRECTIONS CONTAINED IN THIS SUPPLEMENTAL LABELING

When using Outrider herbicide as permitted according to this supplemental labeling, read and follow all applicable directions, restrictions, and precautions on the label booklet provided with the pesticide container and on this supplemental labeling. This supplemental labeling must be in the possession of the user at the time of pesticide application.



EPA Reg. No. 524-500

Outrider is a trademark of Monsanto Technology LLC.

Weed Control in Established Stands of Non-Crop Trees In Conservation and Wildlife Areas

Keep out of reach of children.

CAUTION!

In case of an emergency involving this product or for user safety information on this product,
Call Collect, day or night (314) 694-4000.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in any manner inconsistent with its labeling.

This label must be in the possession of the user at the time of application.

See the "GENERAL INFORMATION" and "MIXING" and "APPLICATION EQUIPMENT AND TECHNIQUES" sections of the "Complete Directions for Use" for Outrider herbicide for essential product information.

WEED CONTROL IN ESTABLISHED STANDS OF NON-CROP TREES

Outrider herbicide can be applied as a broadcast application around or over the top of select hardwood and conifer tree species in conservation and wildlife areas to control johnsongrass, tall fescue, purple and yellow nutsedge, and other weed species listed on the Outrider herbicide label. This product generally has been shown to be safe for use on the following tree species:

American Plum	Pecan
Bald Cypress	Pin Oak
Burr Oak	Swamp Oak
Cottonwood	Sycamore
Green Ash	Walnut

Treated trees must be growing in areas where commercial fruit or nut harvest will not occur. Make over-the-top applications to non-bearing trees only. Treat over the top of transplanted trees after they are well established. Temporary yellowing and growth reduction may occur in some species. Do not apply by air.

Apply up to 1.33 ounces of this product per acre with a non-ionic surfactant at 0.25 to 0.5 percent by volume (1 to 2 quarts per 100 gallons of spray solution). Sequential applications of this product can be made at a minimum of 21 days between applications, up to a maximum use rate of 2.66 ounces per acre per year.

Use only nonionic surfactants that contain at least 90 percent active ingredient. Do not use nonionic surfactants or other additives that alter the pH of the spray solution below pH 5.

Read the "LIMIT OF WARRANTY AND LIABILITY" in the label pamphlet for Outrider herbicide before using. These terms apply to this supplemental labeling and if these terms are not acceptable, return the product unopened at once.

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5/18/2006

71014E1-15

Injury to Seedling Stage Native American Prairie Grasses from Postemergence Applications of Sulfosulfuron

Doug Prosch
July 15, 2003

Objective: Determine the tolerance of some Native American prairie grasses to postemergence applications of sulfosulfuron relative to the sensitive indicator species, grain sorghum.

Background: Sulfosulfuron is a herbicide utilized in roadside maintenance and pasture renovation for the control of johnsongrass (*Sorghum halepense*). While this herbicide is highly selective for certain grass weed species, little is known regarding the sensitivity of some native American prairie grasses when they are in the seedling stage to postemergence applications of sulfosulfuron. This study investigates seven of these prairie grasses along with two varieties of bermudagrass to determine their tolerance to sulfosulfuron relative to the sensitive indicator species, grain sorghum.

Materials and Methods

ARM Study #2003392213

Species Tested:

Big Bluestem (*Andropogon gerardii*) - ANOGE

Little Bluestem (*Andropogon scoparium*) - ANOSC

Eastern Gamagrass (*Tripsicum dactyloides*) - TRWDA

Buffalograss (*Buchloe dactyloides*) - BUCDA

Indiangrass (*Sorghastrum nutans*) - SOSNU

Sideoats Grama (*Bouteloua curtipendula*) - BOBCU

Switchgrass (*Panicum virgatum*) - PANVI

Bermudagrass var. Wrangler & var. Riviera (*Cynodon dactylon*) - CYNDA

Grain Sorghum (*Sorghum bicolor*) - SORGR

Application volume: 20 gal/A

Application rates: 0.02, 0.04, 0.16, 0.32, 0.64, 1.28, and 2.56 g ai/ha

Growth stage at application: GS 13 for Wrangler bermudagrass and buffalograss, all others GS 12

Data: % injury at 14 and 27 days after treatment (DAT)

Summary

Grain sorghum has been identified in numerous studies as a good indicator species for johnsongrass control with sulfosulfuron. Data taken at 14 DAT showed significant injury to grain sorghum at the lowest rate tested (Fig. 1). Injury increased as sulfosulfuron rates increased to a maximum of 94% at 2.56 g ai/ha. Among the native prairie grasses sideoats grama and buffalograss exhibited the greatest degree of injury from sulfosulfuron; however, injury was significant at the highest application rate only. While injury was less severe in eastern gamagrass, switchgrass, and Riviera bermudagrass, the injury proved to be statistically significant at the 1.28 g ai/ha rate of sulfosulfuron. Big bluestem, little bluestem, Wrangler bermudagrass, and indiangrass showed no injury symptoms at this 14 DAT time-point with any

rate tested. Data taken at 27 DAT again showed significant injury to grain sorghum at the lowest rate tested (Fig. 2). Injury reached a maximum of 98% at the two highest rates. Eastern gamagrass exhibited significant injury at the two highest rates tested, although the degree of injury was substantially less than that observed with grain sorghum. Significant injury was also observed with Riviera bermudagrass, but at the highest application rate only. None of the remaining grasses at this time-point showed any injury symptomology at any rate tested.

Conclusions

These data indicate that of the species tested eastern gamagrass would be the one where some low level injury might be expected under field conditions from postemergence sulfosulfuron rates sufficient to control johnsongrass. Slight stunting within the first 1-2 weeks after application might also be expected with Riviera bermudagrass, buffalograss, sideoats grama, and switchgrass

Figure 1.

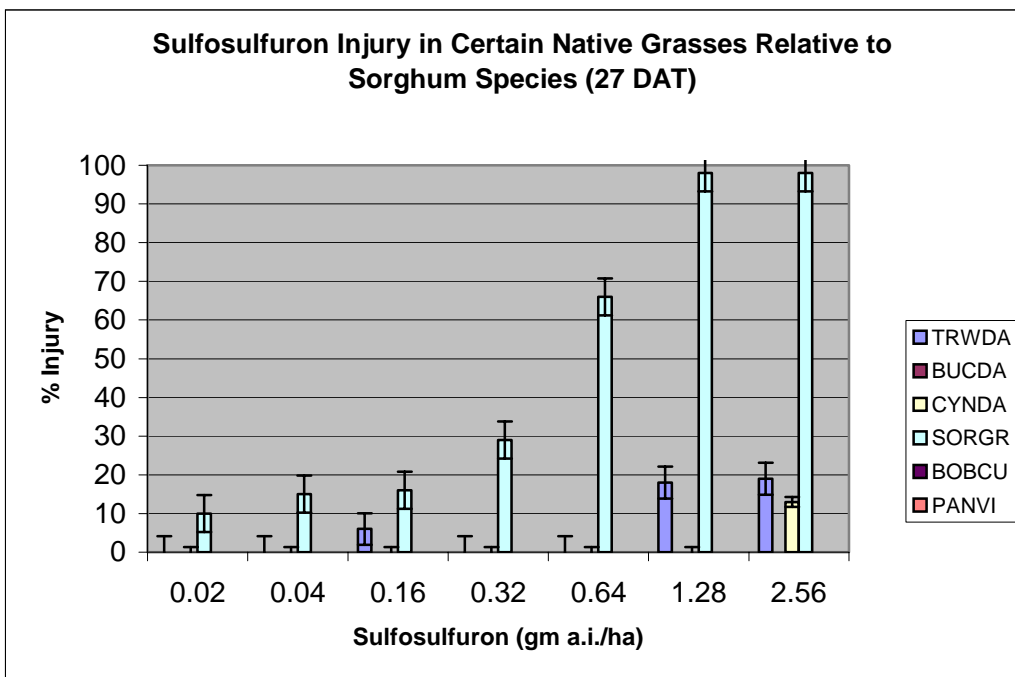
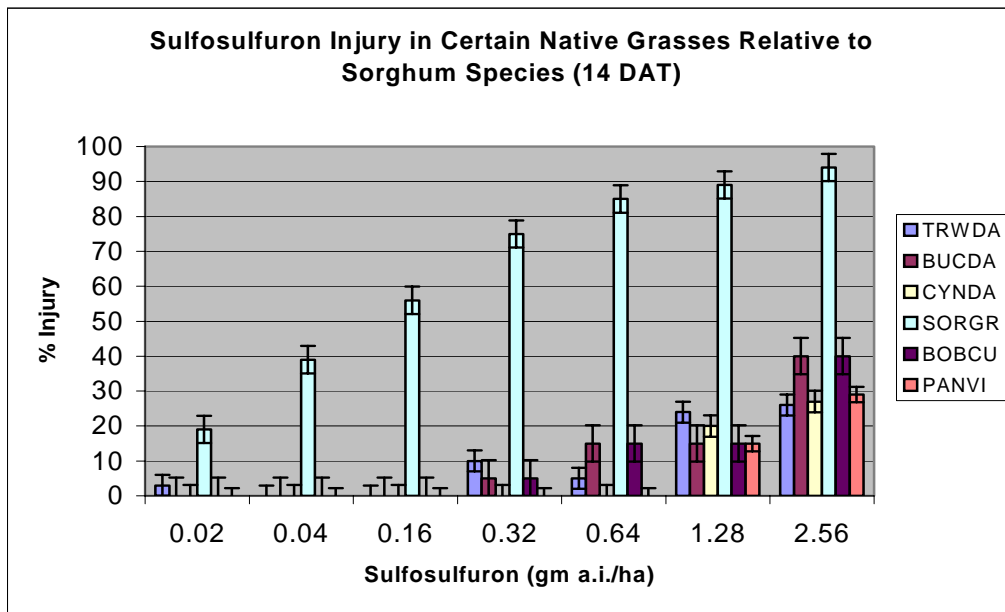


Figure 2.

Testing of Outrider safety on Eastern Gamagrass

Outrider did cause stunting and suppression of seedheads and is not labeled for use.

07-15-2003 (Outrider Safety on Eastern Gamagrass)

AOV Means Table Page 1 of 2

Monsanto Agricultural Group

Title: Outrider Safety on Eastern Gamagrass									
Protocol Number: 2003-01-A7-14				Region: NA		Units of Measure: U			
EXPERIMENT #:				By: James C Graham					
Rating date				05-23-2003	05-23-2003	06-14-2003	06-14-2003	07-05-2003	
Crop Code				TRWDA	TRWDA	TRWDA	TRWDA	TRWDA	
Crop Stage				VEG	VEG	HEADING	HEADING	HEADING	
Symptom				STUNTING	PHYTO	STUNTING	Seedhead	STUNTING	
Plant part eval				PLANT	PLANT	PLANT	PLANT	PLANT	
Evaluation type				%CTRL	%CTRL	%CTRL	%CTRL	%CTRL	
Evaluator				User ID	User ID	User ID	User ID	User ID	
TRT-EVAL Interval				9 DA-A	9 DA-A	31 DA-A	31 DA-A	52 DA-A	
Trt No.	Practice/Product	Rate	Rate Unit						
1	OUTRIDER INDUCE	0.75 0.25	OZ WT/A % V/V	0.0 b	0.0 a	16.3 cd	30.0 a	5.0 b	
2	OUTRIDER INDUCE	1.0 0.25	OZ WT/A % V/V	2.5 b	0.0 a	27.5 bc	30.0 a	13.8 ab	
3	OUTRIDER INDUCE	1.33 0.25	OZ WT/A % V/V	5.0 ab	0.0 a	47.5 ab	2.8 a	15.0 ab	
4	OUTRIDER INDUCE	2.66 0.25	OZ WT/A % V/V	12.5 a	0.0 a	57.5 a	2.5 a	26.3 a	
5	UNTREATED CHECK			1.3 b	0.0 a	5.0 d	53.8 a	0.0 b	
LSD (P=.05)				8.95	0.00	21.14	52.21	19.53	
Standard Deviation				5.81	0.00	13.72	33.88	12.67	
CV				136.69	0.0	44.63	142.37	105.61	
Bartlett's X2				5.282	0.0	7.768	20.662	1.47	
P(Bartlett's X2)				0.152	0.00*	0.10	0.001*	0.689	
Replicate F				2.605	0.000	0.414	0.969	0.540	
Replicate Prob(F)				0.1000	1.0000	0.7462	0.4394	0.6642	
Treatment F				2.926	0.000	9.982	1.629	2.541	
Treatment Prob(F)				0.0667	1.0000	0.0009	0.2305	0.0945	

Means followed by same letter do not significantly differ (P=.05, LSD)

Monsanto Agricultural Group

Rating date				07-05-2003
Crop Code				TRWDA
Crop Stage				HEADING
Symptom				Seedhead
Plant part eval				PLANT
Evaluation type				%CTRL
Evaluator				User ID
TRT-EVAL Interval				52 DA-A
Trt No.	Practice/Product	Rate	Unit	
1	OUTRIDER	0.75	OZ WT/A	63.8 ab
	INDUCE	0.25	% V/V	
2	OUTRIDER	1.0	OZ WT/A	62.5 ab
	INDUCE	0.25	% V/V	
3	OUTRIDER	1.33	OZ WT/A	27.5 bc
	INDUCE	0.25	% V/V	
4	OUTRIDER	2.66	OZ WT/A	5.0 c
	INDUCE	0.25	% V/V	
5	UNTREATED CHECK			87.5 a
LSD (P=.05)				38.00
Standard Deviation				24.66
CV				50.08
Bartlett's X2				11.302
P(Bartlett's X2)				0.023*
Replicate F				1.613
Replicate Prob(F)				0.2382
Treatment F				7.036
Treatment Prob(F)				0.0037

Means followed by same letter do not significantly differ (P=.05, LSD)

Testing of Outrider and Outrider plus Roundup combinations for control of reed canarygrass

10/21/2005 (Outrider Enhancement of Roundup on Reed C Grass.PRT)

Protocol Description Page 1 of 3

Monsanto Agricultural Group

Title: Outrider Enhancement of Roundup Activity on Reed Canarygrass		
Protocol Number: 2006-01-A7-XX	Region: NA	Units of Measure: U
EXPERIMENT #:	By: James C Graham	

*** OBJECTIVE ***
Objective: Determine if tank mixes of Roundup and Outrider are more effective in long term control of Reed Canarygrass than Roundup alone.

Study Director: JAMES C GRAHAM **Version:**
Log the dates of Revisions. (MM/DD/YYYY)
 10/18/2005

Background:
 Previous work has shown that Outrider will only provide suppression of Reed Canarygrass (RCG). Roundup PRO CONC provides short term control of RCG but with time control is only 70 to 80%. Work in 2004 and 2005 gave an indication that tank mixes of Roundup PRO CONC and Outrider enhanced the long term control of RCG over Roundup alone. This was demonstrated in both fall and spring applications. This study is to determine if these results can be duplicated in a more conclusive trial. This work will also continue to examine how one might selectively control RCG in existing tree plantings by timing applications.

General Study Guidelines:
Scope: PD ONLY **Exp. Design:** RACOB **Country:** USA
of Trts: 11 **# of Reps:** 4 **Plot Width (ft):** 6.6 **Plot Length (ft):** 15

Crop	Weed	Disease	Insect	Evaluation Code	Timing/Comments
	PHACA				Fall applications will be made after frost.

Application Code Description: Treatment A is Nov 2005
 Treatment B is May 2006

*** ADDITIONAL COMMENTS ***
Additional Comments: The treatments are designed to determine if a fall application could be made after deciduous trees would have lost their foliage and would not be injured by a Roundup application. Previous work has shown this tree safety. In addition various combinations and timings and Roundup and Outrider alone will be studied to see which are the most effective for long term RCG control

Data submitted as (F)inal by : 8/1/2005

Results

Treatment #7, the split application of Roundup plus Outrider in the fall and also applied in the spring, gave the best control but did not give long term total control. Indications are it will take multiple applications to control reed canarygrass totally.

Monsanto Agricultural Group

Title: Outrider Enhancement of Roundup Activity on Reed Canarygrass

Protocol Number: 2006-01-A7-XX Region: NA Units of Measure: U

EXPERIMENT #: By: James C Graham

Trt No.	Type	Practice/Product	Form Amt	Form Unit	FM-DS or Characteristic	Rate	Rate Unit	Appl Code	Alternate Rate	Alternate Rate Unit
1	HERB	OUTRIDER	75	%	WG	0.0623	ai #/a	A	1.33	oz wt/a
		-SULFOSULFURON	75			0.062				
	ADJ	INDUCE	100	%	AD	0.25	% v/v	A	0.25	% v/v
		-SURFACTANT	100			0.25				
2	HERB	ROUNDUP PROCONCENTRATE	3.75	#/G AE	SL	1.13	ai #/a	A	1.2	qt/a
		-GLYPHOSATE - IPA SALT	3.75			1.13				
3	HERB	ROUNDUP PROCONCENTRATE	3.75	#/G AE	SL	1.13	ai #/a	A	1.2	qt/a
		-GLYPHOSATE - IPA SALT	3.75			1.13				
	HERB	OUTRIDER	75	%	WG	0.0623	ai #/a	A	1.33	oz wt/a
		-SULFOSULFURON	75			0.062				
4	HERB	ROUNDUP PROCONCENTRATE	3.75	#/G AE	SL	1.13	ai #/a	A	1.2	qt/a
		-GLYPHOSATE - IPA SALT	3.75			1.13				
	HERB	ROUNDUP PROCONCENTRATE	3.75	#/G AE	SL	1.13	ai #/a	B	1.2	qt/a
		-GLYPHOSATE - IPA SALT	3.75			1.13				
5	HERB	ROUNDUP PROCONCENTRATE	3.75	#/G AE	SL	1.13	ai #/a	A	1.2	qt/a
		-GLYPHOSATE - IPA SALT	3.75			1.13				
	HERB	OUTRIDER	75	%	WG	0.0623	ai #/a	A	1.33	oz wt/a
		-SULFOSULFURON	75			0.062				
	HERB	ROUNDUP PROCONCENTRATE	3.75	#/G AE	SL	1.13	ai #/a	B	1.2	qt/a
		-GLYPHOSATE - IPA SALT	3.75			1.13				
6	HERB	ROUNDUP PROCONCENTRATE	3.75	#/G AE	SL	1.13	ai #/a	A	1.2	qt/a
		-GLYPHOSATE - IPA SALT	3.75			1.13				
	HERB	OUTRIDER	75	%	WG	0.0623	ai #/a	A	1.33	oz wt/a
		-SULFOSULFURON	75			0.062				
	HERB	OUTRIDER	75	%	WG	0.0623	ai #/a	B	1.33	oz wt/a
		-SULFOSULFURON	75			0.062				
	ADJ	INDUCE	100	%	AD	0.25	% v/v	B	0.25	% v/v
		-SURFACTANT	100			0.25				
7	HERB	ROUNDUP PROCONCENTRATE	3.75	#/G AE	SL	1.13	ai #/a	A	1.2	qt/a
		-GLYPHOSATE - IPA SALT	3.75			1.13				
	HERB	OUTRIDER	75	%	WG	0.0623	ai #/a	A	1.33	oz wt/a
		-SULFOSULFURON	75			0.062				
	HERB	ROUNDUP PROCONCENTRATE	3.75	#/G AE	SL	1.13	ai #/a	B	1.2	qt/a
		-GLYPHOSATE - IPA SALT	3.75			1.13				
	HERB	OUTRIDER	75	%	WG	0.0623	ai #/a	B	1.33	oz wt/a
	-SULFOSULFURON	75			0.062					
8	HERB	ROUNDUP PROCONCENTRATE	3.75	#/G AE	SL	1.13	ai #/a	B	1.2	qt/a
		-GLYPHOSATE - IPA SALT	3.75			1.13				
9	HERB	ROUNDUP PROCONCENTRATE	3.75	#/G AE	SL	1.13	ai #/a	B	1.2	qt/a
		-GLYPHOSATE - IPA SALT	3.75			1.13				
	HERB	OUTRIDER	75	%	WG	0.0623	ai #/a	B	1.33	oz wt/a
		-SULFOSULFURON	75			0.062				
10	HERB	OUTRIDER	75	%	WG	0.0623	ai #/a	B	1.33	oz wt/a
		-SULFOSULFURON	75			0.062				
	ADJ	INDUCE	100	%	AD	0.25	% v/v	B	0.25	% v/v
		-SURFACTANT	100			0.25				
11	OTH	UNTREATED CHECK	0	%	ND	0	ai #/a	A		
		-UNTREATED								

Type	Additional Treatment Information
HERB = HERBICIDE	
ADJ = ADJUVANT	
OTH = OTHER	
<u>Practice/ Product</u>	
OUTRIDER, 75, %, WG = SULFOSULFURON 75	
ROUNDUP PROCONCENTRATE, 3.75, #/G AE, SL = GLYPHOSATE - IPA SALT 3.75	

Monsanto Agricultural Group

Additional Treatment Information

WG = Water dispersible granules (WDG)

AD = Our code for surfactant

SL = Soluble concentrate (Our old S and AS)

ND = Our code for products like UNTREATED CHECK

Rate Unit

AI #/A = 'A' Pounds Active Ingredient per Acre (Metric=ai kg/ha)

% V/V = 'Z' Percent, Volume Product per Volume Mix Basis (Metric=same)

Alternate Rate Unit

OZ WT/A = Ounces Dry Product per Acre

% V/V = Percent, Volume Product per Volume Mix Basis

QT/A = Quarts Product per Acre

Replications: 4, Design: Randomized Complete Block, Treatment units: US standard, Treated plot size Width: 6.6 feet,

Treated plot size Length: 15 feet, Application volume: 32 gal/ac, Mix size: 1.4 liters, Mix overage: 25%, Format definitions:

WWSYSTEM.DEF, WWSYSTEM.FRM

Monsanto Agricultural Group

Title: Outrider Enhancement of Roundup Activity on Reed Canarygrass								
Protocol Number: 2006-01-A&-12					Region: NA Unites of Measure: U			
Experiment #:					By: James C. Graham			
					3/29/2006	4/19/2006	5/3/2006	5/4/2006
Rating date					3/29/2006	4/19/2006	5/3/2006	5/4/2006
Pest type					WEED	WEED	WEED	WEED
Pest Code					PHACA	PHACA	PHACA	CYPSS
Pest Stage					2-3 LF	4-6 LF	4-6 LF	1-3 LF
Plant part Eval					FOLIAGE	FOLIAGE	FOLIAGE	FOLIAGE
Evaluation type					% CTRL	% CTRL	%CTRL	% CTRL
Evaluator					User ID	User ID	User ID	User ID
TRT-EVAL Interval					140-DA-A	161 DA-A	175 DAA	175DAA
Trt No.	Type	Practice/Product	Rate	Rate Unit	1	2	3	4
1	HERB	OUTRIDER	0.0623	ai #/a	90 b	76 b	63 b	25 bc
	ADJ	INDUCE	0.25	% v/v				
2	HERB	ROUNDUP PROCONCENTRATE	1.5	ae #/a	100 a	97 a	88 a	13 bc
3	HERB	ROUNDUP PROCONCENTRATE	1.5	ae #/a	100 a	100 a	89 a	48 abc
	HERB	OUTRIDER	0.0623	ai #/a				
4	HERB	ROUNDUP PROCONCENTRATE	1.5	ae #/a	100 a	99 a	100 a	50 abc
	HERB	ROUNDUP PROCONCENTRATE	1.5	ae #/a				
5	HERB	ROUNDUP PROCONCENTRATE	1.5	ae #/a	100 a	100 a	100 a	58 abc
	HERB	OUTRIDER	0.0623	ai #/a				
	HERB	ROUNDUP PROCONCENTRATE	1.5	ae #/a				
6	HERB	ROUNDUP PROCONCENTRATE	1.5	ae #/a	100 a	100 a	100 a	88 a
	HERB	OUTRIDER	0.0623	ai #/a				
	HERB	OUTRIDER	0.0623	ai #/a				
	ADJ	INDUCE	0.25	% v/v				
7	HERB	ROUNDUP PROCONCENTRATE	1.5	ae #/a	100 a	100 a	98 a	71 ab
	HERB	OUTRIDER	0.0623	ai #/a				
	HERB	ROUNDUP PROCONCENTRTE	1.5	ae #/a				
	HERB	OUTRIDER	0.0623	ai #/a				
8	HERB	ROUNDUP PROCONCENTRATE	1.5	ae #/a	0 c	0 c	55 b	
9	HERB	ROUNDUP PROCONCENTRATE	1.5	ae #/a	0 c	0 c	60 b	
	HERB	OUTRIDER	0.0623	ai #/a				
10	HERB	OUTRIDER	0.0623	ai #/a	0 c	0 c	13 c	10 c
	ADJ	INDUCE	0.25	% v/v				
11	OTH	UNTREATED CHECK	0	ai #/a	0 c	0 c	0 d	0 c
LSD (P=.05)					5.0	2.5	10.8	38.8
Standard Deviation					3.5	1.7	7.5	26.3
CV					5.55	2.81	10.81	65.69
Grand Mean					62.73	61.07	69.41	40.08
Bartlett's X2					0.0	5.772	17.518	11.277
P)Bartlett's X2					.	0.056	0.008*	0.046*
Replicate F					1.000	0.194	0.187	0.981
Replicate Prob (F)					0.4064	0.8999	0.9045	0.4214
Treatment F					819.000	3257.785	90.164	5.153
Treatment Prob (F)					0.0001	0.0001	0.0001	0.0014

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

Final Discussion / Results

These studies answered several questions about the use of Outrider herbicide by Monsanto.

#1 Is Outrider safe to apply over the top of woody vegetation?

Yes, Outrider is safe for application over the top of selected woody vegetation, see attachment #1 (page 190) for the supplemental label.

- #2 Outrider is labeled for use on several native warm season grass species but does not include Eastern gamagrass. Is Outrider safe for use on Eastern gamagrass?
No, not entirely. It will stunt it and suppress seedhead development but does not appear to totally kill it. It could possibly be used as a rescue operation to get Johnsongrass out of Eastern gamagrass as a last resort with no guarantee.
- #3 Outrider is labeled for use on several native warm season grass species but does that include young seedlings the establishment year?
Yes, for labeled species. Eastern gamagrass had low level injury and bermudagrass, buffalograss, sideoats grama, and switchgrass had slight stunting the first 1 to 2 weeks.
- #4 Will Outrider effectively kill reed canarygrass?
No, even in combination with roundup there was not total control in one application cycle. Canarygrass is hard to kill and has a viable seed bank in the soil requiring repeat applications
for total control.

Ratings of Comparison of Overall Condition of Trees being Evaluated

Treatment #1 Split Application -
1.3oz. Of Outrider 5/11/2004,
1.3oz. Of Outrider 6/29/2004

Treatment #2 - 2.0oz. Of Outrider -
Single application 6/29/2004

Treatment #3 - Roundup 2.0 Quart/Acre
Single application - 11/5/2004

	Comparison of treatment #1 and check \\1 Ratings of condition (RC) comparison		Comparison of treatment #2 and check \\1 Ratings of condition (RC) comparison			Comparison of treatment #3 and check \\1 Ratings of condition (RC) comparison
	8/12/2004	9/22/2004	8/12/2004	9/22/2004	4/29/2005	4/29/2005
Silver Maple	1.25	3.00	-1.00	0.25	-2.30	-3.80
Sycamore	0.35	0.45	0.60	0.95	2.65	1.70
Swamp Oak	0.98	1.43	1.48	1.68	2.08	-1.10
Pin Oak	2.90	2.85	2.40	2.10	1.25	-1.85
Burr Oak	1.65	1.25	-0.10	-0.25	1.35	-1.15
Walnut	-0.30	-0.35	-0.80	-3.10	0.70	4.55
Pecan	-0.40	2.30	-0.15	-1.20	-0.05	-0.85
Cottonwood	-0.60	0.05	-2.60	-1.95	-1.55	-0.60
Bald Cypris	0.30	-0.50	0.80	0.00	-0.60	5.15
Green Ash	2.45	2.65	-0.05	0.65	-0.95	-2.10
Roughleaf						
Dogwood	4.25	3.50	1.50	1.25	0.85	-0.15
American Plum	1.05	0.20	1.05	-1.30	4.20	2.00
Blackhaw	1.15	0.85	0.40	0.35	-1.40	-0.25
Hazelnut	2.75	3.10	1.50	2.35	1.10	-0.50
Chokecherry	1.00	1.15	0.75	-1.35	-0.45	-0.35
False Indigo	2.00	1.75	1.75	1.75	3.25	2.75
Buttonbush	2.00	1.45	0.25	-0.30	1.35	0.90

\\1 Ratings of condition comparison

- negative numbers indicate improvement in tree condition with treatment
- 0 to 3 indicates little to no damage from chemical treatment
- 3 to 5 indicates moderate damage from chemical treatment
- 5 to 7 indicates extensive damage from chemical treatment
- 7 to 9 severe damage or death of tree

Ratings of comparison of Height of Trees being evaluated

Table #1

Treatment #1 Split Application -
1.3oz. Of Outrider 5/11/2004,
1.3oz. Of Outrider 6/29/2004

Treatment #2 - 2.0oz. Of Outrider -
Single application 6/29/2004

Treatment #3 - Roundup 2.0 Quart/Acre
Single application - 11/5/2004

	Comparison of treatment #1 and check √2 Ratings of heighth (RH) comparison		Comparison of treatment #2 and check √2 Ratings of heighth (RH) Comparison			Comparison of treatment #3 and check √2 Ratings of heighth (RH) comparison
	8/12/2004	9/22/2004	8/12/2004	9/22/2004	4/29/2005	4/29/2005
Silver Maple	-0.36	-0.41	-0.23	-0.44	-0.38	-0.02
Sycamore	-0.10	0.05	0.21	0.31	0.40	-0.04
Swamp Oak	-0.19	-0.21	-0.08	-1.21	-0.64	0.57
Pin Oak	0.26	0.25	-0.01	-0.03	0.30	0.08
Burr Oak	0.18	0.21	0.15	0.13	0.12	0.02
Walnut	0.04	-0.79	0.42	0.53	-1.06	-1.44
Pecan	-0.12	-0.21	0.10	-0.68	-0.64	0.77
Cottonwood	-0.60	-1.93	1.16	1.25	2.01	1.26
Bald Cypris	0.05	-0.40	0.87	-0.33	-0.33	-0.02
Green Ash	-0.20	-0.48	-0.13	-0.28	0.14	0.32
Roughleaf						
Dogwood	-0.19	0.00	0.22	0.07	-0.17	-1.57
American Plum	-0.96	-1.08	-0.11	-0.01	-0.12	-0.52
Blackhaw	0.26	-0.01	0.29	0.19	0.97	0.88
Hazelnut	0.48	0.44	0.71	1.14	-0.22	-1.33
Chokecherry	0.90	0.74	0.04	0.29	0.38	-0.01
False Indigo	-0.84	-0.90	-1.37	-1.60	-2.05	0.05
Buttonbush	-0.79	-1.02	-0.04	0.00	0.02	-0.23

√2 Ratings of height comparison

negative numbers indicate that treated plants outperformed untreated trees

0 to 3 indicates that treated trees may have encountered minor stunting

3 to 5 indicates trees show signs of moderate stunting

5 to 7 indicates extensive stunting

7 to 9 severe stunting to death among treated trees

Study: MOPMC-P-0613-PA, WL

Study Title: Evaluation and Release of a Shade Tolerant Big Bluestem, *Andropogon gerardii*, L., for Silvopasture

Study Leaders: Van Sambeek, J., Wallace, D., Garrett, G., Bruckerhoff, S.

Introduction:

Big bluestem is one of the most widespread important forage grasses of the North American tallgrass prairie region. It is usually associated with one or more of the other three dominant species; Indiangrass, switchgrass, and little bluestem. Big bluestem occurs on sub-irrigated lowlands, nearly level to gently undulating glacial till plains, overflow sites, level swales and depressions, residual and glacial uplands, and stream terraces and bottomlands along rivers and tributaries. The abundant, leafy forage is palatable to all classes of livestock.

The Elsberry PMC initiated a big bluestem collection from the Ozark region (Missouri, Arkansas, and Oklahoma) in 1988 to develop an improved big bluestem that would be better adapted to this region. The collection effort resulted in an assembly of 370 big bluestem accessions and three releases, OZ70 germplasm, a selected release for forage; Refuge germplasm, a medium height selection for buffers, filters and wildlife; and OH370 germplasm, a source identified release for diversity.

Problem:

There is limited information available on species selected for forage to be primarily used for savannas and silvopasture systems throughout Missouri.

Objective:

An existing PMC big bluestem collection displays an amazing range of morphological and phonological characteristics – color, plant height, blade width, stem erectness, rust resistance, spring emergence, anthesis, etc. This collection has never been evaluated for shade attributes that might be valuable in silvopasture systems or with savanna restoration efforts. This study will select and evaluate for forage production in relation to shade tolerance.

Cooperators:

The USDA Natural Resources Conservation Service, Plant Materials Center and the University of Missouri, Columbia, Horticulture and Agroforestry Research Center, HARC.

Procedure:

Randomized complete block design with three replications, five shade levels: full sun, 30% shade, 55% shade, 78% shade with sunflecks, and 80% shade.

Twenty-two accessions of big bluestem were selected based on original collection site descriptions and phenotypic characteristics such as leaf width, and chlorophyll content. These collections came from previous work (Study 29I097G) at the Elsberry and Arkansas PMC's and were assembled in 2005 at the University of Missouri Agroforestry Center (HARC). Additional species being evaluated are eastern gamagrass, Canada wildrye, riveroats, cluster fescue, and tall fescue. Plants were started in the greenhouse and planted in replicated plots the spring 2006.

Forty-five pots for each accession were randomized within each treatment. Above ground dry weight, leaf weight, and forage quality (acid detergent fiber, neutral detergent fiber, crude protein) will be collected for each accession.

Discussion:

2005/2006

Key Findings:

All big bluestem accessions exhibited growth reductions in harvested seasonal biomass (summer plus fall harvest in 2005) under reduced light, although four accessions had produced greater biomass at 70% of full sunlight than under full sunlight (Table 1). Response of most accessions closely approximated a linear relationship between harvested biomass and percentage reduction in light from full sunlight. When fitted to the equation $Y = MX + B$ where Y is g/pot harvested biomass and X is percent reduction from full sunlight, M approximates decrease in biomass per percent reduction in full sunlight and B approximates yield under full sun. We hypothesize the best accessions for most agroforestry practices will exhibit a compromise between relatively low values for M and relatively high values for B such as exhibited by PMC-6925, a high producing shade tolerant accession, compared to PMC-6974, an accession that did poorly under increasing shade (fig. 1). Yield data was also fitted to a second order polynomial and first derivative solved to estimate the percent of full sunlight produced maximum yields (estimated peak biomass production was at 76 % and >100% of full sunlight for PMC-6925 and PMC-6974, respectively).

Analysis of summer 2005 big bluestem biomass for forage quality showed highly significant interactions for Crude Protein (CP), Acid Detergent Fiber (ADF), and Relative Feed Value (RFV) under differing shade levels with and overall increase in CP and ADF and an overall decrease in RFV as shade levels increased (Table 2). Neutral Detergent Fiber (NDF) and Total Digestible Nutrients (TDN) also showed significant and very significant responses, respectively, to increasing shade levels.

Table 1.—Seasonal biomass production in 2005 for 21 accessions of big bluestem under five light regimes, coefficients for linear regression for each accession, and calculated percentage of full sunlight for maximum biomass yield.

State of origin	PMC number	2005 combined summer and fall biomass (g/pot) under five light regimes					Reg. coeff. for mx + b		Max. yield % fs
		Full sun	70%	45%	20%	Sunfleck	b	x	
AR	6967(02)	71	70	51	31	38	77	-0.51	>100
MO	6832(04)	85	81	67	39	32	92	-0.66	89
MO	6812(05)	75	85	61	37	44	86	-0.52	80
MO	6885(06)	96	86	79	32	42	104	-0.76	88
AR	6896(07)	94	82	73	43	50	98	-0.61	95
AR	6972(08)	88	81	78	42	52	94	-0.53	85
MO	6807(10)	91	76	64	47	46	92	-0.57	>100
AR	6974(12)	94	73	53	23	27	97	-0.89	>100
AR	6902(13)	90	80	58	32	46	94	-0.68	>100
MO	6802(14)	110	89	89	52	60	112	-0.66	>100
AR	6905(15)	88	75	67	40	45	91	-0.58	>100
OK	7049(16)	103	92	74	54	53	107	-0.65	>100
MO	6741(17)	87	93	77	52	56	96	-0.47	79
AR	6925(19)	91	96	89	65	58	100	-0.41	76
MO	6838(21)	96	96	78	45	57	105	-0.64	86
MO	6704(22)	73	67	57	37	35	77	-0.48	98
AR	6935(24)	85	64	60	26	37	86	-0.65	>100
OK	7039(25)	78	72	57	52	53	79	-0.34	>100
MO	OZ-70(26)	88	62	54	18	26	89	-0.83	>100
MO	Rountree	85	88	79	55	56	92	-0.41	78
OK	7007(29)	67	54	32	17	20	68	-0.62	>100

Figure 1.—Individual pot biomass in 2005 for shade tolerant PMC-6925 (squares) and intolerant PMC-6974 (diamonds) and fitted linear and quadratic responses as a function of full sunlight.

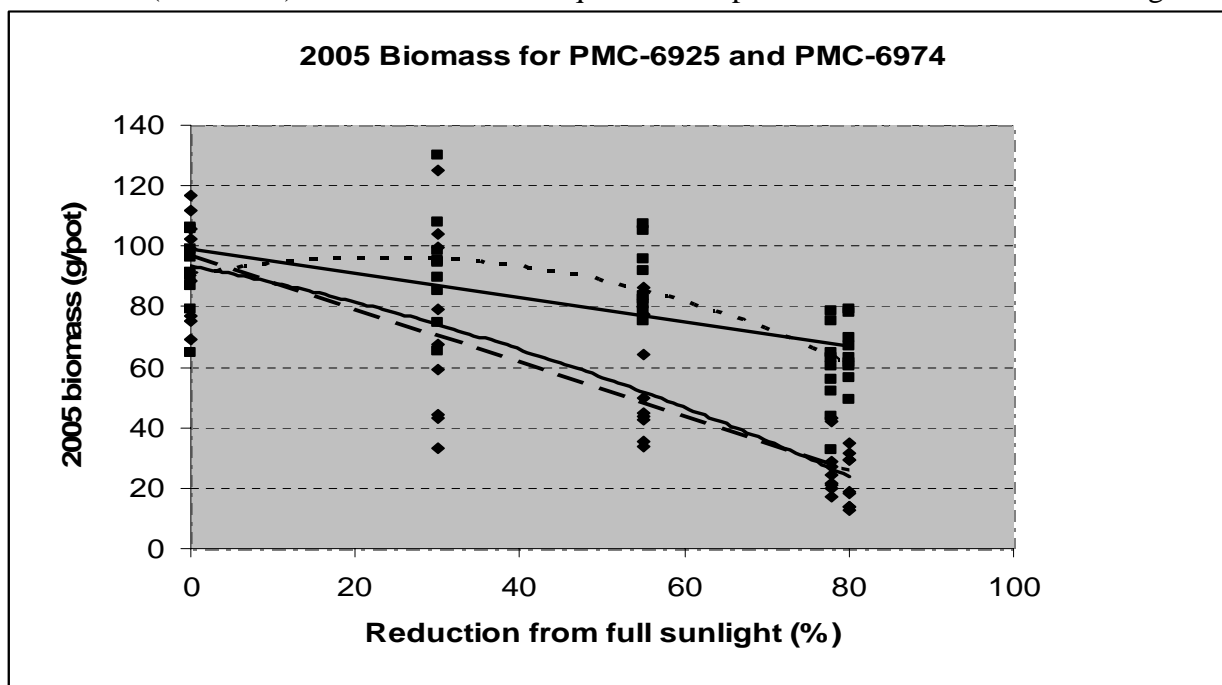


Table 2.– Summer 2005 forage quality mean and standard deviation (SD) averaged across 21 big bluestem (BBS) under five light regimes for percent crude protein (CP=true protein plus non-protein nitrogen), acid detergent fiber (ADF=highly indigestible fiber), neutral detergent fiber (NDF=cell wall or structural components), total digestible nutrients (TDN=111.8 + 0.95 CP - 0.36 ADF- 0.7 NDF), and relative feed value (RFV=(%DDM x %DMI)/1.29 or relative to full bloom alfalfa set at 100).

Light regime	CP (%)		ADF (%)		NDF (%)		TND (%)		RFV	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Full sun	6.2	1.0	36.0	3.2	63.5	2.6	60.2	3.3	89.4	6.8
70 % of full sun	6.2	1.5	39.2	3.6	65.7	3.3	57.6	4.0	83.0	8.0
45 % of full sun	6.9	1.9	40.0	3.9	65.9	3.4	57.7	4.4	81.8	8.1
20% of full sun	8.7	1.9	40.8	3.0	66.4	2.4	58.9	3.9	80.2	5.9
22% sunfleck	8.3	1.9	40.2	2.8	65.6	2.5	59.3	3.8	81.9	5.7
Sign: Shade	***		***		*		**		***	
5% LSD	0.5		1.2		1.5		1.3		2.5	
Interaction sign.: Shade x Acces.	***		ns		ns		**		ns	

Study: MOPMC-P-0614-PA, WL, BF

Study Title: Evaluation and Release of Switchgrass, *Panicum virgatum* L.

Study Leader: Bruckerhoff, S. B.

Introduction:

Switchgrass is one of the most widespread important native forage grasses of the North American tallgrass prairie region. It is usually associated with one or more of the other three dominant species; Indiangrass, big bluestem, and little bluestem. Switchgrass occurs on subirrigated lowlands, nearly level to gently undulating glacial till plains, overflow sites, level swales and depressions, residual and glacial uplands, and stream terraces and bottomlands along rivers and tributaries. The abundant, leafy forage is palatable to all classes of livestock. This species is common in the PMC service area and a more adapted and improved variety should be able to be developed from native collections.

Switchgrass is a warm-season, perennial, native grass and grows one to two meters and rarely to three meters tall. Plants are usually green or glaucous, with numerous scaly creeping rhizomes. Culms are erect, tough and hard, sheaths glabrous; blades 10-60 centimeters long, three to 15 millimeters wide, flat glabrous, or sometimes pilose above or near the base, rarely pilose all over; panicle 15-50 centimeters long; acuminate; first glume clasping, two-thirds to three-fourths as long as the spikelet.

Problem:

The variety of switchgrass most commonly used in the PMC service area is 'Cave-In-Rock'. Its genetic origin is southern Illinois and it performs well but can develop disease problems during seed production. Some uses for switchgrass would prefer a shorter selection without giving up forage quality or quantity.

Objective:

This study will develop a Midwest genetic origin switchgrass with high forage production and quality, high seed production, and seedling vigor for pasture, hay, conservation cover and potential uses for biofuels and bioenergy.

Procedure:

Accession 9062244 was selected from collections taken for development of a low growing switchgrass for waterways (Study 29I108G) at the Elsberry PMC. This accession was selected based on high forage production (very leafy), forage quality (15.6% crude protein in mid-summer) and late maturity. The selection was increased in the greenhouse by vegetative propagation from original material and placed in a 200 plant evaluation nursery (#1). Unwanted plants were rogued and seed was collected from the remaining plants.

Plants were selected from the seed harvested from nursery #1 based on heavier seed and quick seedling emergence. A 300 plant evaluation nursery (#2) will be established and evaluated for forage quality and quantity, seed production, late maturity and plant vigor. Selected plants will be allowed to cross and this will become the breeder's block of a medium height, forage type switchgrass.

Seed harvested from selected plants in evaluation nursery #2 will be generation zero (G0) and used to establish an increase field to produce G1 seed. This planting will be evaluated and seed produced will be used for further testing.

The final selection will be in a randomized complete block with four replications and compared to released cultivars of switchgrass.

Evaluation criteria will be emergence and establishment from seed in a field situation, forage quantity and quality, biofuel quality (height, lodging, leaf:stem ratio, nitrogen, etc.) and biomass production seed production, vigor, and late maturity. Emergence, biomass and maturity evaluations will be by rod row. All other evaluations will be in plots. Plot size is three feet by six feet consisting of three rows of plants, six plants per row with one foot spacing.

The accession will be compared to Cave-In-Rock, Blackwell, Shawnee, and Kanlow. Testing for forage quality and production will be twice a year for three years, and testing for biofuel will be once a year for three years.

Discussion:

2006

Evaluation nursery #2, consisting of 400 plants was evaluated and approximately 15 percent were eliminated. The nursery will be evaluated again in 2007 and reduced to 25 to 50 percent.

Study ID Code: MOPMS-T-0615-WL-WO

Study Title – Direct Seeding of Woody Shrubs for Establishing Shrub Cover for Wildlife Habitat of the Following Species. False Indigo Bush, *Amorpha fruticosa*, (a native legume), American Plum, *Prunus americana*, Roughleaf Dogwood, *Cornus drummondii*, Fragrant Sumac, *Rhus aromatica*, Chokecherry *Prunus virginiana*, Arrow-wood *Viburnum dentatum*, American Hazelnut, *Corylus Americana*, (all are native woody shrubs.)

Study Leader: Kaiser, J. U.

Introduction:

The direct seeding of seed in shrub species planted for wildlife habitat are typically planted as one to three year old bare root stock. Direct seeding (planting seed of woody species rather than plants) is an alternative method of establishing woody shrub species for wildlife habitat.

Problem:

The establishment period of seedlings for wildlife habitat, especially for small size plantings for quail covey winter habitat, is challenging because of loss from wildlife damage, drought, and poor survivability of the seedling species.

Objectives:

The objective of this study is to test an establishment technique for woody species using seed rather than seedlings. Direct seeding and management techniques will be tested in three replicated plots to determine which species can adequately establish and perform by direct seeding.

Procedure:

Randomized complete block with split plots design and three replications. Each species is evaluated in its own randomized complete block.

The seedlings will be evaluated during and after the first growing season for average seedling height, vigor, density (plants/sq.ft.) and establishment techniques and weed management.

In additional growing season will be evaluated for plant density.

Evaluation Criteria-

Legume: Species	Seeds/Lb	Planting Date	Seeding Rate	Seeds/Sq. Ft.	Plot Size	Split Plot
False indigobush	59,200	May 8, 2006	15# PLS/acre	20 PLS/Sq. ft.	30'x50'	10'x50'

Treatments between plots – Establishment Techniques

- 1) Prepared seedbed, broadcast seed and harrow.
- 2) Prepared seedbed, broadcast seed and light disk-in.
- 3) Prepared seedbed , drill seed 7.5 inch spacing

Treatments within plots (split plot) -Weed Management

- 1) No management (control/check)
- 2) Mowing above canopy of developing seedlings
- 3) Post emergent herbicides application for grass control.

Evaluation Criteria

Table for Woody Species

WOODY SPECIES	PLANTING DATE	SEEDS/ POUND	PLOT SIZE 45.5 X 33 FT	PLOT SEEDIN G RATE	BULK SEEDS/ SQ. FT.
Roughleaf dogwood	9-6-06	15,700	1,500 sq ft.	1# bulk	10.5
American plum	9-6-06	1,500	1,500 sq. ft.	1# bulk	1.0
Aromatic sumac	9-6-06	5,060	1,500 sq. ft.	1# bulk	3.4
Chokecherry	9-6-06	6,855	1,500 sq. ft.	1# bulk	4.6
Arrowwood	9-6-06	20,400	1,500 sq. ft.	1# bulk	13.6
American hazelnut	9-6-06	490	1,500 sq. ft.	1# bulk	0.33

Treatments between plots- Establishment techniques

- 1) Prepared seedbed, broadcast seed and light disk-in.

Treatments within plots (split plot)-Weed Management

- 1) No management (control/check)
- 2) Mowing above canopy of developing seedling
- 3) Post emergent herbicides application for grass control.

Plot size 33' x 45.5', (1500 sq. ft.) - Split block 33'x 15.15' (500 sq .ft.) .

The seed will be collected from species from the assemblies at the Elsberry PMC, except for fragrant sumac that was provided by the Missouri Department of Conservation state tree nursery.

This management will be done for the 1st year after seeding and documented for what is applied. The releases will be compared to determine which species can perform by direct seeding under field conditions.

Discussion:

2006

False indigo bush

The evaluation blocks with the treatments and management of false indigobush were planted May 8, 2006, using a randomized split plot design, with 3 replications and 3 treatments.

Treatment 1- Broadcast and harrow in prepared seedbed. Management was a Check (No weed control), Mowed and sprayed with the herbicide Poast Plus (sethoxydim).

Treatment 2 – Broadcast and disk-in (light incorporation of seed) in a prepared seedbed. Management was a Check (No weed control), Mowed and sprayed with the herbicide Poast Plus (sethoxydim).

Treatment 3- Drilled (TruaxDrill) in a prepared seedbed. Management was a Check (No weed control), Mowed, and sprayed with the herbicide Poast Plus (sethoxydim).

After a dry spring the area received 2.25” of rain in May and 1.1” rain on June 3.

On June 6 the herbicide treatment was used; for the split plot for all three treatments of establishment. The application rate of 24 oz/acre of Poast Plus (sethoxydim) was sprayed directly over the top of the split plots. The herbicide did an excellent control on the annual grasses; however this provided a release of broadleaf species during the growing season, especially Common Purslane (*Portulaca oleracea*).

Mowing started on the split plots for all three treatments of establishment on 6-9-06, sequential mowing was conducted during the growing season to suppress canopy closure of annual grasses and broadleaf weeds. A total of six mowings were conducted during the growing season. The mowing height initially was three inches after planting the first month. By the end of the growing season a height of 12 inches of the stubble was remaining.

The false indigobush seedlings were evaluated at the end of the growing season for stand, density of plants/square foot, and vigor rating on a scale of 1 = Excellent and 9 = Very Poor, 0= None. The seedlings were also measured for height in feet.

The following chart explains the results during this first year growing season.

False Indigobush Treatments	Check			Mowed			Herbicide		
	Rating and Plants/Sq Ft.	Av. Vigor Rating	Av. Height inches	Rating and Plants/Sq Ft.	Av. Vigor Rating	Av. Height inches	Rating and Plants/Sq Ft.	Av. Vigor Rating	Av. Height inches
Broadcast/Harrow									
Rep 1	9=1/25 sq'	9'	1"	0=0/25 sq'	0	0	7=2/25 sq'	1	15"
Rep 2	0=0/25 sq'	0	0	7=2/25 sq'	7	3"	5=4/25 sq'	3	10"
Rep 3	7=3/25 sq'	7	4"	7=2/25 sq'	7	3"	1=16/25 sq'	3	12"
Disk In									
Rep 1	0=0/25 sq'	0	0	7=2/25 sq'	7	3"	3=6/25 sq'	3	8"
Rep 2	0=0/25 sq'	0	0	5=4/25 sq'	7	5"	3=7/25 sq'	5	6"
Rep 3	7=2/25 sq'	7	2"	0=0/25 sq'	0	0	1=23/25 sq'	1	18"
Drilled									
Rep 1	0=0/25 sq'	0	0	7=2/25 sq'	9	1"	3=6/25 sq'	3	12"
Rep 2	9=1/25 sq'	7	3"	7=3/25 sq'	7	5"	1=11/25 sq'	3	8"
Rep 3	5=4/25 sq'	5	5"	9=1/25 sq'	7	2"	1=18/25 sq'	3	8"

Ratings: 1=Excellent, 3=Good, 5=Fair, 7=Poor, 9=Very Poor, 0=None

Summary of Results

False Indigobush

The check treatments exhibited on average for the three replications. a very poor stand density in plants/square foot, with each treatment having at least one rep having zero plants/per square foot. Plant vigor was very poor with limited growth because of competition of annual grasses and broadleaf weeds in dense shading of the block.

The mowed treatments exhibited on average for the three replications a poor stand density in plants/square foot with poor average seedling vigor and plant height.

The herbicide treatments on average for all three replications exhibited good plants/square foot with all treatments having good vigor ratings and plant growth response.

The checks and mowed treatments were dominated with annual grasses and several broadleaf weed species. The herbicide treatment controlled the annual grasses through the growing season with only competition from broadleaf weeds, heavy common purslane; and smartweed, however light still penetrated the canopy to aid the seedling development which is critical.

American Plum, Roughleaf Dogwood, Fragrant Sumac, Chokecherry, Arrow-wood, American Hazelnut

The six woody species were direct seeded in the random split plots with three replications on September 6, 2006. This seeding time was selected for a warm (fall) stratification period to follow with cold (winter) stratification. The species were seeded in a prepared (disked) seedbed that had soybean residue. All species were seeded by hand using a cyclone seeder except for the American hazelnut and American plum seed that was evenly spread by hand. All plots were lightly disked to cover the seed for fall. A late fall application of Roundup (glyphosate) was applied to control winter annuals.

2006 Elsberry PMC Plant Releases

**Refuge Germplasm Big Bluestem
Midwest Premium American Plum
Central Iowa Pale Purple Coneflower**

**Selected Class Release
Selected Class Release
Source Identified Release**

Release Notices as follows:

UNITED STATES DEPARTMENT OF AGRICULTURE

NATURAL RESOURCES CONSERVATION SERVICE

ELSBERRY, MISSOURI

NOTICE OF RELEASE OF REFUGE GERMPASM BIG BLUESTEM

SELECTED CLASS OF NATURAL GERMPASM

The Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture announce the release of a selected ecotype of Refuge Germplasm big bluestem (*Andropogon gerardii* L.). It has been assigned the NRCS accession number 9078832. Refuge Germplasm is released as a selected class of certified seed.

This alternative release procedure is justified because there are no existing commercial sources of big bluestem that are shorter than average in height and stiff stemmed. The potential for immediate use is high.

Collection Site Information: Collections of vegetative material were taken from native prairie remnants in Arkansas. Three collections were selected from the counties of Fulton, Washington, and Montgomery. They refer to the Major Land Resource Area's (MLRA) in Arkansas, 116, 117, and 119.

Description: Big bluestem is a tall, warm-season, perennial, native grass with stiff, erect culms; flattened and keeled sheaths; membranous ligules; and flat or folded leaf blades. Big bluestem has developed a very efficient spreading root system which may reach depths of 5-8 feet (150-200 cm) in northern latitudes, and 6-8 feet (180-240 cm) or more in the southern part of its natural range. Although short rhizomes may be present, it usually makes a bunch type growth. Big bluestem is composed of many ecotypes with a wide range of adaptation to soil and climate. Big bluestem is one of the most widespread and important forage grasses of the North American tallgrass prairie region. It is usually associated with one or more of the other three dominant species; indiangrass, (*Sorghastrum nutans* L. Nash.), switchgrass, (*Panicum virgatum* L.), and little bluestem (*Schizachyrium scoparium* Michx.). Big bluestem occurs on sub-irrigated lowlands, nearly level to gently undulating glacial till plains, overflow sites, level swales and depressions, residual and glacial uplands, and stream terraces and bottomlands along rivers and tributaries.

The Refuge Germplasm selection is at the shorter end of the range of height for the species. Average total height is 4.5 to 5.5 feet tall.

Method of Selection: Three hundred and seventy collections were vegetatively collected from 190 counties throughout the Ozark region of Missouri, Arkansas, Oklahoma, and Illinois. Each collection was increased vegetatively in the greenhouse and planted into an evaluation nursery with two replications and six plants per collection in each replication. Each plant was evaluated independently and ten collections. Selected plants were vegetatively removed, increases

vegetatively in the greenhouse, and isolated in an evaluation nursery containing approximately one hundred plants. Three individual plants representing three collections, accession numbers 9056902, 9056906 and 9056906, were selected for their short, columnar shape. These three plants were again vegetatively removed, vegetatively increased in the greenhouse, and planted into a crossing block. Seed from this block was used to establish the increase (G1) field.

Selection Criteria: The Refuge germplasm was selected and isolated because of its shorter than average height and its stiff stem that prevented lodging while being evaluated in an assembly of 370 collections of big bluestem. Refuge had good seed production in 2005, a very dry year with no irrigation. Bulk seed production was 320 bulk pounds of clean seed per acre.

Comparison of Refuge Germplasm big bluestem to 'Rountree' big bluestem was Refuge was approximately two and a half feet shorter and exhibited considerable resistance to lodging from maturity throughout the dormant season with standability to spring.

The Refuge Germplasm selection has characteristics of being very good for wildlife habitat and also works well in buffers and filters.

Ecological Considerations and Evaluation: Refuge Germplasm big bluestem is a selection of naturally occurring germplasm and has undergone selection for its short stature, columnar shape, and resistance to lodging. Refuge Germplasm did not meet the assessment of a plant which could become invasive, based on guidelines adopted by the NRCS Plant Materials Program.

Anticipated Conservation Use: The potential uses of Refuge Germplasm big bluestem include wildlife habitat, vegetative buffers, filters, and landscape uses.

Potential Area of Adaptation: Big bluestem occurs throughout the tallgrass prairie biome. Flowering begins in July and may continue until frost.

Refuge Germplasm big bluestem's recommended area of use is the Ozark Highland region of Southern Missouri, Northern Arkansas, Eastern Oklahoma, and Southern Illinois and could extend into adjacent regions with further testing.

Availability of Plant Materials: G1 material is being produced in limited supply by the Elsberry Plant Materials Center. For information contact USDA, NRCS, Plant Materials Center, 2803 N. Hwy 79, Elsberry, Missouri 63343 (573 898-2012).

References:

Flora of Missouri; p. 932; Steyermark, J. A.; Iowa State University Press, Ames, IA 1968.

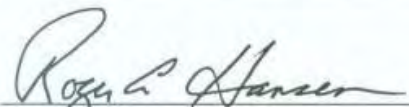
Gray's Manual of Botany, p. 232; Fernald, M. L.; Harvard University, Boston, Mass., 1950.

Manual of the Grasses of the United States; pp. 749, 751, and 812; United States Department of Agriculture, Washington, DC, 1951.

Prepared by: Ron Cordsiemon, USDA NRCS Plant Materials Center, 2803 North Hwy 79, Elsberry, Missouri 63343.

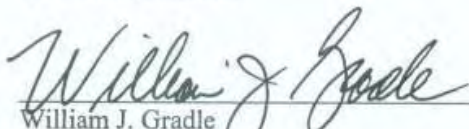
Signatures for release of:

Refuge Germplasm big bluestem(*Andropogon gerardii* L.)



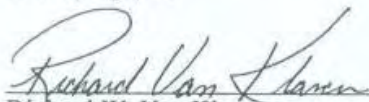
Roger A. Hansen
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Columbia, Missouri

5/2/06
Date



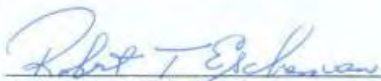
William J. Gradle
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Champaign, IL

5-2-2006
Date



Richard W. Van Klavern
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Des Moines, Iowa

5/03/06
Date



Robert T. Escherman
National Program Leader - Plant Materials
Ecological Sciences Division
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

5/16/06
Date

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
ELSBERRY, MISSOURI

NOTICE OF RELEASE OF MIDWEST PREMIUM GERMPLASM AMERICAN PLUM

SELECTED CLASS OF NATURAL GERMPLASM

The Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture announce the release of a selected ecotype of American plum (*Prunus americana*, Marsh.) for the Elsberry, Missouri Plant Materials Center three state service area; Iowa, Missouri, and Illinois.

As a selected release, this plant will be referred to as Midwest Premium Germplasm American plum. It has been assigned the NRCS accession number 9083241. Midwest Premium Germplasm is a selected class of certified seed.

This alternative release procedure is justified because there is a lack of available selections of American plum, specifically for the three state service area.

Collection Site Information: Midwest Premium Germplasm originally was collected from naturally occurring wild plants in the states of Missouri, Illinois, and South Dakota. Midwest Premium American plum, 9083241, is made up of six different collections.

Description: *Prunus americana*, American plum is one of the first shrubs or small trees to flower in the woodland. The showy clusters of fragrant white flowers are blooming while most of the woods are bare of foliage. American plum flowers from April through May and produces fruit from July to September. The flowers are bisexual and normally have five white petals and 15 to 20 stamens. Pollination of the flowers is achieved by insects. Flowers are solitary, in umbellike clusters and usually appear before the leaves. Leaves alternate and are somewhat oval, long and narrow-pointed. The leaves are doubled-toothed along the edge and have a dark green top and a paler bottom. The length is 2 to 5 inches and width is about 2 inches for each leaf. The fruit is thick and fleshy consisting of a one-seeded drupe that has a bony pit. American plum is very prone to root suckering and can form a thicket from a single tree. Bark from American plum is thin, reddish-brown and broken into thin plates. Thorny extrusions are often found on the trunk and branches. Mature American plum trees can grow to an average maximum height of 24 feet and can have a diameter of 5 to 10 inches.

Method of Selection: There were 18 different collections (170 individual plants) of the American plum assembly. From 1993 to 2000, evaluations were conducted for height, width, drought tolerance, insect and disease resistance, form, and survival. Six collections were selected based primarily on fruit production, drought tolerance, and insect and disease resistance. There were four accessions, (9068545, 9068546, 9068580, and 9058485) that exemplified excellent fruit production. Accession 9057088 was selected based on its remarkable resistance to

drought and insect and disease resistance. Accession 9062309 is a collection from South Dakota and it has extraordinarily large fruit. This accession was selected based on the size of fruit and because it did not differ significantly in other categories from the other selected accessions. (Refer to table 1 for evaluation data.) The six collections were made up of 37 trees and all other trees were eliminated from the assembly.

Ecological Considerations and Evaluation: Midwest Premium American plum is a selection of naturally occurring germplasm and has undergone minimal purposeful selection. Midwest Premium American plum does not differ significantly in rate of spread and vigor from naturally occurring wild plum. Midwest Premium American plum was “O.K. to release” when evaluated through the “Worksheet for Conducting an Environmental Evaluation of NCRS Plant Releases”.

Anticipated Conservation Use: American plum provides excellent food and wildlife habitat. There is a potential use for American plum in windbreaks as a medium size shrubby tree. American plum thickets could be used to help prevent soil erosion with their root systems. American plum can be used in poor soils with a wide range of pH.

Anticipated Area of Adaptation: American plum can generally be found in thickets, particularly along stream banks. It grows in rich soil or in moist locations, but also has a hardiness that will withstand severe locations. American plum trees perform best in a well drained soil and a sunny location. *Prunus americana* is present from Florida to New Mexico and Arizona, north to Massachusetts, New York, Ontario, Michigan, Wisconsin, Minnesota, Manitoba, Wyoming, and Utah.

Availability of Plant Materials: G1 material is being produced in limited supply by the Elsberry Plant Materials Center. For information contact USDA, NRCS, Elsberry Plant Materials Center, 2803 N. Hwy 79, Elsberry, Missouri 63343 (573 898-2012).

References:

Young, J. and Young, C. 1992. Seeds of Woody Plants in North America. Dioscorides Press. Portland, OR.

Styermark, J. 1963. Flora of Missouri. Iowa State University Press. Ames, IA.

Wisconsin Department of Natural Resources 2005. American Plum (*Prunus americana*). www.dnr.state.wi.us/org/land/forestry/treeid/TreePgs/prunusamer.htm, 3/24/2005 11:40am

Prepared by:

Ron Cordsiemon, USDA-NRCS Plant Materials Center, 2803 North Hwy. 79, Elsberry, Missouri 63343.

Midwest Premium American Plum Selection Data								Table 1	
<i>Acc. Number</i>	<i>Height</i>	<i>Width</i>	<i>Fruit Production</i>	<i>Drought Tolerance</i>	<i>Insect Damage</i>	<i>Disease Damage</i>	<i>Percent Survival</i>	<i># of Plants in Assembly</i>	<i># of Plants Selected</i>
9068545	10.06	12.33	3.44	1.22	2.33	2.11	87	15	9
9068546	10.63	12.88	4.63	1.63	2.50	2.13	100	12	8

9068580	9.89	10.67	4.78	1.11	1.67	1.22	78	18	9
9068485	8.50	9.11	5.14	3.00	3.86	3.57	70	10	4
9057165	8.30	9.30	5.80	3.20	4.00	3.60	100	5	
9068514	8.83	9.08	6.50	5.67	2.50	2.50	86	7	
9062308	8.58	9.67	6.50	3.00	3.67	2.33	60	10	
9068543	8.88	10.13	6.75	3.75	3.50	2.25	40	10	
9068480	8.38	9.21	6.75	2.58	4.00	2.75	80	15	
9062309	9.40	10.60	6.80	3.20	3.20	2.00	71	7	5
9068516	8.75	10.17	6.83	4.83	2.67	2.00	86	7	
9068515	8.33	9.28	6.89	0.44	3.00	2.78	82	11	
9068478	8.25	8.95	7.40	2.10	1.50	1.30	91	11	
9057088	11.50	14.00	8.00	1.00	1.00	1.00	91	11	2
9057096	10.10	9.30	8.00	3.40	4.00	2.60	42	12	
9057146	7.50	10.00	2.00	2.00	2.00	1.00	100	1	
434340	9.00	11.00	9.00	0.00	7.00	7.00	29	7	
ND286	0.00	0.00	0.00	0.00	0.00	0.00	0	1	

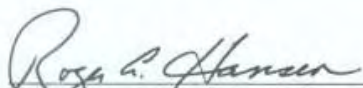
*Height and width are measured in feet (ft.)

*Fruit Production, Drought Tolerance, Insect Damage, and Insect Damage were Evaluated and given a 1-9 rating; (1 is excellent and 9 is poor)

*Plants selected for the Midwest Premium Germplasm American plum release are highlighted

Signatures for release of:

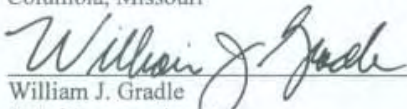
Midwest Premium Germplasm American plum (*Prunus americana*, Marsh.)



Roger A. Hansen
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Columbia, Missouri

5/2/06

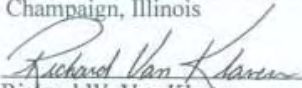
Date



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United States Department of Agriculture
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5-2-2006

Date



Richard W. Van Klavern
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Des Moines, Iowa

5/03/06

Date



Robert T. Eschman
National Program Leader - Plant Materials
Ecological Sciences Division
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

5/16/06

Date

UNITED STATES DEPARTMENT OF AGRICULTURE

NATURAL RESOURCES CONSERVATION SERVICE
ELSBERRY, MISSOURI

And

THE IOWA ECOTYPE PROJECT AT THE
UNIVERSITY OF NORTHERN IOWA
CEDAR FALLS, IOWA

TALLGRASS PRAIRIE CENTER
CEDAR FALLS, IOWA

IOWA CROP IMPROVEMENT ASSOCIATION
AMES, IOWA

NOTICE OF RELEASE OF CENTRAL IOWA GERMPLASM
PALE PURPLE CONEFLOWER
SOURCE IDENTIFIED CLASS OF NATURAL GERMPLASM

The Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture and the Iowa Ecotype Project at the University of Northern Iowa (UNI), the Tallgrass Prairie Center, (TPC), and the Iowa Crop Improvement Association (ICIA) announce the release of a source identified ecotype of pale purple coneflower (*Echinacea pallida*, Nutt.) for Central Iowa counties.

As a source identified release, this plant will be referred to as Central Iowa Germplasm pale purple coneflower to document its original collections. Central Iowa Germplasm pale purple coneflower released as a source identified type of certified seed (natural track). It has been assigned the NRCS accession number 9068612.

This alternative release procedure is justified because there are no existing commercial sources of pale purple coneflower collected from numerous native sites throughout this specific region. Propagation material of specific ecotypes is needed for roadside plantings and prairie restoration and enhancement. The potential for immediate use is high.

Collection Site Information: Collections were taken from native prairie remnants within the three tiers of counties located in central Iowa.

Ecotype Description: Pale purple coneflower is a perennial native prairie wildflower which grows 2 to 3 feet tall. The leaves are mostly basal; elongate-oval, blades 7 inches by $\frac{3}{4}$ inch with leaf stalks from 6 inches for basal leaves to $\frac{3}{4}$ inch for stem leaves; parallel veins in the blades; bulb-based hairs above and below. There is a single head at the top of a stalk having stiff hairs and a few small leaves. The heads are pale to deep rose-purple, drooping rays, 1 $\frac{1}{2}$ inches long, dark purple disk flowers on a conical base, the disk about 1 inch tall and 1 inch in diameter;

flowering from May to July; rays often last until August. The fruits (seeds) are 1/8 inch long, squarish and pointed at one end; no plume; fruiting begins in late June; often fruits persist in the head through the winter.

Environmental Impact Assessment: Central Iowa Germplasm pale purple coneflower is a collection of naturally occurring germplasm and has been unaltered. Central Iowa Germplasm pale purple coneflower did not meet the assessment of a plant which could become invasive based on guidelines adopted by the NRCS Plant Materials Program.

Anticipated Conservation Use: The potential uses of Central Iowa Germplasm pale purple coneflower include roadside and wildlife plantings, prairie creations and restorations, landscaping, and for increasing plant diversity in prairie communities.

Potential Area of Adaptation: Pale purple coneflower occurs throughout the tallgrass prairie biome, and common on limestone glades, barrens, bald knobs, fields, along railroads, and prairies, rarely in dry rocky woods. The range is from Illinois and Michigan to Minnesota and Nebraska, south to Georgia, Alabama, Louisiana, and Texas.

Availability of Plant Materials: G1 material is being produced in limited supply by the Elsberry Plant Materials Center and the University of Northern Iowa, Tallgrass Prairie Center. For information contact USDA, NRCS, Plant Materials Center, 2803 N. Hwy 79, Elsberry, Missouri 63343 (573 898-2012) or the University of Northern Iowa, Tallgrass Prairie Center, 2414 W. 27th St., Cedar Falls, IA 50614-0293 (319 273-3005).

References:

Flora of Missouri; pp. 1560-1562; Steyemark, J. A; Iowa State University Press, Ames, IA 1968.

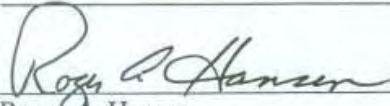
An Illustrated Guide to Iowa Prairie Plants; p. 43, Christiansen, P. and Muller, M.; University of Iowa Press, Iowa City, IA 1999.

Prepared by:

Ron Cordsiemon, USDA NRCS Plant Materials Center, 2803 North Hwy 79, Elsberry, Missouri, 63343.

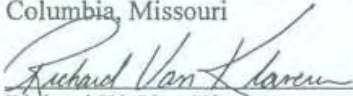
Signatures for release of:

Central Iowa Germplasm pale purple coneflower (*Echinacea pallida Nutt.*)



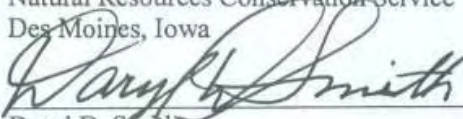
Roger A. Hansen
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Columbia, Missouri

5/2/06
Date



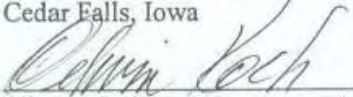
Richard W. Van Klavern
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Des Moines, Iowa

5/03/06
Date



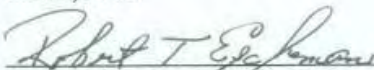
Daryl D. Smith
Director, Tallgrass Prairie Center
University of Northern Iowa
Cedar Falls, Iowa

5/18/06
Date



~~Eileen Wuebker~~ Delwin Koch
Director
Iowa Crop Improvement Association
Ames, Iowa

5/30/06
Date



Robert T. Eschman PM - NPL
National Program Leader - Plant Materials
Ecological Sciences Division
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

6-14-06
Date

Releases from the Elsberry Plant Materials Center
Alphabetically

Scientific Name	Release Name	Common Name	Accession Number	Secondary Agency(ies)	Type of Release	Year of Release
<i>Acer ginnala</i> Maxim.	Flame	Amur maple	483442		I	1978
<i>Amorpha fruticosa</i> L.	Missouri Covey False Indigo Bush	False indigo bush	9083248		N	2005
<i>Amorpha fruticosa</i> L.	Iowa Covey False Indigo Bush	False indigo bush	9083249		N	2005
<i>Amorpha fruticosa</i> L.	Illinois Covey False Indigo Bush	False indigo bush	9083250		N	2005
<i>Andropogon gerardii</i> L.	OZ-70	big bluestem	9078831			2004
<i>Andropogon gerardii</i> Vitman.	Northern Iowa	big bluestem	9068614	UNI, IARV, IAT, ICIA	N	2000
<i>Andropogon gerardii</i> Vitman.	Southern Iowa	big bluestem	9068616	UNI, IARV, IAT, ICIA	N	1999
<i>Andropogon gerardii</i> Vitman.	Northern MO	big bluestem	9079000	UMC, MDC, MODOT	N	1999
<i>Andropogon gerardii</i> Vitman.	Central Iowa	big bluestem	9068615	UNI, IARV, IAT, ICIA	N	1998
<i>Andropogon gerardii</i> Vitman.	OH-370	big bluestem	9062323	ARPMC	N	1997
<i>Andropogon gerardii</i> Vitman.	Rountree	big bluestem	474216	MOA	N	1983
<i>Andropogon gerardii</i> Vitman.	Refuge	big bluestem	9078832		N	2006
<i>Aster novae-angliae</i> L.	Central Iowa	New England Aster	9068682	UNI, IARV, IAT, ICIA	N	2002
<i>Aster novae-angliae</i> L.	Northern Iowa	New England Aster	9068681	UNI, IARV, IAT, ICIA	N	2002
<i>Aster novae-angliae</i> L.	Southern Iowa	New England Aster	9068683	UNI, IARV, IAT, ICIA	N	2002
<i>Bouteloua curtipendula</i> (Michx.) Torr.	Central Iowa	sideoats grama	9062279	UNI, IARV, IAT, ICIA	N	1995
<i>Bouteloua curtipendula</i> (Michx.) Torr.	Northern Iowa	sideoats grama	9062278	UNI, IARV, IAT, ICIA	N	1995
<i>Bouteloua curtipendula</i> (Michx.) Torr.	Southern Iowa	sideoats grama	9062280	UNI, IARV, IAT, ICIA	N	1995
<i>Bromus inermis</i> Leyss.	Elsberry	smooth brome	469227	MOA	Nat.	1954
<i>Coreopsis Palmata</i> Nutt.	Northern MO	prairie coreopsis	9079028	MDC, NAS	N	2001
<i>Coreopsis Palmata</i> Nutt.	Western MO	prairie coreopsis	9079029	MDC, NAS	N	2001
<i>Cornus drummondii</i> C.A. Meyer	Corinth	roughleaf dogwood	9055632		N	1997
<i>Cornus drummondii</i> C.A. Meyer	Jefferson	roughleaf dogwood	9055650		N	1997
<i>Cornus drummondii</i> C.A. Meyer	Tazewell	roughleaf dogwood	9055667		N	1997
<i>Cornus drummondii</i> C.A. Meyer	Nicholson	roughleaf dogwood	9055594		N	1997
<i>Cornus mas</i> L.	Redstone	cornelian cherry dogwood	516476		I	1991
<i>Dalea purpurea</i>	Northern Iowa	purple prairie clover	9068608	UNI, IARV, IAT, ICIA	N	2003
<i>Dalea purpurea</i>	Central Iowa	purple prairie clover	9068609	UNI, IARV, IAT, ICIA	N	1998
<i>Desmodium spp.</i>	Northern MO	showy tick trefoil	9079012	MDC	N	2004
<i>Desmodium canadense</i> L.	Alexander	showy tick trefoil	9057110		N	1997
<i>Echinacea pallida</i> Nutt.	Northern Iowa	pale purple coneflower	9068611	UNI, IARV, IAT, ICIA	N	2002
<i>Echinacea pallida</i> Nutt.	Southern Iowa	pale purple coneflower	9068613	UNI, IARV, IAT, ICIA	N	2002
<i>Echinacea pallida</i> Nutt.	Central Iowa	pale purple coneflower	9068612	UNI, IARV, IAT, ICIA	N	2006
<i>Elaeagnus umbellata</i> Thunb.	Elsberry	autumn olive	476986		I	1979

Releases from Elsberry PMC - continued

Scientific Name	Release Name	Common Name	Accession Number	Secondary Agency(ies)	Type of Release	Year of Release
<i>Elymus canadensis</i> L.	Northern Iowa	Canada wildrye	9062275	UNI,IARV,IAT,ICIA	N	1995
<i>Elymus virginicus</i> L.	Cuivre River	Virginia wildrye	9803169	MDC	N	2002
<i>Elymus virginicus</i> L.	Northern MO	Virginia wildrye	9079044	UMC,MDC,MODOT	N	1999
<i>Eryngium yuccifolium</i> Michx.	Southern Iowa	rattlesnake master	9068604	UNI, IARV, IAT, ICIA	N	1999
<i>Eryngium yuccifolium</i> Michx.	Central Iowa	rattlesnake master	9068603	UNI, IARV, IAT, ICIA	N	1999
<i>Eryngium yuccifolium</i> Michx.	Northern Iowa	rattlesnake master	9068602	UNI,IARV,IAT,ICIA	N	1998
<i>Glycine</i> sp. L	** Bobwhite	soybean	421822	MOPMC,ARS, MOA,	I	1975
<i>Heliopsis helianthoides</i> (L.) Sweet	Southern Iowa	oxeye false sunflower	9068607	UNI,IARV,IAT,ICIA	N	1997
<i>Heliopsis helianthoides</i> (L.) Sweet	Northern Iowa	oxeye false sunflower	9068605	UNI,IARV,IAT,ICIA	N	1996
<i>Heliopsis helianthoides</i> (L.) Sweet	Central Iowa	oxeye false sunflower	9068606	UNI,IARV,IAT,ICIA	N	1995
<i>Koeleria macrantha</i>	Central Iowa	Prairie Junegrass	9068621	UNI, IARV, IAT, ICIA	N	2003
<i>Koeleria macrantha</i>	Northern Iowa	Prairie Junegrass	9068620	UNI, IARV, IAT, ICIA	N	2003
<i>Lespedeza capitata</i> Michx.	Northern Iowa	roundhead lespedeza	9062284	UNI, IARV, IAT, ICIA	N	2000
<i>Lespedeza capitata</i> Michx.	Southern Iowa	roundhead lespedeza	9062283	UNI, IARV, IAT, ICIA	N	1997
<i>Lespedeza capitata</i> Michx.	Central Iowa	roundhead lespedeza	9062282	UNI, IARV, IAT, ICIA	N	1996
<i>Liatris aspera</i> , Michx.	Southern Iowa	Rough Blazing Star	9068686	UNI, IARV, IAT, ICIA	N	2003
<i>Liatris aspera</i> , Michx.	Central Iowa	Rough Blazing Star	9068685	UNI, IARV, IAT, ICIA	N	2003
<i>Liatris aspera</i> , Michx.	Northern Iowa	Rough Blazing Star	9068684	UNI, IARV, IAT, ICIA	N	2003
<i>Liatris pycnostachya</i> , Michx	Northern MO	prairie blazing star	9079020	MDC, NAS	N	2001
<i>Liatris pycnostachya</i> , Michx	Northern Iowa	prairie blazing star	9068626	UNI, IARV, IAT, ICIA	N	1999
<i>Liatris pycnostachya</i> , Michx	Central Iowa	prairie blazing star	9068627	UNI, IARV, IAT, ICIA	N	1999
<i>Liatris pycnostachya</i> , Michx.	Western MO	prairie blazing star	9079021	MDC, NAS	N	2001
<i>Liriodendron tulipifera</i> L.	Union	tulip poplar	9055584		N	1997
<i>Lonicera maackii</i> Maxim	Cling Red	Amur honeysuckle	483450		I	1978
<i>Monarda fistulosa</i> L.	Southern Iowa	wild bergamot	9068680	UNI, IARV, IAT, ICIA	N	2003
<i>Panicum virgatum</i> L.	Central Iowa	switchgrass	9068706	UNI, IARV, IAT, ICIA	N	2003
<i>Panicum virgatum</i> L.	Cave-In-Rock	switchgrass	469228	MOA	N	1974
<i>Panicum virgatum</i> L.	* Shawnee	switchgrass	591824		N	1995
<i>Prunus americana</i>	Midwest Premium	American plum	9083241		N	2006
<i>Ratibida pinnata</i> , Barnh.	Northern MO	Grayhead coneflower	9079060	MDC	N	2004
<i>Schizachyrium scoparium</i> (Michx.) Nash	Southern MO	little bluestem	9079006	MDC	N	2004
<i>Schizachyrium scoparium</i> (Michx.) Nash	Central Iowa	little bluestem	9062320	UNI,IARV,IAT,ICIA	N	1997
<i>Schizachyrium scoparium</i> , Michx.	Northern Iowa	little bluestem	9062319	UNI, IARV, IAT, ICIA	N	1999
<i>Schizachyrium scoparium</i> , Michx.	Southern Iowa	little bluestem	9962321	UNI, IARV, IAT, ICIA	N	1999
<i>Schizachyrium scoparium</i> , Michx.	Northern MO	little bluestem	9079004	UMC,MDC,MODOT	N	1999

Releases from the Elsberry Plant Materials Center						
By Year						
Scientific Name	Release Name	Common Name	Accession Number	Secondary Agency(ies)	Type of Release	Year of Release
<i>Andropogon gerardii</i> Vitman.	Refuge	big bluestem	9078832		N	2006
<i>Echinacea pallida</i> Nutt.	Central Iowa	pale purple coneflower	9068612	UNI, IARV, IAT, ICIA	N	2006
<i>Prunus americana</i>	Midwest Premium	American plum	9083241		N	2006
<i>Amorpha fruticosa</i> L.	Missouri Covey False Indigo Bush	False indigo bush	9083248		N	2005
<i>Amorpha fruticosa</i> L.	Iowa Covey False Indigo Bush	False indigo bush	9083249		N	2005
<i>Amorpha fruticosa</i> L.	Illinois Covey False Indigo Bush	False indigo bush	9083250		N	2005
<i>Andropogon gerardii</i>	OZ-70	big bluestem	9078831		N	2004
<i>Desmodium</i> spp.	Northern MO	showy tick trefoil	9079012	MDC	N	2004
<i>Ratibida pinnata</i> , barnh.	Northern MO	grayhead coneflower	9079060	MDC	N	2004
<i>Schizachyrium scoparium</i> (Michx.) Nash	Southern MO	little bluestem	9079006	MDC	N	2004
<i>Dalea purpurea</i>	Northern Iowa	purple prairie clover	9068608	UNI, IARV, IAT, ICIA	N	2003
<i>Panicum virgatum</i> L.	Central Iowa	switchgrass	9068706	UNI, IARV, IAT, ICIA	N	2003
<i>Koeleria macrantha</i>	Central Iowa	prairie Junegrass	9068621	UNI, IARV, IAT, ICIA	N	2003
<i>Koeleria macrantha</i>	Northern Iowa	prairie Junegrass	9068620	UNI, IARV, IAT, ICIA	N	2003
<i>Monarda fistulosa</i> L.	Southern Iowa	wild bergamot	9068680	UNI, IARV, IAT, ICIA	N	2003
<i>Liatris aspera</i> , Michx.	Southern Iowa	rough blazing star	9068686	UNI, IARV, IAT, ICIA	N	2003
<i>Liatris aspera</i> , Michx.	Central Iowa	rough blazing star	9068685	UNI, IARV, IAT, ICIA	N	2003
<i>Liatris aspera</i> , Michx.	Northern Iowa	rough blazing star	9068684	UNI, IARV, IAT, ICIA	N	2003
<i>Elymus virginicus</i> L.	Cuivre River	Virginia wildrye	9803169	MDC	N	2002
<i>Aster novae-angliae</i> L.	Central Iowa	New England aster	9068682	UNI, IARV, IAT, ICIA	N	2002
<i>Aster novae-angliae</i> L.	Northern Iowa	New England aster	9068681	UNI, IARV, IAT, ICIA	N	2002
<i>Aster novae-angliae</i> L.	Southern Iowa	New England aster	9068683	UNI, IARV, IAT, ICIA	N	2002
<i>Echinacea pallida</i> Nutt.	Northern Iowa	pale purple coneflower	9068611	UNI, IARV, IAT, ICIA	N	2002
<i>Echinacea pallida</i> Nutt.	Southern Iowa	pale purple coneflower	9068613	UNI, IARV, IAT, ICIA	N	2002
<i>Sporobolus compositus</i> var. com.	Southern Iowa	tall dropseed	9062315	UNI, IARV, IAT, ICIA	N	2002
<i>Solidago rigida</i> L.	Southern Iowa	rigid goldenrod	9068619	UNI, IARV, IAT, ICIA	N	2002
<i>Solidago rigida</i> L.	Central Iowa	rigid goldenrod	9068618	UNI, IARV, IAT, ICIA	N	2002
<i>Coreopsis palmata</i>	Northern MO	prairie coreopsis	9079028	MDC, NAS	N	2001
<i>Coreopsis Palmuta</i> Nutt.	Western MO	prairie coreopsis	9079029	MDC, NAS	N	2001
<i>Sporobolus compositus</i> var. comp.	Northern MO	tall dropseed	9079040	MDC, NAS	N	2001
<i>Liatris pycnostachya</i> , Michx.	Western MO	prairie blazing star	9079021	MDC, NAS	N	2001
<i>Liatris pycnostachya</i> , Michx	Northern MO	prairie blazing star	9079020	MDC, NAS	N	2001
<i>Sporobolus compositus</i> (Poir.) Merr.	Northern Iowa	tall dropseed	9062313	UNI, IARV, IAT, ICIA	N	2000
<i>Andropogon gerardii</i>	Northern Iowa	big bluestem	9068614	UNI,IARV,IAT,ICIA	N	2000
<i>Liatris pycnostachya</i> , Michx	Southern Iowa	prairie blazing star	9068628	UNI, IARV, IAT, ICIA	N	2000
<i>Lespedeza capitata</i> Michx.	Northern Iowa	roundhead lespedeza	9062284	UNI, IARV, IAT, ICIA	N	2000
<i>Andropogon gerardii</i> Vitman	Southern Iowa	big bluestem	9068616	UNI, IARV, IAT, ICIA	N	1999
<i>Schizachyrium scoparium</i> , Michx.	Northern Iowa	little bluestem	9062319	UNI, IARV, IAT, ICIA	N	1999
<i>Eryngium yuccifolium</i> Michx.	Southern Iowa	rattlesnake master	9068604	UNI, IARV, IAT, ICIA	N	1999
<i>Eryngium yuccifolium</i> Michx.	Central Iowa	rattlesnake master	9068603	UNI, IARV, IAT, ICIA	N	1999
<i>Schizachyrium scoparium</i> , Michx.	Southern Iowa	little bluestem	9962321	UNI, IARV, IAT, ICIA	N	1999
<i>Liatris pycnostachya</i> , Michx	Northern Iowa	prairie blazing star	9068626	UNI, IARV, IAT, ICIA	N	1999
<i>Liatris pycnostachya</i> , Michx	Central Iowa	prairie blazing star	9068627	UNI, IARV, IAT, ICIA	N	1999
<i>Elymus virginicus</i> L.	Northern MO	Virginia wildrye	9079044	UMC,MDC,MODOT	N	1999
<i>Sorghastrum nutans</i> (L) Nash.	Northern MO	Indiangrass	9079036	UMC,MDC,MODOT	N	1999
<i>Andropogon gerardii</i> Vitman	Northern MO	big bluestem	9079000	UMC,MDC,MODOT	N	1999

Releases from the Elsberry Plant Materials Center - continued						
Scientific Name	Release Name	Common Name	Accession Number	Secondary Agency(ies)	Type of Release	Year of Release
<i>Sorghastrum nutans</i> (L.) Nash.	Western MO	Indiangrass	9079037	UMC,MDC,MODOT	N	1999
<i>Schizachyrium scoparium</i> , Michx.	Northern MO	little bluestem	9079004	UMC,MDC,MODOT	N	1999
<i>Andropogon gerardii</i> Vitman	Central Iowa	big bluestem	9068615	UNI,IARV,IAT,ICIA	N	1998
<i>Dalea purpurea</i>	Central Iowa	purple prairie clover	9068609	UNI,IARV,IAT,ICIA	N	1998
<i>Eryngium yuccifolium</i> Michx.	Northern Iowa	rattlesnake master	9068602	UNI,IARV,IAT,ICIA	N	1998
<i>Solidago rigida</i> L.	Northern Iowa	rigid goldenrod	9068617	UNI,IARV,IAT,ICIA	N	1998
<i>Sorghastrum nutans</i> (L.) Nash.	Southern Iowa	Indiangrass	9062318	UNI,IARV,IAT,ICIA	N	1998
<i>Andropogon gerardii</i> Vitman.	OH-370	big bluestem	9062323	ARPMC	N	1997
<i>Cornus drummondii</i> C.A. Meyer	Corinth	roughleaf dogwood	9055632		N	1997
<i>Cornus drummondii</i> C.A. Meyer	Jefferson	roughleaf dogwood	9055650		N	1997
<i>Cornus drummondii</i> C.A. Meyer	Tazewell	roughleaf dogwood	9055667		N	1997
<i>Cornus drummondii</i> C.A. Meyer	Nicholson	roughleaf dogwood	9055594		N	1997
<i>Desmodium canadense</i> L.	Alexander	showy tick trefoil	9057110		N	1997
<i>Elymus canadensis</i> L.	Southern Iowa	Canada wildrye	9062277	UNI,IARV,IAT,ICIA	N	1997
<i>Heliopsis helianthoides</i> (L.) Sweet	Southern Iowa	oxeye false sunflower	9068607	UNI,IARV,IAT,ICIA	N	1997
<i>Lespedeza capitata</i> Michx.	Southern Iowa	roundhead lespedeza	9062283	UNI, IARV, IAT, ICIA	N	1997
<i>Liriodendron tulipifera</i> L.	Union	tulip poplar	9055584		N	1997
<i>Schizachyrium scoparium</i> (Michx.) Nash	Central Iowa	little bluestem	9062320	UNI,IARV,IAT,ICIA	N	1997
<i>Heliopsis helianthoides</i> (L.) Sweet	Northern Iowa	oxeye false sunflower	9068605	UNI,IARV,IAT,ICIA	N	1996
<i>Lespedeza capitata</i> Michx.	Central Iowa	roundhead lespedeza	9062282	UNI, IARV, IAT, ICIA	N	1996
<i>Sorghastrum nutans</i> (L.) Nash	Central Iowa	Indiangrass	9062317	UNI,IARV,IAT,ICIA	N	1996
<i>Sorghastrum nutans</i> (l.) Nash	Northern Iowa	Indiangrass	9062316	UNI,IARV,IAT,ICIA	N	1996
<i>Sporobolus compositus</i> (Poir.) Merr.	Central Iowa	tall dropseed	9062314	UNI,IARV,IAT,ICIA	N	1996
<i>Bouteloua curtipendula</i> (Michx.) Torr.	Central Iowa	sideoats grama	9062279	UNI,IARV,IAT,ICIA	N	1995
<i>Bouteloua curtipendula</i> (Michx.) Torr.	Northern Iowa	sideoats grama	9062278	UNI,IARV,IAT,ICIA	N	1995
<i>Bouteloua curtipendula</i> (Michx.) Torr.	Southern Iowa	sideoats grama	9062280	UNI,IARV,IAT,ICIA	N	1995
<i>Elymus canadensis</i> L.	Northern Iowa	Canada wildrye	9062275	UNI,IARV,IAT,ICIA	N	1995
<i>Heliopsis helianthoides</i> (L.) Sweet	Central Iowa	oxeye false sunflower	9068606	UNI,IARV,IAT,ICIA	N	1995
<i>Panicum virgatum</i> L. *	Shawnee	switchgrass	591824		N	1995
<i>Cornus mas</i> L.	Redstone	cornelian cherry dogwood	516476		I	1991
<i>Lonicera maackii</i> Maxim	Cling Red	Amur honeysuckle	483450		I	1978
<i>Ulmus parvifolia</i> Jacq.	Elsmo	lace bark elm	9004438		I	1990
<i>Andropogon gerardii</i> Vitman.	Rountree	big bluestem	474216	MOA	N	1983
<i>Sorghastrum nutans</i> (L.) Nash.	Rumsey	Indiangrass	315747	MOA	N	1983
<i>Elaeagnus umbellata</i> Thunb.	Elsberry	autumn olive	476986		I	1979
<i>Acer ginnala</i> Maxim.	Flame	Amur maple	483442		I	1978
<i>Glycine</i> sp. L. **	Bobwhite	soybean	421822	MOPMC,ARS, MOA,	I	1975
<i>Panicum virgatum</i> L.	Cave-In-Rock	switchgrass	469228	MOA	N	1974
<i>Bromus inermis</i> Leys.	Elsberry	smooth brome	469227	MOA	Nat.	1954
* Primary Agencies: ARS=Agricultural Research Service; NEARD=Nebraska Agricultural Research Division; MOPMC=Missouri Plant Materials Center; IAA=Iowa Agricultural Experiment Station at Ames; PARP=Purdue Agricultural Research Program						
** Primary Agency: MDC=Missouri Department of Conservation						
N=native releases; collected within the USA, occurring naturally in the USA. Generally refers to a plant which occurs naturally in a particular region, state ecosystem or habitat without direct or indirect human activity.						
Nat.=naturalized releases; collected from a population within the USA, but were originally introduced to the USA sometime in the past.						
I=introduced; means that the original collection from which the release was made was not from within the USA.						

**Studies/Projects at the Elsberry Plant Materials Center
Studies 1958 through 2006**

Study/Project Number System: Initially the numbers were assigned numerically plus the year the study/project was initiated. Later a different numbering system was adopted which involved the designated state number, a letter to denote the type of project/study and finally a numerical number.

Study/ Project Number	Title	Annual Technical Report/ Page Reference	
		ATR	Page
2-58	Quaker Comphrey Evaluation	1962	28
3-58	Comparison of Winter Annual Cover Crops	1962	30
6-62	Fertilizer Rate Study on Midland Bermudagrass, <i>Cynodon dactylon</i>	1963	47
10-59	Interseeding Cover Crops in Corn	1963	52
14-61	Evaluation of <i>Lotus corniculatus</i> L. Strains	1966	24
15-61	Evaluation of Bermudagrass Strains	1965	17
17-61	Black Locust, <i>Robinia pseudoacacia</i> L. Trials	1967	35
18-61	The Rate, Date and Method of Seeding <i>Lespedeza daurica schimadae</i>	1962	23
19-61	Living Fence Trials	1968	26
20-61	Plants for Bank stabilization	1962	10
21-62	Evaluation of Legumes for wildlife	1962	11
23-63	Evaluation of <i>Phalaris arundinacea</i> L. 'Ioreed' Reed Canarygrass Strains	1964	13
24-72	Method of Seeding Creeping Foxtail	1962	24
25-63	Advanced Evaluation of Plant Materials for Grass Waterways	1968	27
26-63	Evaluation of Japanese Pagodatree, <i>Sophora japonica</i> , for Posts	1962	16
27-63	Direct Seeding vs. Transplanting Sawtooth Oak, <i>Quercus acutissima</i> , Carruthers	1964	60
28-63	Effect of Cultural Methods on Crownvetch, <i>Coronilla varia</i> L., Seed Production	1964	64
31-63	<i>Lespedeza capitata</i> Michx. – Roundhead Lespedeza Ecotype Evaluation	1964	64
34-63	Cultural Methods for Seeding Grasses in woodland Pastures	1963	58
35-63	Effect of Cultural Methods on Seed Production of <i>Phalaris arundinacea</i> L., 'Ioreed' Reed Canarygrass	1964	13
37-63	Forage Yields and Season of Production for Several Grasses and Legumes Clipped Bi-Weekly at Three Inches and Six Inches	1964	78
38-64	Advanced Evaluation of Perennial Grasses for Summer Pasture	1968	28
42-65	Establishment of Crownvetch and Trefoil in Dead Litter Mulch	1967	41
44-65	Grasses and Legumes for Goose Browse on the Clarence Cannon Wildlife Refuge	1973 Part 1 Part 2	8 44
46-66	Method of Seeding Trials with 'Garrison' Creeping Foxtail	1966	26
49-69	Seed Yield of Three <i>Panicum virgatum</i> , Switchgrass Selections: Mich 381; 'Blackwell', M1-5714, and M1-5845, 'Cave-In-Rock'	1971 Part 1 Part 2	5 46
50-69	Seed Yield and Seed Retention of Four <i>Phalaris arundinacea</i> , Reed Canarygrass Selections – 'Ioreed', 'Rise', 'Frontier', and 'Auburn'	1976	12

Study/ Project Number	Title	Annual Technical Report/ Page Reference	
		ATR	Page
51-C-71	Herbicide tolerance of New Seeding of tall Fescue, Big Bluestem, Indiangrass, and Switchgrass	1979	55
29I052W	Growth Rate Study of European Alder on Deep Alluvial Soil	1980	4
53-72	Growth Rate Study of Poplar (Cottonwood) On A Deep Alluvial Soil	1972 Part 1 Part 2	7 53
54-72	Rhizome Development of Two tall Fescue, <i>Festuca arundinacea</i> , Selections: M1-6161 and M1-6162	1971 Part 1 Part 2	7 54
29A055	Evaluations of <i>Sorghastrum nutans</i> , Indiangrass (M1-7073), Poly-Cross Indiangrass for Leafiness, Disease-Free Characteristics and Seed Production	1981	81
56-71	Comparative Evaluation of New Lotus Accessions with Names and Used Varieties to Determine Potential as a Long Lived Legume in Three State Areas Served	1974 Part 1 Part 2	4 4
29I057-72	Growth Rate Study of Poplars (Cottonwood) on a Deep Alluvial Soil	1981	4
29A058-72	Evaluation For Naming and Releasing of Elsberry Developed Big Bluestem and Indiangrass	1981	83
59-72	Sorghum Evaluation as Wildlife Game Feed	1973 Part 1 Part 2	11 55
29I060-69	Replacement of the American Elm Tree	1979	80
61-72	Advanced evaluation of Meadow Foxtail, <i>Alopecurus pratensis</i> , PI-305495, as Waterway Grass as Compared to 'Garrison' Creeping Foxtail, <i>Alopecurus arundinaceus</i> , the Standard for Comparison	1973 Part 1 Part 2	12 56
29I062J	Trees and Shrubs for Use as Wildlife Food and Cover Plants	1979	11
29I063	Plants for Use in Critical Area Stabilization	1979	21
29I064W	Plants for Wood Products	1979	23
65-78	Plants for Use in Landscape and Beautification	1976	10
29I066W-72	Developing Winter Hardy Nut Bearing Trees and Shrubs for Planting in Parks, Wildlife Areas and Natural Areas	1979	27
29I067K	Trees for windbreaks	1979	29
29A068-72	Response of Yellow Poplar to thinning	1979	67
29A069-72	Black Cherry Demonstration	1979	70
29A070-73	<i>Desmodium</i> for Wildlife Food and Cover	1979	31
29A071-73	Evaluation for Naming and Releasing of Elsberry Developed Autumn Olive, M1-6369	1978	73
29A072-73	Evaluation of M1-4701, <i>Lonicera maackii</i> , Amur Honeysuckle for Naming and Releasing	1978	74
29A073G	Establishment of warm-Season Grasses with Herbicides for Weed Control. Herbicides are Not Tested or Have Label Clearance for Warm-Season Grasses	1979	72
29A074M	Cover Crops in Soybeans	1984	258
Misc. Study	NJ-927, <i>Eleagnus umbellata</i> , Autumn Olive for wildlife Food and Cover	1981	101

Study/ Project Number	Title	Annual Technical Report/ Page Reference	
		ATR	Page
29A075F	Plants for Shoreline and Wetland Stabilization	1990	64
29I076G-78	Establishment of Warm Season Grasses	1981	7
Misc. Study	Evaluation of Cold Hardy <i>Paspalum notatum</i> Selections	78	76
29I077P	Evaluation of Plants for Vegetating Salt Damaged Areas	1981	11
29I078D	Field Evaluation Planting to Evaluate Species of Plants for Use on Alkali Bearing Soils in Southern Illinois	1981	19
29I079D	Field Evaluation Planting to Evaluate Species of Plants for Use on Revegetating Acid Coal Mine Spoil in Illinois (Saline County SWCD and Peabody Coal Company)	1984	25
29I080D	Field Evaluation Planting to Evaluate Species of Plants for Use in Revegetating Acid Coal Mine Spoil in Iowa (VanBuren County SWCD)	1980	56
29I081D	Field Evaluation Planting to Evaluate Species of Plants for Use in Revegetating Acid Coal Mine Spoil in Iowa (Marion County SWCD)	1980	77
29I082D	Field Evaluation Planting to Evaluate Species of Plants for Use in Revegetating Acid Coal Mine Spoil in Illinois (Fulton County SWCD and Freeman United Coal Mine)	1984	117
29I083M	Legume Cover Crop for No-Till Corn Production	1984	160
29I084G	Legumes to Enhance Fescue Pastures	1986	6
29A085S	Debearding Fluffy Native Grass Seed (Big Bluestem and Indiangrass)	1981	92
29A086L	Use of an Absorbent Polymer in Coating Native Grass Seed	1982	106
29I087D	Plants with Increased tolerance to Aluminum and Manganese	1984	192
29A088W	Cooperative Screening Study of Native and Introduced Sources of Eastern Cottonwood	2000	129
29I089V	Multiple Use Legume Assembly and Evaluation	1988	4
29I090G	No-Till Establishment of Warm-Season Grasses in Cool Season Grass Sod	1984	219
29I091G	Weed Control Treatments for Warm Season Grass Establishment	1988	7
29I092G	Perennial Grasses as Cover Crops for Use in No-Till Systems	1988	12
29I093R	Miscellaneous Grass Evaluation	2006	9
29A094M	Cover Crops in Corn, Soybeans, and Milo	1987	5
29I096F	Streambank Stabilization	1988	14
29I097G	Assembly and Evaluation of Big Bluestem, <i>Andropogon gerardii</i> , Vitman.	2006	13
29I098M	'Tinga' Tangier Pea for Soil Protection	1987	7
29I099J	Assembly and Evaluation of Roughleaf Dogwood, <i>Cornus drummondii</i>	1994-1998	13
29I100J	Assembly and Evaluation of Blackhaw, <i>Viburnum prunifolium</i> L.	1999	17
29I101J	Assembly and Evaluation of Arrowwood, <i>Viburnum dentatum</i>	2006	21
29A102M	Evaluation of Perennial Grass as Cover Crops for No-Till Soybeans	1990	85
29A105M	Evaluation of Winter Annual Grass for Cover Crops in No-Till Soybeans	1993	34
29I107G	Assembly and Evaluation of Eastern Gamagrass, <i>Tripsacum dactyloides</i> L.	2006	24

Study/ Project Number	Title	Annual Technical Report/ Page Reference	
		ATR	Page
29I108G	Assembly and Evaluation of Low Growing Rhizomatous Switchgrass, <i>Panicum virgatum</i> L., for Use in Waterways, Filter Strips and Other Conservation Uses	2006	30
29I109W	Direct Seeding Methods of <i>Quercus</i> sp., Oaks	1993	17
29I110J	Assembly and Evaluation of Chokecherry, <i>Prunus virginiana</i> L.	2006	36
29A111G	Field Evaluation of Selected Perennial Grasses for Pasture Wildlife Habitat and Erosion control (Varietal Study)	1994-1998	91
29I112J	Assembly and Evaluation of Nannyberry, <i>Viburnum lentago</i> L.	1993	21
29I113J	Assembly and Evaluation of Serviceberry, <i>Amelanchier arborea</i> (Michx.F.) Fern.	1993	22
29I114K	Field Evaluation of Woody Plant Materials in Cooperation with Mineral area College	1993	22
29A116W	Field Evaluation of Woody Plant Materials in Cooperation with Mineral Area College	2006	38
29A117H	Intercenter Strain Trial of <i>Tripsacum dactyloides</i> L., Eastern gamagrass	1993	46
29A118G	Field Evaluation of Selected Perennial Grasses for Pasture, Wildlife Habitat and Erosion Control (Varietal Study)	1994-1998	91
29A121W	Conifer Evaluation for Windbreak Plantings	2000	137
29A122G	Evaluation of Perennial Warm-Season Grasses as Windbarriers in Southeast Missouri	1994-1998	125
29A123M	Winter Cover Crop Study for No-Till Soybeans	1993	54
29A124G	Fertility and Harvest Management of Eastern Gamagrass for Forage Production	2006	45
29I126W	Woody Columnar Collection	1993	30
29A127G	Field Evaluation of Selected Perennial Grasses for Pasture, Wildlife Habitat and Erosion Control	1994-1998	91
29A128J	<i>Cornus florida</i> L., Flowering Dogwood, Interagency Study Between Department of Interior, National Parks Service, National Capital Region and the Department of Agriculture	2006	52
29A131O	Treatment of Animal wastewaters by Constructed Wetlands	1993	66
29I132O	Miscellaneous Wetland Plant evaluation	2003	49
29I133J	Assembly and Evaluation of Gray Dogwood, <i>Cornus racemosa</i>	work plan not developed	
29I134J	Assembly and Evaluation of Eastern Redcedar, <i>Juniper virginiana</i> L.	2002	55
29I135J	Assembly and Evaluation of Hazelnut, <i>Corylus Americana</i> , Marsh	2006	53
29I136J	Assembly and Evaluation of Wild Plum, <i>Prunus Americana</i> , Marsh.	2006	54
29A137O	Wetland Riparian Propagation, Establishment and Demonstration	2006	74
29I138G	Residue Decomposition Trial	1994-1998	68
29A139G	Field Evaluation of Establishment of Herbaceous Plants	1994-1998	149
29A140W	Yellow Poplar Evaluation	1994-1998	159
29I141G	Assembly and Evaluation of Little Bluestem, <i>Schizachyrium scoparium</i> , Michx.	2006	95
29I142G	Production of Native Missouri Ecotypes of Grasses, Legumes and Forbs for Roadside, Critical Areas, and All Other Vegetative Plantings Where Native Plants are Now Being Planted	2006	104
29I143G	Seed Coating/Seed Rates	2002	129
29A144G	Biofuel Study of Different Strains/Varieties of Switchgrass	1999	147
29A145	Wear Tolerance Demonstration of Vegetation in High Traffic Areas	2000	154

Study/ Project Number	Title	Annual Technical Report/ Page Reference	
		ATR	Page
MOPMC-P-0001, WO, WL, WE	Assembly, Evaluation and Selection of Bur Oak, <i>Quercus macrocarpa</i> , Michx.	2006	109
MOPMC-P-0002, WE, WL	Assembly, Evaluation and Selection of False Indigo Bush, <i>Amorpha fruticosa</i> , L.	2006	127
MOPMC-P-003 PA,WL	Evaluation and Release of Eastern Gamagrass, <i>Tripsacum dactyloides</i> , L.	2006	136
MOPMC-T-0104	Native Plant Identification	2005	150
MOPMC-T-0105, PA	Compatibility Study Using Warm Season and Cool Season Native Grasses with Legumes and Forbs	2006	140
MOPMC-T-106, BU	Collection and Evaluation of Native Cool Season Grasses and Sedges for Filter Strips	2006	150
MOPMC-P-0107, PA, WL	Evaluation and Release of Big Bluestem, <i>Andropogon gerardii</i> L.	2002	176
MOPMC-T-0208, PA	Testing Warm Season Grasses for Forage Quality	2006	162
MOPMC-T-0209, PA, WL	Evaluation and Release of <i>Paspalum</i> Species 2003	2003	156
MOPMC-T-310-PA,WL	Incorporating Native Warm Season Grasses into Cool Season Pasture with Grazing Management	2006	173
MOPMC-T-0311, RI, BU	Control of Reed Canarygrass in Riparian Buffer Plantings	2006	175
MOPMC-T-0412, WE, WL, RI	Testing Selected Trees for Tolerance to the Herbicide Outrider	2006	185
MOPMC-P-0613-PA, WL	Evaluation and Release of a Shade Tolerant Big Bluestem, <i>Andropogon gerardii</i> , L. for Silvopasture	2006	187
MOPMC-P-0614-PA, WL, BF	Evaluation and Release of Switchgrass, <i>Panicum virgatum</i> L.	2006	190
MOPMS-T-0615-	Direct Seeding of Woody Shrubs for Establishing Shrub Cover for Wildlife Habitat of the Following Species. False Indigo Bush, <i>Amorpha fruticosa</i> ,(a native legume), American Plum, <i>Prunus americana</i> , Roughleaf Dogwood, <i>Cornus drummondii</i> , Fragrant Sumac, <i>Rhus aromatica</i> , Chokecherry <i>Prunus virginiana</i> , Arrow-wood <i>Viburnum dentatum</i> , American Hazelnut, <i>Corylus Americana</i> , (all are native woody shrubs.)	2006	192

Herbaceous and Woody Seed and Plant Production at the Elsberry PMC 2005

The plant and seed inventory at the Elsberry PMC is used for field plantings, special plantings, demonstration plantings, research studies and commercial release.

Name	Seed Harvested in 2006
Herbaceous Species	Bulk (Pounds)
<u>'Rountree' big bluestem</u> <i>Andropogon gerardii</i>	326.3 Foundation
<u>Refuge Big Bluestem</u> (9078832) <i>Andropogon gerardii</i>	193.2 SG1
<u>'Rumsey' Indiangrass</u> <i>Sorghastrum nutans</i>	111 Foundation
<u>'Pete' eastern gamagrass</u> <i>Tripsicum dactyloides</i> L.	0 Foundation
<u>'Cave-In-Rock' switchgrass</u> <i>Panicum virgatum</i>	0 Foundation
<u>'OH-370' big bluestem</u> <i>Andropogon gerardii</i>	221.4 SG1
<u>'OZ-70' big bluestem</u> <i>Andropogon gerardii</i>	219.2 SG1
<u>'Alexander' tick trefoil</u> <i>Desmodium canadense</i>	9.3 SG1
<u>Flood tolerant switchgrass</u> <i>Panicum virgatum</i>	0 SG1
<u>Low growing switchgrass</u> <i>Panicum virgatum</i>	140.3 SG1
<u>'Bobwhite' soybean</u> <i>Glycine spp.</i>	0 Foundation
<u>Virginia Wild Rye</u> <i>Elymus virginicus</i>	737.8 SG1
<u>Iowa Ecotype Plantings</u> (10 Species; 28 Plots)	130 Total
<u>Missouri Ecotype Plantings</u> (15 Species; 17 Plots)	209 Total

Herbaceous and Woody Seed and Plant Production – continued

Name:	Seed Harvested & Plant Inventory as of December 2006	
	Plants	Seed Bulk (Pounds)
Woody Species		
<u>'Union' tulip tree</u> <i>Liriodendron tulipifera</i>	0	0
<u>American hazelnut (9083247) (Composite)</u> <i>Corylus americana</i>	200	16.6
<u>American plum (9083241) (Composite)</u> <i>Prunus Americana</i>	300	101.6
<u>Arrowwood (9068590) (Iowa Selection)</u> <i>Viburnum dentatum</i>	180	1.8
<u>'Redstone' Cornelian cherry (9055585)</u> <i>Cornus mas</i>	20	0
<u>Chokecherry (9083259)</u> <i>Prunus virginicus</i>	0	1.2
<u>Missouri Covey False Indigo Bush</u> <i>Amorpha fruticosa (9083248)</i>	230	9.8
<u>Iowa Covey False Indigo Bush</u> <i>Amorpha fruticosa (9083249)</i>	640	0.5
<u>Illinois Covey False Indigo Bush</u> <i>Amorpha fruticosa (9083250)</i>	490	0



Refuge Big Bluestem, August 2006
Steven Bruckerhoff, PM Center Manager

For more information about this and other conservation plants, contact your local NRCS field office or Conservation District, or browse the Web at <http://Plant-Materials.nrcs.usda.gov> (Plant Materials) or <http://plants.usda.gov> (PLANTS database).

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