

# Elsberry Plant Materials Center 2005 Annual Technical Report



Missouri Covey Germplasm False Indigo, *Amorpha fruticosa*

## PLANT SOLUTIONS FOR CONSERVATION NEEDS

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2005**

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**2005**  
**Annual Technical Report**  
**Elsberry Plant Materials Center**  
**Elsberry, Missouri**

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## **Introduction**

The Elsberry Plant Materials Center (PMC) was established in June 1934 and is the oldest Center in the nation. The Elsberry Plant Materials Center is one of 27 plant materials centers 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.

The mission of the NRCS Plant Materials Program is to develop and transfer plant materials and plant technology for the conservation of natural resources. In working with a broad range of plant species, including grasses, forbs, legumes, trees, and shrubs, the program seeks to address priority needs of field offices and land managers in both public and private sectors. Emphasis is focused on using native plants as a healthy way to solve conservation problems and protect ecosystems.

The objectives of the Elsberry PMC and of the plant materials program are to assemble, test, select and develop improved plants; and to develop 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 70-year history. In 2005 there were three new plant releases. The PMC released three varieties of *Amorpha fruticosa*, false indigo bush. They are Missouri Covey, Illinois Covey, and Iowa Covey False Indigo, all of which are selected class releases. The center also discontinued a release in 2005, *Bromus inermis*, Elsberry smooth brome. Elsberry smooth brome was discontinued because there was no commercial interest in this release and there had been no allocations for several years. Elsberry smooth brome was the first release for the Elsberry PMC in 1954. Currently the Elsberry Plant Materials Center has 78 active releases and of these 78 releases, 76 of them are native.



**CLIMATIC DATA – CALENDAR YEAR 2005**

**TEMPERATURE (Fahrenheit)**

<b>Month</b>	<b>73 Year Monthly High Average</b>	<b>2005 Monthly High Average</b>	<b>2005 Monthly High Departure</b>	<b>73 Year Monthly Low Average</b>	<b>2005 Monthly Low Average</b>	<b>2005 Monthly Low Departure</b>
<b>January</b>	38.01	39.16	+1.15	18.21	24.61	+6.40
<b>February</b>	43.18	47.89	+4.71	22.49	30.14	+7.65
<b>March</b>	53.84	52.55	-1.29	36.58	32.52	-4.06
<b>April</b>	66.72	68.57	+1.85	42.05	45.87	+3.82
<b>May</b>	76.49	76.16	-0.33	56.75	50.65	-6.10
<b>June</b>	85.35	87.93	+2.58	71.18	63.53	-7.65
<b>July</b>	89.56	89.68	+0.12	64.60	66.48	+1.88
<b>August</b>	87.54	86.97	-0.57	62.50	67.58	+5.08
<b>September</b>	80.41	82.90	+2.49	49.30	60.73	-11.43
<b>October</b>	69.41	67.39	-2.02	43.19	45.71	+2.52
<b>November</b>	50.52	56.00	+5.48	32.32	36.97	-4.65
<b>December</b>	42.00	36.52	-5.48	22.82	22.77	-.05

<b>2005</b>	
<b>Last Killing Frost (26° and below)</b>	March 20
<b>First Killing Frost (26° and below)</b>	November 16
<b>Number of Frost-Free Days</b>	241

## CLIMATIC DATA – CALENDAR YEAR 2005

### Precipitation (Inches)

<b><u>Month</u></b>	<b><u>75 Year Average</u></b>	<b><u>2005 Total</u></b>	<b><u>Departure</u></b>
<b>January</b>	1.95	7.57	+5.62
<b>February</b>	1.98	2.12	+0.14
<b>March</b>	3.16	1.43	-1.73
<b>April</b>	3.67	2.80	-0.87
<b>May</b>	4.14	1.76	-2.38
<b>June</b>	3.78	2.00	-1.78
<b>July</b>	3.41	1.69	-1.72
<b>August</b>	3.42	6.00	+2.58
<b>September</b>	3.29	3.25	-0.04
<b>October</b>	3.03	1.74	-1.29
<b>November</b>	2.94	4.78	+1.84
<b>December</b>	2.45	1.58	-0.87
<b>Year Total</b>	37.22	36.72	-0.52



## 2005 Tours, Visitors, and Meetings

The Elsberry Plant Materials Center entertained 193 registered visitors in 2005. Guests included agricultural professionals, farmers, students, and the general public.

All visitors expressed an interest in the Plant Materials Program and its relevance to current conservation programs, practices, and future needs.

The following is a list of groups touring and holding meetings at the Elsberry Center in 2005.

<b>2005 Elsberry Plant Materials Center Visitors</b>
<b>State Resource Conservationists</b>
<b>Soil and Water Conservation District Watershed Project Committee</b>
<b>Grazing School</b>
<b>Audubon Society</b>
<b>Annual Plant Materials Center Tour/Training</b>
<b>Calibration/Seed Course Training</b>
<b>Junior Elsberry Community Betterment Association</b>
<b>EMERGE Group</b>
<b>Missouri Department of Conservation and NRCS/PMC Meeting</b>

**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 exist on the center that 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: indiangrass, 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>
<b>4/24/02</b>		<b>27</b>		<b>26</b>		<b>47</b>
<b>5/30/01</b>	<b>9</b>	<b>12</b>	<b>40</b>	<b>34</b>	<b>61</b>	<b>60</b>
<b>10/11/01</b>	<b>15</b>	<b>15</b>	<b>31</b>	<b>34</b>	<b>52</b>	<b>55</b>
<b>11/15/01</b>	<b>20</b>	<b>17</b>	<b>22</b>	<b>24</b>	<b>37</b>	<b>44</b>

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
<b>Festuca</b>	<b>paradoxa</b>	<b>Cluster fescue</b>	<b>9083254</b>	<b>Tucker Prairie, MO</b>
<b>Festuca</b>	<b>paradoxa</b>	<b>Cluster fescue</b>	<b>9083255</b>	<b>Paintbrush Prairie, MO</b>
<b>Festuca</b>	<b>paradoxa</b>	<b>Cluster fescue</b>	<b>9083252</b>	<b>Harrison Co, MO</b>

## 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.

**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 prevarietal 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 9066960) 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 9083253) 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 9066960 and shorter growing, - accession 9083253) both produced seed in 2005. These blocks were planted 4/28/04. Accession 9066960 produced 65.7 bulk pounds on 0.183 acre for a yield of 359 bulk pounds per acre. Accession 9083253 produced 144.9 bulk pounds on 0.51 acre for a yield of 287 bulk pounds per acre.

**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	Mayer	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	Pushmatoho	9957052	119	Bosville
William R. Bin	Oklahoma	Pushmatoho	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.

<b>Year of Harvest</b>	<b>Amount of Seed Harvested</b>
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.

**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.

**Study 29I107G -Selected Accessions of Eastern Gamagrass**

**Table #1**

<b>Collector</b>	<b>State</b>	<b>County</b>	<b>Accession Number</b>
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	5/3/1996	6/27/1996	7/19/1996	Regrowth 3/8/27/1996	Regrowth 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 Seedhead Emergence	_1/ Forage Quantity	_2/ Vigor	Forage Height (ft)	_3/ Forage Regrowth	_4/ % 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.

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. Cloyd
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.

## 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.

### 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' redbosier 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

<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>
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
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.	Accn. /	Date	No.	No. Survived										Ave. Ht. (Ft.)										Ave. Wd. (Ft.)									
No.	Sc. Name	Alt. No.	Plt.	Plt.	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 hispidia	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	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	O0	O1	O2	O3	90	91	92	98	99	O0	O1	O2	O3	90	91	92	98	99	O0	O1	O2	O3
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 Bergamot (*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

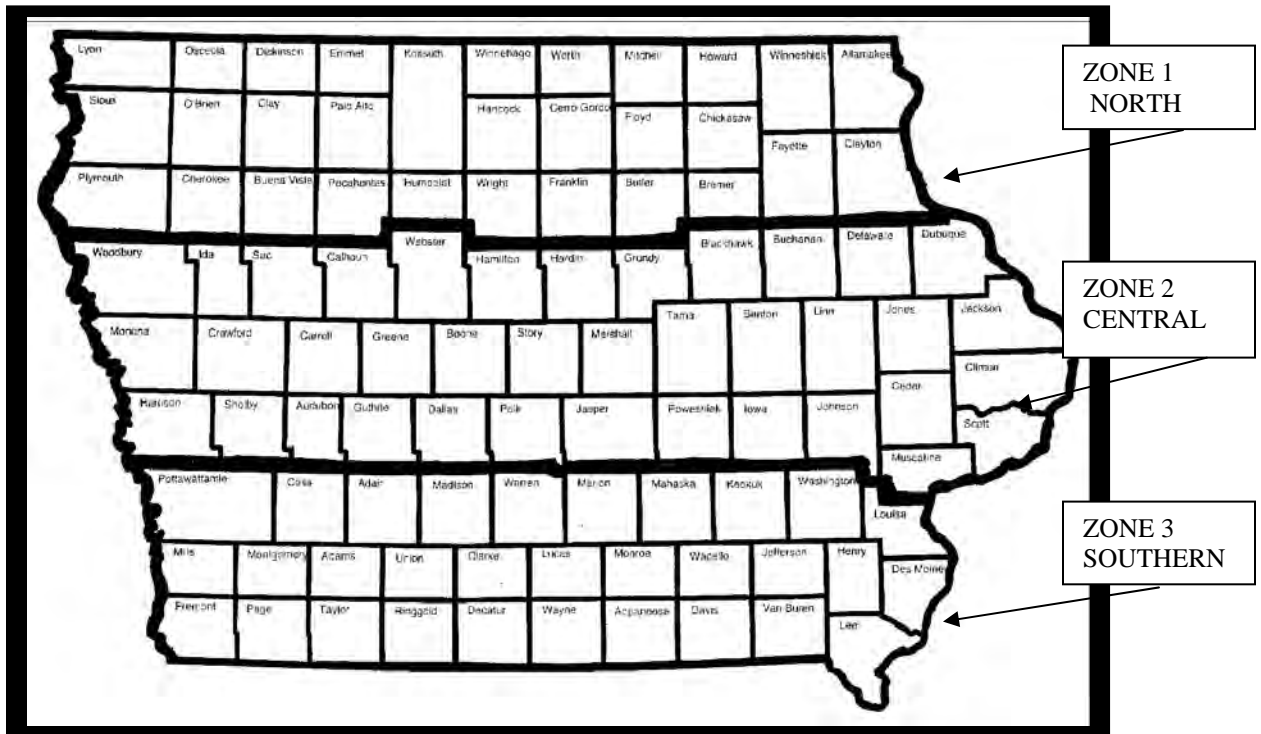
The Iowa Ecotype Program continued to produce seed for the three different zones on the center in 2004. Although there were no new plots established and no plot increases, the PMC plans to introduce five new Iowa releases in 2005. Weed control was very similar to that of 2003, with the use of non-selective 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.

TABLE #1

IOWA ECOTYPE ZONE MAP



<b>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).</b>					
				<b>Table #2</b>	
<b>Common Name</b>		<b>Accession</b>	<b>Status of</b>	<b>Status of</b>	<b>Harvested Seed</b>
<b>Genus/Species</b>	<b>Zone</b>	<b>Number</b>	<b>Accession</b>	<b>Increase Plot</b>	<b>2005 (in pounds)</b>
Big bluestem	1	9068614	Released in 2000	in production	Did Not Harvest
<i>Andropogon gerardii</i>	2	9068615	Released in 1998	in production	5.00
	3	9068616	Released in 1999	in production	13.90
Sideoats grama	1	9062278	Released in 1994	in production	7.00
<i>Bouteloua curtipendula</i>	2	9062279	Released in 1994	in production	2.30
	3	9062280	Released in 1994	in production	4.00
Purple prairie clover	1	9068608	Released in 2003	in production	0.80
<i>Dalea purpurea</i>	2	9068609	<b>Future Release</b>	in production	1.20
	3	9068610	<b>Future Release</b>	in production	4.40
Pale purple coneflower	1	9068611	Released in 2002	in production	6.50
<i>Echinacea pallida</i>	2	9068612	<b>Release in 2006</b>	in production	7.20
	3	9068613	Released in 2002	in production	225 grams
Canada wildrye	1	9062275	Released in 1994	in production	12.00
<i>Elymus canadensis</i>	2	9062276	Released in 1994	in production	Did Not Harvest
	3	9062277	Released in 1994	in production	Did Not Harvest
Rattlesnake master	1	9068602	Released in 1998	out of production	3.00
<i>Eryngium yuccifolium</i>	2	9068603	Released in 1999	in production	0.60
	3	9068604	Released in 1999	in production	0.90
Oxeye false sunflower	1	9068605	Released in 1997	in production	12.70
<i>Heliopsis helianthoides</i>	2	9068606	Released in 1996	in production	9.60
	3	9068607	Released in 1997	in production	2.00
Junegrass	1	9068620	Released in 2003	out of production	4.00
<i>Koeleria macrantha</i>	2	9068621	Released in 2003	out of production	5.00
	3	9068622	<b>Future Release</b>	in production	1.30
Round-head bushclover	1	9062281	Released in 1999	out of production	6.00
<i>Lespedeza capitata</i>	2	9062282	Released in 1996	out of production	4.00
	3	9062283	Released in 1997	out of production	n/a
Rough blazing star	1	9068684	Released in 2003	out of production	n/a
<i>Liatris asper</i>	2	9068685	Released in 2003	in production	0.30
	3	9068686	Released in 2003	in production	1.40
Blazing star	1	9068626	Released in 1999	in production	2.00
<i>Liatris pycnostachya</i>	2	9068627	Released in 1999	in production	1.40
	3	9068628	Released in 2000	in production	1.00

Study 29I124G - Native Iowa Ecotypes			Table #2 - continued		
Common Name		Accession	Status of	Status of	Harvested Seed
Genus/Species	Zone	Number	Accession	Increase Plot	2005 (in pounds)
Horsemint	1	9068678	<b>Future Release</b>	in production	206 grams
<i>Monarda fistulosa</i>	2	9068679	<b>Future Release</b>	in production	4.90
	3	9068680	Released in 2003	in production	418 grams
Little bluestem	1	9062319	Released in 1999	in production	3.00
<i>Schizachyrium</i>	2	9062320	Released in 1997	in production	11.70
<i>scoparium</i>	3	9062321	Released in 1999	in production	18.70
Compassplant	1	9068675		out of production	n/a
<i>Silphium laciniatum</i>	2	9068676		out of production	n/a
	3	9068677		out of production	n/a
Stiff goldenrod	1	9068617	Released in 1998	in production	Did Not Harvest
<i>Solidago rigida</i>	2	9068618	Released in 2002	in production	Did Not Harvest
	3	9068619	Released in 2002	in production	Did Not Harvest
Indiangrass	1	9062316	Released in 1997	in production	12.10
<i>Sorghastrum nutans</i>	2	9062317	Released in 1996	in production	12.00
	3	9062318	Released in 1998	in production	4.30
Tall dropseed	1	9062313	Released in 2000	in production	1.30
<i>Sporobolus compositus</i>	2	9062314	Released in 1996	in production	50.60
	3	9062315	Released in 2002	in production	2.10
New England aster	1	9068681	Released in 2002	in production	Did Not Harvest
<i>Aster novae angliae</i>	2	9068682	Released in 2002	in production	Did Not Harvest
	3	9068683	Released in 2002	in production	Did Not Harvest
Butterfly milkweed	1	9068687		out of production	n/a
<i>Asclepias tuberosa</i>	2	9068688		out of production	n/a
	3	9068689		out of production	n/a
Blue lobelia	1	9068696		out of production	n/a
<i>Lobelia siphilitica</i>	2	9068697		out of production	n/a
	3	9068698		out of production	n/a
Switchgrass	1	9068705		out of production	n/a
<i>Panicum virgatum</i>	2	9068706	Released in 2003	out of production	n/a
	3	9068707		out of production	n/a
Golden alexanders	1	9068702		out of production	n/a
<i>Zizia aurea</i>	2	9068703		out of production	n/a
	3	9068703		out of production	n/a

**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.

### **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.

<b>Accession Numbers</b>	<b>Nut Production With Husks</b>	<b>Date Nut Dropped</b>
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.

### Performance Data 1997 – 2002

Table #1

Acc. Number	Criteria	1997	1998	1999	2000	2001	2002	Averages
<b>9057168</b>	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.
<b>9068562</b>	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.
<b>9068573</b>	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.
<b>9068574</b>	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.
<b>9057188</b>	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.
<b>9068528</b>	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**

<b>Accession Number</b>	<b>State or Origin</b>	<b>City or County</b>
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 291135J - 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	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	R 1,3,8	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 narrow 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**

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

**Study 29I136J - Assembly and Evaluation of Wild Plum, *Prunus americana* Marsh.**

**Table #2 – Accessions, Locations and Collector’s Name**

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

**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 Malathoin 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.

Study 29I136J - Assembly and Evaluation of Wild Plum, *Prunus americana* Marsh.

Table #3

Acc. Number	1995	1996	1997	1998	1999	2000	2001	2002	Ave.
<b>9062309</b>									
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
<b>9068580</b>									
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
<b>9068485</b>									
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
<b>9068545</b>									
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
<b>9068546</b>									
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**

<b>Acc. Number</b>	<b>2000 Pound(s)</b>	<b>2001 Pound(s)</b>	<b>2002 Pound(s)</b>	<b>Average</b>
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												
Accssion	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	<b>5.30</b>	R2	9068545	7.70	6.40	6.80	6.20	5.70	Dead	5.40	-	6.37	<b>7.70</b>	R1		
9068580	3.60	5.00	2.60	4.30	1.50	2.00	2.60	3.00	3.08	<b>5.00</b>	R2	434240	7.10	7.30	6.30	6.00	5.10	Dead	6.00	-	6.30	<b>7.30</b>	R2		
9057088	4.30	3.10	3.10	4.80	2.50	2.50	2.60	3.50	3.30	<b>4.80</b>	R4	9057096	5.20	7.00	6.20	Dead	Dead	1.30	Dead	-	4.93	<b>7.00</b>	R2		
9068545	4.50	3.00	3.00	3.20	2.30	Dead	2.00	-	3.00	<b>4.50</b>	R1	9068514	7.00	6.50	5.10	4.50	Dead	4.10	4.50	-	5.28	<b>7.00</b>	R1		
9068546	3.70	4.30	3.60	2.30	2.60	1.80	2.10	2.40	2.85	<b>4.30</b>	R2	9068580	6.90	7.00	6.60	6.80	4.40	4.60	6.00	6.30	6.08	<b>7.00</b>	R2		
9068516	2.50	2.00	Dead	4.00	2.00	Dead	Dead	-	2.63	<b>4.00</b>	R4	9068480	4.70	3.10	5.10	6.80	2.90	Dead	Dead	Dead	4.52	<b>6.80</b>	R4		
9068515	2.50	0.60	3.80	2.70	1.50	2.50	2.30	2.30	2.28	<b>3.80</b>	R3	9057088	6.50	5.70	5.20	4.60	5.60	5.10	5.40	-	5.44	<b>6.50</b>	R1		
9057096	3.60	2.30	1.40	Dead	Dead	1.10	Dead	-	2.10	<b>3.60</b>	R1	9068546	5.50	6.20	6.50	5.60	4.70	3.60	4.40	5.20	5.21	<b>6.50</b>	R3		
9068485	3.30	2.00	2.30	2.70	1.50	Dead	1.20	-	2.17	<b>3.30</b>	R1	9062309	6.30	Dead	3.60	4.80	3.80	4.80	Dead	-	4.66	<b>6.30</b>	R1		
9068514	3.10	1.90	2.60	2.00	Dead	1.80	2.10	-	2.25	<b>3.10</b>	R1	9057165	5.30	5.00	6.20	6.00	5.10	-	-	-	5.52	<b>6.20</b>	R3		
9068480	2.60	3.10	2.40	3.00	1.60	Dead	Dead	Dead	2.54	<b>3.10</b>	R2	9068516	4.90	5.00	Dead	5.10	6.10	Dead	Dead	-	5.28	<b>6.10</b>	R5		
9068478	2.60	2.40	3.00	2.80	1.60	2.60	1.40	-	2.34	<b>3.00</b>	R3	9068543	4.20	6.00	5.30	4.70	Dead	Dead	Dead	-	5.05	<b>6.00</b>	R2		
9062309	2.80	Dead	2.00	3.00	2.60	2.90	Dead	-	2.66	<b>3.00</b>	R4	9068515	5.10	2.40	5.90	5.30	4.30	4.20	4.10	4.80	4.51	<b>5.90</b>	R3		
9057165	1.90	1.80	2.80	2.00	1.40	-	-	-	1.98	<b>2.80</b>	R3	9062308	4.40	5.00	3.10	4.80	Dead	Dead	2.60	Dead	3.98	<b>5.00</b>	R2		
9068543	2.40	2.70	2.50	2.00	Dead	Dead	Dead	-	2.40	<b>2.70</b>	R2	9068478	3.10	4.50	3.40	4.50	4.30	4.30	3.40	-	3.93	<b>4.50</b>	R2,4		
9062308	2.00	2.20	2.30	1.60	Dead	Dead	1.75	Dead	1.97	<b>2.30</b>	R3	9068485	4.10	4.10	4.00	4.50	4.00	Dead	2.60	-	3.88	<b>4.50</b>	R4		
9057146								1.60	1.60	<b>1.60</b>	R8	9057146								4.50	4.50	<b>4.50</b>	R8		
ND-286								Dead		<b>0.00</b>		ND-286								Dead		<b>0.00</b>			
1997													1998												
Accssion	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	<b>10.00</b>	R8	9068545	12.10	10.90	7.70	10.40	9.60	Dead	7.90	-	9.77	<b>12.10</b>	R1		
9068545	11.00	9.80	6.60	9.10	8.00	Dead	7.00	-	8.58	<b>10.00</b>	R1	9068580	11.30	11.00	10.90	11.80	9.00	8.80	9.40	-	10.31	<b>11.30</b>	R1		
9068580	10.00	10.00	9.60	10.80	7.20	7.00	8.20	-	8.97	<b>10.00</b>	R1,2	9057088	10.20	7.70	8.30	8.20	9.60	8.00	7.30	11.20	8.81	<b>11.20</b>	R8		
9068546	7.20	9.70	9.00	8.40	7.00	6.00	7.60	8.00	7.86	<b>9.70</b>	R2	434240	10.20	10.00	10.70	8.90	8.60	Dead	8.60	-	9.50	<b>10.70</b>	R3		
434240	9.50	9.00	9.50	7.60	7.30	Dead	8.20	-	8.52	<b>9.50</b>	R1,3	9068515	8.90	5.80	10.30	8.10	6.00	7.00	9.90	7.10	7.89	<b>10.30</b>	R3		
9068515	8.20	4.20	9.10	7.40	5.00	6.00	8.20	6.20	6.79	<b>9.10</b>	R3	9068480	8.80	6.80	10.20	7.70	7.00	Dead	Dead	6.90	7.90	<b>10.20</b>	R3		
9057096	7.30	7.20	8.00	Dead	Dead	2.50	Dead	-	6.25	<b>8.00</b>	R3	9068546	8.70	10.20	10.00	9.90	8.20	67.90	8.20	9.80	16.61	<b>10.20</b>	R2		
9062309	8.00	Dead	7.00	7.20	6.40	7.00	Dead	-	7.12	<b>8.00</b>	R1	9057146								8.90	8.90	<b>8.90</b>	R8		
9068516	7.80	7.20	Dead	6.00	7.20	Dead	Dead	-	7.05	<b>7.80</b>	R1	9062309	8.90	Dead	8.10	8.40	7.10	8.30	Dead	-	8.16	<b>8.90</b>	R1		
9062308	6.40	2.50	5.10	7.60	Dead	Dead	4.00	Dead	5.12	<b>7.60</b>	R4	9068514	8.80	7.30	8.10	7.40	Dead	8.10	7.40	-	7.85	<b>8.80</b>	R1		
9068514	7.60	6.40	7.40	6.30	Dead	7.00	6.60	-	6.88	<b>7.60</b>	R1	9057096	7.90	7.70	8.60	Dead	Dead	4.50	Dead	-	7.18	<b>8.60</b>	R3		
9068543	6.00	5.00	7.20	7.00	Dead	Dead	Dead	-	6.30	<b>7.20</b>	R3	9068516	8.10	8.60	Dead	7.20	8.30	Dead	Dead	-	8.05	<b>8.60</b>	R2		
9057146								7.20	7.20	<b>7.20</b>	R8	9068543	7.00	6.00	8.30	8.10	Dead	Dead	Dead	-	7.35	<b>8.30</b>	R3		
9068480	7.00	5.40	9.00	6.30	6.00	Dead	Dead	6.00	6.62	<b>7.00</b>	R1	9062308	7.30	4.90	6.60	8.00	Dead	Dead	5.00	Dead	6.36	<b>8.00</b>	R4		
9057165	5.30	5.10	6.10	7.00	5.70	-	-	-	5.84	<b>7.00</b>	R4	9057165	6.60	6.80	7.40	8.00	6.80	-	-	-	7.12	<b>8.00</b>	R4		
9068478	3.20	6.50	4.40	6.40	Dead	Dead	4.60	-	5.02	<b>6.80</b>	R6	9068478	4.00	6.90	5.40	7.20	Dead	Dead	5.20	-	5.74	<b>7.20</b>	R4		
9068485	5.70	6.30	5.00	6.80	6.30	Dead	2.70	-	5.47	<b>6.80</b>	R4	9068485	6.10	7.20	6.00	7.40	7.10	Dead	3.80	-	6.27	<b>7.20</b>	R2		
ND-286								Dead		<b>0.00</b>		ND-286										<b>0.00</b>			
Height measured in feet																									





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

Study 291136J Assembly and Evaluation of Prunus Americana, Wild Plum											
Table #6 - continued											
1999											
Spread in Feet											
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	<b>10.50</b>	R3
9057096	8.50	9.50	10.50	0.00	0.00	0.00	0.00	0.00	9.50	<b>10.50</b>	R3
9068478	5.00	8.00	8.00	0.00	8.00	11.50	11.00	0.00	8.58	<b>11.50</b>	R6
9068515	10.00	7.50	7.00	12.00	9.00	11.00	9.00	0.00	9.36	<b>12.00</b>	R4
9062308	9.00	0.00	7.00	10.00	0.00	0.00	10.00	0.00	9.00	<b>10.00</b>	R4
9068485	8.30	8.50	7.00	12.00	10.00	0.00	5.00	0.00	8.47	<b>12.00</b>	R4
9057088	12.50	10.00	12.50	11.00	14.00	9.00	13.00	13.00	11.88	<b>14.00</b>	R5
9068545	14.50	12.00	0.00	11.00	14.00	0.00	0.00	0.00	12.88	<b>14.50</b>	R1
9068543	8.50	10.00	12.00	10.00	0.00	0.00	0.00	0.00	10.13	<b>12.00</b>	R3
9068516	10.00	11.00	0.00	11.00	11.00	0.00	9.00	0.00	10.40	<b>11.00</b>	R2,4,5
9068514	9.50	9.00	9.00	9.00	0.00	10.00	8.00	0.00	9.08	<b>10.00</b>	R6
9068580	11.00	10.00	0.00	13.00	11.00	11.00	10.00	13.00	11.29	<b>13.00</b>	R4,8
9057146								10.00	10.00	<b>10.00</b>	R8
9068546	10.00	5.00	13.00	11.50	11.00	12.00	14.00	11.00	10.94	<b>14.00</b>	R7
434240	0.00	11.00	11.00	11.00	0.00	0.00	0.00	0.00	0.00	<b>11.00</b>	R2,3,4
ND-286									0.00	<b>0.00</b>	
9062309	11.50	0.00	8.50	11.00	11.00	11.00	0.00	0.00	10.60	<b>11.50</b>	R1
9057165	8.00	9.00	11.00	10.00	8.50	0.00	0.00	0.00	9.30	<b>11.00</b>	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		
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													Form
1999													
Accssion	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	<b>0.00</b>		
9057088	1.00	4.00	4.00	6.00	5.00	3.00	4.00	3.00	3.75	<b>1.00</b>	R1		
9068545	1.00	2.00	0.00	5.00	5.00	0.00	0.00	0.00	3.25	<b>1.00</b>	R1		
9068580	1.00	3.00	0.00	2.00	3.00	3.00	3.00	2.00	2.43	<b>1.00</b>	R1		
9068514	6.00	8.00	5.00	4.00	0.00	6.00	2.00	0.00	5.17	<b>2.00</b>	R7		
9068546	5.00	3.00	2.00	2.00	4.00	4.00	3.00	4.00	3.38	<b>2.00</b>	R3,4		
9068478	8.00	6.00	6.00	0.00	7.00	5.00	3.00	0.00	5.83	<b>3.00</b>	R7		
9068515	3.00	5.00	4.00	4.00	7.00	5.00	3.00	0.00	4.43	<b>3.00</b>	R1,7		
9062308	3.00	0.00	7.00	7.00	0.00	0.00	7.00	0.00	6.00	<b>3.00</b>	R1		
9068516	3.00	6.00	0.00	8.00	5.00	0.00	4.00	0.00	5.20	<b>3.00</b>	R1		
9062309	3.00	0.00	4.00	4.00	5.00	5.00	0.00	0.00	4.20	<b>3.00</b>	R1		
9068480	4.00	7.00	4.00	5.00	7.00	0.00	0.00	7.00	5.67	<b>4.00</b>	R1		
434240	0.00	4.00	6.00	0.00	0.00	0.00	0.00	0.00	5.00	<b>4.00</b>	R2		
9057096	5.00	6.00	6.00	0.00	0.00	0.00	0.00	0.00	5.67	<b>5.00</b>	R1		
9068485	6.00	6.00	5.00	6.00	5.00	0.00	6.00	0.00	5.67	<b>5.00</b>	R3,5		
9068543	6.00	6.00	5.00	5.00	0.00	0.00	0.00	0.00	5.50	<b>5.00</b>	R3,4		
9057146								5.00	5.00	<b>5.00</b>	R8		
9057165	7.00	6.00	6.00	5.00	6.00	0.00	0.00	0.00	6.00	<b>5.00</b>	R4		
<b>Rating: 1= Excellent, 9=Poor</b>				<b>0=Dead Plant</b>									

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		0.00		ND-286								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	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	7.00	R4

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	<b>0.00</b>	
9068480	4.00	4.50	4.50	1.00	4.50	0.00	0.00	1.50	3.33	<b>1.00</b>	R4, 8
9068478	4.00	2.50	1.50	0.00	1.00	1.00	1.00	0.00	1.69	<b>1.00</b>	R3,5,6,7
9068515	2.50	3.50	5.50	1.00	4.50	3.00	3.00	0.00	3.29	<b>1.00</b>	R4
9057088	1.50	2.00	1.50	1.00	1.50	1.00	1.00	1.00	1.31	<b>1.00</b>	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	<b>1.00</b>	R1,2,5
9068580	2.50	1.00	0.00	1.00	3.00	1.00	1.50	1.50	1.64	<b>1.00</b>	R2,4,6,7,8
9068546	6.00	1.00	1.00	1.00	1.00	1.00	1.00	1.50	1.69	<b>1.00</b>	R2,7,8
9057096	5.50	3.00	1.50	0.00	0.00	0.00	0.00	0.00	3.33	<b>1.50</b>	R3
9062308	6.00	0.00	3.50	1.50	0.00	0.00	2.00	1.50	2.90	<b>1.50</b>	R4,7,8
9068485	5.50	5.50	4.00	1.50	1.50	0.00	3.00	0.00	3.50	<b>1.50</b>	R4,5
9068516	2.50	4.00	0.00	2.50	3.50	0.00	2.00	0.50	2.73	<b>1.50</b>	R4,7,8
9057146	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	1.50	<b>1.50</b>	R8
9062309	3.50	0.00	3.50	1.50	3.50	2.50	0.00	0.00	2.90	<b>1.50</b>	R4,6,7,8
9068543	2.50	4.50	2.00	2.50	0.00	0.00	0.00	0.00	2.88	<b>2.00</b>	R1,3,4
9068514	3.00	3.00	2.00	2.00	0.00	2.50	2.00	0.00	2.42	<b>2.00</b>	R3,4,6,7
9057165	6.00	4.50	2.50	3.00	3.00	0.00	0.00	0.00	3.80	<b>2.00</b>	R3,5
434240	0.00	5.50	5.00	0.00	0.00	0.00	0.00	0.00	5.25	<b>3.00</b>	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, big bluestem ('erect' 9083274 and 'short-growing' known as 'Refuge' 9078832) and switchgrass ('low growing' 9083172 and 'Cave-in-Rock' 469228), were allowed to establish; and control of broadleaf weeds was addressed. The flooding sequences are again planned for 2006, but with lack of help may be put off indefinitely.

Study 29A1370 - Wetland Species in Wetland at Elsberry PMC							Table #1
<b>Plugs Planted 5-2-97 (Eastern Gamagrass)</b>							
<b>2002 Data</b>	<b>Began Flooding on 4/24/02</b>						
<b>2003 Data</b>	<b>Began Flooding on 6-10-03</b>						
	<b>Total #</b>	<b>Active</b>	<b>Weed</b>	<b>Disease/</b>	<b>Developed</b>		
	<b>Planted</b>	<b>Growing</b>	<b>Comp.</b>	<b>Insect</b>	<b>Seed Head</b>	<b>Vigor</b>	<b>Ave. Ht.</b>
<b>Eastern Gamagrass 9078840 Chariton, Missouri. 5' spacing, planted 5/2/97.</b>							
							<b>25 plants planted</b>
<b>Dates Evaluated</b>							
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'
<b>5/27/03 (BFE)</b>	<b>15</b>	<b>15</b>	<b>light</b>	<b>none</b>	<b>yes</b>	<b>exc.</b>	<b>2'</b>
<b>8/5/03 (AFE)</b>	*						
<b>Percent surviving as of 6/17/02 was 75%</b>							
<b>Eastern Gamagrass 9078844 Atchison, Missouri. 7' spacing, planted 5/2/97.</b>							
							<b>18 plants planted</b>
<b>Dates Evaluated</b>							
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'
<b>5/27/03 (BFE)</b>	*						
<b>8/5/03 (AFE)</b>	*						
<b>Percent surviving as of 6/17/02 was 75%</b>							
<b>Eastern Gamagrass 9078842 Atchison, Missouri. 15' spacing, planted 5/2/97.</b>							
							<b>9 plants planted</b>
<b>Dates Evaluated</b>							
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'
<b>5/27/03 (BFE)</b>	*						
<b>8/5/03 (AFE)</b>	*						
<b>Percent surviving as of 6/17/02 was 44%</b>							
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.
<b>Eastern Gamagrass 9078846 Clinton, Missouri. 8' spacing, total planted 5/2/97.</b>						<b>16 plants planted</b>	
<b>Dates Evaluated</b>							
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)	*						
<b>Percent surviving as of 6/17/02 was 63%</b>							
<b>Eastern Gamagrass 9078843 Atchison, Missouri. 15' spacing, planted 5/2/97.</b>						<b>9 plants planted</b>	
<b>Dates Evaluated</b>							
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)	*						
<b>Percent surviving as of 6/17/02 was 44%</b>							
<b>Eastern Gamagrass 9078845 Holt, Missouri. 8' spacing, planted 5/2/97.</b>						<b>16 plants planted</b>	
<b>Dates Evaluated</b>							
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)	*						
<b>Percent surviving as of 6/17/02 was 63%</b>							
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.	
<b>Switchgrass 9062213 3' spacing, 41 total planted (plugs) 6/24/97.</b>							
<b>Dates Evaluated</b>							
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"	
<b>5/27/03 (BFE)</b>	<b>32 plants</b>	<b>light</b>	<b>none</b>	<b>none</b>	<b>exc.</b>	<b>1' 7"</b>	
<b>8/5/03 (AFE)</b>	<b>32 plants</b>	<b>light</b>	<b>none</b>	<b>none</b>	<b>good</b>	<b>2' 5"</b>	
Percent surviving as of 6/17/02 was 76%							
<b>Switchgrass 9062235 4' spacing, 31 total planted (plugs) 6/24/97.</b>							
<b>Dates Evaluated</b>							
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'	
<b>5/27/03 (BFE)</b>	<b>23 plants</b>	<b>light</b>	<b>none</b>	<b>none</b>	<b>exc.</b>	<b>1' 8"</b>	
<b>8/5/03 (AFE)</b>	<b>23 plants</b>	<b>light</b>	<b>none</b>	<b>none</b>	<b>good</b>	<b>2' 9"</b>	
Percent surviving as of 6/17/02 was 65%							
<b>Switchgrass 9062193 5' spacing; 25 total planted (plugs) 6/24/97.</b>							
<b>Dates Evaluated</b>							
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"	
<b>5/27/03 (BFE)</b>	<b>19 plants</b>	<b>light</b>	<b>none</b>	<b>none</b>	<b>exc.</b>	<b>1' 5"</b>	
<b>8/5/03 (AFE)</b>	<b>19 plants</b>	<b>light</b>	<b>none</b>	<b>none</b>	<b>good</b>	<b>2' 8"</b>	
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						
<b>Cave-In-Rock Switchgrass 23 plants planted.</b>							
<b>Dates Evaluation</b>							
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"
<b>5/27/03 (BFE)</b>	<b>16</b>	<b>16</b>	<b>light</b>	<b>light</b>	<b>none</b>	<b>good</b>	<b>1' 5"</b>
<b>8/5/03 (AFE)</b>	<b>16</b>	<b>16</b>	<b>light</b>	<b>light</b>	<b>none</b>	<b>fair</b>	<b>2' 6"</b>
<b>Percent surviving as of 6/17/02 was 52%</b>							
<b>Flood Tolerant Switchgrass, seeded 50' row plus 3' wide.</b>							
<b>Dates Evaluated</b>							
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"
<b>5/27/03 (BFE)</b>	<b>45%</b>	<b>45%</b>	<b>light</b>	<b>none</b>	<b>none</b>	<b>good</b>	<b>1' 6"</b>
<b>8/5/03 (AFE)</b>	<b>45%</b>	<b>45%</b>	<b>light</b>	<b>none</b>	<b>none</b>	<b>good</b>	<b>2' 5"</b>
<b>Flood tolerant switchgrass plugs block, 63 plants planted 5/25/99.</b>							
<b>Dates Evaluated</b>							
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'
<b>5/27/03 (BFE)</b>	<b>85%</b>	<b>66 plants</b>	<b>light</b>	<b>none</b>	<b>none</b>	<b>good</b>	<b>1' 3"</b>
<b>8/5/03 (AFE)</b>	<b>85%</b>	<b>66 plants</b>	<b>light</b>	<b>none</b>	<b>none</b>	<b>fair</b>	<b>2' 2"</b>
<b>Bermudagrass block plugs, planted 5/25/99.</b>							
<b>Dates Evaluated</b>							
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"
<b>5/27/03 (BFE)</b>	<b>100%</b>	<b>100%</b>	<b>none</b>	<b>none</b>	<b>none</b>	<b>fair</b>	<b>1"</b>
<b>8/5/03 (AFE)</b>	<b>100%</b>	<b>100%</b>	<b>none</b>	<b>none</b>	<b>none</b>	<b>fair</b>	<b>1"</b>
<b>BFE = Before Flood Event</b>							
<b>AFE = After Flood Event</b>							

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.	
<b>Swamp milkweed block 8 rows plugs, 1' center planted 5/25/99.</b>								
<b>Dates Evaluated</b>								
9/28/99	8 plants		severe foxtail	none	none	poor	9"	
5/11/2000	46 plants		moderate	none	none	poor	8"	
9/19/2000	30%	30%	moderate	none	30%	fair	1' 2"	
6/26/2001	54	54	light	none	none	good	2' 2"	
4/24/02 (BFE)	No plants observed; heavy mulch cover of weeds							
6/17/02 (AFE)	41	41	light	none	none	good	1'	
<b>5/27/03 (BFE)</b>	<b>50</b>	<b>50</b>	<b>light</b>	<b>none</b>	<b>none</b>	<b>good</b>	<b>1' 3"</b>	
<b>8/5/03 (AFE)</b>	<b>50</b>	<b>50</b>	<b>light</b>	<b>none</b>	<b>none</b>	<b>fair</b>	<b>1' 7"</b>	
<b>Cardinal flower, planted 8 plants on 4/17/01 and on 5/1/01</b>								
4/24/2001	BFE		8	none	8	good	2"	
5/8/2001	AFE		8	none	8	good	3"	
6/11/2001	BFE		16	none	16	good	10"	
6/26/2001		7	moderate	none	none	poor	10"	
4/24/02 (BFE)		19	none	none	none	exc.	1' 1"	
6/17/02 (AFE)		19	none	none	none	good	2'	
<b>5/27/03 (BFE)</b>		<b>11</b>	<b>light</b>	<b>none</b>	<b>none</b>	<b>good</b>	<b>7"</b>	
<b>8/5/03 (AFE)</b>		<b>8</b>	<b>light</b>	<b>none</b>	<b>none</b>	<b>poor</b>	<b>1' 6"</b>	
<b>BFE - Before Flooding Event</b>								
<b>AFE - After Flooding Event</b>								



Study 29A1370 - Wetland Species in Wetland at Elsberry PMC							Table #3		
<b>Prairie Cordgrass</b>									
<b>2002 Data: Flood Event from 4/29/02 to 5/17/02</b>									
<b>2003 Data: Flooding Began 6/10/03</b>									
		<b>Active</b>					<b>Ave. Ht.</b>	<b>Average</b>	
	<b>Total #</b>	<b>Growing</b>	<b>Weed</b>	<b>Disease/</b>	<b>Developed</b>		<b>Seed</b>	<b>Forage</b>	
	<b>Planted</b>	<b>Spreading</b>	<b>Comp.</b>	<b>Insect</b>	<b>Seed Head</b>	<b>Vigor</b>	<b>Head</b>	<b>Height</b>	
<b>Prairie Cordgrass Collection, planted 9/29/97</b>							10' x 10'		
<b>East</b> →							3   2   1		
							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"	
<b>5/27/03 (BFE)</b>	<b>9</b>	<b>8.5'</b>	<b>light</b>	<b>none</b>	<b>none</b>	<b>exc.</b>	<b>none</b>	<b>30"</b>	
<b>8/5/03 (AFE)</b>	<b>9</b>	<b>8.5'</b>	<b>light</b>	<b>none</b>	<b>none</b>	<b>exc.</b>	<b>6.5'</b>	<b>40"</b>	
Percent surviving as of 6/17/02 was 100%									
<b>Cuivre Island Prairie Cordgrass Collection, planted 5/15/98</b>							3' x 3'		
					<b>North</b> ↑		4   3   2   1		
							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		
		direction							
<b>Lost Creek Prairie Cordgrass Collection, planted 5/15/98</b>							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		
		direction							
9/19/2000									
Total block for both collections			none	none	35%	exc.	6' 0"	5' 0"	
									More lodging Cuivre Island collection
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"		
<b>5/27/03 (BFE)</b>		<b>solid block</b>	<b>none</b>	<b>none</b>	<b>none</b>	<b>exc.</b>	<b>none</b>	<b>29"</b>	
<b>8/5/03 (AFE)</b>		<b>solid block</b>	<b>none</b>	<b>none</b>	<b>none</b>	<b>exc.</b>	<b>6.5'</b>	<b>42"</b>	
<b>BFE - Before Flooding Event</b>									
<b>AFE - After Flooding Event</b>									

**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 from 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.

<b>Study 29I141G - Assembly and Evaluation of Little Bluestem, <i>Schizachyrium scoparium</i>, Nichx.</b>					
<b>Little Bluestem</b>					<b>Table #1</b>
<b>REFERENCE</b>					
<b>ACCESSION</b>	<b>NUMBER</b>	<b>COLLECTOR</b>	<b>MLRA</b>	<b>COUNTY</b>	<b>STATE</b>
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		
ACCESSION	REFERENCE 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

<b>Study 291141G</b>																									<b>Table #2</b>				
<b>Little Bluestem</b>																													
															<b>Plot Layout Map</b>														
															<b>Randomized Complete Block</b>														
															<b>Four Replications</b>														
																									<b>Field #1</b>				
																									North ↑				
<b>PLT #</b>	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												
<b>TIER #</b>																													
I																													
II																													
III																													
IV																													
V																													
VI	<b>REP 1</b>					<b>REP 2</b>					<b>REP 3</b>					<b>ROADWAY</b>		<b>REP 3</b>					<b>REP 4</b>						
VII																													
VIII																													
IX																													
X																													
XI																													
XII																													
XIII																													
XIV																													
XV																													
																									<b>Highway JJ</b>				

Study 29I141G			Forage Rating: 8/9/99										Table #3			
Little Bluestem																
			1 = High					9 = Low								
															Ave.	
Local	Rep 1			Rep 2			Rep 3			Rep 4			Percent	Living	Best	
Number	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	Survival	Plants	Plant	Location/s
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								
													Ave.			
Local	Rep 1			Rep 2			Rep 3			Rep 4			Percent	Living	Best	
Number	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	Survival	Plants	Plant	Location/s
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								
												Ave.				
Local	Rep 1			Rep 2			Rep 3			Rep 4			Percent	Ave.	Best	
Number	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	Survival	Living	Plant	Location/s
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																
												Ave.				
Local	Rep 1			Rep 2			Rep 3			Rep 4			Percent	Living	Best	
Number	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	Survival	Plants	Plant	Location/s
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
Cimmeron	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	Rep 1			Rep 2			Rep 3			Rep 4			Percent	Living	Best	
Number	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	Survival	Plants	Plant	Location/s
														Ave.		
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	Rep 1			Rep 2			Rep 3			Rep 4			Percent	Living	Best		
Number	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	Survival	Plants	Plant	Location/s	
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	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	4	100	4.25	3	P 2, 6
IL-19	4	4	6	3	3	3	5	3	4	4	3	4	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	5	100	5.33	3	P 4
IL-4	6	5	5	4	4	4	5	5	5	6	6	5	5	100	5.00	4	
IL-7	4	4	5	4	5	6	6	5	6	6	7	6	6	100	5.33	4	
IL-22																	
Cimmeron	2	2	2	2	3	2	3	5	4	3	4	3	3	100	2.92	2	P 1, 2, 3, 4, 6
Aldous	4	3	4	3	3	3	5	5	4	3	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	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

<b>Study 29I141G - Assembly and Evaluation of Little Bluestem, <i>Schizachyrium scoparium</i> Michx.</b>					
<b>Selected accessions for each region</b>					<b>Table #5</b>
<b>Northern Region</b>					
IA - All					
MO - North of Missouri River					
IL - Northern 2/3rds of the state					
<b>REFERENCE</b>					
<b>ACCESSION</b>	<b>NUMBER</b>	<b>COLLECTOR</b>	<b>MLRA</b>	<b>COUNTY</b>	<b>STATE</b>
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
<b>Southern Region</b>					
MO - South of Missouri River					
IL - Southern 1/3 of state					
<b>REFERENCE</b>					
<b>ACCESSION</b>	<b>NUMBER</b>	<b>COLLECTOR</b>	<b>MLRA</b>	<b>COUNTY</b>	<b>STATE</b>
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 29I141G													Rep #1	Table #2 - continued				
Little Bluestem																		
Field #1													North ↑					
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							
TIER #																		
I	j	V V X	X j X	X X X	j X X	j X X	X j X	X W W	W W W	W W W	W W W	I						
II	V	MO-9	IA-11	MO-30	MO-45	MO-31	MO-78	MO-47	IL-8	IA-25	MO-63	II						
III	V	MO-55	IL-21	MO-10	IL-13	MO-6	MO-60	MO-28	MO-36	MO-24	IL-15	III						
IV	V	IA-12	MO-74	MO-51	MO-40	MO-27	MO-57	MO-58	MO-15	IA-17	MO-1	IV						
V	V	MO-42	IA-26	IL-3	MO-77	MO-67	ALDOUS	IA-15	MO-28	MO-50	IA-19	V						
VI	V	IA-7	MO-52	MO-39	MO-35	IL-4	IA-5	MO-23	IA-16	MO-21	MO-33	VI						
VII	i	MO-14	IL-17	MO-13	IA-3	IA-23	MO-65	IA-18	MO-61	IA-24	MO-48	VII						
VIII	V	MO-56	MO-26	MO-69	IL-5	MO-46	IL-20	MO-80	MO-5	MO-7	IL-10	VIII						
IX	i	MO-34	PASTURA	IL-11	MO-4	IL-16	MO-16	MO-37	MO-32	MO-59	IA-22	IX						
X	V	IL-2	MO-8	MO-29	MO-49	MO-81	IA-1	IL-7	IA-27	MO-25	CAMPER	X						
XI	i	IA-10	MO-64	MO-20	MO-66	IA-4	MO-12	MO-22	IL-1	IA-2	MO-54	XI						
XII	V	MO-71	MO-17	IL-14	MO-73	MO-44	CIMMERON	MO-18	MO-53	MO-79	MO-72	XII						
XIII	V	IL-12	MO-41	IA-8	IL-19	IA-20	MO-62	IA-6	MO-68	MO-11	IA-21	XIII						
XIV	T	MO-38	IA-13	MO-43	IA-9	IL-9	IL-6	MO-19	MO-3	IA-14	IL-18	XIV						
XV	T	T T j	j T T	T T T	T j j	T T Y	Y Y Y	Y Y Y	Y Y Y	Y Y Y	Y Y Y	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													

Study 29I141G				Rep #2				Table #2 - continued			
Little Bluestem											
				North ↑							
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	
TIER #											
I	? ? ?	W W W	W W W	W W b	b b b	b b b	b b b	b b b	b 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	II
III	MO-71	MO-24	MO-35	IA-14	IA-23	IA-2	MO-74	MO-28	CAMPER	MO-57	III
IV	MO-8	MO-42	MO-67	IL-1	MO-60	MO-33	MO-37	MO-26	IL-21	IL-7	III
V	IA-13	IA-3	MO-9	MO-39	IL-16	IA-8	MO-15	MO-69	MO-14	MO-25	IV
VI	MO-50	CIMMERON	IL-4	MO-59	MO-52	MO-40	MO-51	IA-27	MO-81	IA-16	VI
VII	IA-17	MO-63	MO-66	IL-20	MO-72	IL-19	MO-19	MO-23	IL-11	IL-10	VII
VIII	MO-32	IA-6	MO-4	IA-11	IL-2	MO-54	IA-26	IL-8	MO-41	IA-4	VIII
IX	IA-10	MO-77	IL-5	MO-46	MO-56	MO-64	MO-1	MO-21	MO-65	MO-10	IX
X	IL-14	MO-38	MO-49	MO-27	IL-12	MO-79	IA-19	MO-68	IA-1	ALDOUS	X
XI	MO-61	IA-9	MO-55	IL-15	IA-25	MO-17	MO-7	IA-5	IL-9	IL-3	XI
XII	IA-24	MO-47	MO-78	MO-43	PASTURA	MO-20	MO-73	MO-12	IA-20	MO-13	XII
XIII	MO-30	MO-18	MO-11	IL-6	MO-3	IL-13	IA-12	IA-22	MO-29	MO-44	XIII
XIV	MO-45	MO-62	MO-58	MO-5	IL-17	IA-21	MO-80	MO-16	MO-36	IA-15	XIV
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	h J J	XV



Study 29I141G						Rep #4		Table #2 - continued				
Little Bluestem												
						North ↑						
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	
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 reseeded 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.

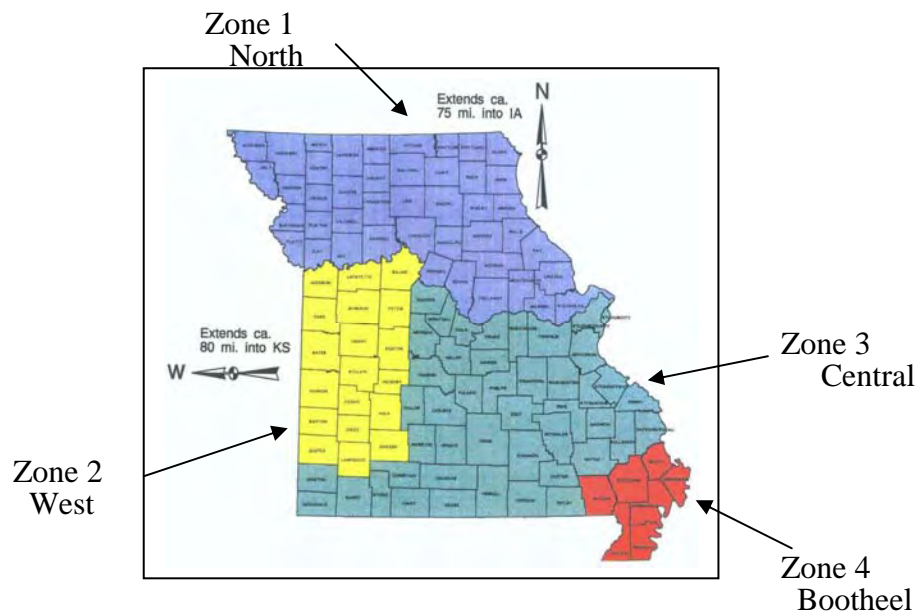
**Cooperators:**

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. See Table #2 for listing of species collected and status of collections.

### **1999**

The Missouri Ecotype program continued during 1999 and the species released listed in Table #3. 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. A list of species in production at both sites is in Table #2 and plants released through the program in Table #3.

## 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). Refer to Tables #2 and #3 for plots in production and past releases.

Study No. 29142G - 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.					Table #2
Project Status					
Common Name		Accession	Collection	Status of Increase Plot	Status of
Genus/Species	Zone	Number	Date	Planting (Where/When)	Accession
<b>Aromatic Aster</b>	1		2001	In production	
<i>Aster oblongifolius</i>				Green CA/2002	
	2		2004	In production	
				Green CA/2004	
<b>Big Bluestem</b>	1	9079000	1997	In production	Released in 1999
<i>Andropogon gerardii</i>				PMC/1998	
<b>Butterfly Milkweed</b>	1	9079024	1997	In production	
<i>Asclepias tuberosa</i>				PMC/1998	
	2	9079025	2001	In production	
				Green CA/2002	
<b>Creamy Wild Indigo</b>	1	9079088	2000	In production	
<i>Baptisia bracteata</i>				Green CA/2001	
<b>Foxglove Beardstongue</b>	1	9079064	1999	In production	
<i>Penstemon digitalis</i>				PMC/2000	
	1	9079064		In production	
				Green CA	
	2	9079065	2001	In production	
				Green CA/2002	
<b>Grayhead Coneflower</b>	1	9079060	1999 & 2000	In production	
<i>Ratibida pinnata</i>				PMC/2000, increased in 2001	
	2	9079061	2000	In production	
				Green CA/2001	
<b>Gravelweed</b>	2	9079081	2001	In production	
<i>Verbesina helianthoides</i>				Green CA/2002	
<b>Green Milkweed</b>	2		2004	In production	
<i>Asclepias hirtella</i>				Green CA/2004	
<b>Horsemint</b>	1	9079056	1999	In production	
<i>Monarda fistulosa</i>				PMC/2000	
	1	9079056	1999 & 2000	In production	
				Green CA/2001(increase)	
	2	9079057	2000	In production	
				Green CA/2001	
<b>Indiangrass</b>	1	9079036	n/a	Not in production on PMC	Released in 1999
<i>Sorghastrum nutans</i>				Commercial production only	
	2	9079037	n/a	Not in production on PMC	Released in 1999
				Commercial production only	

Study 29I142G - Missouri Ecotype					Table #2 cont.
Common Name		Accession	Collection	Status of Increase Plot	Status of
Genus/Species	Zone	Number	Date	Planting (Where/When)	Accession
<b>Largeleaf Wild Indigo</b> <i>Baptisia alba</i>	2	9079093	2000	In production Green CA/2001	
<b>Little Bluestem</b> <i>Schizachrium scoparium</i>	1	9079004	1996 & 1997	In production PMC/1997 (increase 1998)	Released in 1999
	2	9079005	1996 & 1997	In production PMC/1997	
	3	9079006	1996 & 1997	In production PMC/1997	
<b>Maryland Senna</b> <i>Senna marylandica</i>	2		2004	In production Green CA/2004	
<b>Pale Purple Coneflower</b> <i>Echinacea pallida</i>	1	9079032	1997	In production PMC/1998	Released in 2001
	2	9079033	1998	In production PMC/1999	Released in 2001
<b>Prairie Blazing Star</b> <i>Liatris pycnostachya</i>	1	9079020	1998	In production PMC/1999	
	2	9079021	2001	In production Green CA/2002	
<b>Prairie Coreopsis</b> <i>Coreopsis palmata</i>	1	9079028	1997	In production PMC/1998	Released in 2001
	2	9079029	1998	In production PMC/1999	Released in 2001
<b>Prairie Sage</b> <i>Salvia azurea</i>	2		2004	In production Green CA/2004	
<b>Purple Milkweed</b> <i>Asclepias purpurascens</i>	1	9079114	2001	In production Green CA/2002	
<b>Purple Prairie Clover</b> <i>Dalea purpurea</i>	1	9079048	2000	In production PMC/2001	
	1	9079048	2000	In production Green CA/2001	
	2	9079049	2000	In production PMC/2001	
<b>New England Aster</b>	1	9079103	2001	In production Green CA/2001	
<b>Rosin Weed</b> <i>Siphium integrifolium</i>	1		2004	In production Green CA/2004	

Study 29I142G - Missouri Ecotype					Table #2 cont.
Common Name		Accession	Collection	Status of Increase Plot	Status of
Genus/Species	Zone	Number	Date	Planting (Where/When)	Accession
<b>Rough Blazing Star</b> <i>Liatris aspera</i>	1	9079068	1999	In production PMC/2000	
	2	9079069	2000	In production Green CA/2001	
<b>Roundhead Bushclover</b> <i>Lespedeza capitata</i>	1	9079008	1999	In production PMC/2000	
<b>Showy Goldenrod</b> <i>Solidago speciosa</i>	1	9079110	2001	In production Green CA/2002	
	2	9079111	2003	In production Green CA/2003	
<b>Sideoats</b> <i>Bouteloua curtipendula</i>	1	9079072	2001	In production PMC/2002	
	2	9079073	2001	In production PMC/2002	
<b>Stiff Goldenrod</b> <i>Solidago rigida</i>	1	9079107	2001	In production Green CA/2002	
	2	9079107	2001	In production Green CA/2002	
<b>Sweet Black-eyed Susan</b> <i>Rudbeckia subtomentosa</i>	1		2004	In production Green CA/2004	
	2		2004	In production Green CA/2004	
<b>Swamp Milkweed</b> <i>Asclepias incarnata</i>	2		2004	In production Green CA/2004	
<b>Tall Dropseed</b> <i>Sporobolus compositus</i>	1	9079040	1998	In production PMC/1999	Released in 2001
	2	9079041	2001	In production PMC/2002	
<b>Tall Tickseed</b> <i>Coreopsis tripteris</i>	1	9079076	2000	In production Green CA/2001	
<b>Tick Trefoil</b> <i>Desmodium canadense</i>	1	9079012	1997	In production PMC/1998	
<b>Virginia Wild Rye</b> <i>Elymus virginicus</i>	1	9079044	1998	In production PMC/1999	Released in 1999
<b>White Prairie Clover</b> <i>Dalea candida</i>	1	9079052	2000	In production PMC/2001	
	1	9079052	2000	In production Green CA/2001	
	2	9079053	2000	In production Green CA/2001	

Study 29I142G - Missouri Ecotype					Table #2 cont.
Common Name		Accession	Collection	Status of Increase Plot	Status of
Genus/Species	Zone	Number	Date	Planting (Where/When)	Accession
<b>White Wand Beardtongue</b> <i>Penstemon tubifloris</i>	2	9079101	2001	In production Green CA/2002	
<b>Wild Quinine</b> <i>Parthnium integrifolium</i>	1		2004	In production Green CA/2004	
<b>Whorled Milkweed</b> <i>Asclepias verticellata</i>	2		2004	In production Green CA/2004	
<b>Wild Quinine</b> <i>Parthnium integrifolium</i>	2		2004	In production Green CA/2004	

Study 29I142G - Missouri Ecotype Releases						Table #3
	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.

**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

Study MOPMC-P-0001-WE, WL																		
Assembly, Evaluation and Selection of Bur Oak, <i>Quercus macrocarpa</i> , Michx.													Table #2					
Summary of Iowa Collections, Located in Field #6																		
Summary of Height (Inches)																		
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Rep 11	Rep 12	Average	Best	Location			
IA-1	13 w	4.5 e	10 w	13 e	16 e	7 e	10 e	12 e	9.5 w	12 e	14 w	14 e	11.21	15.5	Rep 5			
IA-2	8 w	10 w	9 e	9 e	15 e	12.5 e	15 e	10 e	10 w	10 w	13 e	16 w	11.42	16	Rep 12			
IA-3	9 w	8 e	9.5 w	13 e	11 e	8 e	7 w	9 e	11 e	12 w	10.5 e	9 w	9.75	13	Rep 4			
IA-4	16 e	15.5 w	14.5 w	9.5 e	10 e	11.5 e		11 w	16 e	13 e	11 w		12.80	16	Rep 9			
IA-5	13 w	15 w	15.5 w	8 w	16 w	14 w	24.5 e	23 e	12 w	17 e	20 w	10 e	15.63	24.5	Rep 7			
IA-6	10 w	8.5 w	12 e	13 e	13 e	12.5 e	5 e	3 e	6.5 e	13 w	7 e	8 e	9.25	12.5	Reps 5, 6			
IA-7	13 w	16 w	9.5 e	12 e	21 e	12.5 e	10 w	5.5 w	6 w	20 w	11 w	19 w	12.96	20	Rep 10			
Summary of Spread (Inches)																		
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Rep 11	Rep 12	Average	Best	Location			
IA-1	-	3.5 e	2.5 w	2 e	0.5 e	-	-	1 e	2 w	1 e	2.5 w	3 e	2.00	3.5	Rep 2			
IA-2	-	3 w	-	1.5 e	2.5 e	2.5 e	1 e	2.5 e	1.5 w	0.5 w	0.5 e	2 w	1.75	3	Rep 2			
IA-3	-	-	1.5 w	2.5 e	1 e	0.5 w	0.5 w	0.5 w	0.5 e	1 w	1.5 e	0.5	1.00	2.5	Rep 4			
IA-4	-	2.5 w	1 e	1.5 e	1.5 e	-		1.5 w	1 e	2.5 e	2 w	-	1.69	2.5	Reps 2,10			
IA-5	-	3 e	1.5 e	1.5 w	3 w	1 w	1 w	3.5 e	0.5 w	0.5 e	0.5 w	1.5 w	1.59	3	Reps 2, 5			
IA-6	-	-	-	2.5 e	2.5 e	1.5 e	-	0.5 e	1 e	2 w	0.5 e	2 e	1.56	2.5	Reps 4, 5			
IA-7	2 w	3 w	1.5 e	-	1 w	1 e	1.5 w	0.5 w	1 w	1.5 w	0.5 w	0.5 w	1.27	3	Rep 2			

Summary of Vigor													- = No Spread on Plant			Table #2 - continued		
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Rep 11	Rep 12	Average	Best	Location			
IA-1	4	5	4	3	4	6	4	4	6	4	4	4	4.33	3	Rep 4			
IA-2	4	4	4	4	3	4	6	4	5	5	4	3	4.17	3	Reps 5,12			
IA-3	dead	4	3	3	4	4	6	6	4	4	5	6	4.45	3	Reps 3, 4			
IA-4	3	3	3	4	4	4	-	4	3	4	4	-	3.60	3	Reps 2,3,9			
IA-5	3	3	3	4	3	3	2	2	6	3	3	3	3.17	2	Reps 7, 8			
IA-6	4	4	3	3	4	4		9	7	4	6	6	4.91	3	Reps 3, 4			
IA-7	3	3	4	3	2	4	4	7	7	3	4	3	3.92	2	Rep 5			
<b>Legend Rating for Vigor: 1 = Excellent, 9 = Poor</b>																		
<b>Summary of Insect and Disease Resistance</b>																		
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Rep 11	Rep 12	Average	Best	Location			
IA-1	3	3	2	2	2	2	5	4	3	2	3	2	2.73	2	R,3,4,4, 6. 10, 12			
IA-2	2	2	2	2	3	2	3	5	4	4	3	2	2.91	2	R,1-4,6,12			
IA-3	2	3	3	3	2	3	3	3	2	4	3	3	2.91	2	R,1, 5, 9			
IA-4	2	2	3	2	2		4	4	3	2	3		2.78	2	R,1,2,4,5, 10			
IA-5	3	2	3	3	3	2	2	2	4	2	2	2	2.45	2	R,2,6,7,8, 10,11,12			
IA-6	2	2	2	2	3	2	4	3	4	3	4	3	2.91	2	R,1-4,6			
IA-7	3	3	2	2	2	3	2	3	3	3	4	3	2.73	2	R,3-5,7			
<b>Legend Rating for Insect and Disease Resistance: 1 = Excellent, 9 = Poor</b>																		

Summary of Missouri Collections Located in Field # 7													Table #3	
Summary of Height (Inches)														
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Average	Best	Location	
MO-1	25 e	14 e	25 w	18.5 w	16 w	19.5 w	20.5 w	21 w	20.5 w	19.5 w	20.0	25	Reps 1,3	
MO-2	20 w	24.5 w	19 w	26 w	17.5 e	9 w	7.5 w	7 w	8.5 w	13.5 w	15.3	26	Rep 4	
MO-3	17 w	13 w	7 e	5 w	9.5 e	15 e	23 w	24 e	17 e	24.5 w	15.5	24	Rep 8	
MO-4	10 w	16 e	20 w	23 e	25.5 w	8 w	18.5 e	16 w	18.5 w	14 w	16.9	25.5	Rep 5	
MO-5	18 e	13 w	15.5 e	13 e	14 e	16.5 w	7 e	19.5 w	13.5 w	16.5 w	14.4	19.5	Rep 8	
MO-6	19 w					24 w	12 w	24 w	20.5 w	22.5 w	20.6	24	Reps 6,8	
MO-7	21 w	21 w	19 e	21 w	18 w	dead	12 e	12 e	15.5 e	16.5 e	17.3	21	Reps 1,2,4	
MO-8	13.5 e	8.5 e	14 e	6 w	13 w	25 w	19 e	22.5 e	25 e	19 e	16.6	25	Reps 6,9	
MO-9	21 e	17 w	19 e	27 e	11.5 w	18.5 w	17.5 e	25 e	17 e	20.5 e	19.4	25	Rep 8	
MO-10	24 e	18 e	28 e	27.5 e	19 w	10 e	18.5 w	15.5 w	18 w	15 w	19.4	27.5	Rep 3	
MO-11	14.5 e	23.5 e	24 w	24 e	10.5 w	7.5 w	18 e	21.5 e	26 e	18.5 e	18.8	26	Rep 9	
MO-12	24.5' e	23 w	20.5 w	13 w	10 w	15 e	18 w	18.5 w	23.5 w	18 w	17.7	24.5	Rep 1	
MO-13	plt mow	25.5 w	20.5 w	25 w	18 e	25.5 w	25.5 w	19.5 e	24.5 w	17 w	22.3	25.5	Reps 6,7	
MO-14	21 e	21.5 w	27 w	20 e	13 e	15.5 e	14 w	18.5 w	20 w	17 w	18.8	27	Rep 3	
MO-15			14.5 w	16.5 e	19.5 w						16.8	19.5	Rep 5	
Summary of Spread (Inches)														
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Average	Best	Location	
MO-1	1.5 e	2 d	2.5 w	0.5 w	0.5 w	2 e	5.5 w	4 w	4 w	2.5 w	2.6	5.5	Rep 7	
MO-2	5 w	2 w	2 w	3 w	5 e	1.5 w	1.5 w	2.5 w	0.5 w	5 w	2.6	5	Reps 1,5,10	
MO-3	1 w	0.5 w	0.5 e	0.5 e	1 e	2 w	0.5 w	0.5 e	0.5 e	1.5 w	0.8	2	Rep 6	
MO-4	1.5 w	1.5 e	1 w	0.5 e	1 w	1 w	2 e	1.5 w	0.5 w	1 w	1.1	2	Rep 7	
MO-5	1.5 e	1.5 w	1.5 e	0.5 e	1 e	2 w	2.5 e	1.5 w	3 w	1 w	1.6	3	Rep 9	
MO-6	2 w								1 w	3 w	2	3	Rep 10	
MO-7	2.5 w	1 w	1.5 e	2.5 w	3 w	dead	0.5 e	3 e	1 e	2 e	1.8	3	Reps 5,8	
MO-8	4 e	2 e	3.5 e	1 e	3 w	4 w	1 e	2 e	1 e	1 w	2.1	4	Reps 1,6	
MO-9	3 e	1.5 w	2 e	3 e	1 w	3.5 w	1 e	3 e	0.5 e	3 w	2.1	3.5	Rep 6	
MO-10	4 e	2.5 e	2 e	1.5 e	1 w	0.5 e	4.5 w	2.5 w	1 w	0.5 w	1.8	4.5	Rep 7	

Table #3 - continued

Summary of Spread - continued

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Average	Best	Location
MO-11	1.5 e	2 e	2 e	1.5 e	0.5 w	1 w	1.5 e	1 e	1 e	3.5 e	1.6	3.5	Rep 10
MO-12	4 e	3.5 w	4 w	2 w	1.5 w	0.5 e	2 w	2 w	4 w	1 w	2.5	4	Reps 1,3,9
MO-13	plt mow	0.5 w	1.5 w	2.5 w	1 e	3.5 w	1 w	1.5 e	4 w	2 w	1.9	4	Rep 9
MO-14	2 e	2 w	2 w	3 e	5 e	2 e	0.3 w	0.5 w	4 w	2 w	2.3	5	Rep 5
MO-15			1.5 w	1 e	1.5 w						1.3	1.5	Reps 3,5

Summary of Vigor

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Average	Best	Location
MO-1	1	4	1	3	4	2	4	2	2	3	2.6	1	Reps 1,3
MO-2	1	1	3	1	3	7	7	8	8	5	4.4	1	Reps 1,2,4
MO-3	3	4	8	8	5	4	7	1	4	5	4.9	1	Rep 1
MO-4	3	3	2	1	1	7	3	5	3	4	3.2	1	Reps 4,5
MO-5	3	4	4	4	4	4	8	3	4	4	4.2	3	Reps 1,8
MO-6	3					2	5	1	2	1	2.2	1	Reps 8,10
MO-7	2	7	3	2	3	dead	6	5	4	4	4.0	2	Reps 1,4
MO-8	2	7	4	8	4	1	3	1	1	3	3.4	1	Reps 6,8,9
MO-9	2	4	3	1	5	6	3	1	4	2	3.1	1	Reps 4,8
MO-10	1	4	1	1	3	6	3	4	2	6	3.1	1	Reps 1,3,4
MO-11	4	1	1	1	5	8	3	2	1	4	3.0	1	Reps 2-4,9
MO-12	1	1	1	1	4	4	3	3	1	4	2.3	1	Reps 1-4,9
MO-13	plt mow	1	2	1	3	1	1	3	1	4	1.9	1	Reps 2,4,6,7,9
MO-14	2	1	8	2	4	4	4	3	2	4	3.4	1	Rep 2
MO-15		3		4	3						3.3	3	Reps 2,5

Legend for Vigor: 1 = Excellent, 9 = Poor

Summary of Insect and Disease Resistance													Table #4	
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Average	Best	Location	
MO-1	2	3	2	3	4	2	5	3	2	3	2.9	2	Reps 1,3,6,9	
MO-2	2	2	4	2	3	4	4	4	5	2	3.2	2	Reps 1,2,4,10	
MO-3	3	3	4	4	4	5	3	2	4	2	3.4	2	Reps 8,10	
MO-4	2	3	4	2	2	4	4	3	5	2	3.1	2	Reps 1,4,5,10	
MO-5	3	4	3	4	3	2	3	4	4	3	3.3	2	Rep 6	
MO-6	4					2	3	2	3	2	2.4	2	Reps 6,8,10	
MO-7	2	3	3	4	4	dead	3	2	4	3	3.1	2	Reps 1,8	
MO-8	2	4	4	5	3	2	4	3	2	2	3.1	2	Reps 1,6,9,10	
MO-9	3	3	3	2	3	3	4	2	2	3	2.8	2	Reps 4,8,9	
MO-10	2	2	2	2	2	4	2	5	3	4	2.8	2	Rep 1-5,7	
MO-11	4	2	3	3	3	5	3	3	2	3	3.1	2	Reps 2,9	
MO-12	2	2	2	4	3	4	2	2	4	2	2.7	2	Reps 1-3,7,8,10	
MO-13	plt mow	2	2	4	2	2	2	3	2	3	2.4	2	Reps 2,3,5,6,7,9	
MO-14	3	2	3	3	2	4	3	2	3	3	2.8	2	Reps 2,5,8	
MO-15		4	4	3	3						3.5	3	Reps 4,5	
<b>Legend for Insect and Disease Resistance: 1 = Excellent, 9 = Poor</b>														
<b>Summary of Illinois Collections, Located in Field #12</b>														
<b>Accession</b>	<b>Average Height (Inches)</b>					<b>Average Spread (Inches)</b>								
IL-1	12.5					IL-1 2.8								
IL-2	13.3					IL-2 3								
	<b>Average Insect/Disease</b>					<b>Average Vigor</b>								
IL-1	2					IL-1 3								
IL-2	2.3					IL-2 3.9								



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

Table #5

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

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

Table #6

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

<b>Summary of Vigor (1-9 Rating) 1=Very Good 9=Poor</b>													
<b>Acc. No.</b>	<b>Rep 1</b>	<b>Rep 2</b>	<b>Rep 3</b>	<b>Rep 4</b>	<b>Rep 5</b>	<b>Rep 6</b>	<b>Rep 7</b>	<b>Rep 8</b>	<b>Rep 9</b>	<b>Rep 10</b>	<b>Rep 11</b>	<b>Rep 12</b>	<b>Avg.</b>
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
<b>Summary of Insect/Disease Resistance (1-9 Rating) 1=Very Good 9=Poor</b>													
<b>Acc. No.</b>	<b>Rep 1</b>	<b>Rep 2</b>	<b>Rep 3</b>	<b>Rep 4</b>	<b>Rep 5</b>	<b>Rep 6</b>	<b>Rep 7</b>	<b>Rep 8</b>	<b>Rep 9</b>	<b>Rep 10</b>	<b>Rep 11</b>	<b>Rep 12</b>	<b>Avg.</b>
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

**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 #7

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, <i>Quercus macrocarpa</i> , Michx.									
Plot Layout: 5-11-02									
Field 7 - Missouri Collections					2 ROWS		Table #11		
	Reps							Reps	
		12	Border Plant			Border Plant	3		
			14	← accessions →		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	← accessions →		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	← accessions →		Repeat			
	8		14			1 to 14		3	
			to 1			replacing 6 with 15			
			Repeat	← accessions →		Repeat			
	7		14			1 to 14		4	
			to 1			replacing 6 with 15			
			Repeat	← accessions →		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				
		3 (BP)		3 (BP)		NORTH
REPS		2		6		REPS
		5		2		
		6		7		
12		4		1		1
		7		3		
		1		5		
		3		4		
		4		5		
		7		3		
		5		7		
11		1		2		2
		3		6		
		2		1		
		6		4		
		4		1		
		7		3		
		2		2		
10		1		7		3
		3		5		
		5		4		
		6		6		
		5		7		
		4		3		
9		3		1		
		7		4		4
		1		6		
		2		2		
		6		5		
		1		4		
		6		2		
		5		5		
8		3		3		5
		7		1		
		4		6		
		2		7		
		1		2		
		6*		5		
		4		7		
7		2		1		6
		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)						

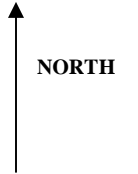
**STUDY MOPMC-P-0001-WO**

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

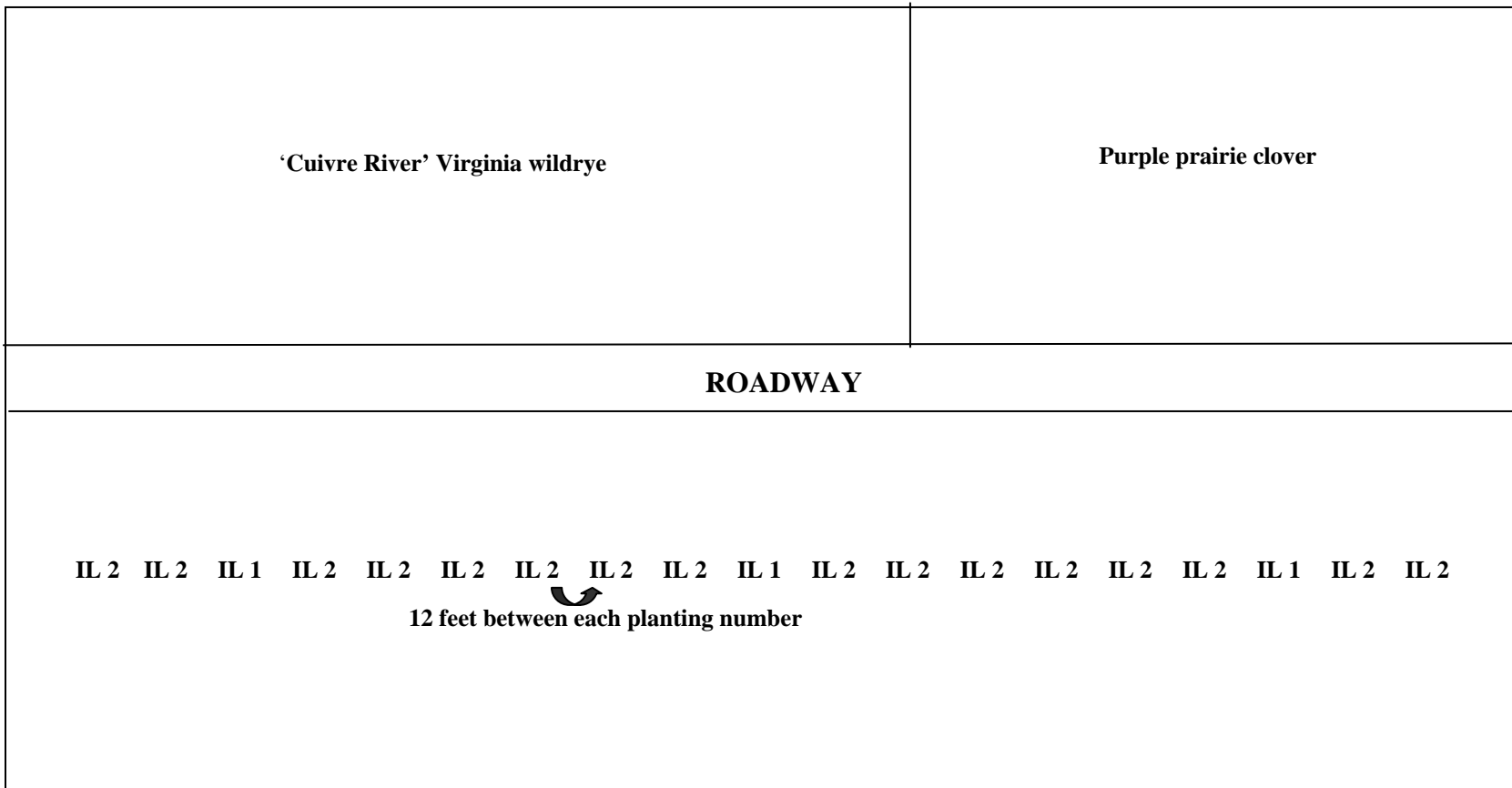
**Table #13**

**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.

### **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

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.

<b>State</b>	<b>Size in Acres</b>	<b>2004 Production</b>	<b>2005 Production</b>
Illinois	0.30	23.5	64.1
Missouri	0.49	4.2	2.5
Iowa	1.26	12.9	6.2

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

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.

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



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

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

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

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

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

**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 a three-foot spacing. The accessions will be tested for forage quality and production twice a year for three years.

## **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 PMCs 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 PMC's 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.

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 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	2576	
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	

**Study ID Code: MOPMC-T-0104**

**Study Title: Native Plant Identification**

**Study Leader:** Kaiser, J. U.

**Description:**

Plant identification by landowners and NRCS Field Personnel is very challenging in the early seedling stages. As a result, plant identification workshops are being held in several locations in Missouri, Illinois and Iowa. As a result of these sessions, a need has developed which would make available via PowerPoint or on the web, color digital photos illustrating different characteristics of native grasses, legumes, and forbs. These photos could then be used during training workshops or extracted from the web by individuals interested in specific plant identification.

**Objective:**

There are many publications presently available for use regarding plant identification; however, the majority of these deal only with identification of matured plants. Not much information (photos) is readily available regarding seedling identification of native grasses, forbs, and legumes. The objective is to make available, particularly over the web, color photos of seedlings of native grasses (cool and warm season), legumes and forbs.

**Materials and Methods:**

Assemble seed and plants of selected native cool and warm season grasses, legumes and forbs and take color photos at different stages of growth.

**Discussion:**

**2001**

The study plan was developed and approved in August 2001. A total of 31 different species of native grasses (cool and warm season), legumes and forbs are involved in this study: five cool season grasses, four warm season grasses, five legumes and 17 forbs. Color photos will be taken of the seed of each species, seven, 14 and 30 days after germination and at flowering and seed set. These photos will then be placed on the plant materials web site and made available to those individuals interested in these plants.

The following is a listing of plant species included in this study.

**2002**

Digital photos and color slides are being taken of New England aster, roundhead lespedeza, oxeye false sunflower, Canada wildrye, Virginia wildrye, stiff goldenrod, prairie blazing star, oxeye false sunflower and rattlesnake master. Photos are being taken of the seed, seven days, 14 days, and 30 days after germination, at flowering, and seed set. Photos will then be placed on the plant materials web site and made available to NRCS employees and other individuals interested in these plants.

<b>Native Cool Season Grasses</b>	<b>Native Warm Season Grasses</b>
<i>Elymus canadensis</i>	<i>Spartina pectinata</i>
<i>Elymus virginicus</i>	<i>Paspalum laeve</i>
<i>Calamagrostic canadensis</i>	<i>Dichanthelium clandestinum</i>
<i>Cinna arundinacea</i>	<i>Sporobolus asper</i>
<i>Uniola latifolia</i>	
<b>Native Forbs</b>	<b>Native Legumes</b>
<i>Liatris pycnostachya</i>	<i>Lespedeza capitata</i>
<i>Eryngium yuccifolium</i>	<i>Desmodium canadense</i>
<i>Coreopsis palmata</i>	<i>Dalea purpureum</i>
<i>Ratibida pinnata</i>	<i>Dalea candida</i>
<i>Aster novae-angliae</i>	<i>Tephrosia virginiana L.</i>
<i>Heliopsis helianthoides</i>	
<i>Echinacea pallida</i>	
<i>Monarda fistulosa</i>	
<i>Zizia aurea</i>	
<i>Asclepias tuberosa</i>	
<i>Solidago rigida</i>	
<i>Silphium laciniatum</i>	
<i>Veronicastrum virginicum</i>	
<i>Penstemon digitalis</i>	
<i>Lobelia siphilitica</i>	
<i>Desmanthus illinoensis</i>	
<i>Liatris aster</i>	

## 2003

The quality of the photography produced within the agency could not provide the enhanced resolution to capture the details needed from the species for the photos to be used on the web sites.

## 2004

A revision to the study plan was approved to be a partnership with Missouri Department of Conservation (MDC), a private professional photographer, and the Elsberry PMC to provide quality photography for web based native plant species.

The study will involve the photographer growing from seed the species listed below and photographing them at various stages. The stages are:

- 1) Seeds - 10 to 15 together, with a ruler for size.
- 2) Seedling - showing the cotyledons and the first true leaves.
- 3) Juvenile - 3 to 6 inches in height showing typical leaves together.
- 4) Diagnostic characteristic - a representative part of the plant that aids in identification.
- 5) Mature plant – showing the flowering stage.

The five stages of the 14 plants will provide 70 images.

Native Forbs	Native Legumes
<i>Aster novae-angliae</i> - New England Aster	<i>Chamaecrista fasciculata</i> - Partridge pea
<i>Coreopsis palmata</i> - Prairie Coreopsis	<i>Dalea candida</i> - White prairie clover
<i>Echinacea pallida</i> - Pale Purple coneflower	<i>Dalea purpureum</i> - Purple prairie clover
<i>Eryngium yuccifolium</i> - Rattlesnake master	<i>Desmnanthus illinoensis</i> - Illinois bundleflower
<i>Heliopsis helianthoides</i> - Ox-eye sunflower	<i>Desmodium canadense</i> - Showy tick trefoil
<i>Liatris pycnostachya</i> - Prairie blazing star	<i>Lespedeza capitata</i> - Round-headed bushclover
<i>Ratibida pinnata</i> - Gray-headed coneflower	
<i>Rudbeckia hirta</i> - Black-eyed susan	

The photography was completed on the species above and our partner, MDC, is working on developing the website for the species photo images. The website will be developed in 2005. Once established, a link to the site will be set up within NRCS. The Elsberry PMC will inform the field when the website is on line. Twenty-six additional species consisting of native legumes, forbs and native grasses will be added in 2005.

## 2005

The additional 26 species were completed in 2005. See chart below for the 40 species that were finalized with photo images in the 5 stages of development for each species.

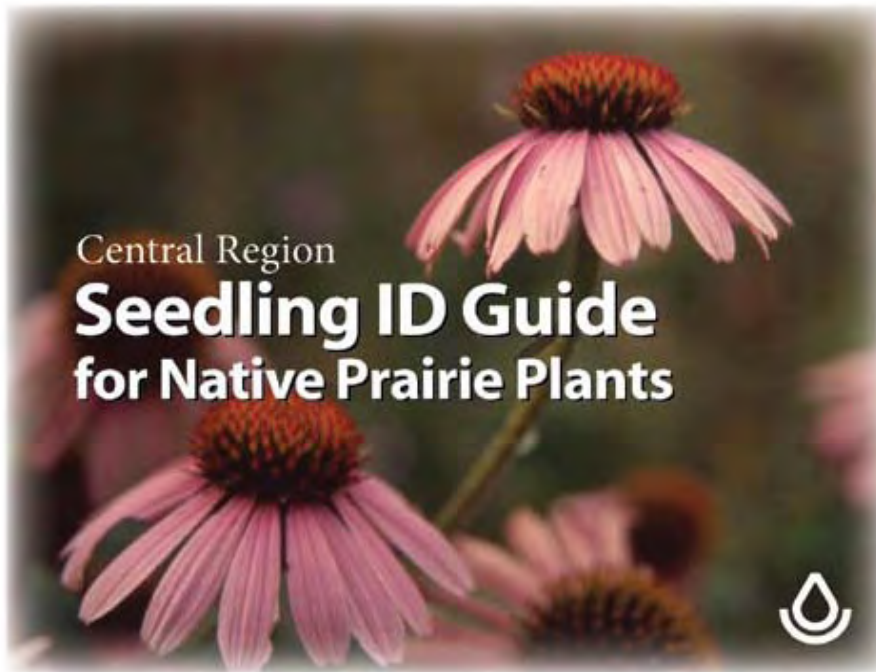
### Species List

Big Bluestem – <i>Andropogon gerardii</i>	Prairie Blazing Star – <i>Liatris pycnostachya</i>
Black-Eyed Susan – <i>Rudbeckia hirta</i>	Prairie Coreopsis – <i>Coreopsis palmata</i>
Blue Lobelia – <i>Lobelia siphilitica</i>	Purple Coneflower – <i>Echinacea purpurea</i>
Butterfly Milkweed – <i>Asclepias tuberosa</i>	Purple Prairie Clover – <i>Dalea purpurea</i>
Cardinal Flower – <i>Lobelia cardinalis</i>	Rattlesnake Master – <i>Eryngium yuccifolium</i>
Compass Plant – <i>Silphium laciniatum</i>	Rough Blazing Star – <i>Liatris aspera</i>
Culver’s Root – <i>Veronicastrum virginicum</i>	Rough Dropseed – <i>Sporobolus compositus</i> ( <i>asper</i> )
Flowering Spurge – <i>Euphorbia corollata</i>	Round-headed Bushclover – <i>Lespedeza capitata</i>
Foxglove Beard Tongue – <i>Penstemon digitalis</i>	Royal Catchfly – <i>Silene regia</i>
Golden Alexanders – <i>Zizia aurea</i>	Sensitive Briar – <i>Mimosa quadrivalvis</i> var. <i>nutallii</i>
Gray-headed Coneflower – <i>Ratibida pinnata</i>	Showy Goldenrod – <i>Solidago speciosa</i>
Illinois Bundleflower – <i>Desmanthus illinoensis</i>	Showy Tick Trefoil – <i>Desmodium canadense</i>
Leadplant – <i>Amorpha canescens</i>	Sideoats Grama – <i>Bouteloua curtipendula</i>
Little Bluestem – <i>Schizachyrium scoparium</i>	Slender Lespedeza – <i>Lespedeza virginica</i>
New England Aster – <i>Aster novae-angliae</i>	Slender Mountain Mint – <i>Pycnanthemum</i> <i>tenusifolium</i>
Obedient Plant – <i>Physostegia virginiana</i>	Stiff Goldenrod – <i>Solidago rigida</i>
Ohio Spiderwort – <i>Tradescantia ohioensis</i>	Virginia Wildrye – <i>Elymus virginicus</i>
Oxeye False Sunflower – <i>Heliopsis</i> <i>helianthoides</i>	White Prairie Clover – <i>Dalea candida</i>
Pale Purple Coneflower – <i>Echinacea pallida</i>	Wild Bergamot – <i>Monarda fistulosa</i>
Partridge Pea – <i>Chamaecrista fasciculata</i>	
Pitcher Sage – <i>Salvia azurea</i>	

A goal of this study was to also have the availability of a hard copy “Seedling ID Guide for Native Prairie Plants” for the use in the field for agency personnel.

An issue paper was developed and presented at the National State Conservationist Meeting for funding support. Ten Midwestern states approved the development of 10,000 hardcopies to meet the needs within their state.

The prototype guides was developed by the Elsberry Plant Materials Specialist/Center along with the partners on this project Missouri Department of Conservation Grow Native Program and the Central Region USDA NRCS National Technology Support Center.



## ABOUT THE GUIDE

The goal of this guide is to help identify native plants at various stages of growth. Color photos illustrate seed, seedling, juvenile, and flowering stages, in addition to a distinguishing characteristic. Brief text provides additional identification help.

Images of the seedling stage depict the appearance of a single cotyledon (first leaf) in grasses and a pair of cotyledons in broad-leaved plants, followed by photos of the first true leaves within three weeks of growth in a controlled environment.

Images of the juvenile stage portray the continued development of a seedling with more fully formed leaves within the first eight weeks of shoot development.

Images of the distinguishing characteristics show a specific biological feature representative of the plant.

Please note that seed images do not represent the actual size of the seed. The scale is in 1/16-inch increments.



The final version is a 5" X 4" 92 page pocket guide containing the 40 species in alphabetical order by common name along with scientific name in a spiral bound heavy photo grade water resistant card. Each species has two cards when open to view the species. The top card contains the text that describes the Distinguishing characteristics photo to focus on for identification along with a description of height bloom and flowering stage photo. The lower card contains the photo of the seedling stage and juvenile stage with a ruler for scale on this photo. The text on the lower photo contains comments related to where the species can be found or planted by habitats and detailed facts about that individual species.

**Gray-headed Coneflower**

*Ratibida pinnata*

**Distinguishing Characteristics:**

- Leaves divided into 3 to 7 leaflets with a few teeth or small side lobes along the margins.

**Description:**

- Height: Up to 5 feet
- Blooms: June – September
- Each flower head has its own stalk.
- Before opening, the small disk flowers are ashy gray – they turn brown as the flowers open.
- A slender, hairy-stemmed plant.
- Will bloom the second year after seeding.



**Comments:**

- Throughout tallgrass prairie region, common on glades, woodland edges, and prairies.
- Easily established from seed, it does well in new warm-season grass and wildflower plantings.
- Good food source for wildlife and forage for livestock.



*Gray-headed Coneflower - Seedling*



*Gray-headed Coneflower - Juvenile*



The remaining photos of the seed of each species were placed near the end of the guide. Each seed card contains 6 species with a scale = 1/16 inch increments to visualize the size of the seed.

The last page contains the common name for each species in alphabetical order with the average Seeds/lb. documented from sources.



<i>COMMON NAME</i>	<i>SEEDS/LB</i>	<i>COMMON NAME</i>	<i>SEEDS/LB</i>
Big Bluestem	130,000	Pitcher Sage	149,000
Black-eyed Susan	1,500,000	Prairie Blazing Star	136,000
Blue Lobelia	7,320,000	Prairie Coreopsis	200,000
Butterfly Milkweed	7,000	Purple Coneflower	115,000
Cardinal Flower	4,800,000	Purple Prairie Clover	275,000
Compass Plant	10,600	Rattlesnake Master	177,770
Culver's Root	12,000,000	Rough Blazing Star	191,000
Flowering Spurge	160,000	Rough Dropseed	1,500,000
Foxglove Beard Tongue	2,000,000	Round-headed Bushclover	159,000
Golden Alexanders	176,000	Royal Catchfly	368,000
Gray-headed Coneflower	625,000	Sensitive Briar	38,400
Illinois Bundleflower	60,000	Showy Goldenrod	1,675,200
Leadplant	123,000	Showy Tick Trefoil	88,000
Little Bluestem	225,000	Sideoats Grama	190,000
New England Aster	1,300,000	Slender Lespedeza	160,000
Obedient Plant	240,000	Slender Mountain Mint	6,048,000
Ohio Spiderwort	128,000	Stiff Goldenrod	656,000
Oxeye False Sunflower	103,900	Virginia Wildrye	75,000
Pale Purple Coneflower	106,000	White Prairie Clover	292,992
Partridge Pea	50,000	Wild Bergamot	1,200,000

The back card contains the agencies logo's and contact information along with the photographer credit, Don Kurz, who was contracted for the photography.

The hard copies were distributed after printing and are in use with the agencies of USDA/NRCS and MDC.

These website are available to access the guide at <http://plant-materials.nrcs.usda.gov>, go to the home page on the right side click on Tools and Plant Identification to bring up the guide. Also MDC has the guide on their website under <http://mdc.mo.gov/grownative/plantID/>

To purchase hardcopies our partners MDC have made the "Central Region Seedling ID Guide for Native Prairie Plants" available at [www.mdcnatureshop.com](http://www.mdcnatureshop.com) under books of plants or call 877-521-8632, Item number 01-0290.

USDA-NRCS  
Elsberry Plant Materials Center  
2803 North Highway 79  
Elsberry, Missouri 63343  
Phone: 573-898-2012  
<http://plant-materials.nrcs.usda.gov>



Missouri Department of Conservation  
PO Box 180  
Jefferson City Missouri 65102  
Phone: 573-751-4115  
<http://mdc.mo.gov/grownative/plantID/>



Photography by: Don Kurz

October 2005

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**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 is 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, *Desmodium canadense*, 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 *desmodium*, oxeye daisey, 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.

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 Legume Forb Mixture	8' LB , SO Legume Forb Mixture	8' EG Legume Forb Mixture	T , SG Legume Forb Mixture \1	VW , IG Legume Forb Mixture	VW , WW Legume Forb Mixture	JG , PG Legume Forb Mixture	EG Legume Forb Kura clover	EG Legume Forb Mixture	Check		
<b>WS grass components</b>		<b>CS grass components</b>		<b>Legume components</b>		<b>Forb components</b>					
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		2003	2004	2005		2003	2004	2005		2003	2004	2005		2003	2004	2005	
<b>WS grass components</b>																			
big bluestem (BB)	0.75	1.25	3.00				0.10										0.13		
little bluestem (LB)				0.50	0.38	0.40													
switchgrass (SG)	1.75	1.75	6.80									0.50	0.50	0.90					
sideoats gramma (SO)				1.00	0.38	2.20													
eastern gamagrass (EG)								3.00	2.25	9.50									
indiangrass (IG)						0.10										1.75	1.00	9.40	
<b>CS grass components</b>																			
Virginia wildrye (VW)																0.50	1.75	1.60	
western wheatgrass (WW)																			
junegrass (JG)																			
porcupine grass (PG)																			
timothy (T)												0.25	1.75						
<b>Legume components</b>																			
bush clover	0.13	0.13	0.10		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		0.25	0.50	0.10		0.25	0.50	0.10		0.13	0.13	0.10		0.13	0.38	0.10
goat's rue																			
wild senna	0.38	0.25	0.10		0.38	0.50	0.10		0.38	0.50	0.10		0.25	0.50	0.10		0.25	0.38	0.10
Illinois bundleflower													0.13					0.13	
lead plant																			
kura clover																			
<b>Forb components</b>																			
oxeye daisy	0.50	0.50	0.20		0.50	0.50	0.30		0.50	0.50	0.20		0.50	0.50	0.20		0.50	0.50	0.10
grayhead coneflower	0.50	2.00	2.00		0.50	2.00	4.00		0.50	2.50	3.80		0.50	2.00	0.50		0.50	2.25	2.40
prairie coreopsis	0.13					0.50				0.13				0.25				0.25	

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				2003 2004 2005				2003 2004 2005				2003 2004 2005			
<b>WS grass components</b>															
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					
indiangrass (IG)			0.10					0.13					0.25	0.10	
<b>CS grass components</b>															
Virginia wildrye (VW)	0.50	0.50	1.70												
western wheatgrass (WW)			0.10												
junegrass (JG)															
porcupine grass (PG)															
timothy (T)															
<b>Legume components</b>															
bush clover	0.25	0.50	0.10		0.25	0.25	0.10						0.13	0.13	0.10
purple prairie clover															0.10
white prairie clover															
desmodium	0.38	0.38	0.10		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		0.25	0.38	0.10						0.38	0.13	0.10
Illinois bundleflower													0.13		
lead plant					0.13								0.13		
kura clover									0.25						
<b>Forb components</b>															
oxeye daisy	0.50	0.50	0.30		0.38	0.50	0.20		0.13				0.50	0.50	0.30
grayhead coneflower	0.50	2.75	5.00			2.25	4.00						0.50	3.00	4.00
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	2003	2004	2005	2003	2004	2005	2003	2004	2005	2003	2004	2005	2003	2004	2005			
<b>WS grass components</b>																						
		0.50	1.25	3.30			0.10															
						0.75	0.38	0.50														
		4.25	6.00	12.40			0.10					5.75	20.63	26.30								
						30.00	26.25	30.00														
										1.75	6.38	24.40										
							0.10												2.75	5.00	15.00	
<b>CS grass components</b>																						
																			0.75	4.75	3.30	
<b>Legume components</b>																						
		0.13	0.50	0.20		0.50	0.38	0.50			0.38	0.70			0.38	0.40		0.13	0.38	0.30		
		0.38	0.50	0.10		0.50	0.50	0.40		0.38	0.50	0.20		0.25	0.50	0.10		0.38	0.50	0.20		
			0.13				0.25	0.10			0.38				0.50				0.13	0.10		
		0.38	0.50	0.10		0.38	0.50	0.20		0.50	0.50	0.20		0.38	0.50			0.38	0.50	0.30		
			0.38			0.13	0.25				0.50				0.38			0.00	0.25			
																		0.13				
		0.38	0.50			0.25	0.25	0.10		0.38	0.38			0.50	0.50			0.38	0.38			
		0.38				0.38				0.13				0.13				0.25				
<b>Forb components</b>																						
		0.50	0.50	0.10		0.50	0.50	0.10		0.38	0.50	0.20		0.50	0.50	0.20		0.50	0.50	0.20		
		0.50	1.00	0.30		0.38	0.50			0.38	0.50	0.80		0.38	0.75	1.10		0.38	0.75	0.80		
								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	2003	2004	2005	2003	2004	2005	2003	2004	2005	2003	2004	2005
<b>WS grass components</b>																
big bluestem (BB)																
little bluestem (LB)																
switchgrass (SG)																
sideoats gramma (SO)																
eastern gamagrass (EG)																
indiangrass (IG)																
<b>CS grass components</b>																
Virginia wildrye (VW)																
western wheatgrass (WW)																
junegrass (JG)																
porcupine grass (PG)																
timothy (T)																
<b>Legume components</b>																
bush clover																
purple prairie clover																
white prairie clover																
desmodium																
goat's rue																
wild senna																
Illinois bundleflower																
lead plant																
kura clover																
<b>Forb components</b>																
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.

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.**

<b>Scientific Name</b>	<b>Common Name</b>	<b>Collector</b>	<b>City, State</b>	<b>Temp. Acc. No</b>
<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

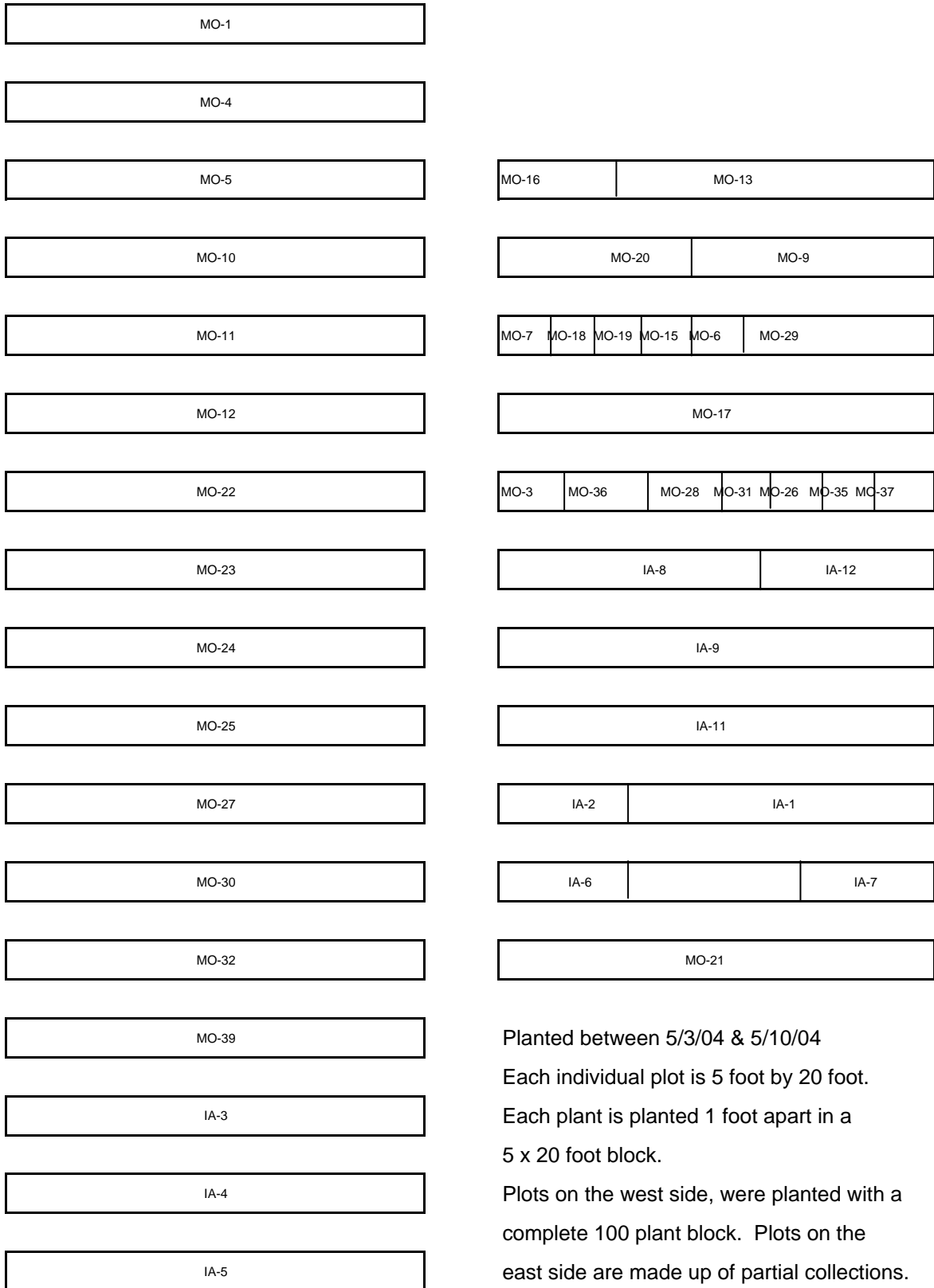
**Table 1-Study MOPMC-T-0106, BU - cont.**

<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			
<b>MISSOURI COLLECTIONS</b>			
<b>Collection</b>	<b>Common Name</b>	<b>Scientific Name</b>	<b># of Plants</b>
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



<b>Table 3 - continued</b>			
	<b><u>IOWA COLLECTIONS</u></b>		
<b><u>Collection</u></b>	<b><u>Common Name</u></b>	<b><u>Scientific name</u></b>	<b><u># of Plants</u></b>
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			

Study ID Code: MOPMC-T-0106, BU

Table #4

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**

<b>Collection #</b>	<b>Name</b>	<b>Number of Plants</b>	<b>Percent Stand</b>	<b>Percent Cover</b>	<b>Lodging (1-9 Rating)</b>	<b>Notes</b>
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**

<b>Name</b>	<b>Collection #</b>	<b>% Stand</b>	<b>% Cover</b>	<b>Lodging</b>	<b>Vigor</b>
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**

<b>Name</b>	<b>Collection #</b>	<b>% Stand</b>	<b>% Cover</b>	<b>Lodging</b>	<b>Vigor</b>
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 MOPMC-T-0106, BU - Collection and Evaluation of Native Cool Season**

<b>Table #5</b>					
<b>2005 Evaluation Averages For Each Species</b>					
<b>Name</b>	<b>Collection #</b>	<b>% Stand</b>	<b>% Cover</b>	<b>Lodging</b>	<b>Vigor</b>
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
Squarrose Sedge	MO-36	100	50	5	5

<b>Study MOPMC-T-0106, BU - Collection and Evaluation of Native Cool Season</b>					
<b>Table #5 - continued</b>					
<b>2005 Evaluation Averages For Each Species</b>					
<b>Name</b>	<b>Collection #</b>	<b>% Stand</b>	<b>% Cover</b>	<b>Lodging</b>	<b>Vigor</b>
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
<b>Lodging</b>					
<b>1 = No Lodging</b>	<b>Severe Lodging</b>				
<b>Vigor</b>					
<b>1= Highly Vigorous</b>	<b>9= Low Vigor</b>				

**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 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:**

<b><u>Original Growth Material</u></b>	<b><u>Regrowth Material</u></b>
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 above 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 processes (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.

**2005**

Vegetative samples were taken from the species/cultivars/accessions listed above. These samples were taken 5/17/05, 6/30/05, 8/10/05 and 9/20/05 for primary (original) growth and 6/30/05, 8/10/05 and 9/20/05 for regrowth. Regrowth samples consisted of approximately 45 days of regrowth materials prior to sample date. At the time of sampling the plants were also evaluated for stage of growth, forage height, and an estimate of amount of forage produced. This data will be compiled and put in a final report and also next year's Annual Technical Report.

**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 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.

**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 maretail and smartweed, were present, but did not significantly change the percent of canarygrass in the plots.

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

		Roundup		Oust		Outrider		Plateau		Check		Mat		Mow	
		height	vigor	height	vigor	height	vigor	height	vigor	height	vigor	height	vigor	height	vigor
<b>Rep 1</b>	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
<b>Rep 2</b>	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
<b>Rep 3</b>	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
<b>Rep 4</b>	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
<b>Averages</b>		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**



		Roundup		Oust		Outrider		Plateau		Check		Mat		Mow	
		height	vigor	height	vigor	height	vigor	height	vigor	height	vigor	height	vigor	height	vigor
<b>Rep 1</b>	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
<b>Rep 2</b>	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
<b>Rep 3</b>	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
<b>Rep 4</b>	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
<b>Averages</b>		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
<b>Rep 1</b>	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
<b>Rep 2</b>	Pecan	Alive	Alive	Alive	Alive	Alive	Alive	Alive
	Bur Oak	Alive	Alive	Alive	<b>DEAD</b>	Alive	<b>DEAD</b>	Alive
	Maple	Alive	Alive	Alive	Alive	Alive	Alive	Alive
<b>Rep 3</b>	Pecan	Alive	<b>DEAD</b>	Alive	Alive	<b>DEAD</b>	Alive	Alive
	Bur Oak	Alive	Alive	Alive	Alive	Alive	Alive	Alive
	Maple	Alive	Alive	Alive	Alive	Alive	<b>DEAD</b>	Alive
<b>Rep 4</b>	Pecan	Alive	Alive	Alive	Alive	<b>DEAD</b>	<b>DEAD</b>	Alive
	Bur Oak	Alive	Alive	<b>DEAD</b>	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
<b>Rep 1</b>	Pecan	Alive	Alive	<b>DEAD</b>	<b>DEAD</b>	<b>DEAD</b>	<b>DEAD</b>	<b>DEAD</b>
	Bur Oak	<b>DEAD</b>	<b>DEAD</b>	<b>DEAD</b>	<b>DEAD</b>	Alive	Alive	<b>DEAD</b>
	Maple	Alive	Alive	Alive	Alive	Alive	Alive	Alive
<b>Rep 2</b>	Pecan	<b>DEAD</b>	<b>DEAD</b>	<b>DEAD</b>	<b>DEAD</b>	<b>DEAD</b>	<b>DEAD</b>	<b>DEAD</b>
	Bur Oak	<b>DEAD</b>	Alive	Alive	<b>DEAD</b>	<b>DEAD</b>	<b>DEAD</b>	<b>DEAD</b>
	Maple	Alive	Alive	Alive	Alive	<b>DEAD</b>	Alive	Alive
<b>Rep 3</b>	Pecan	<b>DEAD</b>	<b>DEAD</b>	<b>DEAD</b>	<b>DEAD</b>	<b>DEAD</b>	<b>DEAD</b>	<b>DEAD</b>
	Bur Oak	Alive	Alive	<b>DEAD</b>	Alive	<b>DEAD</b>	<b>DEAD</b>	<b>DEAD</b>
	Maple	Alive	Alive	Alive	Alive	Alive	<b>DEAD</b>	Alive
<b>Rep 4</b>	Pecan	<b>DEAD</b>	<b>DEAD</b>	<b>DEAD</b>	<b>DEAD</b>	<b>DEAD</b>	<b>DEAD</b>	<b>DEAD</b>
	Bur Oak	Alive	<b>DEAD</b>	<b>DEAD</b>	Alive	<b>DEAD</b>	Alive	<b>DEAD</b>
	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
<b>Rep 1</b>	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
<b>Rep 2</b>	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
<b>Rep 3</b>	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
<b>Rep 4</b>	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"

<b>MOPMC-T-0311 - RI, BU - Control of Reed Canarygrass in Riparian Buffer Plantings</b>														
<b>6/26/2006 Evaluation of Survival/ Height</b>										<b>Table #5</b>				
	<b>Roundup</b>		<b>Oust</b>		<b>Outrider</b>		<b>Plateau</b>		<b>Check</b>		<b>Mat</b>		<b>Mow</b>	
	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
	<b>Outrider</b>		<b>Roundup</b>		<b>Plateau</b>		<b>Oust</b>		<b>Mat</b>		<b>Mow</b>		<b>Check</b>	
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
	<b>Oust</b>		<b>Plateau</b>		<b>Roundup</b>		<b>Outrider</b>		<b>Mow</b>		<b>Mat</b>		<b>Check</b>	
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
	<b>Plateau</b>		<b>Roundup</b>		<b>Oust</b>		<b>Outrider</b>		<b>Check</b>		<b>Mow</b>		<b>Mat</b>	
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
	<b>Roundup</b>		<b>Oust</b>		<b>Outrider</b>		<b>Plateau</b>		<b>Check</b>		<b>Mat</b>		<b>Mow</b>	
<b>Averages</b>	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
<b>D=Dead, M=Maple, B=Bur Oak, P= Pecan</b>														

**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 grass 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  
Burr Oak  
Cottonwood  
Roughleaf Dogwood  
Hazelnut  
Buttonbush

Swamp Oak  
Walnut  
Bald Cypress  
American Plum  
Chokecherry

**Cooperators:**

Jim Graham, 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 four replications. Three chemical treatments were used; treatment #1, a split application of 1.33 ounces 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 rate of 2.0 ounces 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 but 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	

### 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.

### 2005

Testing was continued with applications to reed canarygrass but total control was not achieved. Additional testing with combination tank mixes and other herbicides will be tried in 2006.



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

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
<b><i>Amorpha fruticosa</i> L</b>	<b>Missouri Covey False Indigo Bush</b>	<b>False indigo bush</b>	<b>9083248</b>		<b>N</b>	<b>2005</b>
<b><i>Amorpha fruticosa</i> L</b>	<b>Iowa Covey False Indigo Bush</b>	<b>False indigo bush</b>	<b>9083249</b>		<b>N</b>	<b>2005</b>
<b><i>Amorpha fruticosa</i> L</b>	<b>Illinois Covey False Indigo Bush</b>	<b>False indigo bush</b>	<b>9083250</b>		<b>N</b>	<b>2005</b>
<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>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>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>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>Amorpha fruticosa L.</i>	Missouri Covey False Indigo Bush	False indigo bush	9083248		N	2005
<i>Amorpha fruticosa L.</i>	Iowa Covey False Indigo Bush	False indigo bush	9083249		N	2005
<i>Amorpha fruticosa L.</i>	Illinois Covey False Indigo Bush	False indigo bush	9083250		N	2005
<i>Andropogon gerardii</i>	OZ-70	big bluestem	9078831		N	2004
<i>Desmodium spp.</i>	Northern MO	showy tick trefoil	9079012	MDC	N	2004
<i>Ratibida pinnata, barnh.</i>	Northern MO	grayhead coneflower	9079060	MDC	N	2004
<i>Schizachyrium scoparium (Michx.) Nash</i>	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 L.</i>	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 L.</i>	Southern Iowa	wild bergamot	9068680	UNI, IARV, IAT, ICIA	N	2003
<i>Liatris aspera, Michx.</i>	Southern Iowa	rough blazing star	9068686	UNI, IARV, IAT, ICIA	N	2003
<i>Liatris aspera, Michx.</i>	Central Iowa	rough blazing star	9068685	UNI, IARV, IAT, ICIA	N	2003
<i>Liatris aspera, Michx.</i>	Northern Iowa	rough blazing star	9068684	UNI, IARV, IAT, ICIA	N	2003
<i>Elymus virginicus L.</i>	Cuivre River	Virginia wildrye	9803169	MDC	N	2002
<i>Aster novae-angliae L.</i>	Central Iowa	New England aster	9068682	UNI, IARV, IAT, ICIA	N	2002
<i>Aster novae-angliae L.</i>	Northern Iowa	New England aster	9068681	UNI, IARV, IAT, ICIA	N	2002
<i>Aster novae-angliae L.</i>	Southern Iowa	New England aster	9068683	UNI, IARV, IAT, ICIA	N	2002
<i>Echinacea pallida Nutt.</i>	Northern Iowa	pale purple coneflower	9068611	UNI, IARV, IAT, ICIA	N	2002
<i>Echinacea pallida Nutt.</i>	Southern Iowa	pale purple coneflower	9068613	UNI, IARV, IAT, ICIA	N	2002
<i>Sporobolus compositus var. com.</i>	Southern Iowa	tall dropseed	9062315	UNI, IARV, IAT, ICIA	N	2002
<i>Solidago rigida L.</i>	Southern Iowa	rigid goldenrod	9068619	UNI, IARV, IAT, ICIA	N	2002
<i>Solidago rigida L.</i>	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 Nutt.</i>	Western MO	prairie coreopsis	9079029	MDC, NAS	N	2001
<i>Sporobolus compositus var. comp.</i>	Northern MO	tall dropseed	9079040	MDC, NAS	N	2001
<i>Liatris pycnostachya, Michx.</i>	Western MO	prairie blazing star	9079021	MDC, NAS	N	2001
<i>Liatris pycnostachya, Michx.</i>	Northern MO	prairie blazing star	9079020	MDC, NAS	N	2001
<i>Sporobolus compositus (Poir.) Merr.</i>	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, Michx.</i>	Southern Iowa	prairie blazing star	9068628	UNI, IARV, IAT, ICIA	N	2000
<i>Lespedeza capitata Michx.</i>	Northern Iowa	roundhead lespedeza	9062284	UNI, IARV, IAT, ICIA	N	2000
<i>Andropogon gerardii Vitman</i>	Southern Iowa	big bluestem	9068616	UNI, IARV, IAT, ICIA	N	1999
<i>Schizachyrium scoparium, Michx.</i>	Northern Iowa	little bluestem	9062319	UNI, IARV, IAT, ICIA	N	1999
<i>Eryngium yaccifolium Michx.</i>	Southern Iowa	rattlesnake master	9068604	UNI, IARV, IAT, ICIA	N	1999
<i>Eryngium yaccifolium Michx.</i>	Central Iowa	rattlesnake master	9068603	UNI, IARV, IAT, ICIA	N	1999
<i>Schizachyrium scoparium, Michx.</i>	Southern Iowa	little bluestem	9962321	UNI, IARV, IAT, ICIA	N	1999
<i>Liatris pycnostachya, Michx.</i>	Northern Iowa	prairie blazing star	9068626	UNI, IARV, IAT, ICIA	N	1999
<i>Liatris pycnostachya, Michx.</i>	Central Iowa	prairie blazing star	9068627	UNI, IARV, IAT, ICIA	N	1999
<i>Elymus virginicus L.</i>	Northern MO	Virginia wildrye	9079044	UMC,MDC,MODOT	N	1999
<i>Sorghastrum nutans (L) Nash.</i>	Northern MO	Indiangrass	9079036	UMC,MDC,MODOT	N	1999
<i>Andropogon gerardii Vitman</i>	Northern MO	big bluestem	9079000	UMC,MDC,MODOT	N	1999
<i>Sorghastrum nutans (L) Nash.</i>	Western MO	Indiangrass	9079037	UMC,MDC,MODOT	N	1999
<i>Schizachyrium scoparium, Michx.</i>	Northern MO	little bluestem	9079004	UMC,MDC,MODOT	N	1999
<i>Andropogon gerardii Vitman</i>	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

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
Eryngium yuccifolium Michx.	Northern Iowa	rattlesnake master	9068602	UNI,IARV,IAT,ICIA	N	1998
Solidago rigida L.	Northern Iowa	rigid goldenrod	9068617	UNI,IARV,IAT,ICIA	N	1998
Sorghastrum nutans (L.) Nash.	Southern Iowa	Indiangrass	9062318	UNI,IARV,IAT,ICIA	N	1998
Andropogon gerardii Vitman.	OH-370	big bluestem	9062323	ARPMC	N	1997
Cornus drummondii C.A. Meyer	Corinth	roughleaf dogwood	9055632		N	1997
Cornus drummondii C.A. Meyer	Jefferson	roughleaf dogwood	9055650		N	1997
Cornus drummondii C.A. Meyer	Tazewell	roughleaf dogwood	9055667		N	1997
Cornus drummondii C.A. Meyer	Nicholson	roughleaf dogwood	9055594		N	1997
Desmodium canadense L.	Alexander	showy tick trefoil	9057110		N	1997
Elymus canadensis L.	Southern Iowa	Canada wildrye	9062277	UNI,IARV,IAT,ICIA	N	1997
Heliopsis helianthoides (L.) Sweet	Southern Iowa	oxeye false sunflower	9068607	UNI,IARV,IAT,ICIA	N	1997
Lespedeza capitata Michx.	Southern Iowa	roundhead lespedeza	9062283	UNI, IARV, IAT, ICIA	N	1997
Liriodendron tulipifera L.	Union	tulip poplar	9055584		N	1997
Schizachyrium scoparium (Michx.) Nash	Central Iowa	little bluestem	9062320	UNI,IARV,IAT,ICIA	N	1997
Heliopsis helianthoides (L.) Sweet	Northern Iowa	oxeye false sunflower	9068605	UNI,IARV,IAT,ICIA	N	1996
Lespedeza capitata Michx.	Central Iowa	roundhead lespedeza	9062282	UNI, IARV, IAT, ICIA	N	1996
Sorghastrum nutans (L.) Nash	Central Iowa	Indiangrass	9062317	UNI,IARV,IAT,ICIA	N	1996
Sorghastrum nutans (l.) Nash	Northern Iowa	Indiangrass	9062316	UNI,IARV,IAT,ICIA	N	1996
Sporobolus compositus (Poir.) Merr.	Central Iowa	tall dropseed	9062314	UNI,IARV,IAT,ICIA	N	1996
Bouteloua curtipendula (Michx.) Torr.	Central Iowa	sideoats grama	9062279	UNI,IARV,IAT,ICIA	N	1995
Bouteloua curtipendula (Michx.) Torr.	Northern Iowa	sideoats grama	9062278	UNI,IARV,IAT,ICIA	N	1995
Bouteloua curtipendula (Michx.) Torr.	Southern Iowa	sideoats grama	9062280	UNI,IARV,IAT,ICIA	N	1995
Elymus canadensis L.	Northern Iowa	Canada wildrye	9062275	UNI,IARV,IAT,ICIA	N	1995
Heliopsis helianthoides (L.) Sweet	Central Iowa	oxeye false sunflower	9068606	UNI,IARV,IAT,ICIA	N	1995
Panicum virgatum L. *	Shawnee	switchgrass	591824		N	1995
Cornus mas L.	Redstone	cornelian cherry dogwood	516476		I	1991
Lonicera maackii Maxim	Cling Red	Amur honeysuckle	483450		I	1978
Ulmus parvifolia Jacq.	Elsmo	lace bark elm	9004438		I	1990
Andropogon gerardii Vitman.	Rountree	big bluestem	474216	MOA	N	1983
Sorghastrum nutans (L.) Nash.	Rumsey	Indiangrass	315747	MOA	N	1983
Elaeagnus umbellata Thunb.	Elsberry	autumn olive	476986		I	1979
Acer ginnala Maxim.	Flame	Amur maple	483442		I	1978
Glycine sp. L **	Bobwhite	soybean	421822	MOPMC,ARS, MOA,	I	1975
Panicum virgatum L.	Cave-In-Rock	switchgrass	469228	MOA	N	1974
Bromus inermis Leyss.	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 2005**

Study/Project Number System: Initially the numbers were assigned numerically plus the year the study/project was initiated. Later a different number 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>Sophoro 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	2005	10
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.	2005	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>	2005	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.	2005	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	2005	30
29I109W	Direct Seeding Methods of <i>Quercus</i> sp., Oaks	1993	17
29I110J	Assembly and Evaluation of Chokecherry, <i>Prunus virginiana</i> L.	2005	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	2005	39
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	2005	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	2005	51
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	2005	52
29I136J	Assembly and Evaluation of Wild Plum, <i>Prunus Americana</i> , Marsh.	2005	61
29A137O	Wetland Riparian Propagation, Establishment and Demonstration	2005	75
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.	2005	87
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	2005	108
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 marocarpa</i> , Michx.	2005	117
MOPMC-P-0002, WE, WL	Assembly, Evaluation and Selection of False Indigo Bush, <i>Amorpha fruticosa</i> , L.	2005	137
MOPMC-P-003 PA,WL	Evaluation and Release of Eastern Gamagrass, <i>Tripsacum dactyloides</i> , L.	2005	146
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	2005	156
MOPMC-T-106, BU	Collection and Evaluation of Native Cool Season Grasses and Sedges for Filter Strips	2005	166
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	2005	180
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	2005	182
MOPMC-T-0311, RI, BU	Control of Reed Canarygrass in Riparian Buffer Plantings	2005	184
MOPMC-T-0412, WE, WL, RI	Testing Selected Trees for Tolerance to the Herbicide Outrider	2005	194

## 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 2005
<b>Herbaceous Species</b>	<b>Bulk (Pounds)</b>
<u>'Rountree' big bluestem</u> <i>Andropogon gerardii</i>	235 Foundation
<u>'Rumsey' indiagrass</u> <i>Sorghastrum nutans</i>	111 Foundation
<u>'Pete' eastern gamagrass</u> <i>Tripsicum dactyloides</i> L.	179 Foundation
<u>'Cave-In-Rock' switchgrass</u> <i>Panicum virgatum</i>	0 Foundation
<u>'OH-370' big bluestem</u> <i>Andropogon gerardii</i>	318 Foundation
<u>'OZ-70' big bluestem</u> <i>Andropogon gerardii</i>	163 Foundation
<u>'Alexander' tick trefoil</u> <i>Desmodium canadense</i>	20 Foundation
<u>Flood tolerant switchgrass</u> <i>Panicum virgatum</i>	31 Foundation
<u>Low growing switchgrass</u> <i>Panicum virgatum</i>	454 Foundation
<u>'Bobwhite' soybean</u> <i>Glycine spp.</i>	0 Foundation
<u>Iowa Ecotype Plantings</u> (10 Species; 28 Plots)	178 Total
<u>Missouri Ecotype Plantings</u> (15 Species; 17 Plots)	245 Total

**Herbaceous and Woody Seed and Plant Production – continued**

Name:	Seed & Plant Inventory as of December 2005	
	Plants	Seed Bulk (Pounds)
<b>Woody Species</b>		
<u>'Union' tulip tree</u> <i>Liriodendron tulipifera</i>	20	1.00
<u>Nicholson Germplasm roughleaf dogwood</u> <i>Cornus drummondii</i>	15	0
<u>Corinth Germplasm roughleaf dogwood</u> <i>Cornus drummondii</i>	15	0
<u>Tazewell Germplasm roughleaf dogwood</u> <i>Cornus drummondii</i>	15	0
<u>Jefferson Germplasm roughleaf dogwood</u> <i>Cornus drummondii</i>	15	0
<u>American hazelnut (9083247) (Composite)</u> <i>Corylus americana</i>	200	0
<u>American plum (9083241) (Composite)</u> <i>Prunus Americana</i>	300	4.5
<u>Arrowwood (9068590) (Iowa Selection)</u> <i>Viburnum dentatum</i>	180	0
<u>'Redstone' Cornelian cherry (9055585)</u> <i>Cornus mas</i>	20	2.60



**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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