ELSBERRY PLANT MATERIALS CENTER

1994 - 1998 TECHNICAL REPORT

Pale coneflower
Echinacea pallida Nutt.

Elsberry Plant Materials Center

1994 - 1998

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1994 - 1998
Technical Report
Elsberry Plant Materials Center
Elsberry, Missouri

Introduction

The Elsberry Plant Materials Center (PMC) was established in 1934. The Center is located approximately 60 miles northwest of St. Louis, Missouri, on Highway 79. It includes 243 acres of land.

The Elsberry PMC serves Illinois, Iowa and Missouri, and makes significant contributions to other states in the Midwest region.

The objectives of the Elsberry PMC and of the plant materials program is 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 are finding suitable plants for wetland situations, high traffic areas, wildlife food and habitat, farmstead and field windbreaks, and windbarriers. Also, pastures, landscape and beautification, roadside restoration, biofuel concerns, riparian plantings, woodland, erosion control on cropland and etc.

Each of the three states served by the Center has identified their plant materials problems, needs and priorities. PMC activities are directed toward meeting the needs and priorities set forth in the states' long-range plans.

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 Plan of Operations, 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, Department 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.

New avenues have been established and used by the Plant Materials discipline to release plants to the commercial market: Source Identified, Selected and Tested. 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 thirty-eight plants during its sixty-five (65) year history. Twenty-eight of the total plants were released during the past five years, all of which were natives. Please refer to the following page for a listing of Elsberry's releases.

CLIMATIC DATA – CALENDAR YEAR 1998

TEMPERATURE (Fahrenheit)

Month	1998 Average High	Departure from 66 Year Average	1998 Average Low	Departure From 66 Year Average	1998 Daily Average	66 Year Average	From 66 Year Average Departure
January	40.03	+1.98	27.42	+9.18	33.73	28.16	+5.57
February	46.32	+3.38	31.86	+9.49	39.09	32.66	+6.43
March	49.52	-4.29	34.52	-2.92	42.02	45.63	-3.61
April	63.20	-3.29	44.33	+1.90	53.77	54.46	-0.69
May	79.52	+2.99	59.20	+1.29	69.36	67.22	+2.14
June	82.20	-3.35	64.27	-8.82	73.24	79.32	-6.08
July	85.26	-4.40	69.13	+3.74	77.20	77.53	-0.33
August	86.97	-0.66	66.65	+3.46	76.81	75.41	+1.40
September	82.30	+1.89	62.43	+7.51	72.37	67.67	+4.70
October	67.71	-1.84	47.68	+4.08	57.7	56.58	+1.12
November	56.70	+2.66	37.80	+5.32	47.25	43.26	+3.99
December	44.15	+2.04	26.19	+3.16	35.18	32.58	+2.60
1998	65.32	-2.89	47.62	+3.12	56.47	55.04	+1.43

1998	
Last Killing Frost	**April 11**
First Killing Frost	**October 22**
Number of Frost-Free Days	**193**

CLIMATIC DATA – CALENDAR YEAR 1998

Precipitation (Inches)

Month	**68 Year Average**	**1998 Total**	**Departure**
January	1.844	3.870	+2.026
February	1.961	5.250	+3.289
March	3.200	5.991	+2.791
April	3.370	3.480	- .250
May	3.962	2.210	-1.752
June	3.724	8.130	+4.406
July	3.396	3.781	+ .386
August	3.304	.610	-2.694
September	3.361	4.600	+1.239
October	2.948	3.640	+ .692
November	2.939	2.821	- .118
December	2.478	1.200	-1.278
Year Total	36.847	45.583	+8.737

Tours, Visitors and Meetings

The Elsberry Plant Materials Center was visited by 230 registering guests. These individuals represented many walks of life, foreign and domestic; students, farmers, ranchers, researchers and other professionals.

They came individually and in formal groups. All were interested in one or more aspects of our dynamic soil and water conservation program.

The following groups are representative of the interest in the Elsberry Plant Materials Program:

Groups	Date 1998	**Number of** Participants
Riverlands Master Plan Meeting	February 24	5
Elsberry 8th Grade Science Class	February 25	10
Camp Avery	April 9	12
Lincoln County RII Elsberry High School Science Department	April 16	10
AEP Club	May 19	9
Elsberry Boys Scouts	May 28	15
Elsberry PMC Annual Tour	June 16	51
Resource Inventory Mapping	July 23	9
NRCS New Employees Training	September 8	37
MO PM Committee Mgt.	October 6 & 7	18

Study Number: 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 time plants are assigned to a specific study. Plants are also brought in 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. Individuals who are interested in an unfamiliar species or a plant with unusual characteristics bring in plants. Many species exist on the center which 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:

To 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 and 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 is documented. The accession is assigned a location that best suits its needs for evaluation and is then planted. Plants are evaluated as necessary. Many 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 evaluation 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's (Field Evaluation Plantings); variety studies, 29A111G, 29A118G, and 29A127G. Twenty-six were accessions of native 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 treefoil, 'Mandan' Canada wildrye, and several bermudagrasses including 'Hardy' and OK-74-12-6. Zoiziagrass, centipeedgrass, 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.

Study Number: 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 in 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 materials provided by the Plant Materials Center that included cartons, plastic bags, accession data sheets, and instructions for handling.

PM 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 greenhouse from February until May 1989. More than 4,400 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 collection in 1989 included survival, vigor, disease resistance, plant size, foliage size and visual seed production. Accessions from each state were selected using the above criteria. The number selected from each state was as follows: Arkansas-14, Missouri-44, and Oklahoma-13. Table #1 shows the 71 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.

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 71 accessions collected and is the breeders' block for the new accession 9708831. 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 four-tenths acre increase planting of 9078832 was planted May 22, 1997, in Field #6. This planting was established in a conventional seedbed in 36-inch rows. The first year the planting produced ten 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 Centers will begin an advanced evaluation to compare the new accession 9078832 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 (see 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 (see Table #3). These selections were transplanted into the rod row initial evaluation area for further evaluation.

Study 29I097G - Assembly and Evaluation of Big Bluestem, *Andropogon gerardii*, Vitman. **Table # 1**

Accessions Selected for Crossing Block

Collector	State	County	Accession Number	MLRA	Soil
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	LaClede	9056741	116A	Cherty Silt Loam
Kees VanderMer	Missouri	LaClede	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	

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

Wind Barrier Selection Isolation Block — Table #2

Collector	State	County	Accession Number	MLRA	Soil
	Arkansas	Logan	9056960		Laedvale
Myron Hartzell	Missouri	Ste. Genevieve	9056851	116B	Weingarten
Danny F. Sudmeyer	Arkansas	Garland	9056913	119	Carna Saw
Bryce L. Kelley, III	Missouri	Stone	9056750	116A	Goss
Jeremy R. Funk	Arkansas	Sharp	9056914	116A	Gepp

Landscape Selection Rod Row Area **Table #3**

Collector	State	County	Accession Number	MLRA	Soil
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: 29I099J

Study Title: Assembly and Evaluation of Roughleaf Dogwood, *Cornus drummondii*, C. A. Meyer.

Study Leader: Henry, J.

Introduction:

Roughleaf dogwood is a small native tree with a very general distribution through out the states of Missouri, Illinois and southern Iowa. It is probably found in every county in Missouri. The leaves are opposite, borne simply; very rough above, wooly beneath. Flowers are in flat topped clusters; individual flowers small white. Unlike the flowering dogwood, the flowers of this species have no large petal like bracts. Fruits are white, berry-like drupe. Twigs are slender, red, turning gray. The bark is gray. Tree rarely becoming large enough to attain a definite pattern.

Problem:

There is a need for developing a cultivar/selected class of roughleaf dogwood for use as wildlife habitat, farmstead windbreaks, and landscape and beautification in the three states being served by the Center.

Objective:

The objective is to assemble, comparatively evaluate, select and release an adapted cultivar/selected class of roughleaf dogwood.

Assembly:

1. Area of Collection: Assemble adapted ecotypes throughout Iowa, Illinois and Missouri.

   Major Land Resource Areas: 104, 105, 107, 108, 109, 110, 113, 115, and 116.

2. Collection Dates: September - October, 1987-1988.

3. Collection Sites: Five (5) collections per each administrative area in Iowa, Illinois and Missouri.

Discussion:

1991 - 1997

Sixty (60) seed collections of roughleaf dogwood were harvested from native superior plants in 1987 - 1989. Major Land Resource Areas canvassed were 104, 105, 107, 110, 113, 115, and 116 in Missouri, Illinois, Iowa, and northeastern Kansas. These collections were assembled at the PMC and assigned accession numbers. The seed was planted in greenhouse trays and stratified. The plantlets were transplanted into milk carton containers and grown to a height of two to three feet.

A planting was established in Field #11 on the PMC on April 20, 1991 in a randomized complete block with ten replications.

An evaluation was conducted in the fall of 1992 (November) and indicated all plants survived but one. Heights ranged from 1.3 feet to 5.3 feet. This assembly was again evaluated in 1993 - 1996. The data was compiled on all accessions and analyzed. The following tables document the plants' performances.

Four selections of roughleaf dogwood were released (Selected Class): Nicholson Germplasm roughleaf dogwood (9055594), Corinth Germplasm roughleaf dogwood (9055632), Tazewell Germplasm roughleaf dogwood (9055667), and Jefferson Germplasm roughleaf dogwood (9055650).

Table #1 reflects the plants' performance followed by copies of the above releases and planting guide.

Study: 29I099J
Table #1
Study Title: Assembly and Evaluation of Roughleaf Dogwood, *Cornus drummondii*

	Height (ft)				Spread (ft)				Insect				Disease				Seed Production			
Acc. No.	1992	1993	1996	Ave.	1992	1993	1996	Ave.	1992	1993	1996	Ave.	1992	1993	1996	Ave.	1994	1995	1996	Ave.
9055677	5.0	6.0	7.8	6.3	3.6	6.1	7.3	5.7	2.0	2.2	2.0	2.1	1.8	1.5	1.7	1.7	3.0	4.0	3.0	3.3
9055675	5.0	4.1	6.8	5.3	3.0	6.4	5.2	4.9	2.1	2.2	2.0	2.1	2.2	2.4	2.1	2.2	3.0	3.0	2.0	2.7
9055674	5.0	6.5	7.3	6.3	3.6	6.6	7.5	5.9	1.6	1.4	1.2	1.4	1.8	2.8	3.0	2.5	3.0	2.0	3.0	2.7
9055669	4.4	5.5	6.7	5.5	3.3	6.0	7.3	5.5	1.7	1.8	1.5	1.7	1.9	2.0	2.2	2.0	4.0	3.0	4.0	3.7
9055673	4.9	6.9	7.5	6.4	3.6	6.4	7.2	5.7	2.2	2.0	2.1	2.1	2.0	1.8	1.7	1.8	4.0	4.0	4.0	4.0
9055667	4.8	8.0	9.8	7.5	3.5	7.4	8.3	6.4	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
9055594	4.5	8.1	11.0	7.9	3.2	7.2	8.5	6.3	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
9055664	4.2	6.3	7.1	5.9	3.4	4.9	5.2	4.5	1.8	1.6	1.2	1.5	2.0	2.1	1.8	2.0	3.0	2.0	3.0	2.7
9055650	4.8	10.0	12.0	8.9	3.3	7.8	8.9	6.7	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
9055632	5.1	9.0	10.8	8.3	3.8	8.0	7.6	6.5	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
9055597	4.4	5.6	6.4	5.5	4.0	5.5	6.3	5.3	2.0	2.3	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
9055588	4.0	5.9	6.3	5.4	2.8	4.9	6.1	4.6	1.3	1.6	1.4	1.4	2.0	2.0	1.8	1.9	5.0	4.0	4.0	4.3
9055589	3.8	5.8	6.2	5.3	2.6	4.7	6.0	4.4	1.1	1.3	1.1	1.2	3.0	3.0	3.0	3.0	5.0	5.0	5.0	5.0
9055642	3.8	6.0	6.7	5.5	3.0	5.0	6.3	4.8	2.5	3.0	2.7	2.7	2.0	2.5	2.2	2.2	4.0	4.0	3.0	3.7
9055615	5.5	6.3	6.9	6.2	3.9	4.6	6.2	4.9	2.0	2.0	2.0	2.0	1.5	1.3	1.5	1.4	2.0	2.0	2.0	2.0
9055587	4.7	6.1	6.8	5.9	4.0	5.0	5.8	4.9	2.0	1.7	1.9	1.9	2.0	2.3	2.1	2.1	3.0	2.0	2.0	2.3
9055598	5.5	6.2	6.8	6.2	3.5	4.8	5.9	4.7	2.0	2.0	2.0	2.0	2.0	2.4	3.0	2.5	4.0	4.0	4.0	4.0
905586	4.7	6.0	6.7	5.8	3.0	4.3	6.0	4.4	2.0	1.8	2.0	1.9	2.0	2.0	2.0	2.0	3.0	4.0	4.0	3.7
9055601	3.3	5.0	6.0	4.8	2.3	4.5	6.0	4.3	2.0	2.0	2.0	2.0	2.0	2.3	2.1	2.1	3.0	3.0	3.0	3.0
9055640	4.0	5.5	6.4	5.3	3.0	4.4	5.9	4.4	1.0	1.5	1.7	1.4	2.0	2.0	2.0	2.0	4.0	3.0	4.0	3.7
9055672	4.6	5.9	6.6	5.7	3.5	5.0	5.7	4.7	2.0	2.3	2.1	2.1	2.0	2.2	2.0	2.1	5.0	5.0	5.0	5.0

Disease, Insect, & Fruit Production Ratings - 1 = Excellent, 9 = Poor

NATURAL RESOURCES CONSERVATION SERVICE
NOTICE OF RELEASE
OF
CORINTH GERMPLASM ROUGHLEAF DOGWOOD
CORNUS DRUMMONDII

The United States Department of Agriculture (USDA)-Natural Resources Conservation Service (NRCS), the Elsberry Plant Materials Center at Elsberry, Missouri announces the release of Corinth Germplasm roughleaf dogwood, *Cornus drummondii*, Meyer, as "SELECT CLASS" for wildlife food and cover and windbreaks.

Corinth Germplasm has been assigned the NRCS accession number 9055632.

Origin:

Lincoln County Missouri

Ecotype Description:

Roughleaf dogwood is a small native tree (5-6 m tall) with a very general distribution throughout the states of Missouri, Illinois and southern Iowa. It is probably found in every county in Missouri. The leaves are opposite, borne simply; very rough above, woolly beneath. Flowers small and white in color; unlike the flowering dogwood, the flowers of this species have no large petal-like bracts. Fruits are white, berry-like drupe; globular 6-7 mm. diameter, with minute, tightly appressed hairs and milky flesh. Seeds greenish-white or tan, often red when young, 4-5 mm long, hairy; leaf scars narrow, crescent-shape with ends and center widened; pitch white and large. The bark is gray-brown, thin, scaly with short plates or long, flat strips, wood is hard and white. Trees rarely become large enough to attain a definite pattern. Roughleaf dogwood is predominantly cross-pollinated with some self-pollination. *Cornus* is from the Latin word cornu, "horn"; drummondii is in honor of Thomas Drummond, Scottish Botanist, 1780-1835.

Development:

Corinth Germplasm was selected out of an assembly of 55 collections of roughleaf dogwood planted on the Plant Materials Center in April 1990. After seven years of comparative evaluations, this accession was selected based on the following characteristics: fruit production, insect and disease resistance, form and seedling vigor. This selection has been tested on various soil types throughout the state of Missouri. Plant performance has ranged from good to excellent. This dogwood is able to survive drier and more exposed soil conditions than any other species in Missouri and is often found around limestone glades and rocky exposed outcrops.

Seed Production:

Corinth Germplasm was the best fruit producer of all the accessions included in this assembly from the state of Missouri. Average yield of fruit per individual tree ranges from 5-8 bulk pounds. It takes four to five years for new transplants to produce quantities of fruits.

This selection has approximately 15,000 clean seeds per pound. Average seed weight is approximately 3.70 grams per 100 seeds.

Site Description:

This collection was made from a native stand located north of the town of Foley, Missouri in Burr Oak Township, along old Route #79 near a local rock quarry; approximate elevation, 450 feet.

Climate:

The average annual temperature is 48 degrees Fahrenheit. July is the warmest month with an average high of 88 degrees and low of 71 degrees. January is the coldest month with an average high of 38 degrees and low of 18 degrees. The average annual precipitation for this region is 38 inches with much of this coming during the growing season. The average frost-free growing period runs from April 15 to October 15.

Availability of Plant Materials:

Breeder's material is being produced by the Plant Materials Center, Elsberry, Missouri.

Release Approved By:

/s/ Roger A. Hansen, Missouri State Conservationist Chairman, PM Advisory Committee, NRCS	10-2-97
/s/ William J. Gradle, Illinois State Conservationist	10-29-97
/s/ Leroy Brown, Iowa State Conservationist	10-21-97

USDA-NATURAL RESOURCES CONSERVATION SERVICE
NOTICE OF RELEASE
OF
JEFFERSON GERMPLASM ROUGHLEAF DOGWOOD
CORNUS DRUMMONDII

The United States Department of Agriculture (USDA)-Natural Resources Conservation Service (NCR), the Elsberry Plant Materials Center at Elsberry, Missouri announces the release of Jefferson Germplasm roughleaf dogwood, *Cornus drummondii*, Meyer, (Iowa Source) as "SELECT CLASS" for wildlife food and cover and windbreaks.

Jefferson Germplasm has been assigned the NRCS accession number 9055650.

Origin:

Jefferson County, Iowa.

Ecotype Description:

Roughleaf dogwood is a small native tree (5-6 m tall) with a very general distribution throughout the states of Missouri, Illinois and southern Iowa. It is probably found in every county in Missouri. The leaves are opposite, borne simply; very rough above, woolly beneath. Flowers small and white in color; unlike the flowering dogwood, the flowers of this species have no large petal-like bracts. Fruits are white, berry-like drupe; globular 6-7 mm. diameter, with minute, tightly appressed hairs and milky flesh. Seeds greenish-white or tan, often red when young, 4-5 mm long, hairy; leaf scars narrow, crescent-shape with ends and center widened; pitch white and large. The bark is gray-brown, thin, scaly with short plates or long, flat strips, wood is hard and white. Trees rarely become large enough to attain a definite pattern. Roughleaf dogwood is predominantly cross-pollinated with some self-pollination. *Cornus* is from the Latin word cornu, "horn"; drummondii is in honor of Thomas Drummond, Scottish Botanist, 1780-1835.

Development:

Jefferson Germplasm was selected out of an assembly of 55 collections of roughleaf dogwood planted on the Plant Materials Center in April 1990. After seven years of comparative evaluations, this accession was selected based on the following characteristics: fruit production, insect and disease resistance, form and seedling vigor. This selection has been tested on various soil types throughout the state of Iowa. Plant performance has ranged from good to excellent. This dogwood is able to survive drier and more exposed soil conditions than any other species in Iowa and is often found around limestone glades and rocky exposed outcrops.

Seed Production:

Jefferson Germplasm was the best fruit producer of all the accessions included in this assembly from the state of Iowa. Average yield of fruit per individual tree ranges from 5-8 bulk pounds. It takes four to five years for new transplants to produce quantities of fruits.

This selection has approximately 15,000 clean seeds per pound. Average seed weight is approximately 3.70 grams per 100 seeds.

Site Collection:

This collection was made from a native stand located in Round Prairie Park, near Fairfield, Iowa in Jefferson County: Range 8W, Township 71N (Round Prairie), Section 32. Soil series is a Lindley Loam type.

Climate:

The average annual temperature is 51.1 degrees Fahrenheit. July is the warmest month with an average high of 87.9 degrees and low of 65.2 degrees. January is the coldest month with an average high of 30.8 degrees and low of 12.1 degrees. The average annual precipitation for this region is 34.8 inches with much of this coming during the growing season. The average frost-free growing period runs from April 22 to October 13.

Availability of Plants:

Breeder's material is being produced by the Plant Materials Center, Elsberry, Missouri.

Release Approved By:

/s/ Roger A. Hansen, Missouri State Conservationist Chairman, PM Advisory Committee, NRCS	10-2-97
/s/ William J. Gradle, Illinois State Conservationist	10-29-97
/s/ Leroy Brown, Iowa State Conservationist	10-21-97

USDA-NATURAL RESOURCES CONSERVATION SERVICE
NOTICE OF RELEASE
OF
NICHOLSON GERMPLASM ROUGHLEAF DOGWOOD
CORNUS DRUMMONDII

The United States Department of Agriculture (USDA)-Natural Resources Conservation Service (NRCS), the Elsberry Plant Materials Center at Elsberry, Missouri announces the release of Nicholson Germplasm roughleaf dogwood, *Cornus drummondii*, Meyer, as "SELECT CLASS" for wildlife food and cover and windbreaks.

Nicholson Germplasm has been assigned the NRCS accession number 9055594.

Origin:

Geary County, Kansas

Ecotype Description:

Roughleaf dogwood is a small native tree (5-6 m tall) with a very general distribution throughout the states of Missouri, Illinois and southern Iowa. It is probably found in every county in Missouri. The leaves are opposite, borne simply; very rough above, woolly beneath. Flowers small and white in color; unlike the flowering dogwood, the flowers of this species have no large petal-like bracts. Fruits are white, berry-like drupe; globular 6-7 mm. diameter, with minute, tightly appressed hairs and milky flesh. Seeds greenish-white or tan, often red when young, 4-5 mm long, hairy; leaf scars narrow, crescent-shape with ends and center widened; pitch white and large. The bark is gray-brown, thin, scaly with short plates or long, flat strips, wood is hard and white. Trees rarely become large enough to attain a definite pattern. Roughleaf dogwood is predominantly cross-pollinated with some self-pollination. *Cornus* is from the Latin word cornu, "horn"; drummondii is in honor of Thomas Drummond, Scottish Botanist, 1780-1835.

Development:

Nicholson Germplasm was selected out of an assembly of 55 collections of roughleaf dogwood planted on the Plant Materials Center in April 1990. After seven years of comparative evaluations, this accession was selected based on the following characteristics: fruit production, insect and disease resistance, form and seedling vigor. This selection has been tested on various soil types throughout the states of Western Missouri and Southwest Iowa. Plant performance has ranged from good to excellent. This selection of dogwood is able to survive drier and more exposed soil conditions than any other species in Western Missouri and Southwestern Iowa and is often found around limestone glades and rocky exposed outcrop.

Seed Production:

Nicholson Germplasm was an excellent fruit producer and compared well with any accessions included in this assembly from the Plant Materials service area. Yield of fruit per individual tree ranges from 5-8 bulk pounds. It takes four to five years for new transplants to produce significant quantities of fruits.

This selection has approximately 15,000 clean seeds per pound. Average seed weight is approximately 3.70 grams per 100 seeds.

Site Description:

This collection was made from a native stand located in Geary County, near Junction City, Kansas, on a prairie soil.

Climate:

The average annual temperature is 55.2 degrees Fahrenheit. July is the warmest month with an average high of 92.6 degrees and low of 67.1 degrees. January is the coldest month with an average high of 39.4 degrees and low of 17.3 degrees. The average annual precipitation for this region is 33.8 inches with much of this coming during the growing season. The average frost-free growing period runs from April 22 to October 17.

Availability of Plant Materials:

Breeders material is being produced by the Plant Materials Center, Elsberry, Missouri.

Release Approved By:

/s/ Roger A. Hansen, Missouri State Conservationist Chairman, PM Advisory Committee, NRCS	10-2-97
/s/ William J. Gradle, Illinois State Conservationist	10-29-97
/s/ Leroy Brown, Iowa State Conservationist	10-21-97

USDA-NATURAL RESOURCES CONSERVATION SERVICE
NOTICE OF RELEASE
OF
TAZEWELL GERMPLASM ROUGHLEAF DOGWOOD
CORNUS DRUMMONDII

The United States Department of Agriculture (USDA)-Natural Resources Conservation Service (NCR), the Elsberry Plant Materials Center at Elsberry, Missouri announces the release of Tazewell Germplasm roughleaf dogwood, *Cornus drummondii*, Meyer, as "SELECT CLASS" for wildlife food and cover and windbreaks.

Tazewell Germplasm has been assigned the NRCS accession number 9055667.

Origin:

Tazewell County, Illinois

Ecotype Description:

Roughleaf dogwood is a small native tree (5-6 m tall) with a very general distribution throughout the states of Missouri, Illinois and southern Iowa. It is probably found in every county in Missouri. The leaves are opposite, borne simply; very rough above, woolly beneath. Flowers small and white in color; unlike the flowering dogwood, the flowers of this species have no large petal-like bracts. Fruits are white, berry-like drupe; globular 6-7 mm. diameter, with minute, tightly appressed hairs and milky flesh. Seeds greenish-white or tan, often red when young, 4-5 mm long, hairy; leaf scars narrow, crescent-shape with ends and center widened; pitch white and large. The bark is gray-brown, thin, scaly with short plates or long, flat strips, wood is hard and white. Trees rarely become large enough to attain a definite pattern. Roughleaf dogwood is predominantly cross-pollinated with some self-pollination. *Cornus* is from the Latin word cornu, "horn"; drummondii is in honor of Thomas Drummond, Scottish Botanist, 1780-1835.

Development:

Tazewell Germplasm was selected out of an assembly of 55 collections of roughleaf dogwood planted on the Plant Materials Center in April 1990. After seven years of comparative evaluations, this accession was selected based on the following characteristics: fruit production, insect and disease resistance, form and seedling vigor. This selection has been tested on various soil types throughout the state of Illinois. Plant performance has ranged from good to excellent. This dogwood is able to survive drier and more exposed soil conditions than any other species in Illinois and is often found around limestone glades and rocky exposed outcrops.

Seed Production:

Tazewell Germplasm was the best fruit producer of all the accessions included in this assembly from the state of Illinois. Average yield of fruit per individual tree ranges from 5-8 bulk pounds. It takes four to five years for new transplants to produce quantities of fruits.

This selection has approximately 15,000 clean seeds per pound. Average seed weight is approximately 3.70 grams per 100 seeds.

Site Description:

This collection was made from a native stand located on land owned by the Illinois Department of Conservation (IDC), in Tazewell County, near Pekin, Illinois: Range 2W, Township 24N, Section 2. Soil series is a Roxetta-Fayette type.

Climate:

The average annual temperature is 52.1 degrees Fahrenheit. July is the warmest month with an average high of 86.9 degrees and low of 64.8 degrees. January is the coldest month with an average high of 32.3 degrees and low of 15.4 degrees. The average annual precipitation for this region is 34.2 inches with much of this coming during the growing season. The average frost-free growing period runs from April 20 to October 11.

Availability of Plant Materials:

Breeder's material is being produced by the Plant Materials Center, Elsberry, Missouri.

Release Approved By:

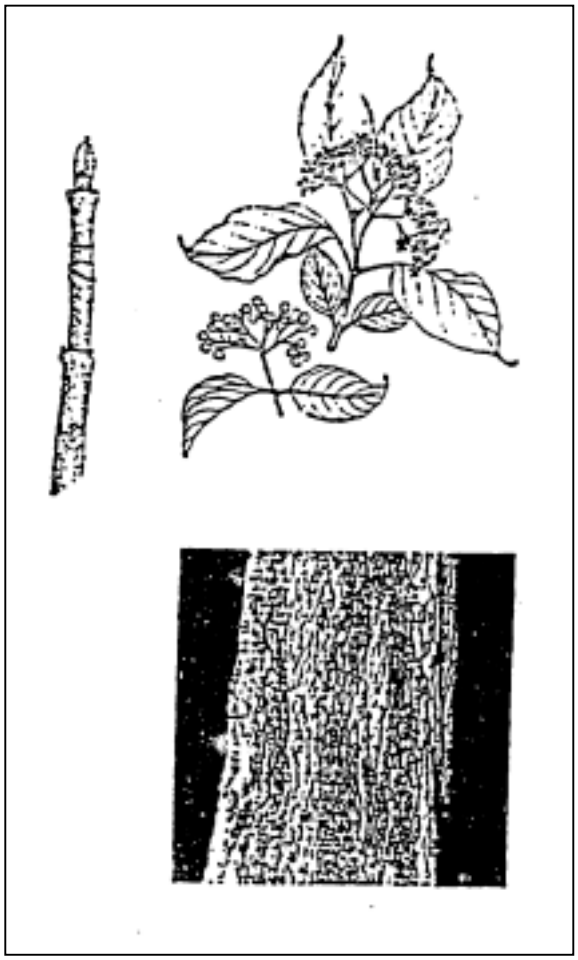
/s/ Roger A. Hansen, Missouri State Conservationist Chairman, PM Advisory Committee, NRCS	10-2-97
/s/ William J. Gradle, Illinois State Conservationist	10-29-97
/s/ Leroy Brown, Iowa State Conservationist	10-21-97

PLANTING GUIDE

Cornus drummondii, Meyer

Common Name
roughleaf dogwood

9055594 - Nicholson Germplasm roughleaf dogwood
9055650 - Jefferson Germplasm roughleaf dogwood
9055667 - Tazewell Germplasm roughleaf dogwood
9055632 - Lincoln Germplasm roughleaf dogwood



Description:

Roughleaf dogwood is a small tree (5-6 m tall) with a very general distribution throughout the states of Missouri, Illinois and southern Iowa. It is probably found in every county in Missouri. The leaves are opposite, borne simply; very rough above, wooly beneath. Flowers are small and white in color; unlike the flowering dogwood, the flowers of this species have no large petal-like bracts. Fruits are white, berry-like drupe; globular 6-7 mm in diameter, with minute, tightly appressed hairs and milky flesh. Seeds greenish-white or tan, globular, finely ridged. Twigs are slender, brown or reddish-gray, often red when young, slender, flexible, finely hairy. End bud, reddish-gray, narrow, 4-5 mm long, hairy; leaf scars narrow, crescent-shape with ends and center widened; pith white and large. The bark is gray-brown, thin, scaly with short plates or long, flat strips. Wood is hard and white. Trees rarely become large enough to attain a definite pattern. Roughleaf dogwood is predominantly cross-pollinated with some self-pollination. Cornus comes from the Latin word cornu, "horn'; drummondii is in honor of Thomas Drummond, Scottish botanist, 1780-1835.

Purpose:

Roughleaf dogwood is an excellent species for use in multi-row field or farmstead windbreaks, wildlife food and cover plantings, landscape and beautification, and dense screen or border planting in recreational development areas.

Source:

Seed collections were obtained from native stands of roughleaf dogwood plants in Missouri, Iowa, Illinois and Kansas. Selections were made based on disease resistance, heavy fruit production, form, and rate of growth.

Site Preparation:

Prepare site by plowing and disking if equipment can be used. Minimum soil preparation should consist of scalping sod off or spot spraying an area at least two feet square.

Date of Planting:

Early spring, as soon as possible after plants have been received.

Planting Method:

Plants may be planted by hand or with a tree planter. Soaking roots in water an hour or so just prior to planting usually increases survival. If planted in rows where equipment can be used, allow enough room to mow or cultivate for weed control.

Management:

Weed control is necessary for good establishment and uniform growth. Control weeds the first year by cultivation if equipment can be used. Selective approved herbicides provide good weed control after establishment year; follow the instructions on the label. Protect from 2,4-D type sprays, fire, and grazing and trampling by livestock. Plastic netting, irritants or similar protective devices should be used to prevent deer and rodent damage the first five years.

Study : 29I100J

Study Title: Assembly and Evaluation of Blackhaw, *Viburnum prunifolium* L.

Study Leader: Henry, J.

Introduction:

Blackhaw is a small native understory tree found in thickets and borders of woods from Florida to Texas, north to Kansas, Missouri, Iowa, Illinois, Ohio, Michigan and other states in the northeast. Leaves are opposite, borne simply on smooth, slightly winged stalks, oval or oblong in shape, base pointed, top drawn out to a point; edges of the leaves finely toothed; yellow-green, not lustrous, and clusters on the ends of the branches; individual flowers 1/4 inch in diameter on slender stalks, white. The fruit is a dark blue, almost black, drupe, egg-shaped, covered with a white frost-like bloom; stone 1/2 inch long, flattened. Twigs are slender; reddish brown and smooth at first becoming dull and grayish; buds essentially smooth. The bark is gray; broken into thick irregular shaped plate like red-brown scales. The leaves of blackhaw turn a brilliant scarlet or deep burgundy red during the fall.

Problem:

There is a need for developing a selection/cultivar of blackhaw for use as wildlife habitat, windbreak planting and landscaping and beautification for the service area of the Elsberry Plant Materials Center.

Objective:

The objective of this study is to assemble, comparatively evaluate, select and release an adapted selection/cultivar of blackhaw.

Discussion:

1994-1998

Several attempts were made to induce germination of the seed from the blackhaw collections (28); however, no success was achieved. As a result, this study was placed on hold in December 1994.

Study: 29I101J

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

Study Leader: Henry, J.

Introduction:

Arrowwood is an upright bushy native shrub to five meters; bracets are glabrous, becoming gray: leaves suboricular 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 reins, with 6-10 pairs of reins; petiole 1-2.5 cm long: cymes slender stalked, 5-8 cm across, glabrous; stamens longer than corolla. Flowers are globose-avoid, 6 mm long, blue-black.

Problem:

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

Objective:

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

Discussion:

1988-1992

Collections were requested from the three states' service area but only nine were made. There was concern according to the literature reviewed about the correct species being collected because of its rare occurrence in the service area. 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. Up to the time of the great flood of 1993, all plants were surviving in good to excellent condition. Approximately eight and a half feet of flood water inundated this planting. Once the flood water 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 the plants were 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.

1997-1998

Accession 9062310, 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 and 1998 and propagated in the PMC greenhouse. Field plantings will only be scheduled for Iowa. Plans are to release this accession as a selected class release in year 2001.

Study Number*:* 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 native 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 a high quality forage with few available varieties and none of local origin in the PMC service area. There is a 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.

Objective:

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 into 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 in the fall of 1989. Two hundred forty-three (243) 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 project 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. Also amount of seed production, plant phonology, 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 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, phonology, 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 (See Table # 2) were increased in the greenhouse and planted in Field # 6. There was only one plant per accession of these 45 plants that was evaluated so additional plants have been 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's 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 planted in an additional 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.

Study 29I107G -Selected Accessions of Eastern Gamagrass **Table #1**

Collector	State	County	Accession Number
Patrick L. Adams	Missouri	Clinton	9061968
Christopher C. Bordon	Illinois	Calhoun	9062012
William L. Brouk	Missouri	Benton	9061948
Dennis J. Browning	Missouri	Daviess	9061896
Dennis J. Browning	Missouri	Daviess	9061897
Paul Frey	Missouri	Dallas	9062082
Paul Frey	Missouri	Dallas	9062085
Darin W. Gant	Missouri	Stoddard	9061991
C. Mark Green	Missouri	Christian	9062032
Kenneth N. Gruber	Missouri	Nodaway	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, *Tripsacum dactyloides,* L.

Top Rated Accessions **Table #2**

Accession Number	Ploidy Level	Percent Protein _3/ 5/3/96	6/27/96	7/19/96	Regrowth 8/27/96	Regrowth 10/15/96
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 Reqrowth	_4/ % Seed Fertility
9061911	6/16/96	1	1.3	5.0	1	59.6
9061984	6/16/96	1	1.6	5.3	2	41.5
9061991	6/24/96	1	2.0	5.0	1	66.9
9061948	6/8/96	2	2.0	5.0	2	71.7
9062005	6/8/96	2	2.8	4.9	4	82.7
9061924	6/10/96	2	1.9	4.0	1	75.9
9062085	6/1/96	5	1.9	4.3	3	83.3
9061937	6/1/96	3	3.0	4.5	4	85.2
9061944	6/24/96	3	2.1	4.8	1	76.4
9062018	7/1/96	2	2.3	4.3	3	59.6
9061994	7/1/96	3	2.7	4.4	3	67.6
9061999	6/24/96	3	2.9	4.4	4	68.4
9062032	6/24/96	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 No: 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 habitats, 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 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 a four feet 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, spread which 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 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 conetainers 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 study 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 (Table #3) were allowed to cross and seed was harvested and grown out in the greenhouse. They were vegetatively 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 wet tolerant switchgrass were vegetatively increased in the greenhouse. Approximately 250 plants were transplanted April 1997 in Field #7. This is now the breeder's block for the accession 9083170, which 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 which is a composite of the five accessions in Table #3.

Study 29I108G-Selected Accessions of Low Growing Switchgrass Table #1

Accession #	State	County	MLRA	Collector Name
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. Doxier
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

Accession #	**State**	**County**	**MLRA**	**Collector Name**
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**

Accession #	State	County	MLRA	Collector Name
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**

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

Study No. 29I110J

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

Study Leader: Henry, J.

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 fence rows, 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 habitat in the three states served by the Center.

Objectives:

The objective is to 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 study was put on hold in 1992 by the State Conservationists' Advisory Committee. The reason for placing this study on hold was the lack of personnel at the PMC to carry out the work involved with new studies. 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). Enough plants of the 11 collections were obtained to initiate a randomized complete block planting with twelve replications. This planting was made on June 23, 1998 in Field #6 on the PMC.

The following Table #1 lists the accessions collected, collector's name, state, county, MLRA, and soil type. Plans are to evaluate for survival, height, spread, insect and disease resistance and vigor in 1999.

Table #1 Accession Information

Collector	State	County	MLRA's	Soil	Accession
R. W. Nuboer	Illinois	Carroll	111	Seaton Silt Loam	9057067
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	Ida Silt Loam	9057182
Maggie Cole	Illinois	Cook	110	Unknown	9068542
Jimmy Henry	Missouri	Lincoln	115	Menfro Silt Loam	9068555
J. R. Heim	Illinois	Lee	108	Martinsville Silt	9068587

Study Number: 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: Bruckerhoff, S. B.

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 mono-cultures 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 Resource 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 become a 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, USDA - Natural Resources Conservation Service 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 (See 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.

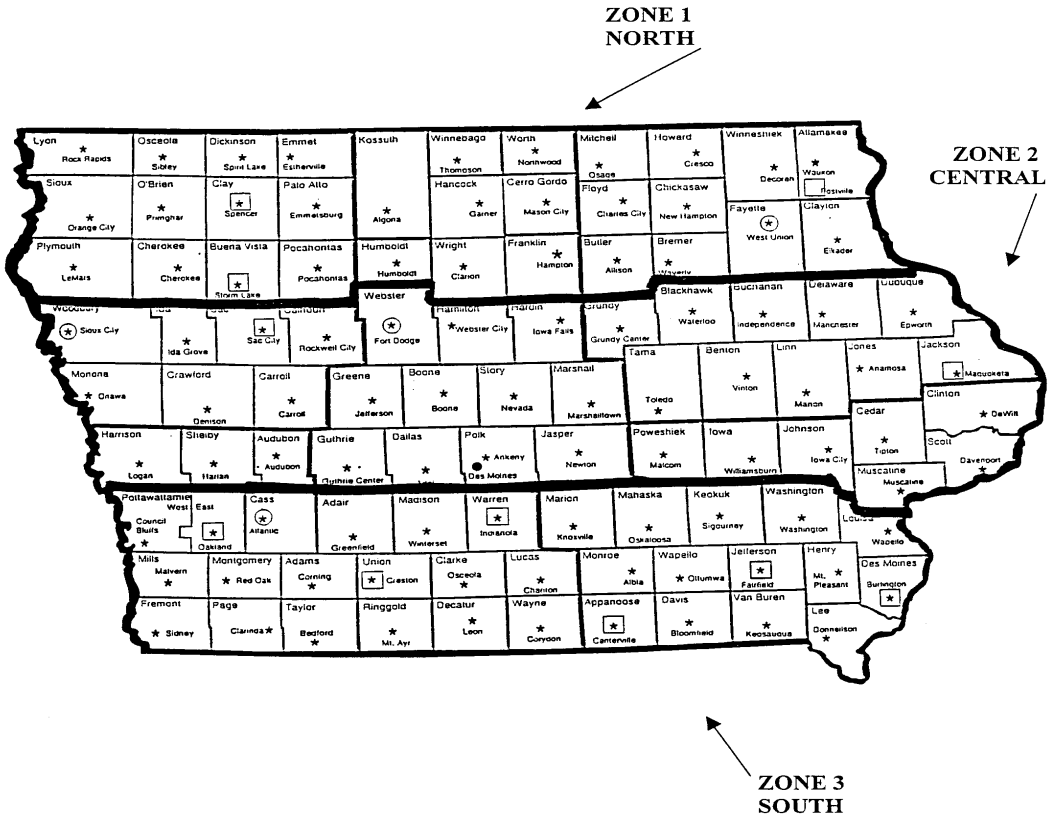
Discussion:

The study officially started October 10, 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. Plot re-establishment started in 1994 and new plots have been started each year. Progress of species being released to growers as ' Source Identified' Germplasm can be seen in Table #2.

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

Table #1

IOWA ECOTYPE ZONE MAP



Study 29I124G-Production of Native Iowa Ecotypes of Grasses and Forbs for Roadside, Critical Areas, and All Other Vegetative Plantings Where Native Grasses and Forbs are Now Being Planted. (UNI)

Project Status **Table #2**

Common Name Genus/Species	Zone	Accession Number	Status of Accession	Status of Increase Plot
Big bluestem	1	9068614	Planned release 2000	Increase plot planned for 1999
Andropogon gerardii	2	9068615	Released in 1998	Increase plot planted in 1996
	3	9068616	Planned release 1999	Increase plot planted in 1998
Sideoats grama	1	9062278	Released in 1994	
Bouteloua curtipendula	2	9062279	Released in 1994	
	3	9062280	Released in 1994	
Purple prairie clover	1	9068608	Planned release 2000	Increase plot planted in 1998
Dalea purpurea	2	9068609	Planned release 2001	Increase plot planned for 1999
	3	9068610	Planned release 2001	Increase plot planned for 1999
Pale purple coneflower	1	9068611	Planned release 2001	Increase plot planned for 1999
Echinacea pallida	2	9068612	Planned release 2001	Increase plot planned for 1999
	3	9068613	Planned release 2001	Increase plot planned for 1999
Canada wildrye	1	9062275	Released in 1994	Increase plot planted in 1994
Elymus canadensis	2	9062276	Released in 1994	Increase plot planted in 1994
	3	9062277	Released in 1994	Increase plot planted in 1994
Rattlesnake master	1	9068602	Released in 1998	Increase plot planted in 1998
Eryngium yuccifolium	2	9068603	Planned release 1999	
	3	9068604	Planned release 1999	
Oxeye false sunflower	1	9068605	Released in 1997	
Heliopsis helianthoides	2	9068606	Released in 1996	
	3	9068607	Released in 1997	
Junegrass	1	9068620		
Loeleria macrantha	2	9068621		
	3	9068622		
Round-head bushclover	1	9062281	Planned seed increase for 1999	
Lespedeza capitata	2	9062282	Released in 1996	
	3	9062283	Released in 1997	
Rough blazing star	1	9068684	Planned seed increase for 2000	
Liatris asper	2	9068685	Planned seed increase for 2000	
	3	9068686	Planned seed increase for 2000	

Common Name Genus/Species	Zone	Accession Number	Status of Accession	Status of Increase Plot
Blazing star	1	9068626	Planned release for 1999	
Liatris pycnostachya	2	9068627	Planned release for 1999	
	3	9068628	Planned seed increase for 1999	
Horsemint	1	9068678	Planned seed increase for 2000	
Monarda fistulosa	2	9068679	Planned seed increase for 2000	
	3	9068680	Planned seed increase for 2000	
Little bluestem	1	9062319	Planned release for 1999	
Schizachyrium	2	9062320	Released in 1997	
scoparium	3	9062321	Planned release for 1999	
Compassplant	1	9068675		
Silphium laciniatum	2	9068676		
	3	9068677		
Stiff goldenrod	1	9068617	Released in 1998	
Solidago rigida	2	9068618	Planned seed increase for 1999	
	3	9068619	Planned seed increase for 1999	
Indiangrass	1	9062316	Released in 1997	
Sorghastrum nutans	2	9062317	Released in 1996	
	3	9062318	Released in 1998	
Tall dropseed	1	9062313	Planned seed increase for 1999	
Sporobolus compositus	2	9062314	Released in 1996	
	3	9062315	Released in 1997	
New England aster	1	9068681	Planned seed increase for 1999	
Aster novae angliae	2	9068682	Planned seed increase for 1999	
	3	9068683	Planned seed increase for 1999	
Butterfly milkweed	1	9068687		
Asclepias tuberosa	2	9068688		
	3	9068689		
Blue lobelia	1	9068696		
Lobilia siphilitica	2	9068697		
	3	9068698		
Switchgrass	1	9068705		
Panicum virgatum	2	9068706		
	3	9068707		
Golden alexanders	1	9068702		
Zizia aurea	2	9068703		
	3	9068703		

Study: 29I132O

Study Title: Miscellaneous Wetland Plant Evaluation

Study Leader: Henry, J.

Introduction:

Wetlands are areas, periodically saturated or inundated by surface or ground water, that support vegetation adapted for saturated soil conditions. In the Environmental Protection Agency (EPA) Region Seven states of Iowa, Kansas, Missouri and Nebraska are generally found along rivers and streams and their associated floodplains or at the margins of lakes and ponds. Wetlands can also occur in upland depressions, such as the prairie "potholes" of Iowa, or in seepage areas along slopes. Because of their location between land and water, wetlands function to improve water quality. They control erosion and trap the runoff from land carrying nutrients, waste, pollution, and sediment and filter the material from flooding waters. Thus ponds, lakes, rivers, streams and our drinking water remain clear and healthy.

Wetland ecosystems support a great diversity of vegetation, which provides food, water, cover, nesting, and wintering ground for many forms of wildlife that use them for all or parts of their life cycles. In fact, wetlands are some of the most biologically unique and productive areas on earth.

Problem:

Naturally occurring wetlands and constructed wetlands, for water quality improvement and wildlife habitat enhancement, require plants that respond to different water regimes and pollutant loads. Facets of these plants' establishment, management and benefits must be explored. This information can then be used and recommended.

Objective:

Identify, establish, and evaluate for possible increase selected plant materials needed for wetland enhancement, restoration, and creation to meet resource conservation and related water quality program requirements.

Discussion:

1992-1998

Initially, seven wetland cells, 16 feet long by four feet wide and 18 inches deep were constructed using landscape ties, tarp and a double layer of plastic (8 mil). Eighteen inches of good topsoil was placed in each cell. Water was then added to saturate the soil before the planting operation. The following plant species were assembled at the PMC and transplanted in the cells during July 1992: *Scirpus validus*, softstem bulrush; *Sagittaria latifolia*, smooth-cone sedge*; Typha latifolia*, cattails; *Ascepias incarnata*, swamp milkweed and *Ludivigia peploides*, water primrose.

Each species was watered according to its need identified in a literature search. It became evident that each species required different quantities of water. When water was not provided to the smooth cone sedge in the suggested amount, the stand began deteriorate. The other species reacted a bit less dramatic than the smooth cone sedge to the reduction in water.

The following table reflects the plant performance for the years evaluated.

Table #1 contains information regarding accession numbers, state of origin and city or county.

Table #2 reflects the plants' performance from 1992 – 1998.

Study 29I1320 Miscellaneous Wetland Plant Evaluation

Table #1

Genus/Species	Accession Number	Source	City/State
Scirpus validus Softstem bulrush	9083201	Kester's Nurseries, Inc.	Omro, Wisconsin
Sagittaria latifolia Arrowhead	9083202	Kester's Nurseries, Inc.	Omro, Wisconsin
Juncus offusus Soft rush	9083203	Kester's Nurseries, Inc.	Omro, Wisconsin
Carex laericonica Smoothcone sedge	9083204	Fld. 7, PMC	Elsberry, Missouri
Typha latifolia Cattail	9083205	County Road #79	Elsberry, Missouri
Ludwigia peplaides Water primose	9083206	BK Leach Wildlife Area	Elsberry, Missouri
Ascepias incarnata Swamp milkweed	9083207	BK Leach Wildlife Area	Elsberry, Missouri

Study 29I1320 Miscellaneous Wetland Plant Evaluation

Table #2

Genus/Species	Year Eval.	Percent Survival	Flower Date	Seed Prod. \1	End of Season Ht	Spread	Vigor \1	Insect Resist. \1	Disease Resist \1
Scirpus validus									
softstem bulrush	1992	100	5/19/92	5	50 inches	solid	1	1	1
9083201	1993	100	5/21/93	5	53 inches	solid	1	1	1
	1994	100	5/17/94	3	55 inches	solid	1	1	1
	1995	100	5/24/95	3	55 inches	solid	1	1	1
	1996	100	5/20/96	2	55 inches	solid	1	1	1
	1997	95	5/23/97	3	55 inches	solid	1	1	1
	1998	90	5/18/98	5	55 inches	solid	1	1	1
Sagittaria latifolia	1992	100	5/27/92	6	65 inches	solid	1	1	1
Arrowhead	1993	100	5/25/93	6	68 inches	solid	1	1	1
9083202	1994	100	5/23/94	6	75 inches	solid	1	1	1
	1995	100	5/24/95	6	75 inches	solid	1	1	1
	1996	95	5/27/96	6	75 inches	solid	1	1	1
	1997	95	5/23/97	6	75 inches	solid	1	1	1
	1998	90	5/26/98	6	75 inches	solid	1	1	1
Juncus offusus	1992	100	5/19/92	5	38 inches	solid	1	1	1
soft rush	1993	100	5/25/93	5	45 inches	solid	1	1	1
9083203	1994	100	5/23/94	5	52 inches	solid	1	1	1
	1995	100	5/26/95	5	52 inches	solid	1	1	1
	1996	95	5/21/96	5	52 inches	solid	1	1	1
	1997	95	5/23/97	5	50 inches	solid	1	1	1
	1998	90	5/26/98	5	50 inches	solid	1	1	1
Carex laericonica	1992	100	6/3/92	6	24 inches	solid	4	1	1
smoothcone sedge	1993	100	6/6/93	5	30 inches	solid	3	1	1
9083204	1994	90	6/1/94	5	32 inches		3	1	1
	1995	85	5/31/95	6	32 inches		2	1	1
	1996	70	6/4/96	7	32 inches		2	1	1
	1997	60	6/6/97	7	32 inches		2	1	1
	1998	50	6/8/98	7	32 inches		2	1	1
Typha latifolia	1992	100	5/5/92	2	60 inches	solid	1	1	1
cattail	1993	100	5/7/93	2	80 inches	solid	1	1	1
9083205	1994	100	5/3/94	2	80 inches	solid	1	1	1
	1995	100	5/1/95	2	80 inches	solid	1	1	1
	1996	100	5/8/96	2	80 inches	solid	1	1	1
	1997	100	5/2/97	2	75 inches	solid	1	1	1
	1998	100	5/4/98	2	70 inches	solid	1	1	1
Ludwigia peplaides	1992	90	6/21/92	0	3 inches		3	3	3
water primose	1993	80	6/24/93	0	6 inches		3	2	2
9083206	1994	70	6/21/94	0	6 inches		3	2	2
	1995	70	6/27/95	0	6 inches		3	2	2
	1996	60	6/24/96	0	6 inches		3	2	2
	1997	60	6/30/97	0	6 inches		3	2	2
	1998	60	6/26/98	0	6 inches		3	2	2
Ascepias incarnata	1992	died 1992							
swamp milkweed									
9083207									

Rating: Vigor, Insect & Disease Resist: 1 = Excellent, 9 = Poor

Rating: Seed Production: 1 = Excellent, 9 = Poor & 0 = No Seed Produced

Study # 29I134J

Study Title: Assembly and Evaluation of Eastern Redcedar**,** *Juniper virginiana L.*

Study Leader: Henry, J.

Introduction:

Eastern redcedar has the most uniform distribution of the four species of conifers native to Missouri. Although it is most common in the Ozark region, it is found throughout the state. Scale-like or awl-shaped leaves are opposite or ternate around a minute four-angled dark green central stem. The flowers are male and female on separate trees with the male flowers being conelike, with four to six scales. The female flower structure has fleshy scales. Fruits are bluish in color and about the size of a pea with a white frost-like bloom and contain one to four seeds. The flesh is sweet and resinous and twigs are slender, four-angled and become reddish-brown with inconspicuous buds. Its bark ranges in color from a tan to reddish-brown and shreddy.

Eastern redcedar flowers during March-May with fruit ripening during September-November.

Problem:

There is a lack of an available cultivar of Eastern redcedar specifically for this area. NRCS and other conservation and wildlife agencies have identified a need for developing a selection and also source identified sources of redcedar for use as a native juniper for windbreaks and secondary benefits for wildlife habitat in the three states being served by the center.

Objective:

The objective is to assemble, comparatively evaluate, select and release a selected, tested and or cultivar of redcedar for the PMC service area. The selection criteria is for a columnar, upright selection with minimal production of seed.

Discussion:

1989 - 1992

Collections were received from Illinois and Missouri between 1989 and 1991. Forty-six collections were made (16 from Illinois and 30 from Missouri) and the seed was stratified the fall of 1992.

1993 - 1998

Thirty-four of the total forty-six collections germinated and were grown out in the PMC greenhouse to a height ranging from 1.5 to 3.0 feet. The planting of the redcedar assembly was made in field # 7 on the PMC on May 17 and 18, 1994. The plot design was a randomized complete block with six replications.

Table #1 reflects the different accessions, states, county or city where these collections were made; Tables #2, 3, 4, 5, and 6 reflect the plants' performance.

Table # 1

Study 29I134J - Assembly and Evaluation of Eastern Redcedar, *Juniper virginiana L.*

Accessions of Eastern redcedar collected for this study.

ACCESSION	STATE	COUNTY OR CITY
9057099	Illinois	Tazewell
9057105	Illinois	Tazewell
9057106	Illinois	Mason
9057115	Illinois	Grundy
9057116	Illinois	Jo Daviess
9057117	Illinois	Jo Daviess
9057136	Illinois	Kendall
9057156	Illinois	Mason
9057180	Illinois	Pope
9068488	Illinois	Jo Daviess
9068579	Illinois	Jo Daviess
9057196	Illinois	Henderson
9068498	Illinois	Ogle
9068497	Illinois	Henderson
9068495	Illinois	Carroll
9068531	Illinois	Cole
9068487	Missouri	Cooper
9068486	Missouri	Pettis
9057198	Missouri	Bates
9057199	Missouri	Cooper
9058476	Missouri	Pettis
9057187	Missouri	Johnson
9057190	Missouri	St. Clair
9057189	Missouri	Morgan
9068504	Missouri	Hickory

Accessions Continued

ACCESSION	STATE	COUNTY OR CITY
9068503	Missouri	Mercer
9068502	Missouri	Cooper
9068501	Missouri	St. Clair
9068500	Missouri	Mercer
9068499	Missouri	Camden
9068496	Missouri	Mercer
9068495	Missouri	Carroll
9068494	Missouri	Livingston
9068493	Missouri	Mercer
9068492	Missouri	Cooper
9068532	Missouri	Miller
9068530	Missouri	Vernon
9068554	Missouri	Phelps
9068551	Missouri	Lafayette
9068566	Missouri	Plattsburg/Clinton
9068569	Missouri	Lincoln
9068564	Missouri	Cole
9068582	Missouri	Warren
9068584	Missouri	Moniteau
9068583	Missouri	Dent
9068588	Missouri	Clinton

Study 29I134J - Assembly and Evaluation of Eastern Redcedar, *Juniper virginia* L.
Table #2

Accession	1997 Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Ave.	Best	Location	Height	Accession	1998 Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Ave.	Best	Location
9057099	8.00	8.60	6.70	6.40	6.80	6.30	7.13	8.60	R2		9057099	9.00	9.60	6.70	7.00	8.00	7.20	7.92	9.60	R2
9057105	8.30	9.00	6.80	8.30	7.40	8.50	8.05	9.00	R2		9057105	8.60	9.50	7.00	8.50	9.00	9.00	8.60	9.50	R2
9057106	8.60	6.30	9.40	6.00	7.00	8.10	7.57	9.40	R3		9057106	9.00	6.60	10.00	6.60	7.70	8.60	8.08	10.00	R3
9057115	6.30	4.50	4.70	7.50	4.50	5.60	5.52	7.50	R4		9057115	6.80	5.00	5.40	7.80	5.70	6.00	6.12	7.80	R4
9057116	8.00	6.00	6.50	5.50	6.50	8.00	6.75	8.00	R1,6		9057116	8.60	6.30	7.00	6.00	7.70	8.20	7.30	8.60	R1
9057117	7.20	8.50	6.00	7.00	7.90	6.20	7.13	8.50	R2		9057117	8.00	9.00	6.50	7.30	8.00	7.00	7.63	9.00	R2
9057136	9.00	7.60	8.00	7.60	5.40	2.50	6.68	9.00	R1		9057136	9.90	8.20	8.50	8.00	6.20	3.00	7.30	9.90	R1
9068486	9.70	8.00	9.00	7.00	7.00	9.30	8.33	9.70	R1		9068486	10.00	8.20	9.50	7.80	7.20	10.00	8.78	10.00	R1,6
9057180	7.60	6.90	7.80	7.50	6.70	7.20	7.28	7.80	R3		9057180	8.00	8.60	8.80	8.00	8.80	8.20	8.40	8.80	R3,5
9057193	8.00	8.50	7.40	7.40	8.10	7.80	7.87	8.50	R2		9057193	8.50	9.00	8.00	8.00	9.00	7.60	8.35	9.00	R2,5
9057196	9.40	6.00	5.00	7.50	7.20	8.00	7.18	9.40	R1		9057196	10.00	7.50	5.60	8.00	7.60	8.50	7.87	10.00	R1
9057198	8.00	9.30	7.50	6.00	7.00	7.20	7.50	9.30	R2		9057198	8.50	10.00	8.60	7.20	7.30	7.50	8.18	10.00	R2
9057199	9.30	8.70	7.00	7.40	7.00	7.00	6.20	9.3	R1		9057199	9.00	8.00	7.30	6.40	7.60	6.40	7.45	9.00	R1
9068476	6.60	7.80	6.70	7.30	7.60	8.00	7.33	8.00	R6		9068476	7.00	8.00	7.10	8.20	8.00	8.40	7.78	8.40	R6
9057190	8.90	8.50	6.90	7.80	8.20	8.60	8.15	8.90	R1,6		9057190	9.40	8.00	7.20	8.00	Dead	8.80	8.28	9.40	R1
9057189	7.80	7.80	7.00	8.60	7.10	8.20	7.75	8.60	R4		9057189	8.00	8.40	8.00	8.60	8.00	7.50	8.08	8.60	R2
9068504	7.80	8.20	7.20	6.30	6.20	7.30	7.17	8.20	R2		9068504	8.00	8.50	7.70	9.40	6.80	8.00	8.07	9.40	R4
9068503	8.30	8.50	7.50	7.60	6.80	6.90	7.60	8.50	R2		9068503	8.80	9.00	7.80	6.60	7.50	8.00	7.95	9.00	R2
9068502	7.70	8.10	6.20	5.50	6.20	5.80	6.58	8.10	R2		9068502	8.00	8.60	6.50	5.50	6.50	7.60	7.12	8.60	R2
9068501	8.70	8.20	8.40	7.60	6.10	7.00	7.67	8.70	R1		9068501	9.00	9.00	8.60	8.00	6.50	7.80	8.15	9.00	R1,2
9068500	9.00	8.80	9.10	8.00	5.10	4.20	7.37	9.10	R3		9068500	9.50	9.00	9.20	8.20	5.80	4.60	7.72	9.50	R1
9068492	8.20	8.20	5.30	7.20	8.10	7.10	7.35	8.20	R1,2		9068492	8.60	8.60	6.20	8.40	8.00	7.20	7.83	8.60	R1,2
9068499	8.60	9.10	4.60	5.60	6.50	6.80	6.87	9.10	R2		9068499	9.00	9.60	6.50	5.00	8.00	5.20	7.22	9.60	R2
9068496	7.30	8.80	6.70	6.30	5.20	4.10	6.40	8.80	R2		9068496	8.00	9.60	8.20	6.50	5.70	4.50	7.08	9.60	R2
9068495	6.80	7.40	8.70	5.20	7.00	6.00	6.85	8.70	R3		9068495	8.00	8.00	8.60	5.60	7.40	6.20	7.30	8.60	R3
9068493	7.60	8.00	6.60	8.00	10.00	5.80	7.67	10.20	R5		9068493	8.00	8.20	7.00	8.40	10.60	6.20	8.07	10.60	R5
9068532	8.90	5.90	7.30	6.00	8.40	8.10	7.43	8.90	R1		9068532	10.60	6.30	8.40	6.60	8.60	8.60	8.18	10.60	R1
9068531	9.00	6.80	6.60	8.20	7.10	7.40	7.52	9.00	R1		9068531	9.40	7.10	7.00	7.80	6.70	6.80	7.47	9.40	R1
9068530	9.20	8.20	8.20	8.20	8.00	8.10	8.32	9.20	R1		9068530	10.00	8.70	8.00	8.60	9.00	8.60	8.82	10.00	R1
9068554	7.80	7.00	8.10	7.70	8.00	7.00	7.60	8.10	R3		9068554	7.00	7.30	8.50	8.00	8.40	7.40	7.77	8.50	R3
9068566	8.60	9.60	7.90	8.00	6.20	6.60	7.82	9.60	R2		9068566	9.00	10.00	9.20	8.70	6.60	7.00	8.42	10.00	R2
9068584	7.00	8.10	5.60	7.30	8.00	6.80	7.13	8.10	R2		9068584	7.50	8.60	6.00	8.30	8.40	7.20	7.67	8.40	R5
9068583	5.00	8.60	8.00	7.20	7.00	7.80	7.27	8.60	R2		9068583	5.50	9.00	8.80	8.00	7.80	10.00	8.18	10.00	R6
9068588	8.60	8.50	5.90	5.70	6.70	7.80	7.20	8.60	R1		9068588	9.00	9.00	6.20	6.00	7.00	8.20	7.57	9.00	R1,2

Height measured in feet

Study 29I134J - Assembly and Evaluation of Eastern Redcedar, *Juniper virginia* L.
Table #3

	1997									Spread	1998									
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Ave.	Best	Location		Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Ave.	Best	Location
9057099	7.60	6.50	3.90	6.80	3.80	6.90	5.92	7.60	R1		9057099	8.00	7.00	4.30	7.10	4.10	7.30	6.30	8.00	R1
9057105	8.50	7.30	5.50	6.60	5.70	6.60	6.70	8.50	R1		9057105	9.00	8.00	6.70	7.00	6.00	7.00	7.28	9.00	R1
9057106	6.70	5.50	7.00	5.00	6.10	5.20	5.92	7.00	R3		9057106	7.00	6.00	7.60	5.40	6.60	5.80	6.40	7.00	R1
9057115	4.70	4.60	5.00	5.60	4.00	4.20	4.68	5.60	R4		9057115	5.10	5.00	5.80	6.10	4.70	4.80	5.25	6.10	R4
9057116	7.10	5.70	4.80	5.80	6.20	5.20	5.80	7.10	R1		9057116	7.60	6.00	5.30	6.00	6.80	6.00	6.28	7.60	R1
9057117	6.10	8.80	5.20	6.30	4.80	5.10	6.05	8.80	R2		9057117	6.60	9.00	5.80	6.90	5.30	5.70	6.55	9.00	R2
9057136	8.60	5.90	6.50	7.20	6.60	4.80	6.60	8.60	R1		9057136	9.30	7.00	6.50	6.60	5.40	9.00	7.30	9.30	R1
9068486	8.50	5.70	6.70	7.00	5.00	5.40	6.38	8.50	R1		9068486	9.00	6.20	7.00	7.50	5.70	6.00	6.90	9.00	R1
9057180	6.60	5.70	5.80	7.60	6.50	5.30	6.25	7.60	R4		9057180	7.00	6.00	6.20	7.80	7.00	5.90	6.65	7.80	R4
9057193	7.00	6.10	5.80	5.80	6.70	5.40	6.13	7.00	R1		9057193	7.50	6.60	6.30	6.50	6.00	5.30	6.37	7.50	R1
9057196	8.00	7.10	5.20	6.10	6.80	4.70	6.32	8.00	R1		9057196	8.50	7.60	6.00	6.60	7.30	5.80	6.97	8.50	R1
9057198	5.40	9.80	5.50	4.60	3.80	5.80	5.82	9.80	R2		9057198	6.00	10.60	5.90	5.00	4.20	6.20	6.32	10.60	R2
9057199	5.30	7.10	5.80	6.00	5.90	5.00	5.85	7.10	R2		9057199	6.00	7.60	6.20	6.50	6.30	5.40	6.33	7.60	R2
9068476	4.60	6.50	5.70	6.70	5.10	5.30	5.65	6.50	R2		9068476	5.00	7.00	6.30	7.00	5.70	5.90	6.15	7.00	R2
9057190	8.50	5.70	4.60	5.80	0.00	5.20	5.96	8.50	R1		9057190	9.00	6.00	5.20	6.00	0.00	5.70	6.38	9.00	R1
9057189	5.70	7.60	7.40	6.30	5.00	5.90	6.32	7.60	R2		9057189	6.00	7.00	8.00	7.20	5.40	6.20	6.63	8.00	R3
9068504	7.00	7.10	6.30	6.00	5.00	5.10	6.08	7.10	R2		9068504	7.50	7.50	6.80	6.40	5.60	5.70	6.58	7.50	R1,2
9068503	6.00	5.50	5.10	5.00	5.60	5.00	5.37	6.00	R1		9068503	6.40	6.00	5.60	5.60	6.10	5.90	5.93	6.40	R1
9068502	6.60	7.20	5.20	3.10	5.20	5.00	5.38	7.20	R2		9068502	7.00	7.80	5.80	3.60	5.70	5.40	5.88	7.80	R2
9068501	5.70	7.30	5.10	5.70	7.10	4.60	5.92	7.30	R2		9068501	6.00	7.70	5.60	6.00	7.60	5.20	6.35	7.70	R2
9068500	6.10	7.20	6.20	5.10	4.20	2.20	5.17	7.20	R2		9068500	6.50	7.60	6.60	5.90	4.90	2.80	5.72	7.60	R2
9068492	6.30	5.80	5.90	6.70	5.80	6.00	6.08	6.70	R4		9068492	7.00	6.20	6.30	6.90	6.20	6.50	6.52	7.00	R1
9068499	5.50	6.90	5.10	5.80	5.30	4.00	5.43	6.90	R2		9068499	6.00	7.20	5.60	6.20	5.90	4.80	5.95	7.20	R2
9068496	7.00	8.00	6.30	4.00	4.80	4.00	5.68	8.00	R2		9068496	7.50	8.40	6.80	4.40	5.30	4.40	6.13	8.40	R2
9068495	6.60	6.10	4.90	4.00	5.70	4.30	5.27	6.60	R1		9068495	6.80	6.70	5.20	4.40	6.20	4.90	5.70	6.80	R1
9068493	6.00	5.00	5.60	5.20	4.90	5.30	5.33	6.00	R1		9068493	6.60	5.40	6.00	5.80	5.30	5.90	5.83	6.60	R1
9068532	7.60	6.20	6.50	6.70	6.50	6.30	6.63	7.60	R1		9068532	8.20	6.60	6.80	7.20	6.80	6.80	7.07	8.20	R1
9068531	8.30	6.50	5.60	6.00	5.50	6.60	6.42	8.30	R1		9068531	8.90	7.00	6.00	6.40	6.00	7.00	6.88	8.90	R1
9068530	6.20	6.60	5.70	6.00	5.60	5.00	5.85	6.60	R2		9068530	6.80	6.90	6.00	6.50	6.00	5.50	6.28	6.70	R2
9068554	6.70	6.80	6.90	6.70	6.60	5.00	6.45	6.90	R3		9068554	7.00	7.00	7.00	6.90	6.90	5.30	6.68	7.00	R1,2,3
9068566	6.80	7.70	7.20	5.90	6.00	4.90	6.42	7.70	R2		9068566	7.40	7.90	8.00	6.30	6.40	5.20	6.87	8.00	R3
9068584	5.70	5.50	5.40	5.70	4.20	6.60	5.52	6.60	R6		9068584	7.00	6.00	4.90	5.40	5.90	5.20	5.73	7.00	R1
9068583	6.80	8.50	7.60	7.00	5.10	6.40	6.90	8.50	R2		9068583	6.00	8.60	7.20	7.00	5.20	6.00	6.67	8.60	R2
9068588	7.70	7.00	7.10	5.30	6.20	4.10	6.23	7.70	R1		9068588	7.90	7.30	7.40	5.90	6.60	4.60	6.62	7.00	R1,2

Spread measured in feet

Study 29I134J - Assembly and Evaluation of Eastern Redcedar, *Juniper virginia* L.

Table #4

Accession	1997 Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Ave.	Best	Location	Vigor	Accession	1998 Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Ave.	Best	Location
9057099	3.00	3.00	5.00	3.00	6.00	4.00	4.00	3.00	R1,2,4		9057099	2.00	3.00	6.00	3.00	6.00	5.00	4.17	2.00	R1
9057105	3.00	3.00	3.00	3.00	3.00	4.00	3.17	3.00	R1,5		9057105	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	R1,6
9057106	2.00	4.00	3.00	4.00	3.00	3.00	3.17	2.00	R1		9057106	2.00	4.00	2.00	3.00	3.00	3.00	2.83	2.00	R1,3
9057115	5.00	3.00	4.00	3.00	3.00	4.00	3.67	3.00	R2,4,5		9057115	4.00	3.00	4.00	3.00	3.00	4.00	3.50	3.00	R2,4,5
9057116	3.00	5.00	4.00	3.00	4.00	3.00	3.67	3.00	R1,4,6		9057116	3.00	4.00	3.00	4.00	4.00	3.00	3.50	3.00	R1,3,6
9057117	4.00	2.00	5.00	4.00	3.00	3.00	3.50	2.00	R2,4,5		9057117	4.00	3.00	5.00	3.00	2.00	3.00	3.33	2.00	R5
9057136	2.00	3.00	2.00	2.00	5.00	4.00	3.00	2.00	R1,3,4		9057136	3.00	3.00	2.00	3.00	4.00	4.00	3.17	2.00	R2,4,5
9068486	1.00	2.00	2.00	2.00	3.00	2.00	2.00	1.00	R1		9068486	1.00	2.00	2.00	3.00	4.00	2.00	2.33	1.00	R1
9057180	4.00	5.00	3.00	4.00	3.00	4.00	3.83	3.00	R3,5		9057180	3.00	3.00	3.00	3.00	3.00	4.00	3.17	3.00	R1,5
9057193	4.00	3.00	3.00	3.00	2.00	3.00	3.00	2.00	R5		9057193	3.00	3.00	3.00	3.00	2.00	3.00	2.83	2.00	R5
9057196	2.00	2.00	2.00	3.00	3.00	3.00	2.50	2.00	R1,2,3		9057196	1.00	3.00	3.00	3.00	3.00	3.00	2.67	1.00	R1
9057198	3.00	2.00	2.00	5.00	3.00	4.00	3.17	2.00	R2,3		9057198	2.00	3.00	2.00	7.00	4.00	3.00	3.50	2.00	R1,3
9057199	3.00	3.00	4.00	2.00	2.00	3.00	2.83	2.00	R4,5		9057199	2.00	3.00	3.00	3.00	1.00	2.00	2.33	1.00	R5
9068476	4.00	3.00	3.00	4.00	3.00	3.00	3.33	3.00	R2,3,5,6		9068476	6.00	2.00	3.00	3.00	3.00	3.00	3.33	2.00	R2,4,5
9057190	2.00	3.00	4.00	3.00	3.00	3.00	3.00	2.00	R1		9057190	2.00	3.00	4.00	3.00	0.00	3.00	3.00	2.00	R1
9057189	4.00	3.00	3.00	3.00	6.00	3.00	3.67	3.00	R2,3,4,6		9057189	3.00	2.00	3.00	3.00	4.00	3.00	3.00	2.00	R2,4,5
9068504	3.00	2.00	3.00	2.00	4.00	2.00	2.67	2.00	R2,4,6		9068504	2.00	3.00	2.00	7.00	4.00	3.00	3.50	2.00	R1,3
9068503	3.00	2.00	4.00	3.00	2.00	4.00	3.00	2.00	R2,5		9068503	3.00	1.00	4.00	3.00	2.00	4.00	2.83	1.00	R2,4,5
9068502	2.00	3.00	4.00	4.00	3.00	3.00	3.17	2.00	R1		9068502	3.00	3.00	4.00	4.00	4.00	3.00	3.50	3.00	R1,2,6
9068501	4.00	3.00	2.00	3.00	3.00	2.00	2.83	2.00	R3,6		9068501	3.00	3.00	3.00	3.00	3.00	2.00	2.83	2.00	R6
9068500	2.00	3.00	3.00	3.00	2.00	6.00	3.17	2.00	R2,5		9068500	2.00	4.00	3.00	3.00	3.00	7.00	3.67	2.00	R1
9068492	3.00	3.00	4.00	4.00	3.00	4.00	3.50	3.00	R1,2,5		9068492	3.00	3.00	4.00	3.00	3.00	4.00	3.33	3.00	R1,2,4,5
9068499	2.00	3.00	3.00	4.00	6.00	4.00	3.67	2.00	R1		9068499	2.00	2.00	3.00	4.00	3.00	5.00	3.17	2.00	R1,2
9068496	2.00	3.00	4.00	3.00	4.00	3.00	3.17	2.00	R1		9068496	1.00	3.00	3.00	3.00	4.00	4.00	3.00	1.00	R1
9068495	3.00	2.00	2.00	4.00	3.00	3.00	2.83	2.00	R2,3		9068495	2.00	3.00	2.00	4.00	3.00	3.00	2.83	2.00	R1,3
9068493	2.00	3.00	2.00	2.00	2.00	3.00	2.33	2.00	R1,3,4,5		9068493	2.00	4.00	3.00	1.00	1.00	4.00	2.50	1.00	R4,5
9068532	3.00	4.00	4.00	5.00	3.00	3.00	3.67	3.00	R1,5,6		9068532	2.00	4.00	3.00	7.00	3.00	3.00	3.67	2.00	R1
9068531	3.00	4.00	4.00	4.00	3.00	3.00	3.50	3.00	R1,5,6		9068531	3.00	3.00	4.00	4.00	3.00	3.00	3.33	3.00	R1,2,5,6
9068530	3.00	4.00	3.00	3.00	2.00	2.00	2.83	2.00	R5,6		9068530	3.00	5.00	3.00	4.00	3.00	3.00	3.50	3.00	R1,3,5,6
9068554	3.00	4.00	4.00	5.00	1.00	2.00	3.17	1.00	R5		9068554	3.00	4.00	3.00	3.00	3.00	1.00	2.83	1.00	R6
9068566	3.00	3.00	3.00	3.00	2.00	2.00	2.67	1.00	R6		9068566	3.00	3.00	2.00	3.00	3.00	3.00	2.83	2.00	R3
9068584	4.00	2.00	5.00	1.00	3.00	2.00	2.83	1.00	R4		9068584	3.00	4.00	4.00	3.00	3.00	3.00	3.33	3.00	R1,4,5,6
9068583	3.00	3.00	2.00	4.00	3.00	3.00	3.00	2.00	R3		9068583	4.00	3.00	3.00	2.00	3.00	2.00	2.83	2.00	R4,6
9068588	3.00	4.00	4.00	3.00	3.00	3.00	3.33	3.00	R1,4,5,6		9068588	3.00	3.00	4.00	3.00	3.00	3.00	3.17	3.00	R1,2,4,5,6

Vigor Rating: 1= Excellent, 9=Poor

Study 29I134J - Assembly and Evaluation of Eastern Redcedar, *Juniper virginia* L.
Table #5

1997										Insect/	1998									
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Ave.	Best	Location	Disease	Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Ave.	Best	Location
9057099	2.00	2.00	4.00	3.00	2.00	2.00	2.50	2.00	R1,2,5,6		9057099	2.00	1.00	4.00	2.00	3.00	3.00	2.50	1.00	R2
9057105	2.00	2.00	2.00	3.00	3.00	4.00	2.67	2.00	R1-3		9057105	2.00	3.00	2.00	3.00	2.00	2.00	2.33	2.00	R1,3,5,6
9057106	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	R1-6		9057106	1.00	3.00	2.00	2.00	3.00	3.00	2.33	1.00	R1
9057115	2.00	2.00	2.00	3.00	2.00	2.00	2.17	2.00	R1-3,5,6		9057115	3.00	3.00	3.00	2.00	2.00	2.00	2.50	2.00	R4-6
9057116	2.00	2.00	2.00	2.00	2.00	3.00	2.17	2.00	R1-5		9057116	3.00	2.00	2.00	2.00	3.00	2.00	2.33	2.00	R2-4,6
9057117	2.00	2.00	3.00	3.00	3.00	3.00	2.67	2.00	R1,2		9057117	3.00	2.00	3.00	3.00	2.00	3.00	2.67	2.00	R2,5
9057136	2.00	2.00	2.00	3.00	5.00	2.00	2.67	2.00	R1-3,6		9057136	2.00	3.00	2.00	2.00	3.00	3.00	2.50	2.00	R2,5
9068486	1.00	2.00	1.00	1.00	2.00	2.00	1.50	1.00	R1,3,4		9068486	2.00	3.00	2.00	2.00	3.00	3.00	2.50	2.00	R1,3,4
9057180	3.00	2.00	3.00	2.00	3.00	3.00	2.67	2.00	R2,4		9057180	2.00	3.00	2.00	2.00	3.00	3.00	2.50	2.00	R1,3,4
9057193	4.00	2.00	2.00	3.00	2.00	2.00	2.50	2.00	R2,3,5,6		9057193	2.00	2.00	2.00	3.00	1.00	2.00	2.00	1.00	R5
9057196	2.00	2.00	2.00	3.00	4.00	3.00	2.67	2.00	R1-3		9057196	1.00	2.00	3.00	2.00	3.00	3.00	2.33	1.00	R1
9057198	2.00	1.00	2.00	5.00	1.00	2.00	2.17	1.00	R2,5		9057198	2.00	2.00	1.00	7.00	1.00	3.00	2.67	1.00	R3,5
9057199	2.00	1.00	3.00	2.00	3.00	1.00	2.00	1.00	R2,6		9057199	1.00	1.00	2.00	2.00	1.00	1.00	1.33	1.00	R1,2,5,6
9068476	4.00	3.00	2.00	2.00	2.00	2.00	2.50	2.00	R3-6		9068476	6.00	3.00	2.00	3.00	2.00	3.00	3.17	2.00	R3,5
9057190	3.00	2.00	2.00	2.00	2.00	3.00	2.33	2.00	R2,5		9057190	2.00	2.00	2.00	3.00	0.00	3.00	2.00	2.00	R1-3
9057189	3.00	3.00	3.00	2.00	4.00	3.00	3.00	2.00	R4		9057189	2.00	2.00	3.00	2.00	3.00	3.00	2.50	2.00	R1,2,4
9068504	1.00	2.00	2.00	1.00	2.00	2.00	1.67	1.00	R1,4		9068504	1.00	2.00	2.00	1.00	3.00	1.00	1.67	1.00	R1,4
9068503	2.00	2.00	3.00	3.00	1.00	3.00	2.33	1.00	R5		9068503	3.00	1.00	3.00	2.00	2.00	3.00	2.33	1.00	R2
9068502	2.00	2.00	1.00	2.00	3.00	3.00	2.17	1.00	R3		9068502	2.00	2.00	1.00	2.00	3.00	2.00	2.00	1.00	R3
9068501	2.00	2.00	2.00	1.00	2.00	2.00	1.83	1.00	R4		9068501	2.00	3.00	2.00	2.00	2.00	2.00	2.17	2.00	R1,3-6
9068500	2.00	2.00	2.00	2.00	1.00	3.00	2.00	1.00	R5		9068500	1.00	3.00	2.00	2.00	1.00	3.00	2.00	1.00	R1,5
9068492	2.00	2.00	3.00	3.00	2.00	3.00	2.50	2.00	R1,2,5		9068492	2.00	2.00	3.00	3.00	2.00	3.00	2.50	2.00	R1,2,5
9068499	1.00	2.00	3.00	2.00	6.00	3.00	2.83	1.00	R1		9068499	1.00	1.00	3.00	2.00	3.00	4.00	2.33	1.00	R1,2
9068496	1.00	2.00	4.00	2.00	2.00	2.00	2.17	1.00	R1		9068496	1.00	3.00	2.00	1.00	1.00	3.00	1.83	1.00	R1,4,5
9068495	1.00	1.00	1.00	-	2.00	2.00	1.40	1.00	R1-3		9068495	2.00	2.00	2.00	2.00	2.00	3.00	2.17	2.00	R1-5
9068493	1.00	2.00	3.00	2.00	1.00	2.00	1.83	1.00	R1,5		9068493	1.00	2.00	2.00	2.00	1.00	2.00	1.67	1.00	R1,5
9068532	3.00	2.00	3.00	5.00	2.00	3.00	3.00	2.00	R2,5		9068532	3.00	2.00	2.00	7.00	2.00	3.00	3.17	2.00	R2,3,5
9068531	3.00	2.00	2.00	2.00	2.00	4.00	2.50	2.00	R2-5		9068531									
9068530	3.00	4.00	3.00	3.00	2.00	2.00	2.83	2.00	R5,6		9068530	3.00	5.00	2.00	3.00	2.00	2.00	2.83	2.00	R3,5,6
9068554	2.00	4.00	2.00	4.00	1.00	1.00	2.33	1.00	R5,6		9068554	1.00	3.00	2.00	2.00	1.00	1.00	1.67	1.00	R1,5,6
9068566	2.00	2.00	1.00	1.00	3.00	3.00	2.00	1.00	R3,4		9068566	2.00	3.00	2.00	2.00	4.00	4.00	2.83	2.00	R1,3,4
9068584	2.00	2.00	4.00	2.00	1.00	1.00	2.00	1.00	R5,6		9068584	2.00	1.00	3.00	2.00	1.00	3.00	2.00	1.00	R2,5
9068583	3.00	2.00	2.00	3.00	3.00	3.00	2.67	2.00	R2,3		9068583	5.00	2.00	1.00	1.00	3.00	1.00	2.17	1.00	R3,4,6
9068588											9068588	3.00	2.00	3.00	2.00	2.00	2.00	2.33	2.00	R2,4-6

Insect/Disease Ratings: 1=None, 9=Severe

Study 29I134J - Assembly and Evaluation of Eastern Redcedar, *Juniper virginia* L.
Table #6

Seed Production

1998

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Ave.	Best	Location
9057099	9.00	5.00	9.00	9.00	9.00	5.00	7.67	9.00	R1,3,-5
9057105	9.00	6.00	9.00	9.00	9.00	3.00	7.50	9.00	R1,3,-5
9057106	6.00	9.00	5.00	9.00	7.00	7.00	7.17	9.00	R2,4
9057115	9.00	8.00	9.00	5.00	5.00	4.00	6.67	9.00	R1,3
9057116	9.00	9.00	9.00	6.00	9.00	7.00	8.17	9.00	R1-3,5
9057117	9.00	8.00	9.00	8.00	9.00	9.00	8.67	9.00	R1,3,5,6
9057136	9.00	9.00	4.00	6.00	9.00	9.00	7.67	9.00	R1,2,5,6
9068486	9.00	3.00	9.00	6.00	9.00	6.00	7.00	9.00	R1,3,5
9057180	9.00	5.00	9.00	9.00	9.00	8.00	8.17	9.00	R1,3-5
9057193	9.00	9.00	9.00	4.00	6.00	9.00	7.67	9.00	R1,3,6
9057196	9.00	8.00	9.00	9.00	9.00	4.00	8.00	9.00	R1,3-5,6
9057198	5.00	9.00	9.00	6.00	9.00	4.00	7.00	9.00	R2,3,5
9057199	9.00	6.00	9.00	4.00	1.00	9.00	6.33	9.00	R1,3,6
9068476	9.00	9.00	4.00	1.00	4.00	8.00	5.83	9.00	R1,2
9057190	9.00	6.00	2.00	8.00	9.00	9.00	7.17	9.00	R1,5,6
9057189	9.00	9.00	8.00	9.00	9.00	9.00	8.83	9.00	R1,2,4-6
9068504	9.00	9.00	9.00	9.00	9.00	3.00	8.00	9.00	R1-5
9068503	9.00	9.00	1.00	4.00	9.00	4.00	6.00	9.00	R1,2,5
9068502	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	R1-6
9068501	9.00	7.00	4.00	1.00	9.00	9.00	6.50	9.00	R1,5,6
9068500	6.00	9.00	1.00	4.00	8.00	9.00	6.17	9.00	R2,6
9068492	9.00	6.00	9.00	4.00	9.00	9.00	7.67	9.00	R1,3,5,6
9068499	6.00	8.00	9.00	9.00	9.00	1.00	7.00	9.00	R3,4,5
9068496	9.00	6.00	9.00	3.00	6.00	9.00	7.00	9.00	R1,3,9
9068495	9.00	9.00	9.00	9.00	9.00	8.00	8.83	9.00	R1-5
9068493									
9068532	9.00	9.00	6.00	9.00	9.00	3.00	7.50	9.00	R1,2,4,5
9068531	6.00	9.00	1.00	1.00	3.00	9.00	4.83	9.00	R2,6
9068530	9.00	9.00	3.00	9.00	6.00	9.00	7.50	9.00	R1,2,4,6
9068554	6.00	9.00	3.00	1.00	4.00	9.00	5.33	9.00	R2,6
9068566	6.00	6.00	6.00	3.00	4.00	4.00	4.83	6.00	R1-3
9068584	9.00	8.00	8.00	9.00	6.00	9.00	8.17	9.00	R1,6
9068583	9.00	3.00	8.00	3.00	1.00	9.00	5.50	9.00	R1,R6
9068588	9.00	9.00	3.00	3.00	8.00	9.00	6.83	9.00	R1,2,6

1=Heavy, 9=No Seed Production

Study: 29I135J

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

Study Leader: Henry, J.

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 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. Only 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 the rate of growth seems to be slow, which seems to be 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. The selection criteria for these accessions is as follows: form, growth, height, width and fruit production and resistance to insect and disease.

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			

Table #1 reflects the accession information.

Tables #2-#5 reflect the plants' performance 1995-1998.

		Table #1
Accession Information		
Accession Number	**State or Origin**	**City or County**
9057081	Illinois	Coles
9057082	Illinois	Coles
9057087	Illinois	Coles
9057119	Illinois	Whiteside
9057120	Illinois	Carroll
9057167	Illinois	Will
9057168	Illinois	Iroquois
9057169	Illinois	Iroquois
9057184	Illinois	Clark
9057186	Illinois	Coles
9057188	Illinois	Coles
9057192	Illinois	Montgomery
9057195	Illinois	Morgan
9068505	Illinois	Coles
9068507	Illinois	Cumberland
9068508	Illinois	Mercer
9068509	Illinois	Ogle
9068510	Illinois	Iroquois
9068511	Illinois	Effingham
9068512	Illinois	Clay
9068513	Illinois	Pike
9068525	Illinois	Cumberland
9068526	Illinois	Coles
9068527	Illinois	Maultrie
9068528	Illinois	Coles
9068529	Illinois	Vermilion
9068562	Illinois	Adams
9068565	Illinois	Jo Daviess
9068585	Illinois	DeWitt
9068586	Illinois	Vermilion
9068570	Missouri	Lincoln
9068573	Missouri	Chariton
9068574	Missouri	Chariton
9068575	Illinois	Johnson

Table #2

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

- Height -

1995

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9068507	1.7	1.0	2.6	Dead	Dead	2.0	1.3	1.8	1.7	2.6	R 3
9068586	Dead	Dead	1.2	1.7	2.0	2.0	1.0	1.3	1.5	2.0	R5,6
9068562	1.2	2.5	1.4	1.3	1.5	1.7	2.9	4.0	2.1	4.0	R8
9057168	1.3	1.3	2.1	1.0	1.9	2.2	1.4	0.9	1.5	2.2	R6
9068558	1.5	2.2	1.7	1.3	2.0	1.5	2.5	Dead	1.8	2.5	R7
9068508	2.0	3.0	2.2	2.3	1.3	1.0	1.6	1.5	1.9	3.0	R2
9068573	3.6	2.7	3.2	1.5	3.0	2.2	2.5	3.2	2.7	3.6	R1
9057188	2.6	4.0	1.6	3.1	2.6	2.0	2.3	2.2	2.6	4.0	R2
9068565	2.3	2.6	2.5	2.0	2.4	2.2	1.6	Dead	2.2	2.6	R2
9057169	2.9	1.6	1.4	1.7	0.8	1.0	1.4	1.6	1.6	2.9	R1
9068528	1.3	1.2	Dead	2.1	Dead	1.7	2.0	1.4	1.6	2.1	R4
9068510	0.6	1.3	2.1	1.7	1.5	1.4	0.6	2.2	1.4	2.2	R8
9068574	1.7	2.0	1.7	3.0	2.3	2.2	1.3	2.0	2.0	3.0	R4
9068525	1.3	1.2	1.0	1.0	1.0	1.5	Dead	1.7	1.2	1.7	R8

1996

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9068507	2.1	1.3	3.2	Dead	Dead	2.9	2.0	1.5	2.2	3.2	R3
9068586	Dead	Dead	2.9	2.6	3.7	3.0	2.0	2.0	2.7	3.7	R5
9068562	2.0	3.8	1.7	1.0	2.7	2.8	3.2	4.1	2.7	3.8	R2
9057168	2.3	1.3	3.3	1.8	3.3	3.0	1.8	1.3	2.3	3.3	R3, 5
9068558	2.0	Dead	2.1	2.1	2.4	3.2	2.7	Dead	2.4	3.2	R6
9068508	2.3	3.4	3.3	2.5	1.7	1.4	2.5	2.3	2.4	3.4	R2
9068573	2.6	3.7	3.4	2.1	3.6	3.0	2.8	3.3	3.1	3.7	R2
9057188	3.3	4.1	2.6	3.2	4.1	3.2	3.4	2.9	3.4	4.1	R2, 5
9068565	2.3	2.9	2.3	2.3	2.6	2.3	1.4	Dead	2.3	2.9	R2
9057169	2.9	3.1	2.3	2.7	1.6	2.2	2.1	1.9	2.4	3.1	R2
9068528	3.0	3.2	Dead	3.3	Dead	2.5	2.5	2.1	2.8	3.3	R4
9068510	1.8	2.2	1.7	2.2	2.7	2.3	1.3	2.7	2.1	2.7	R5,8
9068574	3.2	2.3	2.4	3.7	3.5	2.6	2.7	2.0	2.8	3.5	R5
9068525	2.2	1.6	1.7	2.5	1.6	1.9	Dead	2.5	2.0	2.5	R4,8

1997

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9068507	2.3	Dead	3.5	Dead	Dead	4.0	2.0	2.3	2.8	4.0	R6
9068586	Dead	Dead	2.9	2.6	3.7	3.0	2.0	3.1	2.9	3.1	R8
9068562	3.3	5.2	2.7	2.7	3.4	4.6	4.2	4.5	3.8	5.2	R2
9057168	3.8	1.2	4.6	2.4	4.3	4.1	3.0	2.0	3.2	4.6	R3
9068558	3.6	Dead	2.4	3.5	2.8	4.3	3.9	Dead	3.4	4.3	R6
9068508	3.2	3.6	3.9	3.3	3.4	2.8	3.5	3.3	3.4	3.9	R3
9068573	4.2	4.5	4.0	3.4	4.6	3.1	2.5	3.4	3.7	4.6	R4
9057188	4.0	5.0	2.9	4.2	5.1	3.7	4.7	4.0	4.2	5.1	R5
9068565	2.7	3.3	2.3	3.0	4.0	2.8	1.6	Dead	2.8	4.0	R5
9057169	5.0	4.1	3.4	3.5	2.3	3.6	3.2	2.8	3.5	5.0	R1
9068528	4.5	4.2	Dead	4.0	3.1	3.2	3.0	2.8	3.5	4.5	R1
9068510	3.1	2.0	3.0	4.5	4.3	2.8	2.0	4.0	3.2	4.5	R4
9068574	4.9	4.3	3.8	3.9	6.8	3.8	3.2	2.2	4.1	6.8	R5
9068525	3.3	2.3	4.0	3.6	Dead	3.1	Dead	3.2	2.8	4.0	R3

1998

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9068507	2.3	Dead	4.3	Dead	Dead	5.2	2.8	4.0	3.7	5.2	R6
9068586	Dead	Dead	4.2	4.0	5.0	4.6	3.5	4.1	4.2	5.0	R5
9068562	4.7	7.0	4.0	4.6	5.1	4.1	4.6	5.4	4.9	7.0	R2
9057168	5.0	1.8	5.4	3.8	5.4	5.1	4.2	3.0	4.2	5.4	R5
9068558	4.6	Dead	5.0	4.3	4.1	5.0	6.4	Dead	4.9	6.4	R7
9068508	3.5	3.8	3.2	4.8	4.7	3.8	4.2	4.0	4.0	4.8	R4
9068573	6.3	4.9	5.2	5.0	6.3	5.0	6.0	4.0	5.3	6.3	R5
9057188	4.0	5.8	6.0	5.0	6.4	5.8	5.0	5.7	5.5	6.4	R5
9068565	2.9	4.8	3.2	Dead	4.4	4.0	3.4	Dead	3.8	4.8	R2
9057169	5.9	5.2	5.0	5.0	3.2	4.4	3.2	3.3	4.4	5.9	R1
9068528	5.4	4.4	Dead	4.2	4.0	4.0	4.8	3.2	4.3	5.4	R1
9068510	3.9	4.8	4.0	4.6	5.4	3.0	4.0	4.6	4.3	5.4	R5
9068574	5.2	5.3	5.0	4.0	6.3	3.2	3.6	3.0	4.5	6.3	R5
9068525	4.2	3.5	5.2	4.9	Dead	3.4	Dead	4.6	3.7	5.2	R3

Height Measured in Feet

Study 29I135J - Assembly and Evaluation of Hazelnut, *Corylus americana*, Walt. **Table #3**

- Width -

1995

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9068507	0.6	0.3	1.2	Dead	Dead	1.0	0.3	0.3	0.6	1.2	R3
9068586	Dead	Dead	0.4	0.6	1.0	0.9	0.1	0.2	0.5	1.0	R5
9068562	0.4	1.4	0.3	0.4	0.4	0.6	0.4	1.5	0.7	1.5	R8
9057168	0.7	0.4	1.1	0.4	1.1	0.8	0.7	0.5	0.7	1.1	R3, 5
9068558	0.3	0.3	0.5	0.7	0.9	1.1	0.7	Dead	0.6	1.1	R6
9068508	0.5	0.4	0.4	0.8	0.6	0.9	0.8	0.8	0.7	0.9	R6
9068573	1.5	0.6	0.8	0.8	1.0	0.7	0.9	0.3	0.8	1.5	R1
9057188	1.0	0.7	0.6	1.2	1.4	0.9	0.9	2.0	1.1	2.0	R8
9068565	0.6	0.4	0.9	0.8	0.5	0.7	0.7	Dead	0.7	0.9	R3
9057169	1.0	0.8	0.6	0.4	0.2	0.5	0.7	0.4	0.6	1.0	R1
9068528	0.8	0.6	Dead	0.6	Dead	0.5	0.6	0.3	0.6	0.8	R1
9068510	0.2	1.2	0.6	0.4	0.9	0.6	0.2	0.8	0.6	1.2	R2
9068574	1.5	0.8	1.0	1.0	0.9	0.9	0.6	0.4	0.9	1.5	R1
9068525	0.4	0.4	0.4	0.3	0.3	0.3	Dead	0.6	0.4	0.6	R8

1996

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9068507	1.4	0.8	2.1	Dead	Dead	2.3	1.4	0.6	1.4	2.1	R3
9068586	Dead	Dead	2.6	1.5	1.5	2.0	1.1	1.6	1.7	2.6	R3
9068562	1.8	3.6	1.0	0.9	2.2	2.7	1.8	3.3	2.2	3.6	R2
9057168	2.8	1.0	2.9	1.4	2.8	2.1	2.1	1.2	2.0	2.9	R3
9068558	1.7	Dead	2.4	2.5	2.0	2.1	2.5	Dead	2.2	2.5	R 4,7
9068508	2.0	2.5	2.3	2.2	2.4	1.7	2.8	1.8	2.2	2.8	R7
9068573	3.1	2.7	2.3	2.4	3.0	2.2	2.4	1.2	2.4	3.1	R1
9057188	2.4	2.8	2.4	2.6	2.9	3.3	2.3	3.7	2.8	3.7	R8
9068565	1.0	2.4	1.6	2.0	1.7	2.6	1.0	Dead	1.8	2.6	R6
9057169	3.1	2.5	3.0	2.4	0.8	2.4	1.3	1.0	2.1	3.1	R1
9068528	2.2	2.3	Dead	2.2	1.7	2.4	2.4	1.8	2.1	2.4	R6, 7
9068510	1.6	2.7	2.1	1.8	2.6	1.8	1.0	0.6	1.8	2.7	R2
9068574	2.8	3.1	2.8	2.3	2.5	1.9	3.4	1.1	2.5	3.4	R 7
9068525	1.7	2.2	2.0	2.0	1.4	2.0	Dead	2.3	1.9	2.3	R8

1997

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9068507	2.3	Dead	3.0	Dead	Dead	3.2	1.0	1.8	2.3	3	R3
9068586	Dead	Dead	3.7	2.5	3.1	3.5	1.8	2.8	2.9	3.7	R3
9068562	3.3	6.5	2.3	2.3	3.8	3.7	3.5	4.2	3.7	6.5	R2
9057168	4.4	1.5	4.2	2.0	4.2	3.3	2.5	2.0	3.0	4.4	R1
9068558	3.2	1.5	3.2	3.0	2.7	3.5	3.3	Dead	2.9	3.5	R6
9068508	4.0	Dead	3.2	3.7	3.9	3.0	3.4	3.4	3.5	4	R1
9068573	4.1	3.5	4.3	5.1	5.0	3.6	2.5	2.9	3.9	5.1	R4
9057188	3.6	5.0	4.2	4.7	3.7	4.5	4.0	4.4	4.3	5	R2
9068565	2.8	3.5	2.2	2.0	3.1	3.0	1.5	Dead	2.6	3.5	R2
9057169	3.6	5.0	4.2	4.7	3.7	4.5	4.0	4.4	4.3	5	R2
9068528	3.0	4.4	Dead	3.3	2.9	2.0	3.4	2.3	3.0	4.4	R2
9068510	3.0	3.2	3.0	3.3	3.9	2.1	4.0	3.3	3.2	4	R7
9068574	4.9	4.4	4.6	3.7	4.5	3.2	3.0	2.0	3.8	4.9	R1
9068525	4.0	3.3	4.0	3.4	Dead	2.0	Dead	4.0	3.0	4	R1, 3, 8

1998

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9068507	2.7	Dead	5.0	Dead	Dead	6.0	1.3	4.6	3.9	1.3	R7
9068586	Dead	Dead	4.9	4.0	3.8	3.5	2.1	4.1	3.7	2.1	R7
9068562	4.2	7.4	4.0	3.3	5.0	5.5	5.1	5.8	5.0	3.3	R4
9057168	4.0	2.6	6.0	3.4	7.0	5.0	4.6	3.2	4.5	2.6	R2
9068558	4.0	Dead	5.0	4.4	4.0	5.0	5.2	Dead	4.6	4.0	R1, 5
9068508	4.4	5.8	4.4	5.2	4.8	5.4	4.6	4.9	4.9	4.4	R1, 3, 8
9068573	7.0	5.5	5.4	6.0	6.0	5.4	5.7	4.3	5.7	4.3	R8
9057188	4.6	7.5	5.4	5.4	7.7	7.0	4.8	6.0	6.1	4.6	R1
9068565	4.0	4.6	3.0	Dead	5.0	4.2	2.3	Dead	3.9	2.3	R7
9057169	4.8	4.6	5.3	5.2	2.8	4.3	3.5	4.0	4.3	2.8	R5
9068528	4.3	4.6	Dead	4.0	4.4	3.4	3.8	4.0	4.1	3.4	R6
9068510	3.4	3.2	4.0	4.2	4.8	3.5	3.5	4.0	3.8	3.2	R2
9068574	2.4	5.3	5.2	2.6	5.8	3.8	4.5	3.3	4.1	2.4	R1
9068525	3.4	4.8	5.7	5.2	Dead	3.4	Dead	4.6	3.9	3.4	R1,6

Width Measured in Feet

Study 29I135J - Assembly and Evaluation of Hazelnut, Corylus americana, Walt. **Table #4**

Form

1995

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9068507	5.0	7.0	4.0	Dead	Dead	5.0	6.0	6.0	5.5	4.0	R3
9068586	Dead	Dead	6.0	6.0	7.0	6.0	9.0	8.0	7.0	6.0	R3,4,6
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	3.0	6.0	4.0	5.0	6.0	7.0	5.5	3.0	R3
9068558	7.0	8.0	5.0	7.0	3.0	4.0	7.0	Dead	5.9	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
9068573	3.0	4.0	5.0	5.0	4.0	5.0	4.0	6.0	4.5	3.0	R1
9057188	3.0	4.0	5.0	5.0	5.0	5.0	5.0	2.0	4.3	2.0	R8
9068565	5.0	6.0	7.0	5.0	6.0	5.0	7.0	Dead	5.9	5.0	R1,4,6
9057169	4.0	5.0	5.0	8.0	6.0	6.0	6.0	6.0	5.8	4.0	R1
9068528	5.0	5.0	Dead	5.0	Dead	6.0	6.0	6.0	5.5	5.0	R1,2,4
9068510	8.0	5.0	4.0	5.0	8.0	8.0	5.0	6.0	6.1	4.0	R3,4,6
9068574	4.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	5.5	4.0	R1
9068525	6.0	6.0	5.0	8.0	6.0	8.0	Dead	6.0	6.4	5.0	R3

1997

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9068507	5.0	Dead	4.0	5.0	Dead	4.0	8.0	6.0	5.3	4.0	R3,6
9068586	Dead	Dead	6.0	7.0	4.0	5.0	6.0	5.0	5.5	4.0	R4
9068562	5.0	3.0	5.0	7.0	7.0	4.0	8.0	3.0	5.3	3.0	R2,8
9057168	5.0	8.0	4.0	8.0	3.0	5.0	6.0	7.0	5.8	3.0	R5
9068558	4.0	Dead	5.0	5.0	6.0	5.0	3.0	Dead	4.7	3.0	R7
9068508	7.0	5.0	5.0	5.0	5.0	7.0	6.0	4.0	5.5	4.0	R8
9068573	7.0	4.0	5.0	5.0	3.0	5.0	5.0	6.0	5.0	3.0	R5
9057188	3.0	4.0	4.0	4.0	3.0	5.0	3.0	4.0	3.8	3.0	R1,5,7
9068565	7.0	3.0	6.0	8.0	5.0	5.0	7.0	Dead	5.9	3.0	R2,8
9057169	4.0	4.0	6.0	4.0	7.0	5.0	5.0	8.0	5.4	4.0	R1,2,4
9068528	4.0	4.0	Dead	5.0	6.0	4.0	6.0	6.0	5.0	4.0	R1,3,6
9068510	7.0	8.0	6.0	5.0	5.0	4.0	6.0	3.0	5.5	3.0	R8
9068574	7.0	6.0	4.0	6.0	3.0	6.0	6.0	6.0	5.5	3.0	R8
9068525	5.0	6.0	7.0	8.0	Dead	8.0	Dead	5.0	6.4	5.0	R1,8

1996

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9068507	4.0	5.0	4.0	Dead	Dead	4.0	4.0	5.0	4.3	4.0	R1,3,6,7
9068586	Dead	Dead	5.0	7.0	4.0	5.0	5.0	4.0	5.0	4.0	R3,8
9068562	5.0	5.0	4.0	7.0	5.0	4.0	5.0	4.0	4.9	4.0	R6,8
9057168	6.0	6.0	5.0	6.0	4.0	4.0	6.0	6.0	5.4	4.0	R5,6
9068558	4.0	Dead	6.0	5.0	6.0	5.0	5.0	Dead	5.2	4.0	R1
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
9068573	3.0	4.0	4.0	6.0	4.0	4.0	4.0	5.0	4.3	3.0	R1
9057188	3.0	5.0	5.0	4.0	4.0	4.0	4.0	5.0	4.3	3.0	R1
9068565	5.0	4.0	6.0	7.0	5.0	6.0	5.0	Dead	5.4	4.0	R2
9057169	3.0	5.0	6.0	5.0	4.0	5.0	5.0	5.0	4.8	3.0	R1
9068528	5.0	4.0	Dead	5.0	5.0	5.0	6.0	5.0	5.0	4.0	R2
9068510	5.0	7.0	6.0	4.0	5.0	4.0	4.0	5.0	5.0	4.0	R4,6,7
9068574	5.0	7.0	4.0	5.0	4.0	5.0	5.0	5.0	5.0	4.0	R3,5
9068525	5.0	5.0	5.0	6.0	6.0	6.0	Dead	6.0	5.6	5.0	R1,2,3,

1998

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9068507	7.0	Dead	5.0	Dead	Dead	5.0	7.0	7.0	6.2	5.0	R3,6
9068586	5.0	Dead	3.0	6.0	5.0	7.0	7.0	2.0	5.0	2.0	R8
9068562	5.0	2.0	2.0	5.0	3.0	5.0	6.0	2.0	3.8	2.0	R2,3,8
9057168	5.0	7.0	5.0	5.0	3.0	5.0	5.0	7.0	5.3	3.0	R5
9068558	3.0	5.0	3.0	5.0	3.0	2.0	2.0	Dead	3.3	2.0	R6,7
9068508	Dead	5.0	7.0	5.0	7.0	5.0	6.0	5.0	5.7	5.0	R2,4,6,8
9068573	5.0	5.0	5.0	3.0	3.0	3.0	4.0	5.0	4.1	3.0	R4,5,6
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
9068565	5.0	5.0	7.0	Dead	5.0	5.0	4.0	Dead	5.2	4.0	R7
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
9068528	3.0	5.0	3.0	5.0	3.0	7.0	5.0	6.0	4.6	3.0	R1,3,5
9068510	5.0	7.0	5.0	3.0	3.0	7.0	7.0	5.0	5.3	3.0	R4,5
9068574	5.0	2.0	3.0	6.0	5.0	6.0	3.0	5.0	4.4	2.0	R2
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, *Corylus americana*, Walt. **Table #5**

Fruit Production

1997

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9068507	0.0	Dead	7.0	Dead	Dead	0.0	0.0	0.0	7.0	7.0	R3
9068586	Dead	Dead	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-
9068562	0.0	7.0	0.0	0.0	0.0	3.0	9.0	7.0	6.5	3.0	R6
9057168	9.0	9.0	3.0	0.0	7.0	9.0	0.0	0.0	7.4	3.0	R3
9068558	9.0	Dead	0.0	0.0	0.0	0.0	9.0	Dead	9.0	9.0	R1, R7
9068508	9.0	Dead	9.0	0.0	9.0	0.0	9.0	8.0	8.8	8.0	R8
9068573	3.0	6.0	9.0	0.0	6.0	0.0	0.0	0.0	6.0	6.0	R2, R5
9057188	3.0	7.0	Dead	9.0	9.0	9.0	7.0	7.0	7.3	3.0	R1, R7
9068565	8.0	0.0	9.0	7.0	9.0	9.0	0.0	Dead	8.4	7.0	R4
9057169	2.0	3.0	9.0	9.0	0.0	0.0	0.0	0.0	5.8	2.0	R1
9068528	9.0	6.0	0.0	9.0	0.0	6.0	8.0	0.0	7.6	6.0	R2,6
9068510	0.0	7.0	0.0	0.0	6.0	0.0	0.0	0.0	6.5	6.0	R5
9068574	6.0	0.0	0.0	8.0	3.0	0.0	0.0	0.0	5.7	3.0	R5
9068525	0.0	0.0	0.0	0.0	0.0	0.0	Dead	9.0	9.0	9.0	R8

1=Heavy Fruit Production; 9=Poor Fruit Production

1998

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9068507	5.0	Dead	5.0	Dead	Dead	2.0	0.0	0.0	4.0	2.0	R6
9068586	Dead	Dead	7.0	7.0	7.0	7.0	5.0	2.0	5.8	2.0	R8
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
9057168	7.0	5.0	2.0	0.0	2.0	5.0	7.0	0.0	4.7	2.0	R3,5
9068558	2.0	Dead	5.0	2.0	0.0	5.0	5.0	Dead	3.8	2.0	R2,4
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
9068573	7.0	2.0	2.0	5.0	2.0	7.0	5.0	7.0	4.6	2.0	R2,3,5
9057188	7.0	7.0	5.0	7.0	5.0	0.0	0.0	Dead	6.2	5.0	R3,5
9068565	7.0	7.0	2.0	7.0	0.0	2.0	5.0	0.0	5.0	2.0	R3,6
9057169	7.0	7.0	2.0	7.0	0.0	2.0	5.0	0.0	5.0	2.0	R3,6
9068528	2.0	2.0	Dead	5.0	2.0	5.0	5.0	2.0	3.3	2.0	R1,2,5,8
9068510	7.0	2.0	7.0	7.0	7.0	5.0	0.0	5.0	5.7	2.0	R2
9068574	5.0	7.0	7.0	2.0	2.0	5.0	5.0	0.0	4.7	2.0	R4,5
9068525	5.0	5.0	7.0	7.0	2.0	7.0	Dead	2.0	5.0	2.0	R5,8

1=Heavy Fruit Production; 9=Poor Fruit Production

- Insect/Disease -

1997

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9068507	3.0	Dead	3.0	Dead	Dead	3.0	4.0	4.0	3.4	3.0	R1,3,6
9068586	Dead	Dead	4.0	3.0	4.0	4.0	5.0	4.0	4.0	2.0	R2
9068562	3.0	2.0	4.0	5.0	4.0	2.0	3.0	2.0	3.1	2.0	R2
9057168	3.0	4.0	3.0	3.0	2.0	3.0	4.0	4.0	3.3	2.0	R5
9068558	2.0	Dead	3.0	5.0	7.0	3.0	3.0	Dead	3.8	2.0	R1,3,6
9068508	3.0	3.0	3.0	3.0	2.0	3.0	4.0	5.0	3.3	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	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
9068565	3.0	2.0	7.0	6.0	3.0	5.0	4.0	5.0	4.4	2.0	R2
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
9068528	3.0	3.0	Dead	3.0	3.0	4.0	4.0	4.0	3.4	3.0	R1,2,4,5
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	3.0	5.0	4.0	2.0	5.0	3.0	3.0	3.5	2.0	R5
9068525	2.0	3.0	2.0	7.0	Dead	3.0	Dead	2.0	3.2	2.0	R 1,3,8

1=No Insect/Disease; 9=Severe Insect/Disease

1998

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9068507	4.0	Dead	6.0	Dead	Dead	2.0	9.0	3.0	4.8	2.0	R6
9068586	Dead	Dead	4.0	3.0	3.0	3.0	4.0	2.0	3.2	2.0	R8
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
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	3.0	Dead	4.0	3.0	3.0	2.0	2.0	Dead	2.8	2.0	R6,7
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
9068573	5.0	3.0	2.0	3.0	2.0	3.0	3.0	3.0	3.0	2.0	R5
9057188	7.0	3.0	3.0	2.0	3.0	2.0	2.0	4.0	3.3	2.0	R4,6,7
9068565	7.0	3.0	4.0	6.0	3.0	4.0	3.0	Dead	4.3	3.0	R2,5,7
9057169	2.0	4.0	4.0	3.0	2.0	3.0	2.0	3.0	2.9	2.0	R1,5,7
9068528	3.0	4.0	Dead	3.0	3.0	3.0	2.0	2.0	2.9	2.0	R7,8
9068510	6.0	4.0	3.0	3.0	5.0	3.0	3.0	2.0	3.6	2.0	R8
9068574	3.0	6.0	4.0	4.0	3.0	2.0	3.0	3.0	3.5	2.0	R6
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

Study: 29I136J

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

Study Leader: Henry, J.

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 tooth. 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'; 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", 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 twenty-seven 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 unrandomized 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.

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.

Table #1 lists the different accessions included in this assembly along with the locations and collectors names.

Table # 2, 3, 4 and 5 reflect the plants' performance.

Study 29I136J – Assembly and Evaluation of Prunus americana, Marsh.

Table #1 – Accessions, Locations and Collector's Name

Accession Number	Locations Collected	Collector's Name
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

Study 29I136J Assembly and Evaluation of *Prunus Americana*, Wild Plum **Table #2**

Height

1995

Accssion	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location
9068480	2.60	3.10	2.40	3.00	1.60	Dead	Dead	Dead	2.54	3.10	R2
9057096	3.60	2.30	1.40	Dead	Dead	1.10	Dead	-	2.10	3.60	R1
9068478	2.60	2.40	3.00	2.80	1.60	2.60	1.40	-	2.34	3.00	R3
9068515	2.50	0.60	3.80	2.70	1.50	2.50	2.30	2.30	2.28	3.80	R3
9062308	2.00	2.20	2.30	1.60	Dead	Dead	1.75	Dead	1.97	2.30	R3
9068485	3.30	2.00	2.30	2.70	1.50	Dead	1.20	-	2.17	3.30	R1
9057088	4.30	3.10	3.10	4.80	2.50	2.50	2.60	3.50	3.30	4.80	R4
9068545	4.50	3.00	3.00	3.20	2.30	Dead	2.00	-	3.00	4.50	R1
9068543	2.40	2.70	2.50	2.00	Dead	Dead	Dead	-	2.40	2.70	R2
9068516	2.50	2.00	Dead	4.00	2.00	Dead	Dead	-	2.63	4.00	R4
9068514	3.10	1.90	2.60	2.00	Dead	1.80	2.10	-	2.25	3.10	R1
9068580	3.60	5.00	2.60	4.30	1.50	2.00	2.60	3.00	3.08	5.00	R2
9057146								1.60	1.60	1.60	R8
9068546	3.70	4.30	3.60	2.30	2.60	1.80	2.10	2.40	2.85	4.30	R2
434240	4.50	5.30	3.80	4.30	2.60	Dead	4.10	-	4.10	5.30	R2
ND-286								Dead			
9062309	2.80	Dead	2.00	3.00	2.60	2.90	Dead	-	2.66	3.00	R4
9057165	1.90	1.80	2.80	2.00	1.40	-	-	-	1.98	2.80	R3

1996

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location
9068480	4.70	3.10	5.10	6.80	2.90	Dead	Dead	Dead	4.52	6.80	R4
9057096	5.20	7.00	6.20	Dead	Dead	1.30	Dead	-	4.93	7.00	R2
9068478	3.10	4.50	3.40	4.50	4.30	4.30	3.40	-	3.93	4.50	R2,4
9068515	5.10	2.40	5.90	5.30	4.30	4.20	4.10	4.80	4.51	5.90	R3
9062308	4.40	5.00	3.10	4.80	Dead	Dead	2.60	Dead	3.98	5.00	R2
9068485	4.10	4.10	4.00	4.50	4.00	Dead	2.60	-	3.88	4.50	R4
9057088	6.50	5.70	5.20	4.60	5.60	5.10	5.40	-	5.44	6.50	R1
9068545	7.70	6.40	6.80	6.20	5.70	Dead	5.40	-	6.37	7.70	R1
9068543	4.20	6.00	5.30	4.70	Dead	Dead	Dead	-	5.05	6.00	R2
9068516	4.90	5.00	Dead	5.10	6.10	Dead	Dead	-	5.28	6.10	R5
9068514	7.00	6.50	5.10	4.50	Dead	4.10	4.50	-	5.28	7.00	R1
9068580	6.90	7.00	6.60	6.80	4.40	4.60	6.00	6.30	6.08	7.00	R2
9057146								4.50	4.50	4.50	R8
9068546	5.50	6.20	6.50	5.60	4.70	3.60	4.40	5.20	5.21	6.50	R3
434240	7.10	7.30	6.30	6.00	5.10	Dead	6.00	-	6.30	7.30	R2
ND-286								Dead			
9062309	6.30	Dead	3.60	4.80	3.80	4.80	Dead	-	4.66	6.30	R1
9057165	5.30	5.00	6.20	6.00	5.10	-	-	-	5.52	6.20	R3

1997

Accssion	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location
9068480	7.00	5.40	9.00	6.30	6.00	Dead	Dead	6.00	6.62	7.00	R1
9057096	7.30	7.20	8.00	Dead	Dead	2.50	Dead	-	6.25	8.00	R3
9068478	3.20	6.50	4.40	6.40	Dead	Dead	4.60	-	5.02	6.80	R6
9068515	8.20	4.20	9.10	7.40	5.00	6.00	8.20	6.20	6.79	9.10	R3
9062308	6.40	2.50	5.10	7.60	Dead	Dead	4.00	Dead	5.12	7.60	R4
9068485	5.70	6.30	5.00	6.80	6.30	Dead	2.70	-	5.47	6.80	R4
9057088	9.50	6.40	7.40	7.30	8.60	7.00	9.00	10.00	8.15	10.00	R8
9068545	11.00	9.80	6.60	9.10	8.00	Dead	7.00	-	8.58	10.00	R1
9068543	6.00	5.00	7.20	7.00	Dead	Dead	Dead	-	6.30	7.20	R3
9068516	7.80	7.20	Dead	6.00	7.20	Dead	Dead	-	7.05	7.80	R1
9068514	7.60	6.40	7.40	6.30	Dead	7.00	6.60	-	6.88	7.60	R1
9068580	10.00	10.00	9.60	10.80	7.20	7.00	8.20		8.97	10.00	R1,2
9057146								7.20	7.20	7.20	R8
9068546	7.20	9.70	9.00	8.40	7.00	6.00	7.60	8.00	7.86	9.70	R2
434240	9.50	9.00	9.50	7.60	7.30	Dead	8.20	-	8.52	9.50	R1,3
ND-286								Dead			
9062309	8.00	Dead	7.00	7.20	6.40	7.00	Dead	-	7.12	8.00	R1
9057165	5.30	5.10	6.10	7.00	5.70	-	-	-	5.84	7.00	R4

1998

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location
9068480	8.80	6.80	10.20	7.70	7.00	Dead	Dead	6.90	7.90	10.20	R3
9057096	7.90	7.70	8.60	Dead	Dead	4.50	Dead	-	7.18	8.60	R3
9068478	4.00	6.90	5.40	7.20	Dead	Dead	5.20	-	5.74	7.20	R4
9068515	8.90	5.80	10.30	8.10	6.00	7.00	9.90	7.10	7.89	10.30	R3
9062308	7.30	4.90	6.60	8.00	Dead	Dead	5.00	Dead	6.36	8.00	R4
9068485	6.10	7.20	6.00	7.40	7.10	Dead	3.80	-	6.27	7.20	R2
9057088	10.20	7.70	8.30	8.20	9.60	8.00	7.30	11.20	8.81	11.20	R8
9068545	12.10	10.90	7.70	10.40	9.60	Dead	7.90	-	9.77	12.10	R1
9068543	7.00	6.00	8.30	8.10	Dead	Dead	Dead	-	7.35	8.30	R3
9068516	8.10	8.60	Dead	7.20	8.30	Dead	Dead	-	8.05	8.60	R2
9068514	8.80	7.30	8.10	7.40	Dead	8.10	7.40	-	7.85	8.80	R1
9068580	11.30	11.00	10.90	11.80	9.00	8.80	9.40	-	10.31	11.30	R1
9057146								8.90	8.90	8.90	R8
9068546	8.70	10.20	10.00	9.90	8.20	67.90	8.20	9.80	16.61	10.20	R2
434240	10.20	10.00	10.70	8.90	8.60	Dead	8.60	-	9.50	10.70	R3
ND-286											
9062309	8.90	Dead	8.10	8.40	7.10	8.30	Dead	-	8.16	8.90	R1
9057165	6.60	6.80	7.40	8.00	6.80	-	-	-	7.12	8.00	R4

Height measured in feet

Study 29I136J Assembly and Evaluation of Prunus Americana, Wild Plum **Table #3**

Width -

1995

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location
9068480	0.60	1.60	0.60	0.40	0.20	Dead	Dead	Dead	0.68	1.60	R2
9057096	0.70	0.30	0.20	Dead	Dead	0.20	Dead	-	0.35	0.70	R1
9068478	0.90	0.70	1.00	1.00	0.60	0.80	0.50	-	0.79	1.00	R3,4
9068515	1.00	0.30	0.80	0.60	0.40	0.60	0.40	0.20	0.54	1.00	R1
9062308	0.60	0.60	0.30	0.40	Dead	Dead	0.50	Dead	0.48	0.60	R1,2
9068485	0.30	0.30	0.50	0.30	0.20	Dead	0.10	-	0.28	0.50	R3
9057088	2.00	1.60	0.80	0.60	0.40	0.60	0.90	0.90	0.98	1.60	R2
9068545	2.30	1.50	0.80	1.00	1.00	Dead	0.40	-	1.17	2.30	R1
9068543	0.30	0.20	0.60	0.20	Dead	Dead	Dead	-	0.33	0.60	R3
9068516	1.30	0.20	Dead	0.80	0.60	Dead	Dead	-	0.73	0.60	R3
9068514	0.80	0.70	1.00	0.30	Dead	0.40	0.30	-	0.58	1.00	R3
9068580	1.80	2.00	1.10	0.80	0.40	0.50	0.40	0.40	0.93	2.00	R2
9057146								0.20		0.20	R8
9068546	1.30	1.30	1.40	0.90	0.20	0.40	0.50	0.50	0.81	1.40	R3
434240	2.50	2.50	2.00	1.40	0.60	Dead	1.00	-	1.67	2.50	R1,2
ND-286								Dead			
9062309	0.50	Dead	0.30	0.10	0.40	0.20	Dead	-		0.50	R1
9057165	0.60	0.40	0.50	0.30	0.40	-	-	-	0.44	0.60	R1

1996

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location
9068480	3.00	2.60	3.70	3.20	3.50	Dead	Dead	Dead	3.20	3.70	R3
9057096	3.80	4.00	3.40	Dead	Dead	0.60	Dead	-	2.95	4.00	R2
9068478	2.40	3.80	1.80	4.70	4.50	4.50	2.50	-	3.46	4.70	R4
9068515	3.80	2.60	4.00	4.00	4.50	3.70	3.50	2.60	3.59	4.50	R5
9062308	3.80	3.00	1.80	3.30	Dead	Dead	3.20	Dead	3.02	3.80	R1
9068485	3.00	3.20	3.40	3.60	2.30	Dead	2.00	-	2.92	3.60	R4
9057088	5.50	5.00	5.00	2.80	4.40	4.50	4.30	5.80	4.66	5.80	R8
9068545	7.00	5.00	5.20	5.80	5.00	Dead	2.60	-	5.10	7.00	R1
9068543	3.00	3.50	4.40	3.40	Dead	Dead	Dead	-	3.58	4.40	R3
9068516	3.00	3.00	Dead	3.50	3.50	Dead	1.40	-	2.88	3.50	R4,5
9068514	4.00	3.40	3.30	2.70	Dead	2.80	5.00	-	3.53	5.00	R7
9068580	5.40	6.00	4.80	5.60	3.30	3.00	4.50	4.00	4.58	6.00	R2
9057146								3.00	3.00	3.00	R8
9068546	4.20	5.00	5.00	4.80	2.60	4.40	3.40	4.00	4.18	5.00	R2,3
434240	6.40	5.00	5.20	4.80	3.70	Dead	4.90	-	5.00	6.40	R1
ND-286								Dead	-		
9062309	3.40	Dead	2.70	3.70	3.00	3.30	Dead	-	3.22	3.70	R4
9057165	3.50	2.80	4.20	3.70	2.80	-	-	-	3.40	4.20	R3

1997

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9068480	7.20	6.00	7.40	6.00	6.20	Dead	Dead	4.30	6.18	7.40	R3
9057096	7.60	8.60	7.40	Dead	Dead	3.00	Dead	-	6.65	8.60	R2
9068478	3.00	6.20	4.00	7.30	Dead	7.80	4.60	-	5.48	7.80	R6
9068515	8.30	4.00	7.20	7.50	7.80	6.70	7.40	6.80	6.96	8.30	R1
9062308	6.20	2.80	4.30	8.30	Dead	Dead	4.60	Dead	5.24	8.30	R4
9068485	5.00	6.20	5.50	7.50	6.00	Dead	3.20	-	5.57	7.50	R4
9057088	10.00	6.50	8.30	8.30	8.50	7.50	8.00	11.00	8.51	11.00	R8
9068545	12.80	9.00	9.00	9.30	9.00	Dead	3.90	-	8.83	12.80	R1
9068543	6.60	9.00	6.40	7.70	Dead	Dead	Dead	-	7.43	9.00	R2
9068516	6.80	7.00	Dead	7.40	7.50	Dead	3.60	-	6.46	7.50	R5
9068514	7.20	6.50	7.10	6.50	Dead	6.40	6.50	-	6.70	7.20	R1
9068580	12.00	10.60	10.10	11.30	7.70	6.20	8.00	8.00	9.24	12.00	R1
9057146								8.10	8.10	8.10	R8
9068546	6.00	11.00	8.00	10.00	7.60	6.20	8.00	7.70	8.06	11.00	R2
434240	10.30	7.60	10.00	7.40	7.80	Dead	8.00	-	8.52	10.30	R1
ND-286								Dead	-		
9062309	8.20	Dead	6.60	7.00	6.40	6.50	Dead	-	6.94	8.20	R1
9057165	6.20	6.40	7.10	7.30	6.00	-	-	-	6.60	7.10	R4

1998

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9068480	7.70	6.50	7.90	6.50	6.50	Dead	Dead	4.75	6.64	7.90	R3
9057096	8.00	9.10	7.90	Dead	Dead	4.00	Dead	-	7.25	9.10	R2
9068478	5.00	6.80	5.30	8.10	Dead	8.50	5.70	-	6.57	8.50	R6
9068515	9.10	5.30	8.10	8.50	8.70	7.60	8.10	7.20	7.83	8.70	R5
9062308	7.70	4.90	5.90	9.20	Dead	Dead	5.90	Dead	6.72	9.20	R4
9068485	6.10	6.90	6.50	8.30	7.10	Dead	5.70	-	6.77	8.30	R4
9057088	11.10	7.30	9.20	8.90	9.10	8.20	8.90	11.80	9.31	11.80	R8
9068545	13.20	10.10	10.00	10.80	10.00	Dead	5.30	-	9.90	13.20	R1
9068543	7.40	10.00	7.20	8.10	Dead	Dead	Dead	-	2.03	10.00	R2
9068516	7.20	8.10	Dead	8.80	8.30	Dead	5.10	-	4.44	8.80	R4
9068514	8.10	7.30	8.30	7.00	Dead	7.40	7.40	-	3.63	8.30	R3
9068580	13.00	11.90	11.00	12.60	8.60	7.90	9.50	9.40	6.00	13.10	R1
9057146								9.30	9.30	9.30	R8
9068546	7.20	12.10	9.30	11.30	8.70	7.40	9.20	8.50	5.64	11.30	R4
434240	10.90	8.30	11.20	8.70	8.90	Dead	9.10	-	4.45	11.20	R3
ND-286								Dead	Dead		
9062309	8.90	Dead	7.30	7.90	7.00	7.20	Dead	-	4.42	8.90	R1
9057165	7.10	7.20	8.30	8.30	7.40	-	-	-	3.14	8.30	R3,4

Width measured in feet.

Study 29I136J Assembly and Evaluation of *Prunus Americana*, Wild Plum **Table #4**

1995

Accssion	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location
9068480	4.00	8.00	5.00	7.00	6.00	Dead	Dead	Dead	6.00	4.00	R1
9057096	6.00	7.00	6.00	Dead	Dead	8.00	Dead	-	6.75	6.00	R1, 3
9068478	4.00	7.00	4.00	3.00	5.00	4.00	4.00	-	4.43	3.00	R3
9068515	4.00	6.00	5.00	5.00	7.00	3.00	5.00	6.00	5.13	3.00	R6
9062308	5.00	3.00	6.00	6.00	Dead	Dead	6.00	Dead	5.20	3.00	R2
9068485	7.00	7.00	8.00	7.00	5.00	Dead	8.00	-	7.00	5.00	R5
9057088	2.00	4.00	5.00	4.00	4.00	4.00	2.00	4.00	3.63	2.00	R1, 7
9068545	2.00	3.00	3.00	5.00	2.00	Dead	6.00	-	3.50	2.00	R1, 5
9068543	5.00	8.00	5.00	8.00	Dead	Dead	Dead	-	6.50	5.00	R1, 3
9068516	2.00	8.00	Dead	7.00	2.00	Dead	Dead	-	4.75	2.00	R1 ,5
9068514	4.00	7.00	7.00	8.00	Dead	4.00	5.00	-	5.83	4.00	R1, 6
9068580	5.00	3.00	5.00	3.00	5.00	5.00	5.00	5.00	4.50	3.00	R2, 4
9057146								7.00	7.00	7.00	R8
9068546	4.00	5.00	3.00	5.00	7.00	5.00	5.00	5.00	4.88	3.00	R3
434240	1.00	2.00	2.00	2.00	4.00	Dead	5.00	-	2.67	1.00	R1
ND-286								Dead	-	-	
9062309	5.00	Dead	6.00	6.00	6.00	7.00	Dead	-	6.00	5.00	R1
9057165	4.00	5.00	8.00	8.00	8.00	-	-	-	6.60	4.00	R1

1996

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location
9068480	8.00	4.00	5.00	3.00	6.00	Dead	Dead	Dead	5.20	3.00	R4
9057096	4.00	3.00	3.00	Dead	Dead	6.00	Dead	-	4.00	3.00	R2, 3
9068478	3.00	4.00	2.00	6.00	6.00	4.00	3.00	-	4.00	2.00	R3
9068515	2.00	5.00	3.00	3.00	4.00	6.00	3.00	6.00	4.00	2.00	R1
9062308	3.00	5.00	3.00	5.00	Dead	Dead	6.00	Dead	4.40	3.00	R1, 3
9068485	5.00	3.00	3.00	3.00	4.00	Dead	3.00	-	3.50	3.00	R2,3,4,7
9057088	3.00	6.00	4.00	6.00	4.00	4.00	3.00	4.00	4.25	3.00	R1, 7
9068545	5.00	4.00	3.00	5.00	4.00	Dead	7.00	-	4.67	3.00	R3
9068543	5.00	4.00	5.00	4.00	Dead	Dead	Dead	-	4.50	4.00	R2, 4
9068516	4.00	4.00	Dead	5.00	3.00	Dead	5.00	-	4.20	3.00	R5
9068514	2.00	5.00	4.00	5.00	Dead	5.00	8.00	-	4.83	2.00	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
9057146								3.00	3.00	3.00	R8
9068546	2.00	6.00	2.00	3.00	4.00	5.00	7.00	3.00	4.00	2.00	R1, 3
434240	3.00	3.00	4.00	7.00	4.00	Dead	3.00	-	4.00	3.00	R1,2, 7
ND-286								Dead	-		
9062309	3.00	Dead	5.00	3.00	4.00	4.00	Dead	-	3.80	3.00	R1, 4
9057165	5.00	4.00	5.00	5.00	6.00	-	-	-	5.00	4.00	R2

1997

Accssion	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location
9068480	4.00	5.00	8.00	5.00	6.00	Dead	3.00	6.00	5.29	4.00	R1
9057096	6.00	7.00	7.00	5.00	Dead	8.00	Dead	-	6.60	5.00	R4
9068478	8.00	6.00	7.00	7.00	Dead	5.00	6.00	-	6.50	5.00	R6
9068515	3.00	6.00	5.00	5.00	7.00	5.00	3.00	5.00	4.88	3.00	R1, 7
9062308	4.00	9.00	7.00	8.00	Dead	Dead	7.00	-	5.83	4.00	R4
9068485	6.00	6.00	6.00	7.00	5.00	Dead	6.00	-	6.00	5.00	R5
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	3.00	8.00	7.00	7.00	Dead	5.00	-	5.17	1.00	R1
9068543	6.00	7.00	5.00	5.00	Dead	Dead	Dead	-	5.75	5.00	R3,4
9068516	3.00	7.00	Dead	8.00	5.00	Dead	4.00	-	5.40	3.00	R1
9068514	6.00	8.00	5.00	Dead	6.00	8.00	3.00	-	6.00	3.00	R1
9068580	1.00	3.00	7.00	2.00	5.00	6.00	2.00	2.00	3.50	1.00	R1
9057146								5.00	5.00	5.00	R8
9068546	5.00	3.00	2.00	2.00	5.00	5.00	3.00	5.00	3.75	2.00	R3,4
434240	1.00	5.00	6.00	8.00	5.00	Dead	3.00	-	4.67	1.00	R1
ND-286								Dead			
9062309	5.00	Dead	6.00	5.00	8.00	6.00	Dead	-	6.00	5.00	R1,4
9057165	7.00	7.00	6.00	6.00	6.00	-	-	-	6.40	6.00	R4,5,6

1998

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location
9068480	4.00	6.00	7.00	4.00	6.00	Dead	3.00	6.00	5.14	4.00	R1,4
9057096	5.00	6.00	6.00	5.00	Dead	8.00	Dead	-	6.00	5.00	R1,4
9068478	8.00	6.00	7.00	6.00	Dead	4.00	6.00	-	6.17	4.00	R6
9068515	3.00	5.00	4.00	4.00	7.00	5.00	3.00	4.00	4.38	3.00	R1,7
9062308	4.00	8.00	7.00	8.00	Dead	Dead	7.00	-	6.80	4.00	R1
9068485	6.00	6.00	5.00	6.00	5.00	Dead	6.00	-	5.67	5.00	R3,5
9057088	1.00	6.00	5.00	7.00	5.00	Dead	4.00	-	4.67	1.00	R1
9068545	1.00	2.00	6.00	5.00	6.00	3.00	3.00	-	3.71	2.00	R8
9068543	6.00	6.00	5.00	5.00	Dead	Dead	Dead	-	5.50	5.00	R3,4
9068516	3.00	6.00	Dead	8.00	5.00	Dead	4.00	-	5.20	3.00	R1
9068514	6.00	8.00	5.00	Dead	6.00	7.00	2.00	-	5.67	2.00	R7
9068580	1.00	3.00	5.00	2.00	5.00	5.00	2.00	2.00	3.13	1.00	R1
9057146								5.00	5.00	5.00	R8
9068546	5.00	3.00	2.00	2.00	4.00	4.00	3.00	4.00	3.38	2.00	R3,4,8
434240	1.00	4.00	6.00	8.00	4.00	Dead	3.00	-	4.33	1.00	R1
ND-286								Dead	-		
9062309	5.00	Dead	5.00	5.00	7.00	6.00	Dead	-	5.60	5.00	R1,3,4
9057165	7.00	6.00	6.00	5.00	6.00	-	-	-	6.00	5.00	R4

Rating: 1= Excellent, 9=Poor

Study 29I136J Assembly and Evaluation of *Prunus Americana*, Wild Plum **Table #5**

Fruit Production

Accession	1997 Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location
9068480	0.00	6.00	6.00	6.00	5.00	Dead	Dead	7.00	5.00	5.00	R5
9057096	3.00	7.00	0.00	Dead	Dead	7.00	Dead	-	4.25	5.00	R1
9068478	0.00	6.00	0.00	6.00	Dead	Dead	0.00	-	2.40	6.00	R2,4
9068515	4.00	6.00	6.00	0.00	5.00	1.00	6.00	1.00	3.63	1.00	R6,8
9062308	0.00	0.00	5.00	6.00	Dead	Dead	0.00	Dead	2.20	6.00	R3
9068485	4.00	4.00	5.00	4.00	4.00	Dead	0.00	-	3.50	4.00	R1,2,4
9057088	0.00	6.00	5.00	0.00	0.00	1.00	7.00	1.00	2.50	1.00	R6,8
9068545	2.00	2.00	2.00	4.00	1.00	Dead	0.00	-	1.83	1.00	R5
9068543	5.00	5.00	0.00	5.00	Dead	Dead	Dead	-	3.75	5.00	R1,2,4
9068516	2.00	7.00	Dead	5.00	6.00	Dead	0.00	-	4.00	2.00	R1
9068514	6.00	7.00	6.00	7.00	Dead	7.00	7.00	-	6.67	6.00	R1,3
9068580	6.00	5.00	4.00	2.00	7.00	2.00	4.00	-	4.29	2.00	R4,6
9057146								8.00	8.00	8.00	R8
9068546	3.00	2.00	2.00	3.00	4.00	5.00	2.00	4.00	3.13	2.00	R2,3,7
434240	0.00	0.00	0.00	8.00	0.00	Dead	0.00	-	8.00	3.00	R4
ND-286								Dead			
9062309	4.00	Dead	5.00	4.00	6.00	4.00	Dead	-	4.60	4.00	R1,4,6
9057165	2.00	7.00	7.00	1.00	7.00	-	-	-	4.80	1.00	R4

Accession	1998 Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location
9068480	0.00	7.00	7.00	7.00	7.00	Dead	Dead	7.00	7.00	7.00	R2,3,4,5,8
9057096	2.00	7.00	0.00	Dead	Dead	Dead	Dead	-	4.50	2.00	R1
9068478	0.00	7.00	0.00	7.00	0.00	0.00	0.00	-	7.00	7.00	R2,4
9068515	5.00	7.00	0.00	7.00	1.00	6.00	1.00	7.00	4.86	1.00	R5,7
9062308	0.00	0.00	6.00	7.00	Dead	Dead	0.00	Dead	6.50	6.00	R3
9068485	4.00	5.00	5.00	3.00	4.00	Dead	0.00	-	4.20	3.00	R4
9057088	0.00	6.00	6.00	0.00	0.00	1.00	Dead	1.00	3.50	1.00	R6,8
9068545	1.00	1.00	1.00	4.00	1.00	Dead	Dead	-	1.60	1.00	R1,2,3,5
9068543	4.00	6.00	0.00	6.00	Dead	Dead	Dead	-	5.33	4.00	R1
9068516	1.00	6.00	Dead	4.00	6.00	Dead	0.00	-	4.25	1.00	R1
9068514	6.00	7.00	6.00	6.00	Dead	4.00	4.00	-	5.50	4.00	R6,7
9068580	5.00	4.00	4.00	1.00	6.00	1.00	4.00	-	3.57	1.00	R4,6
9057146								7.00	7.00	7.00	R8
9068546	3.00	1.00	1.00	3.00	4.00	4.00	1.00	Dead	2.43	1.00	R2,3,7
434240	0.00	0.00	0.00	7.00	0.00	Dead	0.00	-	7.00	7.00	R4
ND-286								Dead	Dead		
9062309	3.00	Dead	5.00	5.00	6.00	3.00	Dead	-	4.40	3.00	R1,6
9057165	1.00	6.00	7.00	1.00	6.00	-	-	-	4.20	1.00	R1,4

Rating: 1= Excellent, 9=Poor **0=No production**

Study No. 29I138G

Study Title: Residue Decomposition Trial

Study Leader: Bruckerhoff, S.B.

Introduction:

Soil erosion models being developed by ARS will be used to evaluate conservation compliance, water quality and air quality issues by NRCS and other users. Because crop residues are an important resource for reducing erosion, predictions of soil loss are directly influenced by the crop residue predictions. Effectiveness of crop residues to reduce soil erosion from both wind and water decreases as the residues lose mass and surface area with decomposition. Crop residue management maximizes the time residues reduce soil erosion by maintaining residues in a standing or surface orientation. Soil erosion predictions are therefore influenced by predictions of residue decomposition and soil cover over long simulation periods.

Residue decomposition is primarily influenced by temperature, water availability, and the chemical properties of the residue (resource quality) (Alexander, 1977). Several relationships have been developed and used to relate residue decomposition to resource quality. The resource quality components evaluated include C, N. P, cellulose, hemicellulose, and lignin along with various ratios of these components. Success of the various relationships has varied depending on plant material used to derive the relationship and subsequent application. Even though some of the equations have been successful, their applicability to a wide range of crops and crop varieties remains to be evaluated.

Problem:

The usefulness of published residue decomposition data for developing decomposition rates to be used in decomposition models is restricted because many of these studies have evaluated CO_2 evolution (microbial efficiencies are unknown) or there is limited information on the resource quality of the material used in the studies. Information on resource quality and climate data (soil temperature, soil water content, air temperature, and precipitation on a daily basis) are needed for use in model development and validation. A second limitation within the published data is the small range of crops included in most studies that generally focus on one variety of a single crop. Varieties and geographical differences in plant composition probably play important roles in residue persistence and should be considered for prediction purposes. This has especially become apparent in validation of the decomposition sub models for the Wind Erosion Prediction System (WEPS) and Revised Wind Erosion equation (RWEQ) where large differences were observed between soft wheats and hard red wheats (Schomberg, unpublished data).

Another factor in the rate of residue decomposition and prediction of soil cover is the plant parts decompose at different rates (Collins et al., 1990). Recently the Revised Universal Soil Loss Equation (RUSLE) and RWEQ model development teams have expressed the desire to predict decomposition of stems and leaves as separate components (meeting with ARS and NRCS National Program Staff at Norfolk, VA, August 1994). The desire is to more accurately reflect available residue and soil cover since decomposition rates of leaves and stems are significantly different and they contribute differently to soil cover and erosion control.

Predictions of residue loss could be improved if decomposition rates could be determined from the chemical composition of the residue (resource quality). The relationships needed to relate decomposition to resource quality could be developed by establishing a decomposition and resource quality data base for a number of crops. Resource quality has been measured by wet chemistry and Near Infrared Reflectance Spectroscopy (NIRS). NIRS offers an alternative to traditional wet chemistry for determination of resource quality (McLellan et al., 1991). Advantages include rapid analysis (four to five min per sample), low cost, no toxic chemicals, and reduced chances for operator error. NIRS has been used since 1965 for forage quality, fiber quality, and oil properties analysis (Norris and Hart, 1965; Norris et al., 1976; McLellan et al., 1991; Shenk et al., 1981; Winch and Major, 1981). Determination of resource quality components by NIRS involves measuring the reflectance of the sample over a range of wave lengths. The different chemical bonds within cellulose, lignin and other plant constituents absorb light in the near infrared region (Osborn and Fern, 1986). Spectral patterns are then correlated to known chemical compositions. A data base relating spectral patterns to specific resource quality components then can be used to determine the amounts of lignin, cellulose, N, and other chemical compounds in the sample. McLellan et al. (1991) found that the NIRS analysis of forest foliage had analytical errors significantly lower than those associated with wet chemistry, indicating that the gain in speed and accuracy would allow more detailed evaluation of resource quality effects on decomposition.

Objective:

The study is designed to develop a data base for predicting rates of residue decomposition from the NIRS properties of the residues. Development of a data base and prediction equations would eliminate measuring mass loss to determine decomposition rates, which requires six to 12 months. This would help in developing regional decomposition rates based on predominate crop varieties. As varieties change, resource quality (NIRS measurements) could be used to predict new decomposition rates from the data base. These coefficients would then be placed in the crop residue parameter list of a particular model for the geographical area. Rapid changes to the crop residue parameter list could be made as varieties changed. This would improve predictions of rates of decomposition within WEPS, WEPP, RWEQ, RUSLE and other resource models.

Overall Research Objectives

1. Determine the rate of residue decomposition for stems and leaves of wheat, oats, rye, sorghum, corn, and cotton as separate components.

2. Evaluate the range in resource quality (spectral characteristics from NIRS analysis) for the same crops.

3. Use the data from 1 to 2 to establish the best relationships for predicting the rate of decomposition from the crop residue resource quality (NIRS data).

Cooperators:

This is a national study in cooperation with NRCS, ARS, and Langston University. Several PMC's are involved and their roll of collecting stems and leaves and sending to Langston University for analysis is growing.

Discussion:

1995-1996

This is a national project involving approximately twelve PMC's, ARS, and Langston University. The Elsberry PMC was assigned to collect leaves and stems of corn the fall of 1995 and wheat the spring of 1996. The corn residue collection was made from the following varieties: Pioneer 3489, 3279, 3751, and 3394; MFA 4512, 5350, and 4514; Doebler 82 XP; and Northrup King 3808.

Much of the wheat in the area froze out the winter of 1995/1996 including the plots we planted. Plots of wheat were reestablished the fall of 1996 to provide leaves and stems for clipping the spring of 1997.

1997

The trial was assigned to Dr. Diana Stott at the National Soil Erosion Research Lab in West Lafayette Indiana. Leaves and stems of the wheat planted the fall of 1996 were collected and sent to Dr. Stott.

1998

The study was placed on hold by the State Conservationists' Advisory Committee in April 1998.

Study No. 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 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, 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 are in the same immediate area (within five feet) and appear 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. 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.

Study 29I141G - Assemble and Evaulation of Little Bluestem, *Schizachyrium scoarium,* Nichx.

Little Bluestem **Table #1**

ACCESSION	REFERENCE NUMBER	COLLECTOR	MLRA	COUNTY	STATE
9078894	MO-1	Robert S. Crowder	M115	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 Hoefer	116	Ripley	Missouri
9078900	MO-8	Grant P. Butler	N116B	Jefferson	Missouri
9078901	MO-9			Iron	Missouri
9078902	MO-10	Tommy Robins/ Jim Hoefer	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
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

ACCESSION	REFERENCE NUMBER	COLLECTOR	MLRA	COUNTY	STATE
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
9078951	MO-2	Robert J. Crowder/ George L. Pollard	109	Chariton	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
9078961	IA-27	Robert R. Bryant/ Shawn Dettman	108	Scott	Iowa
9078847	IA-1	Curt Donohue	109	Clarke	Iowa
9078848	IA-27	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

ACCESSION	REFERENCE NUMBER	COLLECTOR	MLRA	COUNTY	STATE
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. voegl	102	Lyon	Iowa
9078870	IA-24	Jay E. Ford	107	Crawford	Iowa
9078871	IA-25	Jay E. Ford	107	Crawford	Iowa
9078872	IA-26	John Vogel	102	Lyon	Iowa
9078962	IA-28		105		Minnesota
9078873	IL-1	Barbara Sheffer	95B	Kane	Illinois
9078874	IL-2	David J. Harrison/ Mark Kaiser	105	Whiteside	Illinois
9078875	IL-3	Barbara Sheffer	95B	Kane	Illinois
9078876	IL-4	Timothy Dring	115	Pike	Illinois
9078877	IL-5	Jim Ritterbusch		Stephenson	Illinois
9078878	IL-6	Jim Ritterbusch		Stephenson	Illinois
9078879	IL-7	Dennis D. Clancy	113	Jasper	Illinois
9078880	IL-8	Bob Jankowski/ Steve Hollister	110	Will	Illinois
9078881	IL-9	Barbara Sheffer	95B	Kane	Illinois
9078882	IL-10	Timothy P. Dring	108	Henderson	Illinois
9078883	IL-11	John D. Lundquist	105	Carroll	Illinois
9078884	IL-12	Bill Kleiman		Lee	Illinois
9078885	IL-13	Laura S. Dufford	105	Jo Daviess	Illinois
9078886	IL-14	David J. Harrison/ Mark Kaiser	108	Whiteside	Illinois
9078887	IL-15	Timothy P. Dring	108	Mason	Illinois
9078888	IL-16	W. Burke Davies	113	Marion	Illinois
9078889	IL-17	Michael Stanfill/ Marty Kemper	115	Monroe	Illinois
9078890	IL-18	Kenton L. Macy	114	Cumberland	Illinois
9078891	IL-19	Martha E. Sheppard	115	Calhoun	Illinois
9078892	IL-20	Michael Stanfill/ Marty Kemper	113	Washington	Illinois
9078893	IL-21	Remington T. Irwin	114	Wayne	Illinois

Study 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: Bruckerhoff, S. B.

Study Coordinator: Erickson, B.

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

Problem:

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

Objective:

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

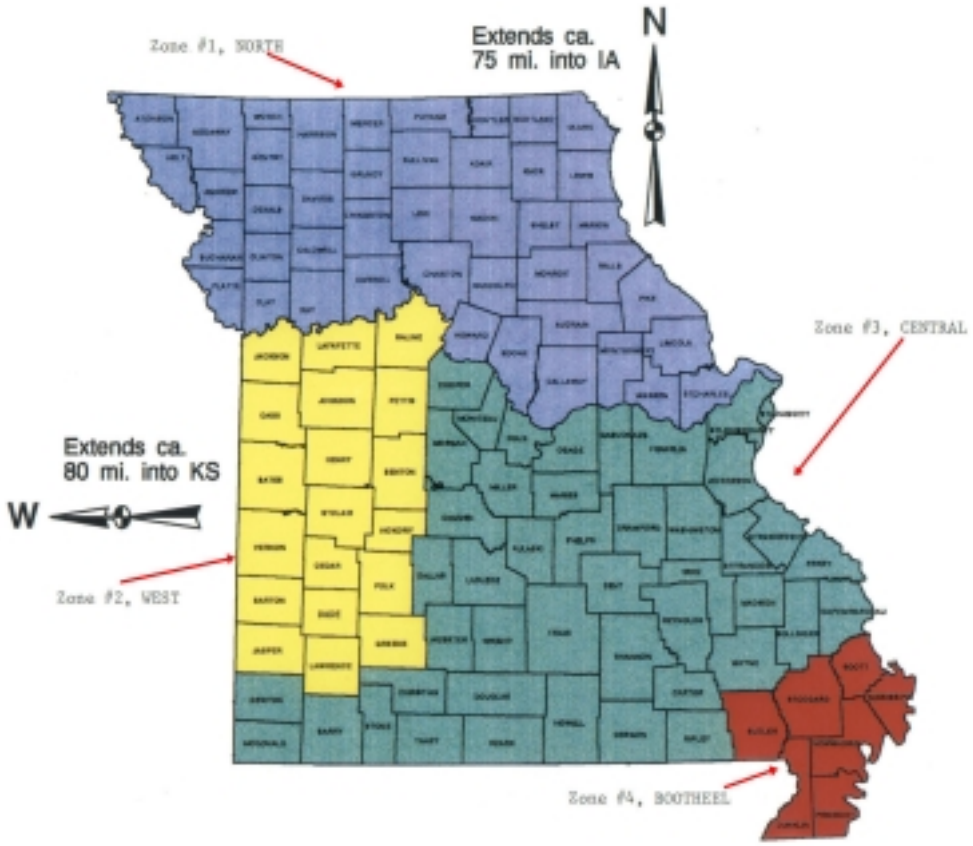
Cooperators:

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

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, Missouri Department of Conservation, University of Missouri 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. 'Source Identified' seed has not been improved by evaluation and selection or plant breeding procedures.

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 Missouri Department of Conservation (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.

A list of species to collect was developed by the cooperators and seed collection, cleaning, and some fall dormant planting started the fall of 1997. See list of species and amount of collections in Table # 2. Most species had a substantial amount of seed except for pale purple coneflower, *Echinacea pallida;* finger coreopsis, *Coreopsis palmata*; and butterfly weed, *Asclepias tuberosa*. These three species had lost the bulk of their seed by the time collections were made. Since there was a limited amount of seed, they were grown in the greenhouse for transplanting in the spring of 1998.

1998

As of January 1, 1998, blazing star was the only plot that was planted. In mid-March a second planting of blazing star was made. Five of the eight species were seeded in the greenhouse and transplanted into plots during spring and summer. They were *Echinacea pallida, Liatris pycnostachya, Asclepias tuberosa, Desmodium* spp., and *Coreopsis palmata*. Problems with the soil media containing gnat larvae caused complications as larvae fed on plant roots. *Echinacia pallida* and *Liatris pycnostachya* were damaged the most as more than 90% were lost. Many different approaches were taken to eradicate the larvae, but changing the soil mix was the only solution. Bush clover, *Lespedeza capitata,* was planted in mid April and big bluestem, *Andropogon gerardii,* and little bluestem, *Schizachyrium scoparium,* were planted in early May. A general rating of how the increase plots established can be seen in Table # 2. Weed control was a problem with most of the plots and will need to be replanted in 1999.

Goals were established for 1998 collections. Some species from 1997 were recollected and some new species were added (See Table #3).

Missouri Ecotype Collection Summary **1997** **Table # 2**

Common Name Genus/species	Accn. Number	Zone	Clean Seed (gm)	Collection Sites	1998 Plot Stand Rating
Big bluestem *Andropogon gerardii*	9079000	1	1846	24	good
Little bluestem *Schizachyrium scoparium*	9079004	1	419	15	poor
Tick trefoil *Desmodium* sp.	9079012	1	133	9	good
Bush Clover *Lespedeza capitata*	9079008	1	572	33	failed
Blazing star *Liatris pycnostachya*	9079020	1	1162	22	poor
Finger coreopsis *Coreopsis palmata*	9079028	1	32	9	fair
Butterfly Milkweed *Asclepias tuberosa*	9079016	1	111	8	fair
Pale purple coneflower *Echinacea pallida*	9079033	1	41	7	poor

Missouri Ecotype Collection 1998 Table # 3
Summary

Common Name Genus/Species	Accn Number	Zone	Clean Seed (gm)	Collection Sites
Big bluestem *Andropogon gerardii*	9079000	1	6195	29
Little bluestem *Schizachyrium scoparium*	9079004	1	2576	18
Virginia wildrye *Elymus virginicus*	9079044	1	6586	20
Indian grass *Sorgastrum nutans*	9079036 9079037	1 2	8332 5448	20 18
Tall dropseed *Sporobolus asper*	9079040	1	3109	13
Blazing star *Liatris pycnostachya*	9079020	1	1334	33
Bush Clover *Lespedeza capitata*	9079008	1	858	24
Finger coreopsis *Coreopsis palmata*	9079028	1 2	84 222	7 8
Butterfly milkweed *Asclepias tuberosa*	9079016	1	5	13
Pale purple coneflower *Echinacea pallida*	9079033 9079034	1 2	487 1062	20 16
Purple prairie clover *Dalea purpurea*	9079048 9079049	1 2	198 61.5	11 4
White prairie clover *Dalea candida*	9079052 9079053	1 2	41.5 34	5 5
Tick trefoil *Desmodium* sp.	9079012	1	66	7

STUDY: 29I143G

Study Title: Seed Coating / Seeding Rates Study

Study Leader: Bruckerhoff, S. B.

Introduction:

There is little information available comparing coated seed, versus non-coated seed, and various seeding rates of commonly used forage species used in the Midwest Region. Studies done have been short lived (one or two years) and have looked only at emergence, plants at the end of the seedling year, or plants at the end of the first year following seeding.

Evaluations will be made on emergence, stems at the end of the seeding year, stems at the end of the first through the fourth year following planting. The study will be repeated for five consecutive planting seasons to compensate for changes in yearly weather patterns.

Problem:

There is a need to compare coated seed to non-coated seed for selected legumes to determine if a significant difference exists. Disagreement of seeding rates between coated versus non-coated legume seed is quite common. The results of this study could improve on the seeding rate recommendations for legume species being tested.

Can seeding rates of selected legumes and forage grasses be reduced to one-half the current rate or increased to one and a half times the current rate and provide similar results in long term stand density. Selected grass/legume species will be monitored for the emergence date, emergence density, and stand density.

Objective:

The objectives of this study is to determine if a significant difference exists between coated versus non-coated seed of selected legume species and determine if the seeding rates of selected legume and forage grasses can be reduced or increased from current rates and provide the same results in stand density.

Location:

Selected field on the Freeman Farm at Lincoln University, Jefferson City, Missouri.

Cooperators:

The following is a listing of cooperators involved with this study: Lincoln University, Jefferson City, Missouri; Seedbiotics, CelPril, and USDA-Natural Resources Conservation Service, Plant Materials Center, Elsberry, Missouri.

Discussion:

1998

Signatures of all cooperators with the study were received by March of 1998. Seed lots were received for accessions to be planted and new seed tests were secured when necessary.

This study was seeded with a cone type plot planter for all species except eastern gamagrass, which was planted with a corn planter using soybean seedcups. Due to a planter malfunction, the legume plots were replanted in the YEAR TWO block and the warm season plots are planted partially in the YEAR ONE block and YEAR TWO block (see Table #2). Seeding dates were as follows:

Plots #1-#13 (Legume Plots) Planted	5/5/98
Plots #14-#19 (Cool Season Grass Plots)	4/23/98
Plot #20 (Untreated Eastern Gama Plot)	3/26/98
Plot #21 (Treated Eastern Gama Plot)	4/23/98
Plots #22-#23 (Warm Season Grass Plots	5/5/98

The study consists of two comparisons, coated verses non coated seed, and three different seeding rates.

The comparison of coated verses non-coated seed was done by planting equal bulk rates. For example, if a bag of seed has a test of 95% purity and 90% germination, it is 85.5% pure live seed (PLS). If an acreage is planted to 10# PLS per acre, 11.7# (10 / .855) BULK per acre is actually planted. A 50# bag of seed with this test has 95% (47.5#) seed and 5% (2.5#) other (dirt, chaff, weed seed, etc.). The 95% seed has a germination of 90% so the seed portion contains 42.75# Pure Live Seed (PLS) and 4.75# nonviable seed.

When seed is coated, the coating generally accounts for 25 to 40 percent of the weight according to the seed industry that coats seed. If the above bag of seed was coated and 30% of the total weight was coating, the composition of the coated and uncoated seed would be as follows:

	Coating	Pure Live Seed	Non-viable Seed	Other (dirt, etc.)
50# coated seed	15# (30%)	29.90# (59.8%)	3.30#	1.8#
50# uncoated seed	0#	42.75# (85.5%)	4.75#	2.5#

When coating is added to seed, the amount of pure live seed goes down and that weight is replaced by coating. This coating is comprised of compounds that are designed to aid in seed germination and seedling development. Discussion from the seed industry suggests that coated seed is equal to

or more beneficial than the loss of pure live seed. In a situation where 10# PLS is recommended, using the above test of 85.5% PLS, a bulk seeding rate of 11.7# of seed is required. To get 10# PLS of the above coated seed you would need 16.7#. The objective of this part of the study is to determine if 11.7# of the coated seed is equal to or better than 11.7# of the uncoated seed.

This study compared bulk weights of coated and uncoated seed. Using the above rates and seed tests, the comparison is as follows;

Uncoated seed 11.7# Bulk Rate containing 10# Pure Live Seed

Compared to:

Coated seed 11.7# Bulk Rate containing 7.0# Pure Live Seed and 3.5# coating

The seeding rate part of the study uses a split plot design (see Table #3) to compare different rates of all species in the study including both the coated and uncoated seed. Seeding rates were calculated as both pounds per acre and pure live seeds per square foot. Seed size and seeding rates vary considerably between species(seeTable #4). Pure live seed per square foot is not calculated for coated seed because the exact percentage of coating is not known. It is generally about one third. Measurements of emergence density and cover density were done on a row foot basis rather than square foot because the plots were seeded in rows rather than broadcast. Seeding rates can be converted from pure live seed per square foot (100 sq. ft. per plot) to row foot (140 row foot per plot) by using a conversion factor of .714 to determine how many seeds it took in correlation to the emergence and cover density evaluations .

Weed control on the plots became somewhat of a problem by mid season due to wet weather. The ladino seed had an incorrect test so both coated and uncoated plots only had about a third of the intended rate but the ratios stayed the same.

The data from the legume plots indicate most of the coated plots were about the same or slightly better than the uncoated at the lower (.5 full rate) and full seeding rates. The higher seeding rate(1.5 X full rate) had about the same or slightly lower emergence density. It also varied between species. Treated seed of the eastern gamagrass showed a considerable increase over untreated seed.

Differences in the seeding rates were also quite evident in the data but not always as much as expected. The 1.5 seeding rate was not always better than the half rate. This indicates the amount of seed may not be the problem of a weak stand.

No conclusions can be made from a single year's data so this data will not be analyzed statistically until after the second year and then each year after.

Study 29I143G - Seed Coat/Seeding Rates Study **Table # 1**

List of Species Evaluated

Genus	Species	Common Name	Standard Full Seeding Rate MOFOTG March 1997
Medicago	sativa	Alfalfa	9.4# PLS/Ac
Trifolium	pratense	Red clover	7.6# PLS/Ac
Lotus	corniculatus	Birdsfoot trefoil	6.2# PLS/Ac
Lespedeza		Lespedeza (annual)	9.5# PLS/Ac
Trifolium	repens	Ladino clover	3.7# PLS/Ac
Festuca	arundinacea	Tall fescue	12.0# PLS/Ac
Dactylus	glomerata	Orchardgrass	5.2# PLS/Ac
Bromus	inermus	Smooth bromegrass	10.0# PLS/Ac
Phyleum	pratense	Timothy	3.9# PLS/Ac
Elymus	canadensis	Canada wildrye	10.0# PLS/Ac
Tripsacum	dactyloides	Eastern gamagrass	10.0# PLS/Ac
Panicum	virgatum	Switchgrass	5.9# PLS/Ac
Bothriochloa	ischaemun	Caucasian bluestem	3.1# PLS/Ac

STUDY 29I143G **PLOT LAYOUT** **PLOT SIZE 15' X 20' Table #2**

SUB-PLOT SIZE 5' X 20'

----- county road ------

30' 445'

30'	REP 1 LEGUMES	20'	COOL S. G	20'	WARM S. G	30'
	20'					
	REP 2 LEGUMES		COOL S. G		WARM S. G	
200'	20' YEAR **ONE**					
	REP 3 LEGUMES		COOL S. G		WARM S. G	
	20'					
	REP 4 LEGUMES		COOL S. G		WARM S. G	
	30'					
	REP 1 LEGUMES		COOL S. G		WARM S. G	
	20'					
	REP 2 LEGUMES		COOL S. G		WARM S. G	
170'	20' YEAR **TWO**					
	REP 3 LEGUMES		COOL S. G		WARM S. G	
	20'					
	REP 4 LEGUMES		COOL S. G		WARM S. G	
880'	30'					
North	REP 1 LEGUMES		COOL S. G		WARM S. G	South
	20'					
	REP 2 LEGUMES		COOL S. G		WARM S. G	
170'	20' YEAR **THREE**					
	REP 3 LEGUMES		COOL S. G		WARM S. G	
	20'					
	REP 4 LEGUMES		COOL S. G		WARM S. G	
	30'					
	REP 1 LEGUMES		COOL S. G		WARM S. G	
	20'					
	REP 2 LEGUMES		COOL S. G		WARM S. G	
170'	20' YEAR **FOUR**					
	REP 3 LEGUMES		COOL S. G		WARM S. G	
	20'					
	REP 4 LEGUMES		COOL S.G		WARM S. G	
	30'					
	REP 1 LEGUMES		COOL S. G		WARM S. G	
	20'					
	REP 2 LEGUMES		COOL S. G		WARM S. G	
170'	20' YEAR **FIVE**					
	REP 3 LEGUMES		COOL S. G		WARM S. G	
	20'					
	REP 4 LEGUMES		COOL S.G		WARM S. G	

30'

* S.G. = SEASON GRASSES

STUDY 29I143G - SEED COAT/SEEDING RATES STUDY **Table #3**

COOL SEASON GRASSES **WARM SEASON GRASSES**

Y E A R # 1

R E P # 1

P #	16			18			14			17			15			19			23			21			22			20		
S #	2	1	3	2	1	3	1	2	3	2	3	1	3	2	1	3	1	2	3	1	2	3	2	1	1	3	2	3	1	2

R E P # 2

P #	16			18			17			14			19			15			21			20			23			22		
S #	3	2	1	1	2	3	3	1	2	1	2	3	3	1	2	3	2	1	3	1	2	3	2	1	3	2	1	2	3	1

R E P # 3

P #	16			19			17			18			14			15			20			22			21			23		
S #	2	1	3	3	1	2	2	3	1	1	2	3	2	1	3	2	1	3	2	3	1	1	3	2	2	1	3	3	2	1

R E P # 4

P #	19			15			17			18			16			14			20			22			21			23		
S #	3	2	1	2	1	3	2	1	3	3	1	2	3	1	2	1	3	2	2	3	1	1	2	3	2	1	3	3	2	1

P # is Plot Number
S # is SubPlot Number

Plot Size = 5' x 20'
Subplot Size = 15' x 20'

STUDY 29I143G - SEED COAT/SEEDING RATES STUDY **Table # 3 - cont.**

LEGUMES

Y E A R # 1

R E P # 1

P#	4	10	7	1	11	2	9	5	13	8	3	12	6
S#	2 3 1	2 1 3	2 1 3	2 1 3	3 1 2	3 2 1	2 1 3	1 3 2	1 3 2	2 1 3	3 2 1	2 1 3	3 2 1

R E P # 2

P#	2	7	13	8	4	1	11	3	6	12	5	9	10
S#	1 3 2	3 2 1	1 3 2	1 2 3	3 1 2	1 2 3	2 1 3	2 1 3	1 2 3	3 2 1	2 1 3	3 2 1	3 1 2

R E P # 3

P#	9	12	8	3	10	2	13	7	4	11	5	1	6
S#	1 3 2	2 1 3	3 1 2	3 1 2	1 2 3	3 2 1	3 2 1	3 2 1	1 2 3	1 3 2	1 3 2	1 2 3	2 1 3

R E P # 4

P#	1	10	9	2	13	6	7	11	8	4	5	12	3
S#	1 3 2	3 1 2	1 2 3	3 2 1	2 1 3	1 2 3	3 2 1	1 2 3	1 2 3	1 3 2	3 1 2	1 3 2	1 3 2

P# is Plot Number
S# is SubPlot Number

Plot Size = 5' x 20'
Subplot Size = 15' x 20'

Study 29I143G - Seed Coat/Seeding Rates Study **Table #4**

Plot Number	Sub Plot Number	Forage - Seeds per LB - full seeding rate \4	Sub Plot Seeding Rates	PLS/square foot
1	1	Alfalfa 200,000 seeds/lb	.5 rate	21.6 PLS / Square foot
"	2	Alfalfa 9.4# / ac	1.0 rate	43.2 PLS / Square foot
"	3	Alfalfa	1.5 rate	64.8 PLS / Square foot
2	1	Alfalfa (Cel-coated) \1	.5 rate	\3
"	2	Alfalfa (Cel-coated)	1.0 rate	\3
"	3	Alfalfa (Cel-coated)	1.5 rate	\3
3	1	Alfalfa (S.B.-coated) \2	.5 rate	\3
"	2	Alfalfa (S.B.-coated)	1.0 rate	\3
"	3	Alfalfa (S.B.-coated)	1.5 rate	\3
4	1	Red clover 275,000 seeds/lb	.5 rate	24.0 PLS / Square foot
"	2	Red clover 7.6# / ac	1.0 rate	48.0 PLS / Square foot
"	3	Red clover	1.5 rate	72.0 PLS / Square foot
5	1	Red clover (Cel-coated)	.5 rate	\3
"	2	Red clover (Cel-coated)	1.0 rate	\3
"	3	Red clover (Cel-coated)	1.5 rate	\3
6	1	Red clover (S.B.-coated)	.5 rate	\3
"	2	Red clover (S.B.-coated)	1.0 rate	\3
"	3	Red clover (S.B.-coated)	1.5 rate	\3
7	1	Birdsfoot trefoil 375,000 seeds/lb	.5 rate	26.7 PLS / Square foot
"	2	Birdsfoot trefoil 6.2# / ac	1.0 rate	53.4 PLS / Square foot
"	3	Birdsfoot trefoil	1.5 rate	80.1 PLS / Square foot
8	1	Birdsfoot trefoil (Cel-coated)	.5 rate	\3
"	2	Birdsfoot trefoil (Cel-coated)	1.0 rate	\3
"	3	Birdsfoot trefoil (Cel-coated)	1.5 rate	\3
9	1	Birdsfoot trefoil (S.B.-coated)	.5 rate	\3
"	2	Birdsfoot trefoil (S.B.-coated)	1.0 rate	\3
"	3	Birdsfoot trefoil (S.B.-coated)	1.5 rate	\3
10	1	Ladino clover 871,650 seeds/lb	.5 rate	37.0 PLS / Square foot
"	2	Ladino clover 3.7# PLS/Ac	1.0 rate	74.0 PLS / Square foot
"	3	Ladino clover	1.5 rate	111.1 PLS /Square foot
11	1	Ladino clover (Cel-coated)	.5 rate	\3
"	2	Ladino clover (Cel-coated)	1.0 rate	\3
"	3	Ladino clover (Cel-coated)	1.5 rate	\3

\1 CelPril coated
\2 Seed Biotics coated
\3 See explanation in Discussion section, 1998
\4 rates addording to NRCS MOFOTG March 1997

Plot Number	Sub Plot Number	Forage - Seeds per LB - Full Seeding Rate	Sub Plot Seeding Rates	PLS/square foot
12	1	Ladino clover (S.B.-coated)	.5 rate	\3
"	2	Ladino clover (S.B.-coated)	1.0 rate	\3
"	3	Ladino Clover (S.B.-coated)	1.5 rate	\3
13	1	Lespedeza (annual)	.5 rate	22.6 PLS / Square foot
"	2	Lespedeza (annual) 9.5# PLS / Ac	1.0 rate	45.3 PLS / Square foot
"	3	Lespedeza (annual)	1.5 rate	67.9 PLS / Square foot
14	1	Tall fescue (end. inf.) 227,000 seeds/lb	.5 rate	31.3 PLS / Square foot
"	2	Tall fescue (end. inf) 12.0# PLS / Ac	1.0 rate	62.5 PLS / Square foot
"	3	Tall fescue (endophyte infested)	1.5 rate	93.8 PLS / Square foot
15	1	Tall fescue (endophyte free)	.5 rate	31.3 PLS / Square foot
"	2	Tall fescue (endophyte free)	1.0 rate	62.5 PLS / Square foot
"	3	Tall fescue (endophyte free)	1.5 rate	93.8 PLS / Square foot
16	1	Orchardgrass 654,000 seeds/lb	.5 rate	39.0 PLS / Square foot
"	2	Orchardgrass 5.2# PLS / Ac	1.0 rate	78.1 PLS / Square foot
"	3	Orchardgrass	1.5 rate	117.1 PLS /Square foot
17	1	Smooth bromegrass 136,000 seeds/lb	.5 rate	15.6 PLS / Square foot
"	2	Smooth bromegrass 10.0# PLS / Ac	1.0 rate	31.2 PLS / Square foot
"	3	Smooth bromegrass	1.5 rate	46.8 PLS / Square foot
18	1	Timothy 1,300,000 seeds/lb	.5 rate	58.2 PLS / Square foot
"	2	Timothy 3.9# PLS / Ac	1.0 rate	116.4 PLS /Square foot
"	3	Timothy	1.5 rate	174.6 PLS /Square foot
19	1	Canada wildrye 115,000 seeds/lb	.5 rate	13.2 PLS / Square foot
"	2	Canada wildrye 10.0# PLS / Ac	1.0 rate	26.4 PLS / Square foot
"	3	Canada wildrye	1.5 rate	39.6 PLS / Square foot
20	1	Eastern gamagrass (n. tr) 7,500 seeds/lb	.5 rate	0.9 PLS / Square foot
"	2	Eastern gamagrass (n. tr) 10.0# PLS / Ac	1.0 rate	1.7 PLS / Square foot
"	3	Eastern gamagrass (nontreated)	1.5 rate	2.6 PLS / Square foot
21	1	Eastern gamagrass (treated)	.5 rate	0.9 PLS / Square foot
"	2	Eastern gamagrass (treated)	1.0 rate	1.7 PLS / Square foot
"	3	Eastern gamagrass (treated)	1.5 rate	2.6 PLS / Square foot
22	1	Switchgrass 389,000 seeds/lb	.5 rate	26.3 PLS / Square foot
"	2	Switchgrass 5.9# PLS / Ac	1.0 rate	52.7 PLS / Square foot
"	3	Switchgrass	1.5 rate	79.0 PLS / Square foot
23	1	Caucasian bluestem	.5 rate	38.1 PLS / Square foot
"	2	Caucasian bluestem 3.1# PLS / Ac	1.0 rate	76.3 PLS / Square foot
"	3	Caucasian bluestem	1.5 rate	114.4 PLS / Square foot

\1 CelPril coated
\2 Seed Biotics coated
\3 See explanation in Discussion section, 1998
\4 rates addording to NRCS MOFOTG March 1997

Study: 29A088W

Study Title: Cooperative Screening Study of Native Sources of Eastern Cottonwood and Introduced Hybrid Poplar.

Study Leader: Henry, J.

Introduction:

Adapted and recommended sources of eastern cottonwood (*Populus deltoides* Bartr.) and hybrid poplar are presently not available for distribution to landowners within the state of Missouri. Attempts have been made at identifying superior trees; however, the rather limited research has produced little in the way of results. With the increasing demand from the fine papers industry for cottonwood, especially in the Bootheel, and for biomass production and erosion control in other parts of the state, an extensive study is needed to (1) establish geographic zones for species within the state; and (2) identify both native sources of cottonwood and sources of hybrid poplar suitable for release within each zone. The proposed screening study at the NRCS Plant Materials Center in Elsberry, Missouri is just part of a statewide network of screening studies currently being established by the Missouri Department of Conservation in an attempt to meet the objectives listed below.

Problem:

A genuine need has developed to search out superior trees of *Populus deltoides* for use within the state of Missouri for biomass production and erosion control in certain parts of the state.

Objectives of the Elsberry Test:

To evaluate the performance (i.e. growth rate, and pest resistance) of selected sources of native cottonwood and introduced hybrid poplar.

To obtain a research block of *Populus* sources for cultural, weed, and pest control research.

To provide materials for teaching and other educational purposes, such as demonstrations during field days that might be put on by the Plant Materials Center.

Release a superior selection(s) exhibiting fast growth, disease and insect resistance and adaptation.

Discussion:

1982 - 1994

This study is a cooperative effort between the Natural Resources Conservation Service (NRCS) and the Missouri Department of Conservation (MDC) Forestry Division. MDC is responsible for evaluation of the trees' performance with assistance from the PMC staff. Sixty-three accessions of cottonwood were planted in April 1982. Forty-two accessions came from MDC, 15 came from the U. S. Forest Service and six came from the NRCS. Three of the NRCS accessions failed due to the poor condition of the planting stock. In 1984 another planting was made including eight accessions from the 1982 planting which did poorly. Evaluations of this planting were made after the first three growing seasons, fifth year, and continued every fourth year thereafter until the study was terminated. The final evaluation and selections were made in August of 1995. In March of 1994 the entire planting of cottonwood was cut down to a stubble height ranging from 8-10 inches. This process would allow regrowth evaluation to be accomplished. As a result of previous years' evaluations and regrowth evaluations the following is a listing of selections made from this study.

Table #1

MDC Accession Number	**USFS Accesion Number**	Nearest Town	County	State	Sex
0404042		Ashburn	Pike	Missouri	
0402059	34	Chamois	Osage	Missouri	
0403059		Chamois	Osage	Missouri	
0403111		Charleston	Mississippi	Missouri	
0401112		New Madrid	Pemiscot	Missouri	
0401114		Hutchinson Plantation	Pemiscot	Missouri	
0406114		Netherlands	Pemiscot	Missouri	
	17	Golconda	Pope	Illinois	F
	20	Grand Chain	Pulaski	Illionis	F
	23	Grand Chain	Pulaski	Illinois	M
	25	McClure	Alexander	Illinois	M
	26	Golconda	Pope	Illinois	

1996 - 1998

The above cuttings were taken and sent to the Missouri State Nursery (MSN) for propagation and later sharing with the Elsberry Plant Materials Center. In April of 1998 the MSN sent ten cuttings each of the selected accessions of cottonwood. This material was planted in Field #7 on the PMC. Selected Class releases from this material may be released for riparian situations and for designing water quality filter strips.

Study Nos. 29A111G Field Evaluation of Selected Perennial Grasses for Pasture,
29A118G Wildlife Habitat, and Erosion Control. (Warm Season Grass
29A127G Variety Trials located at Mt. Vernon, Missouri, Perry, Illinois, and Cedar Falls, Iowa)

Study Leader: Bruckerhoff, S. B.

Introduction:

Forage plants for increased pasture production during the summer has been an issue throughout the three-state service area of Iowa, Illinois, and Missouri. Warm season grasses are known to provide good forage production during hot and dry summer months when cool season species grow less vigorously. There are several varieties available on the market but most available information on pasture and hay species pertains to the predominantly used cool season species.

Problem:

Information is limited in proper selection of species and varieties of warm season grasses for pasture and hay production. Depending on origin and area of adaptation, varieties perform differently depending on where they are planted. Many of the available warm season varieties come from western or southern states where warm season prairie species are used more than in the Midwest.

Objectives:

To establish and evaluate varieties and species of warm season grasses and to determine their performance and area of adaptation.

Cooperators:

The USDA Natural Resources Conservation Service, Plant Materials Center, Elsberry, Missouri; in cooperation with the University of Missouri, Southwest Research Center, Mt. Vernon, Missouri; the Orr Agricultural Research Center, Perry, Illinois; the West Central Illinois Agriculture Research and Demonstration Center, Pittsfield Illinois; and the University of Northern Iowa, Cedar Falls, Iowa.

Procedure:

Three sites were located within the PMC service area for the variety study. The northern site is at Cedar Falls, Iowa (Northeast Iowa), the central site is at Perry, Illinois (West Central Illinois) and the southern site is at Mt. Vernon, Missouri (Southwest Missouri).

Varieties of the most commonly used warm season grasses (See Table #1) were planted in a randomized complete block with three replications. Plot sizes were 15’ X 50’ at the Illinois site where the plots were broadcast and 12’ X 50’ at the other locations where the plots were seeded

with a plot planting drill. Each site had an array that was not randomized and put each species together in side by side plots. Each species had plot numbers arranged in order by origin, lowest plot number of each species is the northern most origin and the highest plot numbers the most southern. If the origin was not known at the time the study was organized, it was put after the most southern.

The second year after seeding, each site was subjected to a spring burn.

Each plot was monitored for establishment the year of planting but was not evaluated until the second year. Evaluation criteria are dry matter yield, plant height, forage quality, percent stand, and plant phenology, which compared plant maturity.

The data collected for dry matter production was done only once per year, typically at the end of the growing season. This did not take into account regrowth potential but rather a full season total growth comparison.

Since plots were sometimes weedy and not complete stands, areas that represented a stand were sampled rather than a completely random sample that could represent mostly weeds. An estimate of nonplanted species (primarily weeds) in each sample was also taken and used to adjust the dry matter yields to better represent the species being evaluated.

Precipitation data for each site can be found in Table #2.

Discussion:

The overall intent of this varietal study is to compare different varieties and species of warm season grasses. The study took place at three locations within the PMC's three-state service area of Missouri, Iowa, and Illinois. Cedar Falls, Iowa represents the Northern Region; Perry, Illinois represents the Central Region; and Mt. Vernon, Missouri, represents the Southern Region. The data is organized according to the three-year average of dry matter production in pounds per acre. Species and variety selection should not be based on this alone but rather on several factors relating to the intended use.

1. Dry Matter Production

The intent was to compare the yield of each species. The method used in acquiring dry matter production in this study was not totally randomized. Plot stands were often incomplete and quite weedy. To take samples in a completely random fashion would take into account plot establishment and weed competition and the intent was to try to only compare the planted species. A two-foot by seven-foot sample that represented a good stand was harvested from each plot. Plot borders were excluded and an estimate of percent dry matter weed content in the sample was deducted from the total sample weight. The intent was to compare the yield of each species.

1a. Big Bluestem

As shown in Table #1, the varieties of big bluestem were from northern and central states. On average, the yields were better at the northern and central locations than they were at the southern locations. Varieties of northern origin, when taken too far south can be too early maturing or can become diseased from higher precipitation and humid climate. Southern origin varieties, when taken too far north can have problems with too short a growing season for adequate production, reduced or no seed production, or winter kill.

Rountree, Pawnee and Champ did the best at the north and central locations. Kaw and Rountree did the best at the southern location.

PI483446 is an experimental composite that was in advanced evaluation at the Manhattan, Kansas PMC but was determined to be too similar to Kaw to justify release at the time.

1b. Switchgrass

Switchgrass is a species with a broad range of adaptation. Alamo and Kanlow were the two highest yielding varieties for dry matter yield except Alamo yields decline at the northern location. At the northern location Blackwell and Shelter followed Kanlow. Carthage is a variety of eastern origins but is not on the commercial market at this time. It looked very good at all three locations and stays green longer in the fall. Cave-In-Rock and Pathfinder looked good at all their locations.

1c. Indiangrass

Rumsey did the best in its state of origin (Illinois) at the central location and also performed well at the southern location. It was only average at the northern location where it did not establish well and plots were spotty.

Osage was slightly better than Rumsey at the southern location and was good at the central location but only average at the northern location.

Cheyenne and Llano did the best at the northern location, which seems odd because they were both farther from their origins than other varieties. Oto still appeared to be the best adapted at the northern location with the highest percent stand in the plots.

1d. Sideoats Grama:

Sideoats grama did not compete well on its own in the plots before weed competition and thinning depleted the stands. The southern location was the only place yield clippings were able to be taken.

Trailway and Haskell yielded the most and maintained a stand into the fourth year. El Reno and Niner yielded less but also maintained into the fourth year. By the fifth year all plots became weedy and no yield data was taken.

1e. Little Bluestem

At the southern location, stands established slowly and steadily got better. Cimmaron did the best at this site. Aldous did the best at the central location and the other varieties declined significantly. At the northern location both Cimmaron and Aldous did well. Cimmaron averaged the highest yield but is declining quicker than Aldous.

1f. Eastern Gamagrass

Only the Pete variety was planted at each of the three locations. It was planted after the other plots at the central and southern locations. At all locations the plantings were done at too shallow seeding depth. These stands were thin and slow to establish but did increase each year..

The yield was surprisingly good at the northern location. Eastern gamagrass is uncommon in Northern Iowa.

The central location had a very dry May and June during which the treated seed was planted at a seeding depth that was too shallow. These stands did improve each year but were weedy and no yield data was taken.

Yields were less at the southern location and were expected to be higher. This is due in part to data being taken the second, third, and fourth year after planting at the southern location and third, fourth and fifth year at the northern location.

1g. Bermudagrass

Two accessions of common bermudagrass were planted at the central and southern locations (hulled and not hulled). The plots survived at the central location but were weak, weedy and not very productive. They were replaced after two years with the eastern gamagrass plots. They did persist well at the southern location.

1h. Caucasian and other Old World Bluestems

These species were planted in 1992 at the southern location only and established quickly. KG-40 caucasian bluestem and T-587 were the highest yielding, the latest maturing, and established quickly.

2. Seedhead Emergence

Early or late maturity is often an important criteria for selecting the most desirable variety. Plants generally maintain forage quality until they start making seed and their emphasis goes from forage

production to seed production. When seedheads start to emerge, forage quality generally starts to decline. In selecting for summer pasture, later maturity is usually best.

2a. Big Bluestem

Kaw and PI483446 are the latest maturing varieties at all three locations. They are about three weeks later than Rountree and Pawnee at the southern location. At the central location Champ is only a week to ten days earlier and Rountree about four weeks earlier than Kaw and PI483446. At the northern location, Rountree, Champ, Kaw, Pawnee and PI483446 are all within a week.

2b. Switchgrass

Alamo and Kanlow are the latest maturing varieties at each location, except Carthage is later than Alamo at the central location. Pathfinder, Cave-In-Rock and Blackwell are all within about a week at all locations.

2c. Indiangrass

Indiangrass is the overall average latest maturing of the tall warm season species tested. Lometa is by far the latest maturing which is understandable because it came from the farthest south but it was not very well adapted to the southern location and not adapted at all to the other two locations. Osage, Rumsey and Cheyenne are the latest maturing, adapted varieties, at all three locations.

2d. Sideoats Grama

Haskel and El Reno are the latest maturing varieties at the southern and central locations. No data was taken at the northern location.

2e. Little Bluestem

Aldous and Cimmaron were the latest maturing varieties at all locations with the exception of Pastura at the northern location. Pastura was very sparse at the northern location and sent up very few seed heads.

2f. Eastern Gamagrass

Eastern gamagrass is the earliest of the tall warm season grasses tested to set seed.

2g. Caucasian and other Old World Bluestems

KG-40 caucasian bluestem is the latest to set seed of the old world bluestems tested but all are earlier than the natives except for eastern gamagrass.

3. Percent Stand

Percent stand is an indication of how quickly the variety/selection established and how well it maintained itself. Warm season species generally establish slower than cool season species. A warm season planting should be useable the second growing season and be in full production by the third.

3a. Big Bluestem

Kaw, Pawnee, and PI483446 had the best stands the third growing season in the southern location. All increased over time. All varieties had adequate stands by the third growing season at the central and northern locations.

3b. Switchgrass

Switchgrass is the most widely adapted species tested. Almost all varieties established quickly at all three locations.

3c. Indiangrass

Indiangrass did not establish as quickly as the switchgrass and big bluestem, especially at the southern and northern locations.

3d. SideoatsGrama

Sideoats grama only did well at the southern location. All varieties established well but by the fourth year only Trailway, El Reno, Niner and Haskel maintained much of a stand. Most varieties established well at the central location but by the fifth year there was very little remaining. At the northern location; establishment of all varieties was very poor and not known why. It did not seem to matter whether it was a northern, southern or western origin. May and June of 1992 were both very dry at the northern location and hurt all varieties.

3e. Little Bluestem

Establishment of all little bluestem was also slower and less consistant than big bluestem and switchgrass. Cimmaron did the best at the southern location. Aldous did the best at the central location. Cimmaron and Aldous both did well at the northern location. Cimmaron decreased quickly at the central location and is not known why.

3d. Bermudagrass

Bermudagrass did well at the southern location, poorly at the central location, and was not planted at the northern location.

3e. Eastern Gamagrass

Eastern gamagrass started slowly at all three locations but was doing very good by the second or third year.

3f. Caucasian and other Old World Bluestems

These varieties were only planted at the southern location. All established quickly the first year. Only T-587 declined significantly.

4. Forage Height

Forage height was taken and generally correlates to dry matter production. Taller varieties like 'Kaw', 'Rountree' and PI483446 big bluestem, and 'Rumsey' indiangrasss are more susceptible to lodging, especially on areas not grazed, mowed, or used for seed production. 'Kanlow' and 'Alamo' switchgrass are tall but resistant to lodging.

5. Forage Quality

The accuracy of forage quality analysis for warm season grass species is often questioned. Quality analysis and standards (Table #6) were set up using legumes and cool season grasses. Whether or not these correlations work equally as well for warm season grasses are questionable. Cattle seem to do as well on warm season species as on cool season species, but forage quality tests are generally lower. Forage analysis from this study should be used to compare varieties and species within this study and not to compare between species outside the study. Table #6 may not accurately correlate to these forage quality analyses. Samples were taken at the central location and at the southern location. At the central location they were all taken on the same day which should benefit the later maturing varieties. At the southern location they were taken just prior to seedhead emergence. This could benefit the early maturing varieties since these samples were taken so much earlier in the summer. Only compare analysis when taken on the same day.

5a. Big Bluestem

The central location did not have a big difference in forage quality. The best forage yielding varieties also had the best quality. At the southern location, there was very little difference in varieties that were tested on the same day but big differences when tested on different days.

5b. Switchgrass

Switchgrass analysis at the central location was similar to big bluestem, not a big range. At the southern location, all the tests were low for switchgrass.

5c. Indiangrass

Indiangrass analyses all tested about the same but were lower than expected.

5d. Sideoats Grama

Due to poor stands, no analyses were taken at the central location. The southern location samples were taken at different times according to phenological maturity and were only compared when taken on the same day.

5e. Little Bluestem

Pastura tested the highest at both locations, but was the lowest producer. The others were similar at both locations.

Caucasian and other Old World Bluestems

The forage quality for T-587 was considerably higher than for WW Spar. The others were about the same.

Summary of Results

	Latest Maturity \1	Dry Matter Yield \2	Percent Stand \3	Forage Quality \4
Big Bluestem				
North Location				
Best Variety/s	PI483466 Pawnee Kaw Rountree	Rountree Pawnee	Niagra Bison Rountree	
Good Variety/s	Champ	Champ PI483446 Kaw	Pawnee Bonilla PI483446	
Central Location				
Best Variety/s	PI483466 Kaw	Champ PI483466	PI483446 Rountree	Champ PI483446 Rountree
Good Variety/s	Pawnee Champ	Rountree Pawnee Kaw	Pawnee Kaw Champ	Bonilla Kaw
South Location				
Best Variety/s	Kaw PI483466	Kaw Rountree	Kaw Pawnee	
Good Variety/s	Pawnee Rountree	Pawnee PI483446	PI483446	

\1 Plant maturity was rated by when each variety first started to set seed. The majority of the plants in the plot were in late boot stage at this time. Later maturing varieties recieved the best ratings. See evaluation tables for average dates.

\2 Dry matter yields were calculated in pounds per acre (see evaluation tables) and similar yields were grouped together in this chart.

\3 Percent stand is an indication of quickness of establishment and stand persistance. See evaluation tables for actual values.

\4 Forage quality was tested for crude protien, adf, and ndf. See discussion section for further explaination and evaluation tables for values.

Summary of Results

Switchgrass

	Latest Maturity \1	Dry Matter Yield \2	Percent Stand \3	Forage Quality \4
North Location				
Best Variety/s	Kanlow Alamo Carthage	Kanlow Blackwell Shelter	Kanlow Alamo Cave-In-Rock	
Good Variety/s	Blackwell Pathfinder	Carthage Alamo	Shelter Carthage	
Central Location				
Best Variety/s	Kanlow Carthage Alamo	Kanlow Alamo Blackwell	Kanlow Cave-In-Rock Pathfinder	Shelter Alamo Cave-In-Rock Forrestburg Kanlow
Good Variety/s	Blackwell Cave-In-Rock Trailblazer	Cave-In-Rock Carthage Pathfinder	Nebraska-28 Blackwell Carthage	Pathfinder Nebraska-28 Trailblazer
South Location				
Best Variety/s	Alamo Kanlow Carthage	Alamo Kanlow Carthage	Nebraska-28 Kanlow Carthage Pathfinder Trailblazer Alamo	
Good Variety/s	Pathfinder Trailblazer Blackwell Cave-In-Rock	Pathfinder Cave-In-Rock Blackwell	Cave-In-Rock Blackwell	

Summary of Results

	Latest Maturity \1	Dry Matter Yield \2	Percent Stand \3	Forage Quality \4
Indiangrass				
North Location				
Best Variety/s	Cheyenne Rumsey	Cheyenne Llano Oto Rumsey	Oto	
Good Variety/s	Osage Llano Oto	Osage	Llano	
Central Location				
Best Variety/s	Rumsey Cheyenne Osage	Rumsey	Rumsey	Llano Osage Cheyenne Oto
Good Variety/s	Llano Oto	Osage Cheyenne Oto Llano	Oto Osage	Rumsey Tomahawk
South Location				
Best Variety/s	Lometa Rumsey Osage	Osage Rumsey	Osage Cheyenne	
Good Variety/s	Cheyenne Oto	Oto Lometa Cheyenne	Rumsey Oto	

Summary of Results

	Latest Maturity \1	Dry Matter Yield \2	Percent Stand \3	Forage Quality \4
Little Bluestem				
North Location				
Best Variety/s	Aldous	Cimmaron	Aldous	
Good Variety/s	Cimmaron Camper	Aldous Camper	Cimmaron	Pastura Aldous
Central Location				
Best Variety/s	Aldous Cimmaron	Cimmaron	Aldous	
Good Variety/s	Camper	Camper Cimmaron	Camper Cimmaron	Camper Cimmaron
South Location				
Best Variety/s	Aldous	Cimmaron	Cimmaron	
Good Variety/s	Cimmaron Camper	Aldous Camper	Camper Aldous	
Caucasian and other old world bluestems				
South location				
Best Variety/s	KG-40	KG-40 T-587	KG-40 WW-Spar	T-587
Good Variety/s	Ironmaster	Plains	Plains	

Study 29A127G - Warm Season Grass Varietal Study **Table #1**

Plot Number	Variety/Accession	Genus/Species Common Name	Seed Source	Origin
1	Bison	Andropogon gerardii big bluestem	USDA-NRCS-PMC Bismark, ND	Oliver Co., ND Price, ND (Central ND)
2	Bonilla	Andropogon gerardii big bluestem	USDA-NRCS-PMC Bismark, ND	Beadle Co., SD Bonilla, SD
3	Rountree	Andropogon gerardii big bluestem	USDA-NRCS-PMC Elsberry, MO	Monona Co., IA West Central IA
4	Champ	Andropogon gerardii big bluestem	USDA-ARS Lincoln, NE	NE and IA
5	Pawnee	Andropogon gerardii big bluestem	USDA-NRCS-NEAES Lincoln, NE	Pawnee Co., NE Southeast NE
6	Niagara	Andropogon gerardii big bluestem	USDA-NRCS-PMC Big Flats, NY	Corning, NY Southwest NY
7	Kaw	Andropogon gerardii big bluestem	USDA-NRCS-PMC Manhattan, KS	Riley Co., KS East Central KS
8	PI483446	Andropogon gerardii big bluestem	USDA-NRCS-PMC Manhattan, KS	KS and OK
9	Sunburst	Panicum virgatum switchgrass	SD State Univ. Brookings, SD	South Dakota
10	Forestburg	Panicum virgatum switchgrass	USDA-NRCS-PMC Bismark, ND	Sanborn Co., SD East Central SD
11	Nebraska 28	Panicum virgatum switchgrass	USDA-ARS NRCS-NEAES	Holt Co., NE North Central NE
12	Trailblazer	Panicum virgatum switchgrass	USDA-ARS NEAES Lincoln, NE	KS and NE
13	Pathfinder	Panicum virgatum switchgrass	USDA-ARS Lincoln, NE	KS & NE
14	Shelter	Panicum virgatum switchgrass	USDA-NRCS-PMC Big Flats, NY	St. Marys, WVA North Central
15	Cave-In-Rock	Panicum virgatum switchgrass	USDA-NRCS-PMC Elsberry, MO	Hardin Co., IL Southern IL
16	Greenville	Panicum virgatum switchgrass	USDA-NRCS Albuquerque, NM	Greenville, NM
17	Blackwell	Panicum virgatum switchgrass	USDA-NRCS-PMC Manhattan, KS	Blackwell, OK North Central OK
18	Kanlow	Panicum virgatum switchgrass	USDA-NRCS-PMC Manhattan, KS	Wetumka, OK East Central OK
19	Carthage	Panicum virgatum switchgrass	USDA-NRCS-NPMC Beltsville, MD	Central North Carolina
20	Alamo	Panicum virgatum switchgrass	USDA-NRCS-PMC Knox City PMC	Frio River River South Central TX

Table #1 (continued)

Plot Number	Variety/Accession	Genus/Species Common Name	Seed Source	Origin
21	Tomahawk	Sorghastrum nutans indiangrass	USDA-NRCS-PMC Bismark, ND	Dickey Co., ND Brown and Marshall Co., SD
22	Oto	Sorghastrum nutans indiangrass	NEAES	Kansas and Nebraska
23	Rumsey	Sorghastrum nutans indiangrass	USDA-NRCS-PMC Elsberry, MO	Jefferson Co., IL South Central
24	Osage	Sorghastrum nutans indiangrass	USDA-NRCS-PMC Manhattan, KS	Eastern and Central KS and OK
25	Cheyenne	Sorghastrum nutans indiangrass	USDA-NRCS-PMC Manhattan, KS	Supply, OK western OK
26	Llano	Sorghastrum nutans indiangrass	USDA-NRSC-PMC Los Lunas, NM	Elida, NM. Near Hudson & Portales, NM
27	Lometa	Sorghastrum nutans indiangrass	USDA-NRCS-PMC Knox City, TX	Lometa, TX Central TX
28	Killdeer	Bouteloua curtipendula sideoats grama	USDA-NRCS-PMC Bismarck, ND	Bowman and Dunn Cos. Western ND
29	Pierre	Bouteloua curtipendula sideoats grama	USDA-NRCS-PMC Bismarck, ND	Stanley Co., SD Central, SD
30	Trailway	Bouteloua curtipendula sideoats grama	NEAS	Holt Co., NE North Central NE
31	Butte	Bouteloua curtipendula sideoats grama	NEAES	Holt Co., NE Platte Co., NE
32	El Reno	Bouteloua curtipendula sideoats grama	USDA-NRCS-PMC Manhattan, KS	Canadian Co., OK Central OK
33	Vaughn	Bouteloua curtipendula sideoats grama	Albuquerque, NM	Vaughn, NM Guadalupe Co, NM East Central NM
34	Niner	Bouteloua curtipendula sideoats grama	NM	Socorro Co, NM Central, NM
35	Haskell	Bouteloua curtipendula sideoats grama	TX	Haskell Co., TX North Central TX
36	Camper	Schizachrium scoparium little bluestem	NEAES	KS and NE
37	Aldous	Schizachrium scoparium little bluestem	NAES Manhattan, KS	Flint Hill, KS So of Manhattan, KS
38	Cimarron	Schizachrium scoparium little bluestem	USDA-NRCS-PMC Manhattan, KS	South western KS and Panhandle, OK
39	Pastura	Schizachrium scoparium little bluestem	NM	Pecos, NM North Central NM
40	Pete	Tripsicum dactyloides eastern gamagrass	USDA-NRCS-PMC Manhattan, KS	KS and OK
40*	S-1142	Cynodon dactylon bermudagrass		Africa

Plot Number	Variety/Accession	Genus/Species Common Name	Seed Source	Table #1 (continued) Origin
41*	Lot 9981022	Cynodon dacatylon bermudagrass		Africa
42*	Pete	Tripsacum dactyloides eastern gamagrass	USDA-NRCS-PMC Manhattan, KS	KS and OK
43*	Plains	Bothriochloa ischeamum old world bluestem		Asia
44*	Ironmaster	Bothriochloa ischaemum old world bluestem		Asia
45*	WW Spar	Bothriochloa ischaemum old world bluestem	Hamilton Seed Elk Creek, MO	Asia
46*	T-587	Bothriochloa ischaemum old world bluestem	USDA-NRCS-PMC Booneville, AR	Asia
47	KG-40	Bothriochloa ischaemum caucasian bluestem		Asia

*at Mt. Vernon, Missouri site only
** NEAES-Nebraska Agricultural Experiment Station, Lincoln, Nebraska

Table #2

Study 29A111G-Field Evaluation of Selected Grasses for Pasture, Wildlife Habitat and Erosion Control

Mt. Vernon , Missouri **Precipitation (equivalent inches of water)**

Month	Total 1991	Total 1992	Total 1993	Total 1994	Total 1995	Average 1959-1995	Departure from 37 Year Average 1991	1992	1993	1994	1995
January	2.90	0.90	2.68	0.62	3.03	1.72	1.18	-0.82	0.96	-1.10	1.31
February	1.14	1.74	2.79	1.88	0.52	1.90	-0.76	-0.16	0.89	-0.02	-1.38
March	1.25	1.28	2.29	3.01	1.94	3.51	-2.26	-2.23	-1.22	-0.50	-1.57
April	4.38	4.20	3.28	9.13	7.23	4.14	0.24	0.06	-0.86	4.99	3.09
May	1.97	5.17	5.63	1.84	7.32	4.79	-2.82	0.38	0.84	-2.95	2.53
June	2.12	7.95	10.03	2.17	9.62	5.27	-3.15	2.68	4.76	-3.10	4.35
July	2.23	7.39	5.08	2.80	1.29	3.09	-0.86	4.30	1.99	-0.29	-1.80
August	2.16	0.76	3.13	4.75	1.34	3.92	-1.76	-3.16	-0.79	0.83	-2.58
September	6.46	9.75	17.93	2.96	2.52	5.10	1.36	4.65	12.83	-2.14	-2.58
October	2.50	1.09	1.97	6.18	0.79	3.48	-0.98	-2.39	-1.51	2.70	-2.69
November	3.73	10.84	4.61	9.12	0.76	4.05	-0.32	6.79	0.56	5.07	-3.29
December	3.94	4.92	1.59	0.96	2.77	2.76	1.18	2.16	-1.17	-1.80	0.01
TOTAL	34.78	55.99	61.01	45.42	39.13	43.73	-8.95	12.26	17.28	1.69	-4.60

Study 29A118G - Field Evaluation of Selected Grasses for Pasture, Wildlife Habitat and Erosion Control

Perry, Illinois **Precipitation (equivalent inches of water)**

Month	Total 1990	Total 1991	Total 1992	Total 1993	Total 1994	Average 1979-1995	Departure from 17 Year Average 1990	1991	1992	1993	1994
January	1.49	1.25	0.40	3.27	0.64	1.41	0.08	-0.16	-1.01	1.86	-0.77
February	5.36	0.47	1.52	1.55	1.30	1.69	3.67	-1.22	-0.17	-0.14	-0.39
March	4.28	3.17	2.58	2.90	1.32	3.02	1.26	0.15	-0.44	-0.12	-1.70
April	2.18	4.03	2.44	5.84	6.97	3.71	-1.53	0.32	-1.27	2.13	3.26
May	7.45	14.2	1.72	1.32	2.50	4.07	3.38	10.12	-2.35	-2.75	-1.57
June	5.43	0.84	0.63	6.59	5.48	3.64	1.79	-2.80	-3.01	2.95	1.84
July	5.41	3.67	5.49	7.25	1.29	4.73	0.68	-1.06	0.76	2.52	-3.44
August	2.12	3.48	0.39	6.07	3.79	3.31	-1.19	0.17	-2.92	2.76	0.48
September	2.31	2.77	3.86	12.6	1.90	3.52	-1.21	-0.75	0.34	9.10	-1.62
October	2.97	4.77	1.23	2.14	2.80	2.94	0.03	1.83	-1.71	-0.80	-0.14
November	4.38	2.77	8.86	3.46	4.89	4.13	0.25	-1.36	4.73	-0.67	0.76
December	4.63	2.14	2.92	0.87	2.22	3.02	1.61	-0.88	-0.10	-2.15	-0.80
TOTAL	48.01	43.55	32.04	53.88	35.13	39.18	8.83	4.37	-7.14	14.70	-4.05

Table #2
(continued)

Study 29A127G-Field Evaluation of Selected Grasses for Pasture, Wildlife Habitat and Erosion Control

Cedar Falls, Iowa **Precipitation**
(equivalent inches of water)

Month	Total 1992	Total 1993	Total 1994	Total 1995	Total 1996	Normal	Departure from Normal 1992	1993	1994	1995	1996
January	1.06	0.58	1.22	0.80	2.19	0.80	0.26	-0.22	0.42	0.00	1.93
February	1.47	1.30	0.94	0.12	0.08	1.08	0.39	0.22	-0.14	-0.96	-0.31
March	2.27	4.00	0.16	2.68	0.99	2.30	-0.03	1.70	-2.14	0.38	1.02
April	4.55	3.67	2.58	4.41	1.55	3.30	1.25	0.37	-0.72	1.11	0.30
May	0.82	6.11	2.17	3.15	5.38	4.08	-3.26	2.03	-1.91	-0.93	8.64
June	1.93	10.11	5.35	4.99	4.42	4.47	-2.54	5.64	0.88	0.52	6.96
July	5.87	11.26	6.11	1.83	2.38	4.83	1.04	6.43	1.28	-3.00	1.34
August	2.84	9.65	7.56	4.97	1.78	3.64	-0.80	6.01	3.92	1.33	2.58
September	2.23	2.86	3.67	2.44	3.90	3.51	-1.28	-0.65	0.16	-1.07	5.18
October	0.72	1.80	1.89	2.39	3.50	2.57	-1.85	-0.77	-0.68	-0.18	5.35
November	5.61	0.97	2.30	1.57	2.71	1.82	3.79	-0.85	0.48	-0.25	-1.08
December	1.60	0.76	1.35	0.16	0.91	1.30	0.30	-0.54	0.05	-1.14	0.61
TOTAL	30.97	53.07	35.30	29.51	29.79	33.70	-2.73	19.37	1.60	-4.19	-3.91

Warm Season Grass Varietal Study - University of Missouri, Southwest Center, Mt. Vernon, Missouri **Table #3a**

Southern Location

29A111G - Field Evaluation of Selected Perennial Grasses for Pasture, Wildlife Habitat and Erosion Control

Planting Dates: **Plot #1-41 5/14-16/91** **Plot #42-47 5/23/92**

Plot No. \1	Variety/ Accession Name \1	Average Date of 1st Seedhead Emergence (Late Boot Stage) \2	Dry Matter Yields #/AC				Percent Stand			Forage Ht	Forage Quality		
			1993	1994	1995	3 Year Average	1992	1993	1994	1992-1994 AVE (Ft)	% Protein	% ADF	Date Taken \7
BIG BLUESTEM													
7	Kaw	8/12/93	6747	5807	8001	**6852**	95	87	98	5.4	5.0	38	8/17/94
3	Rountree	7/20/93	6011	5739	8467	**6739**	45	73	93	5.6	5.6	35	7/19/94
5	Pawnee	7/23/93	6031	4008	9263	**6434**	82	88	90	4.8	5.7	37	7/19/94
8	PI4a83446	8/11/93	4755	7254		**6005**	85	85	93	5.2	-		
4	Champ	7/8/93	3763	4102		**3933**	53	82	95	4.1	7.8	34	6/27/94
6	Niagra	6/30/93	1558	3829		**2694**	18	45	82	3.7	11.0	35	6/15/94
2	Bonilla	7/1/93	2546	1399		**1973**	27	75	94	3.6	7.1	35	6/27/94
1	Bison	6/27/93	1339	1935		**1637**	10	27	65	3.1	11.2	35	6/15/94
SWITCHGRASS													
20	Alamo	8/7/93	13861	15404	11327	**13531**	95	100	100	6.0			
18	Kanlow	7/28/93	11233	17194	11918	**13448**	98	100	100	5.7	4.5	39	8/17/94
19	Carthage	7/14/93	11131	9247	8022	**9467**	98	100	100	4.1	4.8	37	7/19/94
13	Pathfinder	7/8/93	8255	8086	8386	**8242**	98	100	100	4.1	5.0	38	7/19/94
15	Cave-In-Rock	7/1/93	7195	7952	8127	**7758**	95	100	100	4.5	4.8	37	7/19/94
17	Blackwell	7/6/93	7829	5417	9247	**7498**	97	98	100	4.1	4.7	38	7/19/94
12	Trailblazer	7/7/93	6842	7839		**7341**	98	100	100	4.2	4.7	37	7/19/94
14	Shelter	6/30/93	5922	8755		**7339**	45	95	98	3.9	8.4	35	6/27/94
11	Nebraska 28	6/27/93	5931	7597		**6764**	100	100	100	3.7	8.5	37	6/15/94
9	Sunburst	6/30/93	4192	7792		**5992**	92	92	100	3.9	7.0	36	6/27/94
16	Greenville	6/19/93	5813	5793		**5803**	78	88	98	3.5	9.1	38	6/15/94
10	Forestburg	6/26/93	4719	5587		**5153**	92	98	100	3.4	9.0	39	6/15/94

Southern Location **Table #3b**

Plot No. \1	Variety/ Accession Name \1	Average Date of 1st Seedhead Emergence (Late Boot Stage) \2	Dry Matter Yields #/AC				Percent Stand			Forage Ht	Forage Quality		
			1993	1994	1995	3 Year Average	1992	1993	1994	1992-1994 AVE (Ft)	% Protein	% ADF	Date Taken \7
INDIANGRASS													
24	Osage	8/21/93	10149	6535	8413	**8366**	78	93	97	4.5			
23	Rumsey	8/23/93	8520	6467	9773	**8254**	63	93	90	5.0			
22	Oto	8/11/93	9743	3728	8864	**7445**	83	89	90	4.5			
27	Lometa	9/28/93	3923	10268		**7096**	15	57	55	4.0			
25	Cheyenne	8/18/93	9273	4782		**7028**	63	93	95	4.4			
26	Llano	8/5/93	6753	3226		**4990**	58	85	70	4.9	6.7	37	6/27/94
21	Tomahawk	6/25/93		1471		**1471**	15	40	67	2.9	11.6	38	6/15/94
SIDEOATS													
30	Trailway	6/24/93	2439	1964		**2202**	98	67	83	2.1	11.8	33	6/27/94
35	Haskell	7/6/93	2487	1708		**2098**	87	62	62	2.2	11.8	30	6/27/94
28	Killdeer	6/7/93	1947			**1947**	57	38	15	1.7	16.7	35	6/15/94
33	Vaughn	6/20/93	1761			**1761**	90	40	17	1.9	12.9	30	6/27/94
31	Butte	6/22/93	1573			**1573**	90	37	13	1.8	14.1	32	6/27/94
32	El Reno	7/1/93	1973	1138		**1556**	87	70	82	2.3	11.7	31	6/27/94
34	Niner	6/14/93	1596	1466		**1531**	75	53	73	2.1	19.7	33	6/15/94
29	Pierre	6/24/93	778			**778**	53	30	23	1.5	17.4	33	6/15/94
LITTLE BLUESTEM													
38	Cimarron	8/8/93	4500	4983		**4742**	30	72	90	3.3	5.1	40	8/17/94
37	Aldous	8/15/93	3307	4076		**3692**	18	45	58	3.7	4.9	38	8/17/94
36	Camper	7/26/93	1443	4095		**2796**	28	63	57	3.3	4.8	39	8/17/94
39	Pastura	7/19/93					13	10	4	2.6	8.8	35	6/27/94
BERMUDA GRASS													
40	S-1142	6/12/93	2519	1235		**1877**	95	48	88	1.2	11.2	31	6/15/94
41	9981022	6/17/93	1604	1287		**1446**	93	53	78	1.4	12.7	33	6/15/94

Southern Location **Table #3c**

Plot No. \1	Variety/ Accession Name \1	Average Date of 1st Seedhead Emergence (Late Boot Stage) \2	Dry Matter Yields #/AC 1993	1994	1995	3 Year Average	Percent Stand 1992	1993	1994	Forage Ht 1992-1994 AVE (Ft)	Forage Quality % Protein	% ADF	Date Taken \7
EASTERN GAMAGRASS													
42	Pete	6/5/93	3552	2472	6717	**4247**	32	73	70	3.0	12.6	31	6/15/94
OLD WORLD BLUESTEM													
46	T-587	6/20/93	4818	7041		**5930**	83	69	67	2.7	12.0	39	6/15/94
43	Plains	6/18/93	5735	4253		**4994**	85	100	95	2.2	5.7	34	6/27/94
44	Ironmaster	6/25/93	5021	3646		**4334**	88	100	92	2.8	5.7	35	6/27/94
45	WW Spar	6/17/93	4637	3544		**4091**	92	98	100	2.2	7.7	39	6/15/94
CAUCASIAN BLUESTEM													
47	KG-40	6/30/93	3280	5157	10423	**6287**	92	100	100	3.2	5.1	39	6/27/94

\1 See Table #1 for Genus, species and Origin of Each Plot Number

\2 This is the average data the first seedhead emerged in each plot. Most plants are in boot stage at this time. Forage quality generally decreases significantly from this date on as plants set seed and mature.

\7Forage quality samples were taken during boot stage rather than all at one time. It appears this greatly advantaged the early maturing varieties. Only compare quality data taken on the same day. See forage quality section of the text.

Warm Season Grass Varietal Study - Orr Agricultural Research Center, Perry, Illionis **Table #4a**

Central Location

29A118G - Field Evaluation of Selected Perennial Grasses for Pasture, Wildlife Habitat and Erosion Control

Dates Planted: Plots 1-41 (6-13 & 15-90); Plot 40 replanted 5/92

Plot No. \1	Variety/ Accession Name \1	Average Date of 1st Seedhead Emergence (Late Boot Stage) \2	Dry Matter Yields #/AC				Percent Stand			Forage Ht 1991-1993 AVE (Ft)	Forage Quality 6/20/95		
			1992 \4 Eval.	1993 \5 Eval.	1994 \6 Eval.	3 Year Average	1992	1993	1994		% Protein	% ADF	% NDF
BIG BLUESTEM													
4	Champ	8/2/91	5797	11565	5261	**7541**	87	95	97	4.1	11.8	32	54
8	PI483446	8/14/91	5938	11161	4773	**7291**	90	100	100	4.8	11.8	32	56
3	Rountree	7/10/91	5587	7620	7758	**6988**	97	98	100	4.3	11.5	32	62
5	Pawnee	8/3/91	5853	9610	5116	**6860**	93	97	99	3.4	10.2	32	60
7	Kaw	8/9/91	5166	9821	4400	**6462**	90	95	99	4.0	11.2	30	58
2	Bonilla	7/6/91	4852	6037	5902	**5597**	85	95	95	3.3	11.3	34	58
1	Bison	6/13/91	3418	4839	6482	**4913**	78	78	100	3.2	11.0	34	60
6	Niagara	6/30/91	2812	3954	6256	**4341**	76	85	99	3.7	10.5	30	56
SWITCHGRASS													
18	Kanlow	7/25/91	9540	11558	8090	**9729**	100	100	98	5.7	11.0	32	54
20	Alamo	7/17/91	8461	10191	7808	**8820**	75	85	98	4.6	11.8	32	52
17	Blackwell	7/9/91	6882	11768	7285	**8645**	80	100	92	4.0	9.6	32	56
15	Cave-In-Rock	7/4/91	6610	8490	8644	**7915**	95	100	100	4.0	11.1	28	56
19	Carthage	7/23/91	6965	9052	6843	**7620**	97	98	98	3.8	10.2	28	52
13	Pathfinder	7/3/91	5991	8624	7327	**7314**	93	95	100	3.7	10.6	32	58
12	Trailblazer	7/4/91	6540	7206	7210	**6985**	88	98	98	3.8	10.5	32	60
9	Sunburst	6/25/91	5000	7239	7605	**6615**	80	98	98	3.3	10.1	34	62
14	Shelter	6/24/91	5559	4802	8554	**6305**	63	95	92	3.6	12.4	34	58
11	Nebraska 28	6/22/91	4857	4321	6609	**5262**	87	98	100	3.1	10.6	32	60
10	Forestburg	6/30/91	3483	4063	6715	**4754**	75	98	98	2.9	11.1	32	56
16	Greenville	6/12/91	2742	3483	6744	**4323**	85	92	98	3.2	10.2	32	56

Central Location **Table #4b**

Plot No. \1	Variety/ Accession Name \1	Average Date of 1st Seedhead Emergence (Late Boot Stage) \2	Dry Matter Yields #/AC				Percent Stand			Forage Ht 1991-1993 AVE (Ft)	Forage Quality 6/20/95		
			1992 \4 Eval.	1993 \5 Eval.	1994 \6 Eval.	3 Year Average	1992	1993	1994		% Protein	% ADF	% NDF
INDIANGRASS													
23	Rumsey	8/22/91	11940	10338	4701	**8993**	97	100	93	5.3	8.6	32	58
24	Osage	8/21/91	8652	8025	2361	**6346**	95	98	87	4.2	9.0	32	60
25	Cheyenne	8/22/91	8919	7483	1739	**6047**	97	97	70	4.3	9.0	20	58
22	Oto	8/11/91	7575	7018	2492	**5695**	95	98	88	3.7	8.9	32	60
26	Llano	8/12/91	6954	7950	1419	**5441**	93	97	65	4.5	9.3	32	60
21	Tomahawk	6/23/91	2157	3062	3834	**3018**	48	57	55	2.7	8.4	32	60
27	Lometa				1591	**1591**	80	88	57	4.2	7.6	30	60
SIDEOATS GRAMA													
28	Killdeer	6/2/91				**-**	20	18	8	1.5			
29	Pierre	6/6/91				**-**	47	23	7	1.5			
30	Trailway	6/19/91				**-**	87	47	12	1.8			
31	Butte	6/10/91				**-**	70	32	12	1.6			
32	El Reno	6/20/91				**-**	68	32	3	2.0			
33	Vaughn	6/16/91				**-**	18	8	0	1.7			
34	Niner	6/11/91				**-**	28	4	0	1.7			
35	Haskel	6/22/91				**-**	65	20	0	2.1			
LITTLE BLUESTEM													
37	Aldous	8/10/91			3375	**3375**	83	95	85	3.1	8.7	32	58
36	Camper	7/21/91			1588	**1588**	63	77	30	2.7	8.5	32	60
38	Cimarron	8/3/91			1496	**1496**	68	72	27	2.9	8.4	34	58
39	Pastura	7/14/91				**0**	35	18	2	2.5	9.4	32	56
EASTERN GAMAGRASS													
40	Pete					**0**	42	58	88	1.9	12.5	30	64

\1 See Table #1 for genus, species and origin of each plot number.

\2 This is the average data the first seedhead emerged in each plot. Most plants are in boot stage at this time. Forage quality generally decreases significantly from this date on as plants set seed and mature.

\4 Dry matter yields were taken in late summer which represents total dry matter production.

\5 1993 dry matter yields were taken at boot stage which benefited the later maturing varieties

\6 1994 dry matter yields were taken 7/14/94 (mid-summer) which would be advantageous to early maturing varieties

Warm Season Grass Varietal Study - University of Northern Iowa, Cedar Falls, Iowa **Table #5a**

Northern Location

29A127G - Field Evaluation of Selected Perennial Grasses for Pasture, Wildlife Habitat and Erosion Control

Date Planted: 5/12-13/92

Plot No. \1	Variety/ Accession Name \1	Average Date of 1st Seedhead Emergence (Late Boot Stage) \2	Dry Matter Yields #/AC				Percent Stand		Forage Ht 1994-1996
			9/94	7/95	9/96	3 Year Average	1994	1996	AVE (Ft)
BIG BLUESTEM									
3	Rountree	8/17/96	13304	4390	10344	**9,346**	97	95	4.4
5	Pawnee	8/18/96	12214	4614	10602	**9,143**	95	93	3.8
4	Champ	8/4/96	13096	3827	8205	**8,376**	80	93	4.0
8	PI483446	8/23/96	9214	4751	8299	**8,299**	95	90	3.5
7	Kaw	8/18/96	11669	3317	8975	**7,987**	93	87	3.7
6	Niagara	7/25/96	8982	3802	7518	**6,767**	100	100	4.3
2	Bonilla	7/24/96	8828	4267	5707	**6,267**	82	95	3.4
1	Bison	7/13/96	8815	4263	4248	**5,775**	95	98	3.6
SWITCHGRASS									
18	Kanlow	8/18/96	16640	7535	12253	**12,143**	100	100	5.3
17	Blackwell	7/21/96	17304	7312	10577	**11,731**	87	98	3.9
14	Shelter	7/16/96	15822	8616	9004	**11,147**	98	100	4.3
19	Carthage	8/4/96	10686	6027	14103	**10,272**	97	100	4.5
20	Alamo	8/14/96	12826	5317	11164	**9,769**	100	100	4.9
12	Trailblazer	7/16/96	12698	7003	8986	**9,562**	77	98	3.7
13	Pathfinder	7/19/96	10001	6201	12262	**9,488**	87	98	3.9
15	Cave-In-Rock	7/11/96	8205	8444	11305	**9,318**	100	100	4.8
9	Sunburst	7/16/96	8970	5926	11850	**8,915**	87	98	4.1
11	Nebraska 28	7/12/96	9808	6992	7946	**8,249**	88	97	3.9
10	Forestburg	7/15/96	6813	5544	6341	**6,233**	92	97	3.7
16	Greenville	6/30/96	4573	6090	7077	**5,913**	67	93	3.5

Northern Location **Table #5b**

Plot No. \1	Variety/ Accession Name \1	Average Date of 1st Seedhead Emergence (Late Boot Stage) \2	Dry Matter Yields #/AC 9/94	7/95	9/96	3 Year Average	Percent Stand 1994	1996	Forage Ht 1994-1996 AVE (Ft)
INDIANGRASS						**\3**			
25	Cheyenne	9/7/96	15306	4506	12114	**10,642 (2)**	15	38	4.0
26	Llano	9/3/96	14939		8673	**10,240 (3)**	30	48	4.7
22	Oto	9/3/96	10602	3576	12374	**8,851 (1)**	60	65	3.5
23	Rumsey	9/7/96	14006	3412	8744	**8,721 (4)**	38	28	4.0
24	Osage	9/4/96	7647	5279	10328	**7,751 (3)**	30	33	3.6
21	Tomahawk	7/23/96			5119	**5,119 (5)**	37	18	2.6
27	Lometa						3	0	3.2
SIDEOATS GRAMA									
28	Killdeer						13	2	1.4
29	Pierre						15	3	1.9
30	Trailway						3	17	1.8
31	Butte						7	8	1.5
32	El Reno						0	0	
33	Vaughn						2	0	1.4
34	Niner						0	0	
35	Haskel						8	2	1.8

Northern Location **Table #5c**

Plot No. \1	Variety/ Accession Name \1	Average Date of 1st Seedhead Emergence (Late Boot Stage) \2	Dry Matter Yields #/AC				Percent Stand		Forage Ht 1994-1996
			9/94	7/95	9/96	3 Year Average	1994	1996	AVE (Ft)
LITTLE BLUESTEM									
38	Cimarron	8/15/96	9027	3013	6872	**7,111 (3)**	57	48	3.6
37	Aldous	8/20/96	7350		6306	**6,115**	67	65	3.0
36	Camper	8/13/96	1681	8476	7693	**5,950 (4)**	20	27	2.7
39	Pastura	8/25/96	-	-	-		8	0	3.5
EASTERN GAMAGRASS									
40	Pete	6/25/96	5814	7054	8553	**7,136**	82	97	4.2

\1 See Table #1 for genus, species and origin of each plot number.

\2 This is the average data the first seedhead emerged in each plot. Most plants are in boot stage at this time. Forage quality generally decreases significantly from this date on as plants set seed and mature.

\3 Many plots were not harvestable for dry matter yield data. The number in ( ) corresponds to how many plots are in the average. This is listed below:

(1) Averaged 7 of 9 plots
(2) Averaged 5 of 9 plots
(3) Averaged 4 of 9 plots
(4) Averaged 3 of 9 plots
(5) Averaged 1 of 9 plots

Table #6

Warm Season Grass Varietal Study

Quality Standards for Legume and Grass Hay (American Forage Council)

Quality	**CP**	**ADF**	**NDF**
Prime	>19	<31	<40%
1	17-19	31-35	40-46%
2	14-16	36-40	47-53%
3	11-13	41-42	54-60%
4	8-10	43-45	61-65%
5	<8	>45	>65%

CP=Crude protein=Percent N x 6.25

ADF=Acid detergent fiber

NDF=Nutrient detergent fiber

Study No. 29A116W

Study Title: Evaluation of Miscellaneous Trees and Shrubs.

Study Leader: Henry, J.

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:

This study is a long-term ongoing evaluation of miscellaneous trees and shrubs that were not part of a collection made over a broad area. Some new species will be planted yearly. Although this study was started in 1989, it includes some species from past studies.

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

Table #1 reflects the following: different species, accession numbers, sources and date planted.

Table #2 reflects the plant performance for years 1990, 1991, 1992, and 1998.

Study 29A116W

Table #1 List of species included in study.

Common Name	**Genus**	**Species**	**Accession Number**	**Alternate Number**	Source	**Date Planted**
Densehead Mountain ash	Sorbus	alnifolia		7761	F.K. Nursery	11/65
Ruby redosier dogwood	Cornus	stolonifera	443229		Big Flats PMC	5/89
Late lilac	Syringa	villosa	9006228		Bismarck PMC	5/89
Redstone cornelian cherry dogwood	Cornus	mas	9055585		Elsberry PMC	5/89
Roselow sargent crabapple	Malus	sargenti	477986		Roselake PMC	5/89
Elsmo lacebark elm	Ulmus	parvifolia	9004438		Asia	5/89
Blueleaf honeysuckle	Lonicera	korolkowi	9062152		Nebraska	5/89
Birch	Betula	species	502295		Ames, IA	4/90
Willow oak	Quercus	phellos		4723	Ames, IA	4/90
Fragrant epaulettetree	Pterostyrax	hispida		A80779	Ames, IA	4/90
Bradford pear	pyrus	calleryana		19173	Ames, IA	4/98

Common Name	**Genus**	**Species**	**Accession Number**	**Alternate Number**	**Source**	**Date Planted**
Prairie rose	Rosa	setigera	495616		Ames, IA	4/90
Ural falsepirea	Sorbaria	sorbifolia		7778	Ames, IA	4/90
Weeping Lilac	Syringa	pekinensis	478008		Ames, IA	4/90
Flameleaf sumac	Rhus	copallina		7764	Ames, IA	4/90
Western paper birch	Betula	occidentalis	495882		Ames, IA	4/90
Amur honeysuckle	Lnoicera	mackii	477998		Ames, IA	4/90
Mountain ash	Sorbus	reducta		A-8371	Ames, IA	4/90
Blackhaw	Viburnum	prunifolium		2813	Ames, IA	4/90
Largeleaf dogwood	Cornus	macraphylla		10178	Ames, IA	4/90
Border privet	Ligustrum	obtusifolium	477010		Ames, IA	4/90
Willow oak	Quercus	phellos		4724	Ames, IA	4/90
Arrowwood	Viburnum	dentatum			Elsberry, MO	4/90
Redbud	Cercis	canadensis	496399		Ames, IA	5/91
Birch	Betula	species	14942		Ames, IA	5/91
Whihita osageorange	maclura	pomifera			Kansas	5/91
Denmark osageorange	Maclura	pomifera			Denmark, IA	6/92

Common Name	Genus	**Species**	**Accession Number**	**Alternate Number**	**Source**	**Date Planted**
Magenta	Malus	species	514275		Roselake PMC	4/93
Ocean view beach plum	Prunus	maritima	518824		Cape May PMC	5/93
Sandy rugosa rose	Rosa	rugosa			Cape May PMC	5/93
Wildwood bayberry	Myrica	Pensylvanica	548966		Cape May PMC	5/93
Wildwood bayberry	Myrica	Pensylvanica	434150		Cape May PMC	5/93
Wildwood bayberry	Myrica	Pensylvanica	548964		Cape May PMC	5/93
Ocean view beach plum	Prunus	maritima	518822		Cape May PMC	5/93
Ocean view beach plum	Prunus	maritima	518823		Cape May PMC	5/93
Oahe hackberry	Celtis	Occidentalis	476982		Bismarck PMC	5/93
King Red Russian olive	Elaeagnus	angustifolia	434029		NPMC	5/93

Study 29A116W

Plant Performance Data 1998

Table #2

Tree No.	Common Name	Genus	Species	Accession #	Alt. No.	Source	Date Plt.	No. Plt.	No Survived 90	91	92	98	Ave. Ht. (Ft.) 90	91	92	98	Ave. Wd. (Ft.) 90	91	92	98
1	Densehead mountain ash	Sorbus	alnifolia		7761	F.K. Nursery (Elsberry, MO)	Nov-65	2	2	2	2	2	21	22	22	25	8.2	8.2	8.2	12
2	Ruby' redosier dogwood	Cornus	stolonifera	443229		Big Flats, NY	5/9/89	4	4	4	4	4	0.7	3.7	3.9	4	1.8	3.6	4.8	3.5
3	Late lilac	Syringa	villosa	9006228		Bismark, ND	5/9/89	4	4	4	3	0	0.4	0.7	2.3	0	1.2	1.3	2.4	0
4	Redstone' cornelian cherry dogwood	Cornus	mas	9055585		Elsberry, MO	5/9/89	3	3	3	3	3	1.4	1.9	2.8	4.5	0.4	0.8	1.4	4.5
5	Roselow' sargent crabapple	Malus	sargentii	477986		Roselake, MI	5/9/89	3	3	3	3	0	2	2.7	2.9	0	1	1.7	2.6	0
6	Elsmo' lacebark elm	Ulmus	parvifolia	9004438		21	5/9/89	2	2	2	2	2	5.4	9.6	11.8	27	3.3	6.4	7.4	16
7	Blueleaf honeysukle	Lonicera	korolkowi	9062152		Nebraska	5/9/89	6	6	6	6	6	4	6.8	8	13	5.6	8.8	9.8	13
8	Birch	Betula	species	502295		Ames, IA	4/16/90	3	1	1	1	1	3.4	3.4	4.1	6	1.5	1.9	2.8	5
9	Willow oak	Quercus	phellos		4723	Ames, IA	4/16/90	4	4	4	4	4	1.7	2.6	4.1	22.5	1	1.8	3.7	12
10	Fragrant epaulettetree	Pterostyrax	hispida		A-8079	Ames, IA	4/16/90	3	0	0	0	0	0	0	0	0	0	0	0	0
11	Bradford pear	Pyrus	calleryana		19173	F.K. Nursery (Elsberry, MO)	4/21/69	2	2	2	2	2	27	27	27	29	20	20	21	33
12	Prairie rose	Rosa	setigera	495616		Ames, IA	4/16/90	2	2	2	2	2	1.5	3.7	4.7	6.6	1.6	5.5	5.9	10
13	Ural falsespirea	Sorbaria	sorbifolia		7778	Ames, IA	4/16/90	7	7	7	7	7	1	1.8	2.3	5	0.6	1.8	2.1	6
14	Weeping lilac	Syringa	pekinensis	478008		Ames, IA	4/16/90	3	2	2	2	2	1	1	1.5	7	0.7	1	2	7.5
15	Flameleaf sumac	Rhus	copallina		7764	Ames, IA	4/16/90	4	2	2	2	2	1.6	2.9	5.3	7	0.8	2.8	5.3	8
16	Western paper birch	Betula	occidentalis	495882		Ames, IA	4/16/90	3	2	2	2	2	1.3	4.5	3	8	0.3	2.4	3.9	5
17	Honeysuckle	Lonicera	maackii	477998		Ames, IA	4/16/90	4	3	3	3	3	0.7	1.5	2.7	7.5	0.6	1.2	2.7	4.5
18	Mountain ash	Sorbus	reducta		A-8371	Ames, IA	4/16/90	2	0	0	0	0	0	0	0	0	0	0	0	0
19	Blackhaw	Viburnum	prunifolium		2813	Ames, IA	4/16/90	4	2	2	2	2	2.6	2.7	3.4	8	0.7	1.3	2.4	5
20	Largeleaf dogwood	Cornus	macraphylla		10178	Ames, IA	4/18/90	3	3	3	3	3	1.7	2.2	3	7.5	0.5	0.9	1.7	4.5
21	Border privet	Ligustrum	obtusifolium	477010		Ames, IA	4/18/90	4	0	0	0	0	1.4	2.4	2.6	0	0.8	2.3	2,3	0
22	Willow oak	Quercus	phellos		4724	Ames, IA	4/18/90	4	4	4	4	4	1.3	3.1	4.4	13	0.8	2.4	3.8	12
23	Arrowwood	Viburnum	dentatum			Lovelace Seed (Elsberry, MO)	Apr-91	5	4	4	4	4	2	4.3	4.5	7	0.5	2	2.4	4.5
24	Redbud	Cercis		496399		Ames, IA	5/8/91	3	3	3	3	3	0.5	3.2	3.7	11	0.25	0.5	2.7	10
25	Birch	Betula		14942		Ames, IA	5/8/91	5	3	3	3	3	0.5	0.7	1.4	11	0.4	0.4	1.4	7
26	Wichita' osage orange	Maclura	pomifera			Kansas	1992	1	1	1	1	1	0.5	0.5	1	13	0.25	0.25	2.5	13
27	Denmark osage orange	Maclura	pomifera			Denmark, IA	6/19/92	1	1	1	1	1	0.5	0.5	1	13	0.25	0.25	0.5	7
28	Autumn olive	Eleagnus	umbellata				4/26/99	5				5				2.5				2
29	Austree willow						4/14/95	2			2	2			3.5	30			2	10

Study No. 29A121W

Study Title: Conifer Evaluation for Windbreak Plantings.

Study Leader: Henry, J.

Introduction:

The Conservation Reserve Program, conservation compliance requirements, new national tree planting initiatives and water quality concerns are increasing tree planting efforts at the highest levels our country has ever experienced. Farmstead, feedlot, and field windbreak plantings will be a significant part of these efforts. While deciduous trees and shrubs dominate many windbreak plantings, coniferous species are still a common component.

Problem:

Very few native conifers exist in Missouri, Iowa, and Illinois. Current species recommended suitable for windbreaks are limited. Additional coniferous species need to be evaluated for potential use in the Midwest.

Objective:

The objective of this study is to evaluate growth and survivability of selected coniferous species for possible use in Missouri, Illinois, or Iowa Technical Guides.

Cooperators: USDA-Natural Resources Conservation Service.

Discussion:

1991-1993

This study was initiated on April 19, 1991, in Field #3 on the PMC. Four species were planted: Engleman spruce; subalpine fir, mountain white pine and white fir. Evaluation indicated these plants were severely damaged by insects, which resulted in zero survival.

The study was reestablished April 21 and 28, 1993 in Field #3 and included 23 coniferous species of pine, spruce, fir, larch, cedar and hemlock (Table #1). The planting was replicated three times with four trees per plots. Most plants were in very good condition at planting time but survival was only 67 percent at year's end.

Above average precipitation in 1993 supported and enhanced plant growth. Competition and mechanical damage during weed control efforts contributed greatly to plant mortality.

1994-1998

One additional species was planted in 1994 , Canadian hemlock. No replants were available for black spruce and western hemlock. Survival at the end of 1994 was 74 percent. Black spruce, western hemlock, and Canadian hemlock had almost no survival. The other 21 accessions of conifer trees had a survival rate of 82 percent.

Table #1 reflects the plants' performance for the years evaluated; Table #2 is a layout map of the planting.

Study 29A121W

Plant Performance Data for 1998

Table #1

Plant Number	Common Name	Genus	Species	Acc. No	Source	Date Planted	No. Planted	No. Survived 95	96	98	Ave. Ht. (ft) 95	96	98	Ave. Wd. (ft) 95	96	98
1	Jeffrey pine	Pinus	jeffreyi	9083176	Lawyer Nursery	4/21/93	12	10	7	4	0.77	1.52	4.18	1.75	2	2.42
2	Noble fir	Abies	procera	9083177	Lawyer Nursery	4/21/93	12	1	0	0	1	0	0			0
3	White spruce	Picea	glauca	9083178	Lawyer Nursery	4/21/93	12	6	6	5	1.68	2	3.53	1.5	2	2.37
4	Engleman spruce	Picea	englemanni	9083179	Lawyer Nursery	4/21/93	12	9	8	4	1.27	1.13	2.85	0.8	1.25	1.9
5	Alpine fir	Abies	lasiocarpa	9083180	Lawyer Nursery	4/21/93	12	4	3	0	0.5	0.67	0			0
6	Incense cedar	Calocedrus	decurrens	9083181	Lawyer Nursery	4/21/93	12	11	3	3	2.69	3.01	5.5	1.8	2.2	2.57
7	Balsam fir	Abies	balsamea	9083182	Lawyer Nursery	4/21/93	12	9	9	8	1.93	2.78	6.03	2.5	3.2	3.14
8	Port Orford cedar	Chamaecyparis	lawsonian	9083183	Lawyer Nursery	4/21/93	12	10	9	7	3.43	5.07	7.66	3	3.9	5
9	Norway spruce	Picea	abies	9083184	Lawyer Nursery	4/21/93	12	12	12	12	2.2	2.73	5.83	3	3.5	4.37
10	West Coast D. fir	Pseudotsuga	menziesii glauca	9083185	Lawyer Nursery	4/21/93	12	10	7	5	1.72	1.9	5.72	1.5	2.25	2.78
11	Oriental spruce	Picea	orientalis	9083186	Twin Brook Plantation	4/21/93	12	12	11	8	1.4	1.59	3.03	1	1.5	2.13
12	Limber pine	Pinus	flexilis	9083187	Lawyer Nursery	4/21/93	12	7	1	1	0.64	2.5	3.25	1	1.5	1.87
13	Lodgepole pine	Pinus	contorta latifolia	9083188	Colorada	4/21/93	12	11	7	6	1.8	2.1	5.2	2	2.7	3.3
14	Hybrid larch	Larix x	eurolepsis	9083189	Lawyer Nursery	4/21/93	12	8	7	7	2.45	3.74	7.29	2.5	3	3.51
15	Ponderosa pine	Pinus	ponderosa	9083190	Lawyer Nursery	4/21/93	12	11	11	10	2.21	3.21	7.36	3.5	4.9	5.95
16	Black spruce	Picea	mariana	9083191	Lawyer Nursery	4/28/93	12	1	0	1	0	0	7.6	3	4.5	6.4
17	Red pine	Pinus	resinosa	9083192	MO State Nursery	4/28/93	12	12	11	10	1.55	1.99	5.06	2.75	3.5	4.27
18	White pine	Pinus	strobus L.	9083193	Van Pines Nursery	4/28/93	12	12	11	10	1.96	2.81	6.98	2	3.5	4.73
19	Western hemlock	Tsuga	heterophylla	9083194	Lawyer Nursery	4/28/93	12	0	0	0	0	0	0			0
20	Northern W. cedar	Thuja	occidentalis	9083195	Lawyer Nursery	4/28/93	12	12	12	9	2.85	3.75	8.09	3.5	4.25	5.95
21	Grand fir	Abies	grandis	9083196	Lawyer Nursery	4/28/93	12	6	5	4	1.33	1.4	3.55	1	1.85	2.13
22	Fraser pine	Abies	fraseri	9083197	Lawyer Nursery	3/28/93	12	6	5	2	1.4	1.82	5	1	1.75	2.45
23	European larch	Larix	decidua	9083198	Lawyer Nursery	3/28/93	12	10	6	4	3.28	4.2	10.4	3.9	4.8	6.78
24	Canadian hemlock	Tsuga	canadensis	9083199	Lawyer Nursery	3/28/94	12	8	0	0	0	0	0	0	0	0
25	Jack pine	Pinus	banksiana	9083200	Lawyer Nursery	3/28/94	12	0	0	0	0	0	0	0	0	0

Study 29A121W **Plant Layout Map** **Field #3** **Table #2**

Randomized complete block **Four plants per replication, three replications**

Highway JJ

13	8	22	11	14	3	1	2	7	18	5	16	17	21	12	11	20	
18	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	17	
20	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	15	
			Rep I														
15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	18	
17	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	20	
14	16	17	18	25	20	21	22	23	15	13	2	7	17	6	25	22	
13	16	17	18	25	20	21	22	23	15	13	2	7	17	6	25	13	
22	16	17	18	25	20	21	22	23	15	13	2	7	17	6	25	1	
18	16	17	18	25	20	21	22	23	15	13	2	7	17	6	25	14	
											Rep II						
20	4	8	14	22	10	1	12	5	16	21	18	20	3	9	11	11	
1	4	8	14	22	10	1	12	5	16	21	18	20	3	9	11	20	
15	4	8	14	22	10	1	12	5	16	21	18	20	3	9	11	18	
							Rep										
							III										
11	4	8	14	22	10	1	12	5	16	21	18	20	3	9	11	19	
13	11	16	7	6	3	21	8	25	1	5	13	14	2	4	23	1	
18	11	16	7	6	3	21	8	25	1	5	13	14	2	4	23	16	
14	11	16	7	6	3	21	8	25	1	5	13	14	2	4	23	20	
17	11	16	7	6	3	21	8	25	1	5	13	14	2	4	23	17	
20	23	12	23	9	18	10	20	15	12	17	22	18	23	21	11	15	
24	24	20	23	9	18	10	20	15	12	17	22	13					
24	24	6	23	9	18	10	20	15	12	17	22	20					
24	24	20	23	9	18	10	20	15	12	17	22	1					
24	24	20	5	20	22	13	11	1	18	20	14	15					

East **North**

Each number represents one plant
Outside numbers = border row

Study No. 29A122G

Study Title: Evaluation of Perennial Warm-Season Grass as Windbarriers in Southeast Missouri.

Study Leader: Bruckerhoff, S. B.

Introduction:

A need for tall warm-season grasses for use as windbarriers in the Missouri Bootheel counties was identified by the Missouri Plant Materials Committee as being a high priority item. A literature search was conducted by the Elsberry PMC and revealed the following plants as having potential to solve this problem: 'Alamo', 'Shelter', 'Cave-In-Rock', and 'Kanlow' switchgrasses and vetiver grass. Vetiver grass is a stiff stemmed warm season grass native to Asia where it is used as grass hedges for water erosion control.

Problem:

There is a need to research the best adaptable grass species for use in windbarriers on sandy soils in Bootheel counties to control wind erosion. (New Madrid, Mississippi, Pemiscot, Dunklin, Butler, Scott, Pulaski, and Stoddard).

Objective:

The objective is to conduct an advanced evaluation to determine the adaptation and performance of selected species and varieties of warm-season perennial grasses.

Cooperators:

The USDA, Natural Resources Conservation Service in cooperation with the University of Missouri, Delta Center, Rhodes Farm, Clarkton, Missouri.

Assembly:

Four accessions of vetiver grass were obtained through the USDA-ARS Plant Introduction Station at Griffin, Georgia. 'Alamo', 'Kanlow', 'Shelter', and 'Cave-in-Rock' switchgrasses were obtained from Plant Material Centers in Texas, Kansas, New York, and Missouri respectively. Four accessions of eastern gamagrass with best potential as a windbarrier were selected out of an assembly of 243 collections at Elsberry.

Discussion:

1991

Four varieties of switchgrass and four accessions of vetiver grass were started in the greenhouse. They were transplanted April 17, 1991, on the Delta Center, in a randomized complete block with four replications, five plants per replication. Spacing is two feet between plants and six feet between replications.

The planting was evaluated twice during 1991 for percent survival, vigor, forage height, spread, and seed production. Survival was 100 percent with very good growth on most plants. Accession 9054934 of vetiver grass was the only accession that did not develop any seedheads. Viability in the others was not checked.

1992

The planting was again evaluated in 1992. All accessions of vetiver grass experienced some winter kill. The more hardy accessions were 213903 and 271633. No accessions remained vigorous enough to be considered as a grass windbarrier.

1993

The vetiver grass accessions were replaced with eastern gamagrass the spring of 1993. All accessions of switchgrass maintained a one hundred percent survival. The tallest and most vigorous accessions are 'Alamo' and 'Kanlow' switchgrasses respectively.

1994-1995

The planting was again evaluated in 1994. The eastern gamagrass accessions have not yet developed into mature plants because of close proximity to mature switchgrass plants. The best accessions at this time are 'Alamo' and 'Kanlow' switchgrass. Alamo resists lodging slightly better than Kanlow, but Kanlow is slightly taller. The planting was evaluated in 1995 with no notable differences. The tallest and most vigorous accessions of switchgrass were Alamo and Kanlow. The accessions of eastern gamagrass are still receiving a lot of competition from the switchgrass and it cannot be determined yet if any accessions will remain upright through the winter. In observing other eastern gamagrass it is doubtful.

1996

The eastern gamagrass accessions finally began to grow and mature in spite of the competition from the switchgrass. It also became evident that tall eastern gamagrass plants would not stand over the winter and be an effective windbreak. Switchgrass does remain upright and provide protection. The tallest varieties again were Kanlow and Alamo and this year Kanlow averaged slightly taller and more lodging resistant. Cave-in-Rock and Shelter were not significantly different. They are about a foot shorter and lodge slightly more than Kanlow and Alamo.

Final Determinations:

A. Vetiver grass is not winter hardy enough for this region.

B. Eastern gamagrass is not stiff enough stemmed to remain upright through the Winter so is not effective as a windbarrier.

C. 'Alamo' and 'Kanlow' switchgrass are the tallest and most resistant to lodging. They were not found significantly different, but averaged about one foot taller in effective height and were somewhat more resistant to lodging than Cave-in-Rock and Shelter. The latter were also not significantly different.

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: Henry, J.

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 understory 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 anghranose, 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 NCR upon request.

Discussion:

1994 - 1998

As of the date of 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 two and a half feet to three feet; spread ranges from one and a half feet to two feet.

Study: 29A129G

Study Title: Evaluation of Selected Perennial Grasses as a Vege-Terrace at the Plant Materials Center.

Study Leader: Henry, J.

Introduction:

Approximately 40 years ago the Soil Conservation Service, now the Natural Resources Conservation Service proposed that terraces could be better developed vegetatively than with machinery. The idea was passed up largely because of the availability of new machinery and the unwillingness of landowners and conservationists to wait for terraces to form naturally.

In such countries as India, vegetative terraces have been used extensively for years. Researchers indicate the terraces that functioned well and are a low cost option to controlling erosion.

Potential benefits of vegetative (grass) terraces include their abilities to trap sediment, helping to fill rills and gullies; to disperse concentrated flows; and to reduce the amount of runoff by temporarily ponding some of the water and increasing intake opportunity time. Infiltration rates may be increased in areas preferentially retained.

Objectives:

A. Demonstrate the use of several species of selected perennial grasses as vege-terraces vegetatively.

B. Record soil deposition taking place in the vege-terrace at different locations.

Discussion:

1992 - 1998

This study was established in May 1991 in Field #2 on the PMC. A quarter mile of vege-terrace was established using eight inch squared pieces of 'Cave - In- Rock' switchgrass sod placed one foot apart. In the concentrated flow areas the sod was placed leaving no space between them. Measurements were taken in November of 1992, October of 1994 and again in March 1996. Plans are to take measurements in November 1999.

Table #1 reflects the measurements taken in 1992, 1994 and 1996.

Table #2 reflects the summary of deposition at the different locations for 1992, 1994, and 1996.

Study 29A129G - Evaluation of Switchgrass as a Vege-Terrace at Elsberry PMC **Table #1**

Terrace Location Measurements **Measurements made in feet.**

Measurements of six locations along contour switchgrass terrace system; increase or decrease from original elevation.

Terrace Diagram: --> 4' --------- 3' --------- 2' ------- 1' --------- switchgrass terrace -----1 ------ 2' ------3' --- --4'

below terrace ----------:----------above terrace

N.E. Location	11/92*	10/94	3/96	N. Cent. Location	11/92*	10/94	3/96	N.W. Location	11/92*	10/94	3/96
4' Above	0.00	0.05	0.20	4' Above	0.00	0.40	0.30	4' Above	0.00	0.20	0.20
3' Above	0.00	0.10	0.20	3' Above	0.00	0.20	0.50	3' Above	0.00	0.00	0.30
2' Above	0.00	0.25	0.30	2' Above	0.00	0.40	0.50	2' Above	0.00	0.10	0.40
1' Above	0.00	0.10	0.10	1' Above	0.00	0.60	0.50	1' Above	0.00	0.10	0.30
At post	0.00	0.10	0.10	At post	0.00	0.20	0.30	At post	0.00	0.00	0.10
1' Below	0.00	0.15	0.20	1' Below	0.00	0.10	0.20	1' Below	0.00	0.10	0.20
2' Below	0.00	0.15	0.20	2' Below	0.00	0.20	0.10	2' Below	0.00	-0.10	0.10
3' Below	0.00	-0.20	-0.20	3' Below	0.00	-0.20	-0.10	3' Below	0.00	0.05	0.00
4' Below	0.00	-0.10	0.00	4' Below	0.00	0.00	0.00	4' Below	0.00	-0.30	-0.20

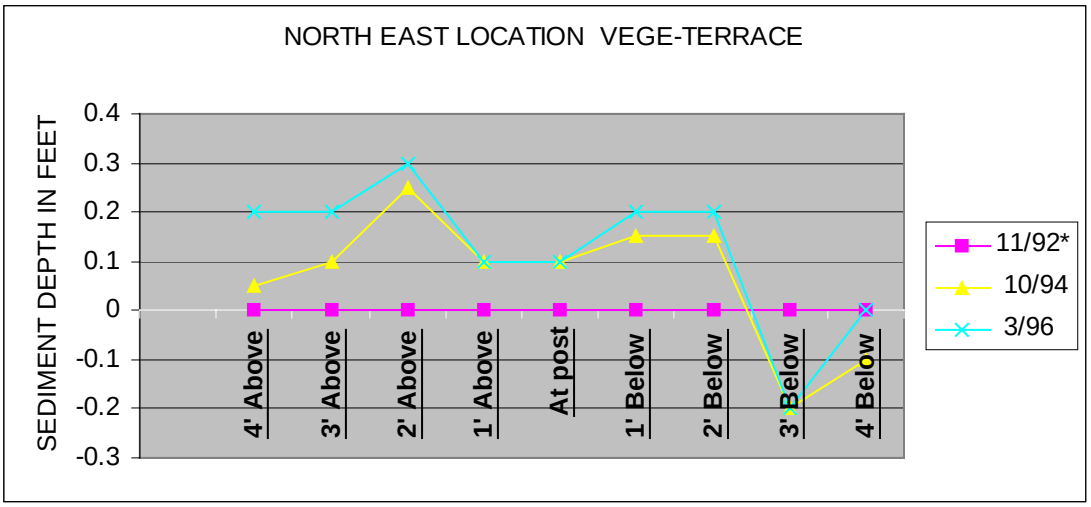
S.E. Location	11/92*	10/94	3/96	S. Cent. Location	11/92*	10/94	3/96	S.W. Location	11/92*	10/94	3/96
4' Above	0.00	0.10	0.20	4' Above	0.00	0.15	0.40	4' Above	0.00	0.20	0.20
3' Above	0.00	-0.10	0.10	3' Above	0.00	0.50	0.60	3' Above	0.00	-0.05	0.30
2' Above	0.00	0.20	0.40	2' Above	0.00	0.45	0.60	2' Above	0.00	0.10	0.30
1' Above	0.00	0.00	0.30	1' Above	0.00	0.25	0.60	1' Above	0.00	0.00	0.20
At post	0.00	-0.10	0.10	At post	0.00	0.35	0.40	At post	0.00	0.05	0.10
1' Below	0.00	0.00	0.20	1' Below	0.00	0.20	0.30	1' Below	0.00	0.20	0.20
2' Below	0.00	0.10	0.20	2' Below	0.00	0.30	0.40	2' Below	0.00	-0.05	0.20
3' Below	0.00	-0.20	0.20	3' Below	0.00	-0.45	-0.30	3' Below	0.00	-0.05	-0.10
4' Below	0.00	0.00	-0.10	4' Below	0.00	-0.10	0.00	4' Below	0.00	0.05	0.20

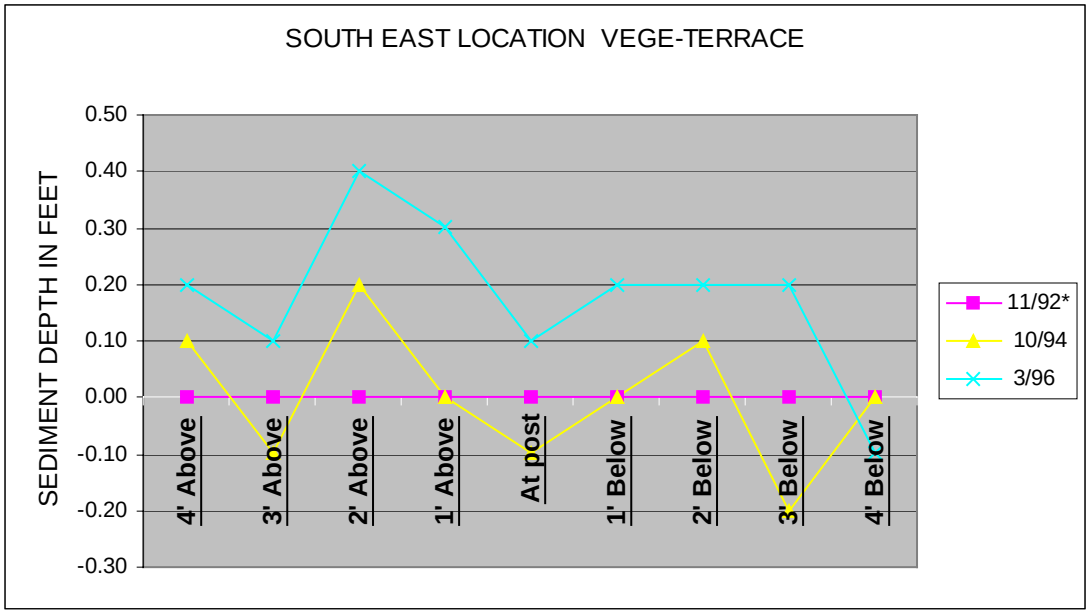
NOTE: 11/92 elevation measurements taken in 1992 are adjusted to 0.00 for starting elevation.

Legend: N.E.=Northeast, S.E.=Southeast, N.Cent. = North Central, S.Cent. = South Central, N.W.=Northwest, S.W.=Southwest

Study 29A129G - Evaluation of Switchgrass as a Vege-Terrace at Elsberry PMC

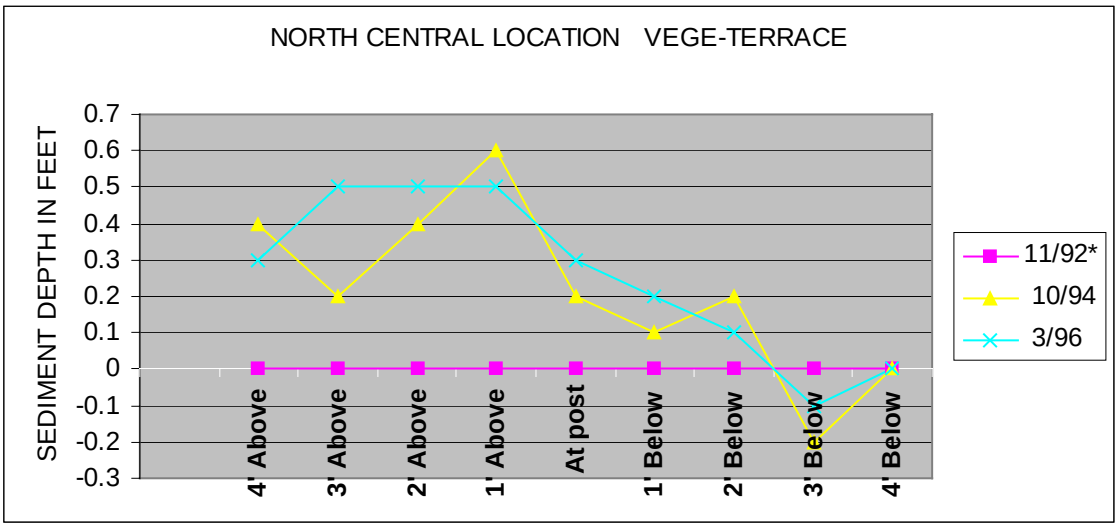
Table #2

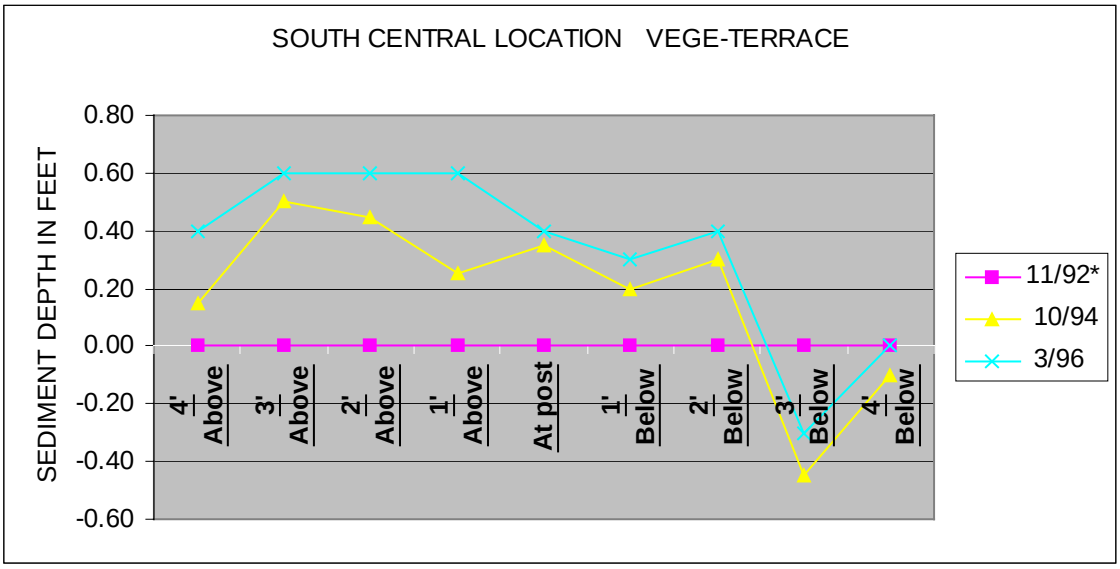




Study 29A129G - continued

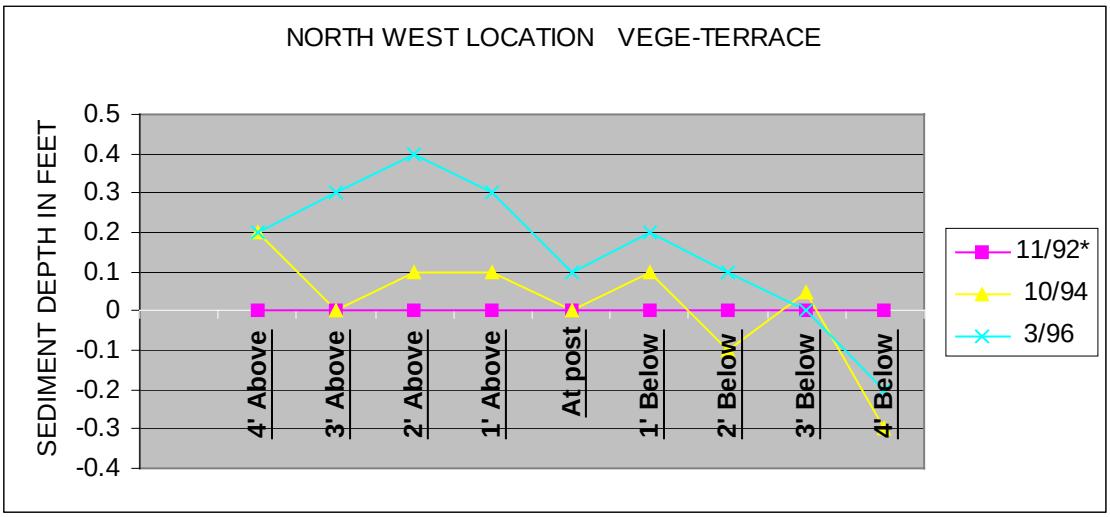
Table #2 cont.

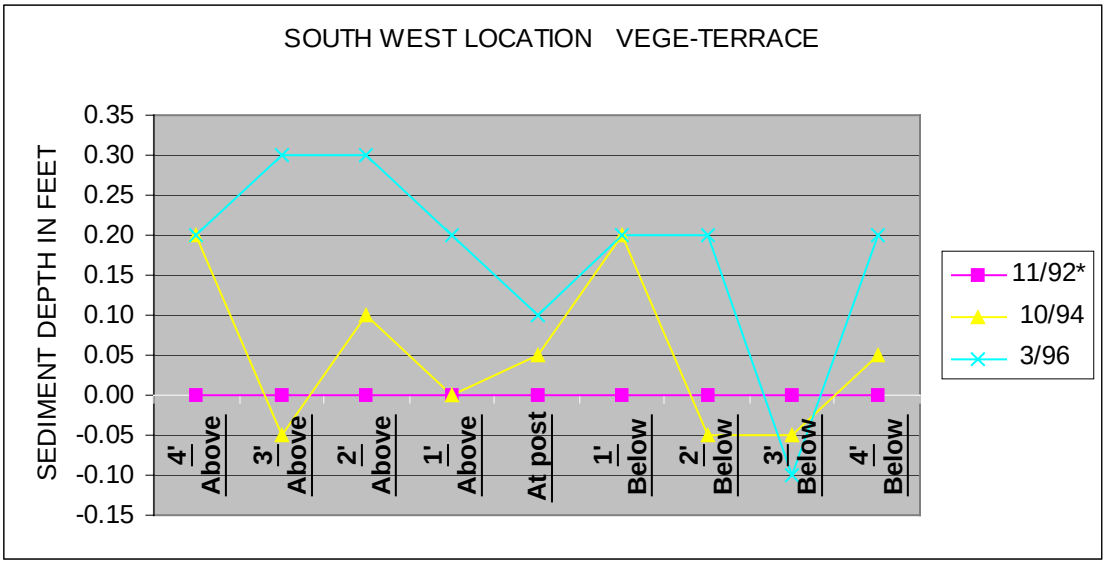




Study 29A129G - continued

Table #2 cont.





Study 29A130G

Study Title: Grass Hedges for Control of Runoff and Erosion

Study Leader: Henry, J.

Introduction:

Severe erosion occurs in the Midwestern U. S. on sloping farmland cropped to corn and soybeans using conventional management practices. This erosion is traditionally controlled by contour farming, conservation tillage, conservation cropping sequences, and terraces. These practices have not always been accepted for various reasons.

Construction of terraces is expensive and removes land from production where slopes are steep. Conservation tillage often requires special equipment and skills to be successful. Contour farming is difficult on irregular slopes.

Narrow grass hedges (stiff stalked, dense well-rooted grass strips) planted or seeded across slopes on a general contour may be a more feasible option for reducing runoff flow and soil losses from irregularly sloped row cropland.

Standard erosion plots established in the early 1940's on a claypan soil near Kingdom City, Missouri can readily be used to determine the ability of grass hedges to control runoff and soil losses from conventionally tilled soybeans. Data obtained from this study will be helpful in planning best management practices for the conservation of soil and water under soybean cropping.

Objectives:

1. Determine the ability of grass hedges to reduce runoff and soil losses from conventionally tilled soybean cropland.

2. Characterize deposition of soil and plant materials within an up slope from grass hedge strips.

3. Characterize deposition of soil and plant materials within and adjacent to grass strips and in runoff water.

4. Evaluate growth characteristics of hedge grasses including tiller density and diameter, rate of growth, ability of grass to coalesce into solid hedges.

5. Evaluate plant survival associated with submergence by sediment deposition.

Cooperators: USDA-Natural Resources Conservation Service, Elsberry, Missouri; USDA Agriculture Research Service Cropping Systems and Water Quality Research Unit, Kingdom City, Missouri and the University of Missouri, Columbia.

Discussion:

Grass hedges were established at the standard erosion plots at the McCredie Farm at Kingdom City on April 29, 1992. 'Cave-In-Rock' switchgrass, *Panicum virgatum* ; 'Pete' eastern gamagrass, *Tripsacum dactyloides*, and Chinese silvergrass *Miscanthus sinensis*, were planted across the end of each plot. Each grass was hand planted with container stock grown from the PMC greenhouse and placed in either a single or double row and replicated twice. Two replications of a control plot with no grass hedge were also included. The plots were initially irrigated and established very well. At the end of 1993 evaluations it became apparent that the Chinese silvergrass was too aggressive for the purpose of this study. It was then decided to remove this species from the study and replace it with Texas bluegrass.

Both the switchgrass and the eastern gamagrass performed good to excellent regarding deposition, weed and insect competition, growth rate and ability to hedge. The Texas bluegrass performed poor, possibly because it may have been out of its growth range.

The following Table #1 reflects the plant's performance (every two years) from 1992 to 1998. Table #2 reflects 1993-1994 runoff data. Table #3 reflects soil loss data and hedge width information. Table #4 reflects a summary of the study.

Study 29A130G - Grass Hedges for Control of Runoff and Erosion **Table #1**

Grass	Plot No.	Stand Percent						2/Survival (Depositon) (1-9) 1/						3/ Survival (Competition from Weeds and Insects) (1-9) 1/						Growth Rate (1-9) 1/						Ability To Hedge (1-9) 1/					
Year		**92**	**93**	**94**	**95**	**96**	**98**	**92**	**93**	**94**	**95**	**96**	**98**	**92**	**93**	**94**	**95**	**96**	**98**	**92**	**93**	**94**	**95**	**96**	**98**	**92**	**93**	**94**	**95**	**96**	**98**
Cave-In-Rock' switchgrass																															
Single Row																															
Rep 1	31	95	100	100	100	100	100	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	2	1	1	1	1
Rep 2	36	95	100	100	100	100	100	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1
Double Row																															
Rep 1	33	95	100	100	100	100	100	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	1	1	2	1	1	1	1	1
Rep 2	35	100	100	100	100	100	100	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	1	1	2	1	1	1	1	1
Silvergrass 1992 and 1993 only																															
Single Row																															
Rep 1	27	85	100					1	1					2	1					3	2					3	2				
Rep 2	34	80	100					1	1					2	1					3	2					3	2				
Double Row																															
Rep 1	29	100	100					1	1					2	1					3	2					2	1				
	39	95	100					1	1					2	1					3	2					2	1				
Texas Bluegrass 1994 through1996																															
Rep 1	37			70	70	60	60			6	6	8	8			8	8	8	8			7	7	8	8			9	9	9	9
Rep 2	34			65	60	60	60			6	6	8	8			8	8	8	8			7	8	8	8			9	9	9	9
Double Row																															
Rep 1	29			75	75	65	65			6	6	8	8			8	8	8	8			8	8	8	8			9	9	9	9
Rep 2	39			70	80	65	70			6	6	8	8			8	9	8	8			8	8	8	8			9	9	9	9

Grass	Plot No.	Stand Percent						2/Survival (Depositon) (1-9) 1/						3/ Survival (Competition from Weeds and Insects) (1-9) 1/						Growth Rate (1-9) 1/						Ability To Hedge (1-9) 1/					
Year		92	93	94	95	96	98	92	93	94	95	96	98	92	93	94	95	96	98	92	93	94	95	96	98	92	93	94	95	96	98
Pete' eastern gamagrass																															
Single Row																															
Rep 1	28	90	100	100	100	100	100	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	4	2	1	1	1	1
Rep 2	40	90	100	100	100	100	100	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	3	2	1	1	1	1
Double Row																															
Rep 1	32	100	100	100	100	100	100	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1
Rep 2	37	95	100	100	100	100	100	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1
control																															
Rep 1	30 Control plots do not have a grass hedge																														
Rep 2	38 Control plots do not have a grass hedge																														

1/ 1=Excellent; 9=Poor

2/ Survival of plant in relation to deposition of soil cover in plot

3/ Survival of plant in relation to competition from weeds and insects

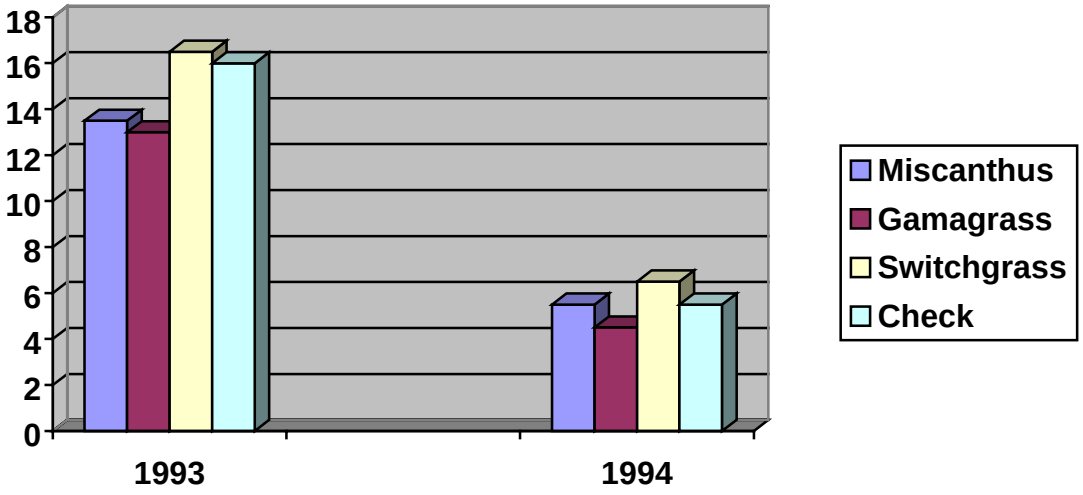
STUDY 29A130G – Grass Hedges for Control of Runoff and Erosion

Table #2

- 12 hedges planted April 1992
- 3 grasses: eastern gamagrass, Chinese silvergrass, switchgrass
- 2 hedge widths: 18 and 36 cm (7 and 14 inches)
- 2 replications
- 2 check plots with no hedges
- Planted to chisel-plowed soybeans in 76 cm (30 inch rows)
- Measure and compare runoff, soil loss, and hedge effect on crop yields.

1993-1994 RUNOFF

(Data in Inches)

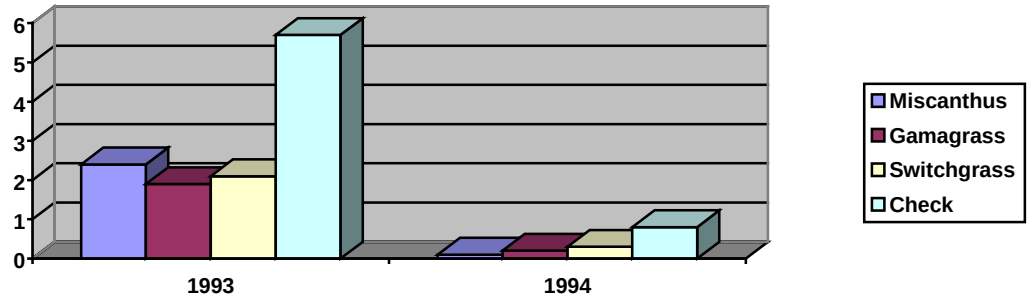


1993 (53" RAIN) **1994 (27" RAIN)**

Study 29A130G - continued

1993-1994 SOIL LOSS **Table #3**

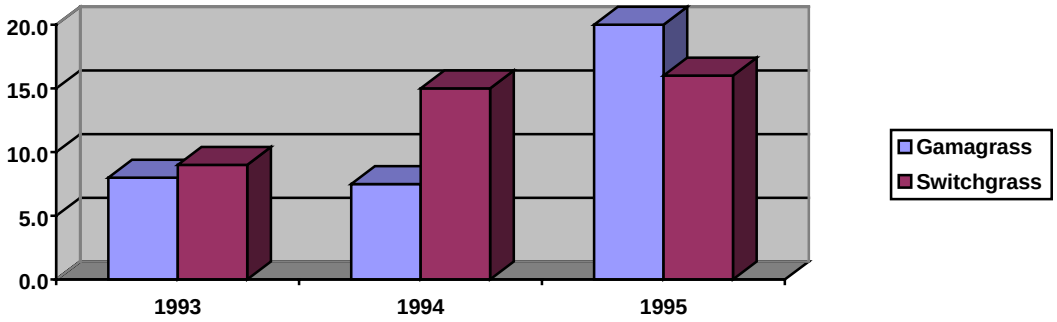
(Data In Tons Per Acre)



1993 (53” RAIN) **1994 (27” RAIN)**

1993-1995 HEDGE WIDTH (7 Inches)

Data In Inches)



1993-1995 HEDGE WIDTH (14 Inches)

(Data In Inches)

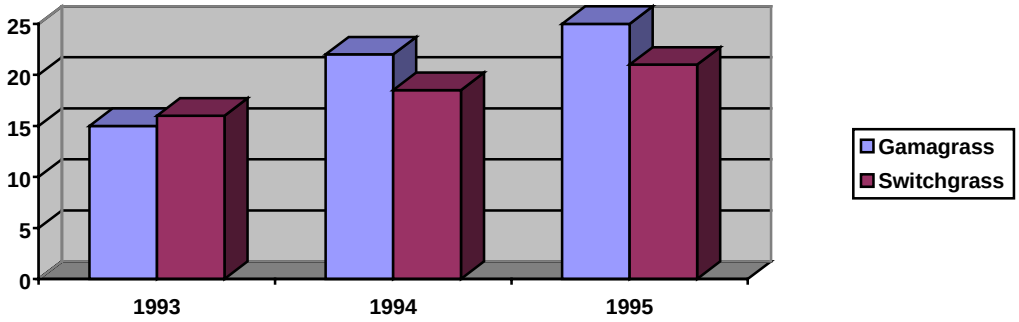


Table #4

Summary

- Runoff
- Soil Loss

Soil Loss

- 1993: Soil loss reduced by 61% average
- (5.7 t/a vs 2.2 t/a)

- 1994: Soil loss reduced by 69% average
- (0.62 t/a vs 0.19 t/a)

Runoff

- 1993: Runoff not significantly reduced

- 1994: Runoff not significantly reduced

Conclusions

- Grass hedges can reduce soil loss by trapping sediment

- Grass hedges may not reduce total runoff amounts

- Grass hedges may reduce yields in adjacent crop rows that are perpendicular to the grass hedge

Study: 29A137O

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

Study Leader: Henry, J.

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 indicates 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 use potential 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:

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 - 1998

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 was working with a flood tolerant switchgrass. 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. Eastern gamagrass 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. 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 is scheduled for October 1999.

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

Study 29A137O **Table #1**

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

Plugs Planted 5-2-97 (Eastern Gamagrass)
Evaluation Date: 7-9-98

	Plant #	South End of Plot	Weed Comp.	Disease/ Insect	Developed Seed Head	Vigor \1	Ave. Ht. Ft.
9078840	25		severe	moderate rust	-	3	2.5'
Chariton,	24		" "	" "	yes	3	" "
Missouri	23		" "	" "	" "	3	" "
5' spacing	22		" "	" "	" "	3	" "
25 total	21		" "	" "	" "	3	" "
planted	20		" "	" " (+)	" "	3	2.0'
	19		" "	" "	" "	3	" "
	18		" "	" "	-	7	1.8' swale area
	17	Plant Dead	-	-	-	-	Swale, 6"standing water
	16	" "	-	-	-	-	" "
	15	" "	-	-	-	-	" "
	14	" "	-	-	-	-	" "
	13	" "	-	-	-	-	" "
	12		Severe	Moderate rust	Yes	3	3.0'
	11		" "	Severe rust	-	7	2.0'
	10		" "	Moderate rust	Yes	3	2.5'
	9		" "	Light rust	" "	3	3.0'
	8		" "	" "	" "	3	2.5'
	7		" "	" "	" " (+)	3	4.0'
	6		" "	" "	" " (+)	3	3.0'
	5		" "	" "	" "	3	2.5'
	4		" "	" "	" "	3	2.5'
	3		" "	" "	" "	3	2.5'
	2		" "	" "	" "	3	2.5'
	1		Severe	" "	" "	7	2.5'
		North end of plot					
9078844	1		Severe	Light rust	Yes	3	3.0'
Atchison,	2		" "	Light rust	" "	3	3.0'
Missouri.	3		" "	Moderate rust	" "	7	2.0'
7' spacing,	4		" "	Light rust	" "	7	2.0'
18 total	5		" "	Moderate rust	" "	8	1.5'
planted.	6		" "	Moderate rust	" "	7	2.0'
	7		" "	Severe rust	" "	7	2.5'
	8		" "	Severe rust	-	7	2.5'
	9	Plant Dead		-	-	-	Swale area
	10	" "		-	-	-	" "
	11	" "		-	-	-	" "
	12	" "		-	-	-	" "

Rating for Vigor:
1=Excellent; 9=Poor

	Plant #	South End of Plot	Weed Comp.	Disease/ Insect	Developed Seed Head	Vigor \1	Ave. Ht. Ft.
9078844	13	" "		-	-	-	" "
continued	14		Severe	Severe rust	Yes	7	2.5'
	15		" "	Moderate rust	Yes	3	3.0' higher above swale
	16		" "	Moderate rust			2.0'
	17		" "	Moderate rust			3.0'
	18	Plant Gone	-				
9078842	9	-	Severe	Light rust	Yes	3	2.0'
Atchison,	8		" "	Light rust	Yes	3	3.0'
Missouri.	7	Plant dead		-	-	-	Start of swale
15' spacing.	6	" "		-	-	-	" "
9 total	5	" "		-	-	-	" "
planted.	4	" "		-	-	-	" "
	3	-	Severe	Light rust	Yes	7	2.0'
	2		" "	Light rust	Yes	3	2.5'
	1		" "	Light rust	Yes	3	3.0'
9078846	1	-	Severe	-	-	3	2.0'
Clinton,	2		" "	light rust	Yes	3	2.5'
Missouri.	3		" "	-	-	3	2.5'
8' spacing.	4		" "	light rust	-	3	2.5'
16 total	5		" "	" "	-	3	2.5'
planted.	6		" "	" "	-	3	2.0'
	7	Plant Dead	-	-	-	-	Swale
	8	" "	-	-	-	-	" "
	9	" "	-	-	-	-	" "
	10	" "	-	-	-	-	" "
	11	" "	-	-	-	-	" "
	12	-	Severe	light rust	-	7	1.0' edge of swale
	13	-	" "	moderate rust	Yes	3	2.5'
	14	-	" "	light rust	-	3	2.5'
	15	-	" "	" "	Yes	4	2.0'
	16	-	" "	" "	-	3	2.0'
9078843	9	-	Severe	Light rust	Yes	7	2.0'
Atchison,	8		" "	Light rust	" "	3	2.5'
Missouri.	7		" "	Moderate rust	" "	8	1.5' Start of swale
15' spacing.	6	Plant Dead		-	-	-	-
9 total	5	" "		-	-	-	-
planted.	4	-	Severe	Severe rust	Yes	8	2.0'
	3		" "	Light rust	" "	7	2.5'
	2	Plant Dead	Dead	-	-	-	-
	1	-	Severe	Light rust	Yes	3	3.0'

Rating for Vigor:
1=Excellent; 9=Poor

	Plant #	North End of Plot	Weed Comp.	Disease/ Insect	Developed Seed Head	Vigor \1	Ave. Ht. Ft.
9078845	1	-	Severe	Light rust	Yes	3	2.5'
Holt,	2		" "	" "	Yes	3	3.0'
Missouri	3		" "	" "	Yes	3	" "
8' spacing.	4		" "	Moderate rust	Yes/Heavy	3	3.5'
16 total	5		" "	" "	Yes/Heavy	3	2.5
planted.	6		" "	Severe rust	Yes/Heavy	7	3.0'
	7		" "	" "	Yes	7	2.0'
	8	Plant Dead	-	-	-	-	Swale start
	9	" "	-	-	-	-	" "
	10	" "	-	-	-	-	" "
	11	" "	-	-	-	-	" "
	12	-	Severe	Severe rust	Yes	7	2.0' edge swale
	13	" "	" "	Light rust	" "	3	2.5'
	14	" "	" "	" "	" "	3	2.5'
	15	" "	" "	Moderate rust	" "	3	3.0'
	16	" "	" "	Light rust	" "	3	2.5'
Pete	25		Severe	Light rust	Yes/Heavy	3	3.0'
variety.	24	-	" "	" "	" "	3	3.0'
5' spacing.	23	" "	" "	" "	" "	1	4.0'
25 total	22	" "	" "	" "	" "	1	4.0'
planted.	21	" "	" "	" "	" "	1	4.0'
	20	" "	" "	" "	Yes	3	3.0' swale start
	19	" "	" "	" "	" "	7	2.0'
	18	" "	" "	" "	" "	3	3.0' in water
	17	Plant dead		-	-	-	-
	16	" "	-	-	-	-	-
	15	" "	-	-	-	-	-
	14	" "	-	-	-	-	-
	13	-	Severe	Moderate rust	Yes	7	2.5' Base plant in water
	12	" "	" "	" "	" "	7	2.0' Base plant in water
	11	" "	" "	Severe rust	" "	7	2.5'
	10	" "	" "	" "	" "	7	3.0'
	9	" "	" "	Moderate rust+	" "	7	3.0'
	8	" "	" "	Moderate rust	Yes/Heavy	3	4.0'
	7	" "	" "	" "	" "	3	3.0'
	6	" "	" "	Light rust	Yes	3	3.5'
	5	" "	" "	" "	Yes/Heavy	3	3.5'
	4	" "	" "	" "	" "	3	3.0'
	3	" "	" "	-	" "	1	3.5'
	2	" "	" "	Light rust	Yes	3	3.0'
	1	" "	" "	-	Yes	3	3.0'

Rating for Vigor:
1=Excellent; 9=Poor

Study 29A137O **Table #2**

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

Plugs Planted 5-2-97 (Switchgrass)
Evaluation Date: 7-9-98

	Plant #	North End of Plot	Weed Comp.	Disease/ Insect	Developed Seed Head	Vigor \1	Ave. Ht. Ft.
Switchgrass # 9062213 3' spacing 41 total planted	1		severe	crewing/ light rust	yes	1	2.0'
	2	Cave-In-Rock invader					
	3	Plant dead					
	4		severe	-	yes	7	1.0'
	5		"	light rust	yes	7	1.5'
	6		"	"	-	7	1.0'
	7	Plant dead					
	8		severe	-	-	8	1.0'
	9		"	-	yes	7	1.0'
	10		"	moderate	"	7	1.5'
	11		"	-	-	7	1.5'
	12		"	light	yes	3	2.0'
	13		"	"	"	7	1.5'
	14		"	"	"	7	1.5' .
	15		"	mod. rust	"	3	2.5'
	16		"	"	"	3	
	17		"	-	-	7	1.5'
	18		"	moderate	yes	3	2.5'
	19		"	"	"	7	1.5'
	20		"	"	"	3	2.5' in swale
	21	Plant dead					
	22		severe	light	yes	7	2.0' in swale
	23		"	-	-	7	1.5' plant in water 1"
	24		"	moderate	yes	3	2.5' swale
	25		"	"	"	7	1.5' swale
	26		"	-	-	7	1.0' swale
	27		"	moderate	yes	7	2.0' swale
	28		"	light	yes	7	1.5' swale end
	29	Plant dead - Eastern Gamagrass invader					
	30		Severe	-	-	7	1.5'
	31		"	-	-	8	1.0'
	32		"	-	Yes	8	1.5'
	33		"	-	-	8	1.5'
	34		"	light	yes	7	2.5'

Rating for Vigor:
1=Excellent; 9=Poor

	Plant #	North End of Plot	Weed Comp.	Disease/ Insect	Developed Seed Head	Vigor \1	Ave. Ht. Ft.
9062213	35		"	-	"	7	1.5'
continued	36	Plant dead					
	37		Severe	-	Yes	7	1.5'
	38		"	-	"	7	2.0'
	39		"	-	-	7	1.5'
	40		"	-	-	7	2.0'
	41		"	-	Yes	3	2.0'
Switchgrass	1	Plant dead	Severe				
#9062235	2	Cave-In-Rock invader					
4' spacing	3		Severe	-	yes	8	1.5'
31 total	4	Plant dead					
planted	5		severe	-	yes	7	2.0'
	6	Plant dead					
	7		severe	-	-	8	1.0'
	8		"	-	yes	7	1.5'
	9		"	-	"	7	2.0'
	10		"	light rust	"	3	3.0'
	11	Plant dead					
	12			mod. rust	yes	3	3.0'
	13			light rust	"	7	1.5'
	14			"	"	7	2.5'
	15			"	"	7	2.5' swale
	16			"	"	7	2.0'
	17			"	"	3	1.5' base plant 2" water
	18	Plant dead					
	19	Plant dead					
	20			light	-	7	.7" base plant 2" water
	21			-	-	7	1.5' swale
	22			mod. rust	-	7	1.5' swale
	23			light rust	yes	3	2.0' swale
	24			"	-	8	1.0' swale
	25			"	yes (heavy)	1	3.0' above water
	26			"	yes	7	2.5'
	27			"	"	7	2.5'
	28			-	"	3	2.0'
	29			-	-	7	1.0'
	30			-	-	8	1.5'
	31			-	yes	1	2.5'

Rating for Vigor:
1=Excellent; 9=Poor

	Plant #	North End of Plot	Weed Comp.	Disease/ Insect	Developed Seed Head	Vigor \1	Ave. Ht. Ft.
Switchgrass	1	Cave-In-Rock invader					
#9062193	2	Cave-In-Rock invader					
5' spacing	3		severe	-	yes	7	2.5'
25 total	4	Plant dead					
planted	5		severe	-	yes	8	1.5'
	6		"	-	-	8	1.5'
	7		"	light rust	yes (heavy)	3	3.0'
	8		"	"	yes	3	3.0'
	9		"	mod. rust	"	3	3.0'
	10		"	"	"	7	2.5'
	11		"	light rust	"	7	2.0' swale
	12		"	mod. rust	yes(heavy)	3	2.5'
	13		"	severe rust	yes	7	2.0' base plant in water
	14		severe	light rust	yes	7	1.5' 2" water on plant
	15	Plant dead					
	16		severe	light rust	yes	7	1.5' 2" water on plant
	17	Plant dead					
	18		severe	moderate	yes	7	2.5' edge of swale
	19		"	"	"	7	2.5'
	20		"	"	"	7	2.5'
	21	Plant dead					
	22		severe	-	yes	3	2.5'
	23		"	light	"	7	2.0'
	24	Plant dead					
	25	Plant dead					

Rating for Vigor:
1=Excellent; 9=Poor

Study 29A137O **Table #3**

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

Plugs Planted 5-2-97 (Prairie Cordgrass)
Evaluation Date: 7-9-98

	Plant #	North End of Plot	Weed Comp.	Disease/ Insect	Developed Seed Head	Vigor	\1 Ave. Ht. Ft.	Spread Width Inch.
Lost Creek	1		severe	-	-	1	4.0'	5"
Collection	2		"	-	-	1	4.0'	9"
Planted	3		"	yellowing lower leaves	yes	3	4.5'	8"
9/29/97	4		severe	light rust	-	3	3.5'	8"
	5		"	-	-	1	4.0'	8"
East - ->	6		"	light rust	-	1	4.0'	8"
	7		"	"	stem swell	3	4.0'	7"
10' x 10'	8		"	"	-	3	4.5'	8"
3 | 2 | 1	9		"	"	-	3	3.5'	8"
6 | 5 | 4								
9 | 8 | 7								

	Plant #	North end of Plot	Weed Comp.	Disease/ Insect	Developed Seed Head	Vigor	\1 Ave. Ht. Ft.	Spread Width Inch
Cuivre	1		severe	light rust	-	3	3.5'	4"
Island	2		"	"	stem swell	3	4.0'	7"
Collection	3		"	"	"	3	4.0"	6"
Planted	4		"	-	"	3	4.0'	5"
5/15/98	5		"	light rust	"	3	3.5'	5"
	6		"			3	4.0'	5.5"
3' x 3'	7		"	-	stem swell	3	4.0'	5"
4 |3 | 2| 1	8		"	insect bore into seed wall	seed head emerging	3	4.0'	6"
8 | 7| 6| 5							

	Plant #	North End of Plot	Weed Comp.	Disease/ Insect	Developed Seed Head	Vigor	\1 Ave. Ht. Ft.	Spread Width Inch
	9		"	light rust	-	3	3.5'	5"
	10		"	-	stem wall	1	4.5'	6"
Lost Creek	11		"	-	"	1	4.0'	6"
Planted	12		"	-	-	1	4.0'	6"
5/15/98	13		"	light rust	stem swell	1	4.0'	6"
	14		"	-	"	3	3.5'	5"
3'x3'	15		"	-	-	3	3.0'	5"
12|11|10|9	16		"	-	-	3	4.0'	5"
16|15|14|13								

Rating for Vigor:
1=Excellent; 9=Poor

Study Number: 29A139G

Study Title: Field Evaluation of Establishment of Herbaceous Plant Materials on Sand Covered Flooded Areas in Missouri.

Study Leader: Bruckerhoff, S. B.

Introduction:

Following the 1993 flood, there were extensive areas of sand deposition along the major drainages in Missouri. Very little information is available pertaining to the selections of plant species and procedures necessary for revegetation of these areas. It is necessary to have better information for sand revegetation when flood events reoccur.

Objective:

To test the establishment and persistence of several species and varieties on deep (four to six feet) sand deposits on the Missouri River flood plain. This information can then be used to make recommendations on revegetation of these areas for stabilization.

Cooperators:

The USDA, Natural Resources Conservation Service (NRCS) in cooperation with the Missouri Department of Conservation (Grand Pass Wildlife Area).

Procedures:

A list of species was developed and acquired from commercial and government sources (see Table #1). A site was located on Missouri Department of Conservation, Grand Pass Wildlife Area that had deposits of four to six feet of sand. The list contained 30 accessions that were planted in a randomized complete block with four replications. Each plot is 10' x 30' with 20' between replications and no border between plots (see Table #2). In late spring of 1994, the site was no-till planted to millet in hopes of reducing wind erosion and protecting seedlings during the 1995 establishment year. The plots were no-till planted using a plot planter that placed the seed approximately two inches deep at the critical area stabilization rate for most of these species (see Table #1 for specific seeding rates in PLS #/AC. and PLS/SQ FT) . No fertility was planned because of the very low content of organic matter at this site. The study continued for three years.

Discussion:

1995

The study was established April 19, 1995 at Missouri Department of Conservation, Grand Pass Wildlife Area. The planting was initially evaluated for date of emergence and later in the year for percent stand, stand density, height, and vigor (see Table #3).

Emergence was good to excellent on all plots except for the sideoats grama and Illinois bundleflower plots. In many cases the seeding rate was probably too high for what the sand could support. The deep, two inch seeding depth did not interfere with emergence of even the small seeded species.

Most of the cool season grasses, forbs, and legumes decreased considerably in percent stand by the August evaluation date.

1996

In 1996 the planting was evaluated for percent stand, percent canopy cover, height, and vigor (see Table #4). These evaluations were taken in June and August.

The warm season grasses persisted better on this sandy, droughty site than the cool season grasses, legumes, and forbs. The best looking species/varieties are as follows:

1. 'Pronghorn' prairie sandreed
2. 'Goldstrike' sand bluestem
3. 'Goshen' prairie sandreed
4. 'Champ' big bluestem
5. vns(variety not stated) sand lovegrass
6. 'Cimmaron' little bluestem
7. 'Cave-In-Rock' switchgrass
8. 'Garden' sand bluestem

The cool season grasses that survived the first year continued to decrease throughout the second year. The following three species had adequate stands after the second year.

1. Canada wildrye (So. Iowa. Eco.)
2. Intermediate wheatgrass (Mandan 756)
3. Mammoth wildrye

No legumes or forbs rated very high at the end of the second year but partridge pea did reseed itself to some extent and maximillian sunflower is persisting best of any species tried. Partridge pea and flatpea established well the first year and produced organic matter that could be valuable in the survival and persistence of other species in a mix.

1997

In 1997 the planting was again evaluated for percent stand, percent canopy cover, height, and vigor (Table #5). These evaluations were taken in June and August.

The warm season grasses again performed best on this site. Of the better performing ones listed in last year's discussion, 'Garden' sand bluestem has increased in percent stand while 'Cave-In-Rock' switchgrass has decreased, even though it increased in percent canopy cover , which is the fourth best of all species. 'Goldstrike' and 'Garden' sand bluestems, 'Champ' big bluestem, and 'Cimmaron' little bluestem all increased in canopy cover.

The cool season grasses continued to decline with the exception of Canada wildrye. Canada wildrye and mammoth wildrye increased in canopy cover while intermediate wheatgrass declined.

The legumes and forbs are not persisting very well with the exception of maximillian sunflower which is increasing. Showy partridge pea again reseeded itself but is continuing to decline. The alfalfa is continuing to decline but what plants are left look good even though they are being used by wildlife.

RESULTS

The top Species/Varieties final ranking is as follows:

Warm Season Grasses

Percent Canopy Cover	**Percent Stand**
1. 'Garden' sand bluestem	1. 'Goldstrike' sand bluestem
2. 'Pronghorn' prairie sandreed	2. 'Garden' sand bluestem
3. 'Goldstrike' sand bluestem	3. 'Pronghorn' prairie sandreed
4. 'Cave-In-Rock' switchgrass	4. 'Goshen' prairie sandreed
5. 'Champ' big bluestem	5. 'Champ' big bluestem
6. common sand lovegrass	6. 'Cimmaron' little bluestem
7. 'Cimmaron' little bluestem	7. common sand lovegrass
8. 'Goshen' prarie sandreed	8. 'Cave-In-Rock' switchgrass

Cool Season Grasses

Percent Canopy Cover	**Percent Stand**
1. (So. Iowa Eco.) Canada wildrye	1. (So. Iowa Eco.) Canada wildrye
2. common mammoth wildrye	2. common mammoth wildrye
3. 'Mandan 756' intermediate wheatgrass	3. 'Mandan 756' intermediate wheatgrass

Legumes and Forbs

Percent Canopy Cover	**Percent Stand**
1. common maximillian sunflower	1. common maximillian sunflower
2. common showy partridge pea	2. common showy partridge pea
3. 'Emerald' crownvetch	3. 'Emerald' crownvetch
4. 'Cody' alfalfa	4. 'Cody' alfalfa

Observations

Of the species tested, warm-season grasses exhibit better overall adaptability on this droughty site than did cool-season grasses, legumes, or forbs.

Canada wildrye and maximillian sunflower did quite well and would provide diversity to an otherwise warm-season grass seeding mixture.

Sand dropseed (*Sporobolus cryptandrus*), though not in this trial, developed on the periphery of the plot by natural succession and could be included in mixtures on similar sites.

Showy partridge pea provided a very strong first year stand but declined rapidly. Succession on these plots seemed enhanced by providing first year cover.

Prairie sandreed and sand bluestem produced stands dense enough to reduce vigor. This was obvious by improved vigor along plot margins. Stand density measurements taken the year of establishment indicate germination and establishment are not the problem in vegetating this type of site, but rather the droughty nature of the site itself to maintain a very dense plant population. The seeding rate used (the NRCS critical area seeding rate, see Table #1) was more than necessary, especially for the warm season grasses.

These soils are structureless, washed sand with little or no natural fertility. It is likely that fertility added would quickly leach through the soil profile.

These sites are fragile and will require careful management following establishment if they are to persist.

TABLE #1

Study No. 29A139G - Field Evaluation of Sand Covered Flooded Areas

Seed Rate - Pure Live Seeds per square foot.

Plot Number	Accession Number	Variety/Origin	Common Name	Genus/Species Seeds Per Pound	Seeding Rates PLS#/Acre	Seeding Rates Seeds/Sq. Foot
1.	474216	'Rountree'	Big bluestem	Andropogon gerardii 165,000	21	80
2.	9005158	'Champ'	Big bluestem	Andropogon gerardii 165,000	21	80
3.	434350	'Cheyenne'	Indiangrass	Sorghastrum nutans 175,000	19	76
4.	315747	'Rumsey'	Indiangrass	Sorghastrum nutans 175,000	19	76
5.	421553	'Aldous'	Little bluestem	Schizachyrium scoparium 260,000	14	84
6.	421552	'Cimmaron'	Little bluestem	Schizachyrium scoparium 260,000	14	84
7.	421281	'El Reno'	Sideoats grama	Bouteloua curtipendula 191,000	14	61
8.	433949	'Goshon'	Prairie sandreed	Calamovilfa longifolia 273,700	13	82
9.	9049969	'Pronghorn'	Prairie sandreed	Calamovilfa longifolia 273,700	13	82
10.	469228	'Cave-In-Rock'	Switchgrass	Panicum virgatum 389,000	9	80
11.	421520	'Blackwell'	Switchgrass	Panicum virgatum 389,000	9	80
12.	9068638	VNS	Sand lovegrass	Eragrostis trichodes 1,300,000	3	90
13.	9068640	Common	Showy partridge pea	Chamaecrista fasciculata 50,000	54	62
14.	9068639	Common	Illinois bundleflower	Desmanthus illinoensis 60,000	41	56
15.	9068641	'Cody'	Alfalfa	Medicago sativa 200,000	17	78
16.	278698	'Emerald'	Crownvetch	Coronilla varia 109,000	29	73
17.	9068642	'Norcen'	Birdsfoot trefoil	Lotus corniculatus 375,000	9	77
18.	434088	'Lathco'	Flatpea	Lathyrus sylvestris 7,842	4	80
19.	9068643	Common	Medium red clover	Trifolium Pratense 275,000	13	82
20.	9068644	'Martin'	Tall fescue	Festuca arundinacea 227,000	17	89
21.	9062277	Southern Iowa	Canada wildrye	Elymus canadensis 115,000	30	79
22.	116252	'Mandan 759'	Intermediate wheatgrass	Elytrigia intermedia 88,000	40	81
23.	422030	'Ioreed'	Reed canarygrass	Phalaris arundinacea 540,000	10	124
24.	9068635	Common	Smooth bromegrass	Bromus inermis 136,000	25	78
25.	313965	Common	Mammoth wildrye	Leymus racemosus 77,500	45	80

Table #1 - continued

Plot Number	Accession Number	Variety/Origin	Common Name	Genus/Species Seeds Per Pound	Seeding Rates PLS#/Acre	Seeding Rates Seeds/Sq. Foot
26.	9036025	Common	Dune wildrye	Leymus arenarius 116,160	30	80
27.	9068646	Common	Maximillian sunflower	Heliopsis maximiliana 150,000	23	79
28.	9062287	Common	Buffalograss	Buchloe dactyloides 56,000	90	116
29.	421277	'Garden'	Sand bluestem	Andropogon hallii 113,000	20	52
30.	9068636	'Goldstrike'	Sand bluestem	Andropogon hallii 113,000	20	52

TABLE #2

Study No. 29A139G - Field Evaluation of Sand Covered Flooded Areas

Planting Key

Planted: April 29, 1995

25	14	18	26	05	07	13	12	03	09	02	24	06	30	27
Replication No. 4														
28	21	11	17	19	22	15	29	01	10	20	16	08	23	04
26	24	13	07	19	10	18	15	21	20	16	28	17	29	06
Replication No.3														
30	25	04	23	09	01	22	11	05	27	03	12	02	08	14
03	26	23	12	01	17	10	02	04	08	07	14	15	24	09
Replication No. 2														
20	16	22	29	28	21	11	27	19	06	30	05	25	13	18
23	06	16	21	20	24	18	14	11	04	25	02	07	22	01
Replication No. 1														
30	10	08	03	29	13	15	28	12	17	19	05	09	27	26

Four replications of two rows each.

Plot size: 10’ x 30’

Alleys between rows: 20’

Alleys and borders planted to switchgrass

NORTH

TABLE #3

1995 - in Order of August Percent Stand Ratings

EVALUATIONS

Separated into Three Catagories - Warm Season Grasses, Cool Season Grasses, and Legumes and Forbs

	Emergance Date - Weeks Following Seeding	Percent Stand		Vigor *		Stand Density Plants/ Row Foot	Average Forage Ht. (cm)	Average Forate Ht. (cm)
	1	June	August	June	August	June	June	August
Warm Season Grasses								
Sand Bluestem (Goldstrike)	6.50	90.00	**98.00**	4.50	3.00	27.00	6.50	16.00
Prairie Sandreed (Goshen)	5.50	95.00	**96.00**	6.20	3.20	29.25	5.50	13.00
Sand Bluestem (Garden)	6.80	90.00	**91.00**	6.50	3.20	21.00	6.80	14.50
Prairie Sandreed (Pronghorn)	5.00	93.00	**90.00**	6.50	3.00	19.75	5.00	14.00
Indiangrass (Cheyenne)	5.00	90.00	**89.00**	6.80	4.50	23.75	5.00	12.50
Switchgrass (Cave-In-Rock)	5.00	91.00	**88.00**	7.50	3.80	21.00	5.00	17.00
Big Bluestem (Champ)	4.75	92.00	**85.00**	6.20	4.00	19.75	4.75	12.50
Little Bluestem (Cimmaron)	3.00	66.00	**85.00**	7.80	3.20	16.25	3.00	8.00
Sand Lovegrass (Common)	3.25	66.00	**85.00**	8.00	4.70	15.00	3.25	13.50
Little Bluestem (Aldous)	2.50	78.00	**74.00**	7.50	5.00	16.25	2.50	7.00
Buffalograss (Sharp's Improved)	3.75	90.00	**72.00**	7.80	4.50	26.25	3.80	7.00
Switchgrass (Blackwell)	3.00	65.00	**68.00**	7.20	4.00	15.75	3.00	14.00
Indiangrass (Rumsey)	4.50	80.00	**58.00**	7.00	4.20	21.00	4.50	16.00
Big Bluestem (Rountree)	4.50	71.00	**42.00**	7.00	4.50	10.75	4.50	15.00
Sideoats Grama (El Reno)	4.50	26.00	**29.00**	7.00	4.50	5.50	4.50	11.50
Cool Season Grasses								
Mammoth Wildrye (common)	12.00	89.00	**82.00**	5.50	6.50	25.25	12.00	19.00
Canada Wildrye (So. Ia. Eco)	7.70	98.00	**70.00**	5.00	4.00	26.75	7.80	11.00
Intermediate Wheatgrass	7.50	91.00	**59.00**	5.00	5.80	27.00	7.50	11.00
Smooth Bromegrass	6.50	58.00	**10.00**	6.00	6.20	12.75	6.50	11.00
Tall Fescue (Martin)	7.25	95.00	**9.00**	6.70	5.50	25.25	7.30	6.00
Dune Wildrye (common)	9.75	74.00	**2.00**	5.50	7.00	11.25	9.80	11.00
Reed Canarygrass (Ioreed)	4.50	49.00	**1.00**	7.20	7.00	17.25	4.50	2.50
Legumes Forbs								
Showy Partridge Pea (Platte)	4.50	94.00	**81.00**	6.20	4.20	28.75	4.50	23.00
Maximillian Sunflower (Common)	5.50	84.00	**48.00**	5.20	7.00	35.50	3.50	8.50
Alfalfa (Cody)	3.50	90.00	**54.00**	6.00	5.00	21.50	5.50	10.00
Median Red Clover (Common)	3.75	69.00	**19.00**	6.80	5.50	19.50	3.80	9.00
Crownvetch (Emerald)	3.50	48.00	**16.00**	6.20	6.20	8.50	3.50	7.50
BIrdsfoot Trefoil (Norcen)	1.62	46.00	**12.00**	8.00	5.80	14.25	1.60	7.00
Flatpea (Lathco)	3.88	90.00	**2.00**	5.20	7.00	31.25	3.90	7.00
Illinois Bundleflower (KS)	2.50	9.00	**2.00**	8.20	4.50	7.75	2.50	14.00

Vigor rating is 1 to 9 with 1 being the best

1.0-4.5 is Excellent; 4.6-5.0 is Good; 5.1-6.5 is Fair; 6.6-9.0 is Poor

TABLE #4

1996 - in Order of August Percent Stand Ratings

EVALUATIONS

Separated into Three Catagories - Warm Season Grasses, Cool Season Grasses, and Legumes and Forbs

	Percent Canopy Cover		Percent Stand		Vigor *		Average Forage Ht. (cm)	Average Forage Ht. (cm)
	June	August	June	August	June	August	June	August
Warm Season Grasses								
Sand Bluestem (Goldstrike)	25.00	47.50	82.00	**97.00**	4.50	6.00	14.00	31.00
Prairie Sandreed (Pronghorn)	34.00	60.00	94.00	**95.00**	6.20	6.00	26.50	36.00
Prairie Sandreed (Goshen)	25.00	41.00	97.00	**91.00**	6.20	6.00	18.00	19.00
Big Bluestem (Champ)	19.00	51.00	76.00	**85.00**	6.20	5.00	17.00	40.00
Little Bluestem (Cimmaron)	15.00	32.50	75.00	**78.00**	7.80	4.80	10.00	24.00
Sand Bluestem (Garden)	6.00	34.00	79.00	**73.00**	8.00	5.30	15.00	34.00
Sand Lovegrass (Common)	27.50	50.00	92.00	**73.00**	6.50	6.00	8.00	31.00
Switchgrass (Cave-In-Rock)	12.50	47.50	76.00	**71.00**	7.50	5.20	20.00	59.00
Switchgrass (Blackwell)	14.00	31.00	64.00	**64.00**	7.20	5.50	14.50	40.00
Little Bluestem (Aldous)	11.00	22.50	58.00	**46.00**	7.50	5.00	11.50	23.00
Big Bluestem (Rountree)	6.00	22.50	28.00	**38.00**	7.50	5.30	18.00	81.00
Buffalograss (Sharp's Improved)	4.20	8.00	60.00	**31.00**	7.80	3.00	6.00	8.00
Indiangrass (Cheyenne)	8.00	14.00	79.00	**24.00**	6.80	6.00	11.00	29.00
Sideoats Grama (El Reno)	5.00	11.50	20.00	**20.00**	7.00	4.50	14.00	38.00
Indiangrass (Rumsey)	2.00	5.50	44.00	**6.00**	7.00	3.30	14.50	30.00
Cool Season Grasses								
Canada Wildrye (So. Ia. Eco.)	14.00	24.00	61.00	**54.00**	5.00	7.00	18.00	56.00
Intermediate Wheatgrs (MD756)	10.50	15.50	46.00	**41.00**	5.00	5.50	15.50	23.00
Mammoth Wildrye (Common)	17.50	26.00	50.00	**40.00**	5.50	5.50	30.00	40.00
Tall Fescue (Martin)	0.10	0.50	1.00	**1.00**	5.50	5.00	1.00	10.00
Smooth Bromegrass (Common)	0.50	0.50	4.00	**<1**	6.00	3.00	11.00	15.00
Dune Wildrye (Common)	0.10	0.20	<1	**<1**	5.50	5.30	24.00	30.00
Reed Canarygrass (Ioreed)	0.00	0.00	0.00	**0.00**	-	-	-	-
Legumes and Forbs								
Showy Partridge Pea (Platte)	0.10	14.00	<1	**31.00**	6.20	5.50	0.50	44.00
Maximillion Sunflower (Common)	19.00	31.00	41.00	**24.00**	6.00	6.70	14.00	66.00
Crownvetch (Emerald)	1.00	11.00	2.00	**8.00**	6.20	6.00	3.50	10.00
Alfalfa (Cody)	0.80	8.50	19.00	**7.00**	5.20	5.00	8.00	24.00
Birdsfoot Trefoil (Norcen)	0.10	1.00	<1	**1.00**	8.00	6.00	3.00	11.00
Illinois Bundleflower (KS)	0.00	0.20	0.00	**<1**	8.20	5.30	0.00	4.00
Med. Red Clover (Common)	0.00	0.00	0.00	**0.00**	-	-	-	-
Flatpea (Lathco)	0.00	0.00	0.00	**0.00**	-	-	-	-

_____

Vigor rating is 1 to 9 with 1 being the best

1.0-4.5 is Excellent; 4.6-5.0 is Good; 5.1-6.5 is Fair; 6.6-9.0 is Poor

TABLE #5

1997 **- in Order of August Percent Stand Ratings**

EVALUATIONS

Separated into Three Catagories - Warm Season Grasses, Cool Season Grasses, and Legumes and Forbs

	Percent Canopy Cover		Percent Stand		Vigor *		Average Forage Ht. (cm)	Average Forage Ht. (cm)
	June	August	June	August	June	August	June	August
Warm Season Grasses								
Sand Bluestem (Goldstrike)	63.50	60.00	96.00	**96.00**	3.20	4.50	32.50	34.00
Sand Bluestem (Garden)	71.50	80.00	97.00	**95.00**	3.50	4.20	35.00	46.00
Prairie Sandreed (Pronghorn)	67.50	62.50	93.00	**94.00**	3.20	3.50	42.50	48.00
Prairie Sandreed (Goshen)	32.50	39.00	96.00	**89.00**	5.00	7.00	18.00	23.00
Big Bluestem (Champ)	55.00	56.00	86.00	**80.00**	3.80	4.20	35.50	47.50
Little Bluestem (Cimmaron)	37.50	42.50	84.00	**78.00**	5.00	4.80	20.00	26.00
Sand Lovegrass (Common)	35.00	46.00	80.00	**68.00**	5.80	5.80	25.00	29.00
Switchgrass (Cave-In-Rock)	57.50	59.00	69.00	**56.00**	3.00	4.00	61.00	72.50
Switchgrass (Blackwell)	36.50	37.50	65.00	**45.00**	5.00	6.00	44.00	56.00
Little Bluestem (Aldous)	27.50	35.00	49.00	**44.00**	4.80	4.80	29.00	32.00
Buffalograss (Sharp's Improved)	15.00	11.00	28.00	**36.00**	6.20	6.50	11.00	9.00
Big Bluestem (Rountree)	21.50	26.50	33.00	**28.00**	3.20	4.80	36.00	54.00
Indiangrass (Cheyenne)	23.00	25.00	26.00	**23.00**	5.00	5.20	39.00	62.50
Sideoats Grama (El Reno)	14.00	18.00	24.00	**22.00**	4.80	6.00	24.00	30.00
Indiangrass (Rumsey)	10.50	13.00	9.00	**12.00**	4.80	4.80	45.00	61.00
Cool Season Grasses								
Canada Wildrye (So. Ia. Eco.)	36.00	34.00	62.00	**52.00**	4.20	5.00	35.50	51.00
Mammoth Wildrye (Common)	36.00	20.50	39.00	**21.00**	5.00	5.00	49.00	51.00
Intermediate Wheatgrass (Man 756)	13.00	10.00	35.00	**19.00**	6.20	5.80	24.00	31.00
Smooth Bromegrass (Common)	2.00	2.00	3.00	**2.00**	6.70	6.00	16.00	16.00
Tall Fescue (Martin)	0.00	0.00	0.00	**0.00**	-	-	-	-
Dune Wildrye (Common)	0.00	0.00	0.00	**0.00**	-	-	-	-
Reed Canarygrass (Ioreed)	0.00	0.00	0.00	**0.00**	-	-	-	-
Legumes and Forbs								
Maximillian Sunflower (Common)	29.00	34.00	36.00	**45.00**	6.00	4.80	39.00	66.00
Showy Partridge Pea (Platte)	29.00	17.00	15.00	**11.00**	4.00	5.00	7.00	46.00
Crownvetch (Emerald)	10.00	12.00	15.00	**8.00**	4.20	4.20	21.00	15.00
Alfalfa (Cody)	3.00	8.00	4.00	**4.00**	5.20	3.00	29.50	31.00
Illinois Bundleflower (KS)	2.00	2.00	<1	**1.00**	7.00	4.00	-	21.00
Birdsfoot Trefoil (Norcen)	4.00	3.00	3.00	**<1**	4.00	4.60	7.50	9.00
Med. Red Clover (Common)	0.00	0.00	0.00	**0.00**	-	-	-	-
Flatpea (Lathco)	0.00	0.00	0.00	**0.00**	-	-	-	-

Vigor rating is 1 to 9 with 1 being the best

1.0-4.5 is Excellent; 4.6-5.0 is Good; 5.1-6.5 is Fair; 6.6-9.0 is Poor

Study Number: 29A140W

Study Title: Response of Tulip-tree**,** *Liriodendron tulipifera* L. to Thinning.

Study Leader: Henry, J.

Introduction:

Wood from yellow poplar, also known as whitewood, canoewood, white poplar and hickory poplar is light yellow to greenish brown and is popular with cabinet and furniture manufacturers. It is also used for interior trim, musical instruments, veneer, woodenware, and other novelty items. The heartwood of this tree is very durable when used out of doors. It is frequently planted as an ornamental due to its pleasing form, unusual leaves and large tulip-like attractive flowers. The tulip tree is deciduous; leaves are alternate, long-petioled, 2-6 lobed, with conspicuous deciduous stipules cohering when young and inclosing the next leaf. Flowers are terminal, solitary, with 3 spreading sepals and 6 erect, broadly ovate petals; stamens numerous, with long and linear anthers; pistils numerous, forming a narrow column, developing into a light brown cone.

The tulip tree reaches a height of 150 feet but rarely to 190 feet. Its trunk can be 10 feet in diameter, often destitute of branches for a considerable height. It is a hardy beautiful tree of pyramidal habit, well adapted for park-planting and for avenues, with handsome, clean foliage of unusual shape and of rather light bluish green color, rarely attacked by insects or fungi, assuming in fall a brilliant yellow color.

Objectives:

1. Study the response of this species to timber stand improvement and thinning.

2. Observe and record the growth response of this high value species on an upland site located on the PMC (Field #2).

3. Select superior trees, remove inferior trees, collect seed, initiate field plantings throughout PMC service area and release.

Discussion:

1997

A one acre planting of tulip trees was made on the PMC in Field # 2. The original planting consisted of 260 trees. Through selective thinning, the number of trees in the planting was reduced to 135. These remaining trees exhibited those characteristics being identified by the NRCS State Foresters from the PMC service area (Iowa, Illinois, and Missouri). Seed was harvested from these remaining trees, germinated, and the

plants were sent out to selected sites in the 3 - state service area. Once the data from field plantings was assembled and analyzed, it was determined to make a selected Germplasm release.

A selected Germplasm release of Union Germplasm tulip-tree was made in October 1997.

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USDA-NATURAL RESOURCES CONSERVATION SERVICE
NOTICE OF RELEASE
OF
UNION GERMPLASM TULIP-TREE*, LIRIODENDRON TULIPIFERA* L.

The United States Department of Agriculture, (USDA)-Natural Resources Conservation Service (NRCS), Plant Materials Center (PMC) at Elsberry, Missouri announce the release of Union Germplasm tulip-tree, *Liriodendron tulipifera* L., as "TESTED CLASS" for woodland revegetation, timber production, landscape and riparian areas.

Union Germplasm has been assigned the NRCS accession number 9055584.

Origin:

Union County, Illinois

Ecotype Description:

Tulip-tree is a large, deciduous, native tree, that attains, a height of 80-120 feet at maturity. It has a dark gray bark, which becomes thick and deeply furrowed. The alternate, long-petioled, deciduous leaves are of usual squarish shape, with 2-3 short pointed paired lobes on each side. Buds covered by the 2 coherent stipules which are also conspicuous on the growing shoot and envelop each successive leaf. The large showy cup-shaped flowers resembling tulips are borne singly at the end of new growth in the spring. They have 6 greenish and orange petals, many long stamens, and many narrow pistols on a long axes. The cone-like fruit is composed of many closely overlapping nutlets with long narrow wings, 2 or 1 seeded, which shed from the axis in autumn. Petals 6, in two rows, making a campanulate corolla. Anthers linear, opening outward. Pistils flat and squamelliform, narrow, imbricated and cohering in an elongated cone, dry, falling away whole, like a samara or key, indehiscent, 1-2 seeded in the small cavity at the base. Leaves are very smooth, with 2 lateral lobes near the base, and 2 at the apex, which appears as if cut off abruptly by a broad shallow notch; petals 5 cm. long, greenish yellow marked with orange; cone of fruit 7.5 cm. long.

Development:

Union Germplasm was selected out of a planting of one hundred and fifty (150) specimens of tulip-tree from a collection in Union County, Illinois planted on the plant materials center in field #1. After 20 years of comparative evaluations on the plant materials along with field plantings, this accession was selected based on the following characteristics: seedling vigor, rate of growth, seed production, insect and disease resistance, and form. This selection has been tested on various soil types and Major Land Resource Areas throughout the tri-state area being served by the Center. Plant performance has ranged from good to excellent. This tulip-tree prefers richer and well drained soils. Tulip-tree occurs in rich woods of ravines, in upland woods and along streams and at the base of wooded bluffs. It ranges from Florida and Louisiana, north to Massachusetts, Vermont, New York, Ontario, Michigan, Indiana, Southern Illinois, and Missouri.

Seed Production:

Union germplasm was the best fruit producer of all the accessions included in this assembly. Average yield of fruit per individual tree ranges from 8-10 bulk pounds. It takes 10 to 15 years for new transplants to produce quantities of fruits.

This selection has approximately 14,500 clean seeds per pound. Average seed weight is 5.50 grams per 100 seeds.

Site Description:

This collection was made from a native stand located in Union County near Anna, Illinois. The collection was seed rather than plants; this seed was then planted in the plant materials center greenhouse and then later transplanted in field #1. This seed was harvested by R. A. Ruth.

Nursery Practice:

Untreated seeds may be sown in the fall, but stratified seeds must be used for spring sowing. Seeds may be broadcast at rates of 4 to 11 pounds per 400 square feet of bed space. Seeds also have been sown in rows 8 to 12 inches apart at a rate of 50 to 75 seeds per linear foot. Bed densities of 25 to 30 seedlings per square foot are recommended. The seeds should be covered with 1/4 inch of soil or 1/2 to 1 inch of sawdust. Shading for one to two months from the start of germination has been recommended.

Climate:

The average annual temperature for Union county Illinois 60 degrees Fahrenheit. July is the warmest month with an average high of 90 degrees and low of 72 degrees. January is the coldest month with an average high of 45 degrees and low of 30 degrees. The average annual precipitation for this region is 45 inches which is fairly uniformly distributed throughout the year. The average frost-free growing period runs from April 5 to October 30.

Availability of Plant Materials:

Breeders material is being produced by the Plant Materials Center, Elsberry, Missouri.

Release Approved By:

Roger A. Hansen, Missouri State Conservationist, NRCS Date: 10-9-97
Chairman, Plant Materials Advisory Committee

William Gradle, Illinois State Conservationist Date: 10-29-97

Leroy Brown, Iowa State Conservationist Date: 10-21-97

References:

Flora of Missouri; p. 671; Steyermark, J. A.; Iowa State University Press, Ames, Iowa, 1968.

A Field Guide to Trees and Shrubs; pp. 203, 318; Peterson, R. T. and McKenny, M. Houghton Mifflin Company, Boston, Mass., 1968.

Gray's Manual of Botany; p. 676; Fernald, M. L.; American Book Company; Eighth Edition; Harvard University, 1950.

Manual of Cultivated Trees and Shrubs; p. 252; Rehder, Alfred, The Macmillan Company; Second Edition; Harvard University, 1940.

Seeds of Woody Plants in the United States; Agriculture Handbook No. 450; p. 510; Schopmeyer, C. S.; Forest Service, U. S. Department of Agriculture, Washington, DC, 1974.

Study: 29A144G

Study Title: Biofuel Study of Different Strains/Varieties of Switchgrass

Study Leader: Henry, J.

Introduction:

There is little to no information available on different strains/varieties of switchgrass as an agricultural/energy crop. Selected plant materials centers are being canvassed to participate in this study to determine the superior strain/variety of switchgrass for the purpose mentioned above. United States Department of Agriculture-Agricultural Research Service (USDA-ARS) best strains will be compared to NRCS' released cultivars of switchgrass. The results obtained from the studies located at the different plant materials centers involved with this study will hopefully determine the potential of switchgrass as an agricultural/energy crop.

Problem:

A need developed to investigate the potential of switchgrass varieties/strains for use as an agricultural/energy crop.

Objective:

Determine the variation in biomass yield and stand persistence among the switchgrass breeding lines and standard commercial varieties.

Cooperators:

USDA-Agricultural Research Service (ARS) at Oklahoma State University,
USDA-NRCS, Elsberry Plant Materials Center, Manhattan Plant Materials Center and the Booneville Plant Materials Center.

Discussion:

1997 - 1998

This study is a cooperative effort between Agricultural Research Service (ARS), Elsberry Plant Materials Center, Manhattan Plant Materials Center and the Booneville Plant Materials Center. The assembly of materials involved seven strains of switchgrass from ARS and three cultivars released from the plant materials program: Alamo, Kanlow and Cave-In-Rock. The planting was initially made in June 1997 but because of poor stands it was re-planted in July 1998. An evaluation of the 1998 planting also revealed poor stands. The planting design was a randomized complete block with four replications. Plot size was 6' X 20'. The plots were seeded with a plot seeder in rows eight inches apart at a seeding rate of eight pounds per acre of Pure Live Seed (PLS). Table #1 reflects the plot layout. Another attempt to establish this study will be made in the spring of 1999.

Table #1

BIOFUEL STUDY NUMBER: 29A144G

Plot Layout/Design

Lowland Switchgrass

Rep 1	2 SL93-2 Syn-1	4 SL94-1 Syn-1	8 Alamo	10 Cave-In-Rock	3 SL93-3 Syn-1	1 SL 93-1 Syn-1	6 NL 94-2 Syn-1	9 Kanlow	7 NL-93-SP	5 NL 93-1 Syn-1
Rep 2	7 NL 93-SP	9 Kanlow	6 NL 94-2 Syn-1	3 SL 93-3 Syn-1	4 SL 94-1 Syn-1	5 NL 93-1 Syn-1	8 Alamo	2 SL 93-2 Syn-1	10 Cave-In-Rock	1 SL 93-1 Syn-1
Rep 3	10 Cave-In-Rock	3 SL 93-3 Syn-1	5 NL 93-1 Syn-1	7 NL 93-SP	2 SL 93-2 Syn-1	6 NL 94-2 Syn-1	9 Kanlow	1 SL 93-1 Syn-1	4 SL 94-1 Syn-1	8 Alamo
Rep 4	3 SL 93-3 Syn-1	7 NL 93-SP	1 SL 93-1 Syn-1	2 SL 93-2 Syn-1	10 Cave-In-Rock	8 Alamo	4 SL 94-1 Syn-1	5 NL 93-1 Syn-1	6 NL 94-2 Syn-1	9 Kanlow

3’ x 20’ area harvested

NORTH 

Study Number: 29A145G

Study Title: Wear Tolerance Demonstration of Vegetation in High Traffic Areas

Study Leader: Bruckerhoff, S. B.

Introduction:

This demonstration will aid in the selection of vegetation which is the most tolerant to wear by vehicle or troop traffic. The demonstration will take place at Fort Leonard Wood, Missouri. Selection criteria of species are known or thought to have resistance to wear.

Problem:

Travel corridors to and from training areas and repetitive training in concentrated areas severely affects vegetation's ability to survive and provide adequate cover to prevent erosion. Under continued use, the vegetation is thinned or completely eliminated. As the vegetation degenerates, the probability of soil erosion increases. With continued use, and no and/or unsuccessful revegetation attempts, the area becomes eroded with sediment causing pollution and in many situations, renders the area unusable for training.

Soil movement and loss of training area are only two of the problems associated with the loss of vegetation on travel corridors. Stream degradation, surface water pollution, loss of wetlands, sedimentation of drainage ways and loss of wildlife habitat are also affected.

Objectives:

To determine which vegetative species are the most tolerant to wear from troop and vehicle traffic at specific problem sites on an individual military installation.

To determine which species are effective on different soil and site conditions under different traffic regimes.

The species found to be wear tolerant will be recommended for use to revegetate denuded corridors or newly developing high traffic areas in their area of effectiveness.

Literature Review:

Literature was reviewed for information on wear, shade and drought tolerance; maintenance and fertility requirements; height of plants; and reproduction method for establishment. Sources of information were the Agriculture Handbook No. 170, Grass Varieties of the United States; Agriculture Research Service, National Turfgrass Evaluation Program; U.S. Golf Association, Turfgrass and Environmental Research Summary; NRCS and Natural Resource Department at Ft. Leonard Wood and University personnel.

Location:

Fort Leonard Wood, Missouri

Site No.	Site Name	Site Description	Problem
#1	Barracks	Open Lawn	Foot Traffic
#2	TA-244	Disturbed Open Upland	Heavy Vehicle Traffic
#3	Landfill Area	Disturbed Open Bottomland	Wheel Traffic
#4	Bivouac Area	Heavy Upland Shade	Heavy Foot Traffic
#5	Shooting Range	Disturbed Open Upland	Traffic and Small Arms Damage

Procedure:

A. Assembly: A listing of the species/varieties to be planted for evaluation is shown in Table #1.

B. Planting Plan:

1. Design: Randomized split plot, randomized complete block plot, or latin square.
2. Replications: Four or five
3. Plot Size: Varies between sites
4. Seed Method: PMC plot planter or by hand
5. Seed Rate: See Tables #2-#6
6. Date of Establishment: April - June, 1998
7. Duration: Three years

C. Management:

1. Seedbed Preparation: Spray, rip, disk

2. Fertilization: Soil test recommendations and critical area rates.

3. Weed Control: To be determined - spray and/or mow as needed.

D. Evaluation Measurements:

1. Plant Performance: See attachment #7

a. Establishment Year (1998)

(1) Measurements:
- (a) First seedling emergence date.
- (b) Visual estimates of % stand and canopy cover, and vigor every two weeks during the growing season for the planted species.
- (c) Visual estimates of total canopy cover of all species in the plot every two weeks.
- (d) Stand density measurements (electronically or stem counts per square foot) at end of growing season.
- (e) Soil compaction.

b. Succeeding years (1999 and 2000)

(1) Measurements:
- (a) Stand density just prior to traffic event.
- (b) Type and duration of traffic event (to be determined for each site).
- (c) Vigor of plant before and one week after traffic event or at two week intervals for continuous traffic.
- (d) Stand density each month.
- (e) Plant height each month.
- (f) Document periods of growth and dormancy.
- (g) Document resistance to disease and insects.
- (h) Soil compaction before and after traffic events.

Cooperators:

The United States Department of the Army, Fort Leonard Wood (FLW), Missouri and the United States Department of Agriculture, Natural Resources Conservation Service (NRCS).

Discussion:

1998

The discussion of erosion problems and a wear tolerance study began during the summer of 1997. David Lorenz, Environmental Specialist, submitted a statement of work (SOW), and on August 20, 1997 was given approval to proceed. A draft copy of the Study Plan was sent out for review on October 30, 1997 and after comments were discussed and revisions made, the final signatures were obtained February 3, 1998.

The five sites were established during April, May, and June. The cool season plots were planted between early April and early May. The warm season plots were planted late April to mid-May with some plugs and sod planted in June. All plots were evaluated throughout the summer for stand establishment. Data for the end of the growing season can be found in Table #7.

Site #1 Barracks Upland Lawn

This site established well with adequate precipitation through mid-summer but crabgrass became a problem. The plots received chemical weed control but did not receive 100% control in most plots. A late summer extremely dry period, along with weed competition and drought compacted soils led to thin stands of some cool season plots by the end of the growing season. The warm season plots did very well except the buffalo grass did not fill in. A winter dormant reseeding of fescue plots with sparse stands is planned.

Evaluations of wear tolerance using foot traffic is planned to start in June, 1999.

Site #2 TA-244 Disturbed Upland

This site established slowly and adequate stands were only achieved with Indiangrass, switchgrass, and tall fescue. The little bluestem is present but not very thick. It is typically a slow starter and may be adequate by next year. The lespedezas were a problem all year. The whole site was infested with volunteer lespedeza and it was hard to tell how much of the planted species was actually there. (Probably not very much.) Evaluations will be conducted on the unplanted species or plugs will be brought in to reestablish the plots next spring.

Evaluations of wear tolerance, using tire and track traffic is planned to start in June 1999.

Site #3 Disturbed Bottomland

This site was the most severely affected by weed pressure and the summer dry spell. The only species with adequate stands are the KY 31 tall fescue and ‘Cave-In-Rock’ switchgrass. It has not yet been determined what is going to be done as far as reestablishment and wear tolerance evaluations for next year.

Site #4 Bivouac Area

This site established very well and no weed control was used. This site is ready for wear tolerance evaluations but still depends on scheduling and if the rest of the area is adequate.

These sites were vegetated in the fall in prior years. The spring seeding of the plots and the successful establishment of all plots demonstrates that spring seeding is also an option.

Site #5 Shooting Range

This site did not receive an establishment period with no bullet impact. The most intense bullet damage is not in the middle of the plots but rather on the side of the plot. The opposite side of the plots received much less impact so a comparison can be made between establishment and damage from bullets. The centipedegrass (plugs), buffalograss (plugs and seed), and bermudagrass (seed), established the best; but the squirreltail and lespedeza were very sparse. This site is very harsh and did not require much weed control. The only weed control performed was some of the bermudagrass plots were sprayed with Methar 30.

The three species that did establish are also holding up somewhat to the traffic. None were able to withstand the intense bullet impact directly in the bullet trench but were trying to maintain on the edges. It will be interesting to see how they persist over a longer period of time.

Study 29A145 - Wear Tolerance Demonstration of Vegetation in High Traffic Areas **Table # 1**

No. of Access.	No. of Species	Genus	Species	Variety	Common Name	Site Numbers
1	1	Festuca	arundinacea	Rebel Jr.	tall fescue	1, 3
2		Festuca	arundinacea	Leprechaun	tall fescue	1, 2, 3
3		Festuca	arundinacea	Fine Lawn 5GL	tall fescue	1,4
4		Festuca	arundinacea	Jaguar	tall fescue	1
5		Festuca	arundinacea	Chieftain II	tall fescue	1,3,4
6		Festuca	arundinacea	Fine Lawn Petite	tall fescue	4
7		Festuca	arundinacea	Kentucky 31	tall fescue	1,2,3
8	2	Festuca	rubra	Shademaster II	red fescue	4
9		Festuca	rubra	Flyer	red fescue	4
10	3	Festuca	ovina	Sr-3100	hard fescue	4
11		Festuca	ovina	Covar	sheep fescue	4
12	4	Cynodon	dactylon	Tufcote	bermudagrass	1
13		Cynodon	dactylon	Guymon	bermudagrass	5
14	5	Buchloe	dactyloides	MO-Buff	buffalograss	1
15		Buchloe	dactyloides	Top Gun	buffalograss	5
16	6	Lespedeza	thunbergii	VA-70	shrub lespedeza	2
17	7	Lespedeza	daurica schimadae		daurica schimadae	2, 3, 5
18	8	Panicum	virgatum	Cave-In-Rock	switchgrass	2, 3
19	9	Phalaris	arundinacea	Ioreed	reed canarygrass	3
20	10	Schizachyrium	scoparium	Cimarron	little bluestem	2
21	11	Zoysia	japonica	Meyer	zoysia grass	1
22	12	Elymus	lanceolatus	Sodar	streambank wheatgrass	3
23	13	Elymus	elymoides		bottlebrush squirrel tail	3, 5
24	14	Eremochloa	ophiuroides	TifBlair	centipedegrass	5
25	15	Poa	pratense	Unique	Kentucky bluegrass	1, 4
26	16	Sorghastrum	nutans	Rumsey	indiangrass	2, 3
27	17	Lolium	perenne	Divine	perennial rye	1, 4

Study 29A145 - Wear Tolerance Demonstration of Vegetation in High Traffic Areas

Table # 2

Plot Size:	**8' X 25'**	**Site Description**	**Barracks Lawn**	**Site # 1**
Number of Species: 6		**Site Dimentions**	**82 X 208**	**Randomized Complete Block**
Total Accessions	**12**	**Type of Traffic Foot**		**Four Replications**

Site No.	Genus	Species	Plot Number	Variety	Common Name	Seeding Rate	Date Planted
1	Festuca	arundinacea	1	Rebel Jr.	tall fescue	5# bulk / 1000 sq ft	4/22/98
1	Festuca	arundinacea	2	Leprechaun	tall fescue	5# bulk / 1000 sq ft	4/22/98
1	Festuca	arundinacea	3	Fine Lawn 5GL	tall fescue	5# bulk / 1000 sq ft	4/22/98
1	Cynodon	dactylon	4	Tufcote	bermudagrass	1 plug / sq ft	4/22/98
1	Buchloe	dactyloides	5	MO-Buff	buffalograss	1 plug / sq ft	5/27/98
1	Lolium	perenne	6	Divine	perennial rye	5# bulk / 1000 sq ft	4/22/98
1	Zoysia	japonica	7	Meyer	zoysia grass	sod	5/27/98
1	Poa	pratensis	8	Unique	bluegrass	2# bulk / 1000 sq ft	4/23/98
1	Festuca	arundinacea	9	Chieftain II	tall fescue	5# bulk / 1000 sq ft	4/22/98
1	Festuca	arundinacea	10	Jaguar	tall fescue	5# bulk / 1000 sq ft	4/22/98
1	Festuca	arundinacea	11	Adobe	tall fescue	5# bulk / 1000 sq ft	4/22/98
1	Festuca	arundinacea	12	Kentucky 31	tall fescue	5# bulk / 1000 sq ft	4/22/98

Table # 3

				Site # 2
Plot Size:	**10 x 40**	**Site Description**	**TA - 244**	**Ramdomized Complete Block**
Number of Species	**6**	**Site Dimensions**	**40 x 200**	**Split Plot Design**
Total Accessions	**6**	**Type of Traffic Traffic**	**Heavy Vehicle**	**Four Replications**

Site No.	Genus	Species	Plot Number	Variety	Common Name	Seeding Rate PLS#/Ac	Date Planted
2	Sorghastrum	nutans	1	Rumsey	indiangrass	14	4/9/98
2	Lespedeza	thunbergii	2	VA-70	shrub lespedea	12	4/9/98
2	Panicum	virgatum	3	Cave-In-Rock	switchgrass	8	4/9/98
2	Lespedeza	daurica schimadae	4		lespedeza schimadae	15	4/9/98
2	Festuca	arundinacea	5	KY 31 (check)	tall fescue	30	4/9/98
2	Schizachyrium	scoparium	6	Cimarron	little bluestem	15	4/9/98

Study 29A145 - Wear Tolerance Demonstration of Vegetation in High Traffic Areas **Table # 4**

Plot Size **10 X 30** **Site Description** **Disturbed Bottomland** **Site # 3**

Number of species **8** **Dimensions 90 X 200** **Randomized Complete Block**

Total Accessions **10** **Type of Traffic Tire and Track** **Split Plot Design Four Reps**

Site No.	Genus	Species	Plot Number	Variety	Common Name	Seeding Rate PLS#/Ac	Date Planted
3	Festuca	arundinacea	1	Leprechaun	tall fescue	30	4/14/98
3	Festuca	arundinacea	2	Rebel Jr.	tall fescue	30	4/14/98
3	Festuca	arundinacea	3	Chieftain II	tall fescue	30	4/14/98
3	Festuca	arundinacea	4	KY 31	tall fescue	30	4/14/98
3	Panicum	virgatum	5	Cave-In-Rock	switchgrass	8	4/14/98
3	Sorghastrum	nutans	6	Rumsey	indiangrass	14	4/14/98
3	Lespedeza	daurica schimadae	7		daurica schimadae	15	4/14/98
3	Phalaris	arundinacea	8	Ioreed	reed canarygrass	12	4/14/98
3	Elymus	lanceolatus	9	Sodar	streambank wheatgrass	14	4/14/98
3	Elymus	elymoides	10		bottlebrush squirrel tail	6	4/14/98

Table # 5

Plot Size: **4' X 4' Per Plot** **Site Description** **Bivouac Area** **Site # 4**

Number of species **5** **Site Dimensions** **12' X 12' Per Rep** **Four Replications**

Total Accessions **9** **Type of Traffic Foot** **Randomized Complete Block**

Site No.	Genus	Species	Plot Number	Variety	Common Name	Seeding Rate Bulk#/1000 sq ft	Date Planted
4	Festuca	rubra	1	Shademaster II	red fescue	2.5	4/7-8/98
4	Festuca	rubra	2	Flyer	red fescue	2.5	4/7-8/98
4	Festuca	ovina	3	Covar	sheep fescue	2	4/7-8/98
4	Festuca	ovina	4	SR-3100	hard fescue	2	4/7-8/98
4	Poa	pratense	5	Unique	Kentucky bluegrass	1,5	4/7-8/98
4	Festuca	arundinacea	6	Chieftain II	tall fescue	5	4/7-8/98
4	Festuca	arundinacea	7	Finelawn 5GL	tall fescue	5	4/7-8/98
4	Festuca	arundinacea	8	Finelawn Petite	tall fescue	5	4/7/8/98
4	Lolium	perenne	9	Divine	perennial rye	3	4/7-8/98

Table # 6

Site # 5

Plot Size: **8' X 20'** **Site Description** **Shooting Range** **Latin square design**

Number of species **5** **Site Dimensions** **20' X 40'** **Split plots (bullet intensity)**

Total Accessions **5** **Type of Traffic** **Small Arms Damage** **Five replications**

Site No.	Genus	Species	Plot Number	Variety	Common Name	Seeding Rate PLS#/Ac	Date Planted
5	Elymus	elymoides	1		bottlebrush squirrel tail	9	5/8/98
5	Lespedeza	daurica schimadae	2		daurica lespedeza	15	5/8/98
5	Cyndon	dactylon	3	Guymon	bermudagrass	4	5/8/98
5	Buchloe	dactyloides	4	Top Gun	buffalograss	87 (later plugged)	5/8/98
5	Eremochloa	ophiuroides	5	TifBlair	Centipedegrass	1 plug / sq ft	5/8/98
							5/8/98

Study 29A145 - Wear Tolerance Demonstration of Vegetation in High Traffic Areas

EVALUATION SUMMARIES FOR 1998 **SITE 1 BARRACKS UPLAND LAWN** **Table # 7**

		END OF GROWING SEASON									
		PERCENT STAND					CANOPY COVER				
PLOT #	COMMON NAME	REP 1	REP 2	REP 3	REP 4	**AVG**	REP 1	REP 2	REP 3	REP 4	**AVG**
1	Rebel Tall Fescue	80	55	85	70	**72.5**	50	30	60	50	**47.5**
2	Leprechaun Tall Fescue	30	30	60	85	**51.25**	20	20	40	55	**33.75**
3	Finelawn 56L Tall Fescue	30	40	80	90	**60**	15	30	60	65	**42.5**
4	Tufcote Bermudagrass	100	100	100	100	**100**	85	100	100	100	**96.25**
5	Mo-Buff Buffalograss	100	100	100	100	**100**	15	10	10	10	**11.25**
6	Divine Perennial Rye	70	60	80	85	**73.75**	60	35	50	60	**51.25**
7	Meyer Zoysia Grass	100	100	100	100	**100**	95	100	95	100	**97.5**
8	Unique Bluegrass	20	20	25	50	**28.75**	10	10	10	30	**15**
9	Chieftain Tall Fescue	30	30	80	75	**53.75**	20	20	60	55	**38.75**
10	Jaguar Tall Fescue	80	45	70	70	**66.25**	50	35	50	50	**46.25**
11	Adobe Tall Fescue	45	60	85	85	**68.75**	30	40	60	60	**47.5**
12	KY-31 Tall Fescue	70	70	70	90	**75**	50	50	50	70	**55**

EVALUATION SUMMARIES FOR 1998 **SITE 2 TA-244 UPLAND DISTURBED**

		END OF GROWING SEASON									
		PERCENT STAND					CANOPY COVER				
PLOT #	COMMON NAME	REP 1	REP 2	REP 3	REP 4	AVG	REP 1	REP 2	REP 3	REP 4	AVG
1	Rumsey Indiangrass	75	75	70	75	**73.75**	35	35	30	30	**32.5**
2	VA-70 Shrub Lespedeza	40	25	25	25	**28.75**	40	15	15	15	**21.25**
3	Cave-In-Rock Switchgrass	70	70	80	80	**75**	35	35	35	35	**35**
4	Lespedeza Daurica Schimadae	25	25	25	25	**25**	15	15	10	15	**13.75**
5	KY-31 Tall Fescue	10	25	70	70	**43.75**	5	10	40	35	**22.5**
6	Cimarron Little Bluestem	30	50	30	40	**37.5**	15	25	15	20	**18.75**

EVALUATION SUMMARIES FOR 1998 **SITE 3 DISTURBED BOTTOMLAND**

		END OF GROWING SEASON									
		PERCENT STAND					CANOPY COVER				
PLOT #	COMMON NAME	REP 1	REP 2	REP 3	REP 4	AVG	REP 1	REP 2	REP 3	REP 4	AVG
1	Leprechaun Tall Fescue	10	10	10	10	**10**	1	5	1	5	**3**
2	Rebel Jr. Tall Fescue	10	25	10	35	**15**	5	15	1	20	**10.25**
3	Chieftain Tall Fescue	10	10	10	10	**10**	5	1	1	1	**2**
4	KY 31 Tall Fescue	40	30	40	40	**37.5**	25	10	20	20	**18.75**
5	Cave-In-Rock Switchgrass	60	70	40	40	**52.5**	20	30	20	20	**22.5**
6	Rumsey Indiangrass	0	5	0	5	**2.5**	0	1	0	1	**0.5**
7	Lespedeza Schimadae?	50	20	20	30	**30**	25	7	10	15	**14.25**
8	Ioreed Reed Canarygrass?	10	20	20	25	**18.75**	5	10	5	10	**7.5**
9	Sodar Streambank Wheatgrass	10	10	10	20	**12.5**	5	1	5	10	**5.25**
10	Bottlebrush Squirrel Tail	10	10	10	10	**10**	1	1	5	1	**2**

Table # 7

EVALUATION SUMMARIES FOR 1998 **SITE 4 BIVOUAC AREA**

END OF GROWING SEASON

		PERCENT STAND					CANOPY COVER				
PLOT #	COMMON NAME	REP 1	REP 2	REP 3	REP 4	AVG	REP 1	REP 2	REP 3	REP 4	AVG
1	Shademaster II Red Fescue	90	80	95	95	**90**	60	60	70	70	**65**
2	Flyer Red Fescue	95	70	95	95	**88.75**	60	50	70	70	**62.5**
3	Covar Sheep Fescue	75	90	95	95	**88.75**	40	60	70	70	**60**
4	SR-3100 Hard Fescue	90	75	95	95	**88.75**	60	50	70	70	**62.5**
5	Unique KY Bluegrass	95	95	95	95	**95**	70	70	70	75	**71.25**
6	Chieftain Tall Fescue	90	70	95	80	**83.75**	50	50	70	50	**55**
7	Finelawn 5GL Tall Fescue	90	75	95	95	**88.75**	50	60	70	70	**62.5**
8	Finelawn Petite Tall Fescue	95	80	95	90	**90**	65	60	70	70	**66.25**
9	Divine Perennial Rye	90	95	95	70	**87.5**	60	65	70	40	**58.75**

EVALUATION SUMMARIES FOR 1998 **SITE 5 SHOOTING RANGE**

END OF GROWING SEAS0N

PERCENT STAND

PLOT #	COMMON NAME	REP 1	REP 2	REP 3	REP 4	REP 5
1	Bottlebrush Squirrel Tail	10	10	10	10	10
2	Lespedeza Daurica Schimadae	25	60	40	15	35
3	Guymon Bermudagrass	70	30	30	60	50
4	Top Gun Buffalograss	95	95	90	95	95
5	TifBlair Centipedegrass	100	100	100	90	80

CANOPY COVER

PLOT #	COMMON NAME	REP 1	REP 2	REP 3	REP 4	REP 5
1	Bottlebrush Squirrel Tail	1	1	1	1	1
2	Lespedeza Daurica Schimadae	10	30	15	5	10
3	Guymon Bermudagrass	40	10	10	35	30
4	Top Gun Buffalograss	40	40	50	40	40
5	TifBlair Centipedegrass	40	40	40	35	30

Releases from the Elsberry Plant Materials Center

Scientific Name	Release Name	Common Name	Accession Number	Secondary Agency(ies)	Type of Release	Year of Release
Andropogon gerardii Vitman	Central Iowa	big bluestem	9068615	UNI,IARV,IAT,ICIA	N	1998
Dalea purpurea	Southern Iowa	prairie clover	9068609	UNI,IARV,IAT,ICIA	N	1998
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	roughlef 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 lespedez	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.	Central Iowa	Canada wildrye	9062276	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 Argicultural 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 orhabitat 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 fromwithin the USA.

Studies/Projects at the Elsberry Plant Materials Center
Studies 1958 through 1998

Project/Study Number System: Initially the numbers were assigned numerically plus the year the the study/project was initiated. Later a different numbering system was adopted which involved the designated state number, a letter to denote the type of project/study and finally a numerical number.

Study No./ Year Started	**Title**
2-58	Quaker Comphrey Evaluation
3-58	Comparison of Winter Annual Cover Crops
6-62	Fertilizer Rate Study on Midland Bermudagrass, *Cynadon dactylon*
10-59	Interseeding Cover Crops in Corn
14-61	Evaluation of *Lotus corniculatus* L. Strains
15-61	Evaluation of Bermudagrass Strains
17-61	Black Locust, *Robinia pseudoacacia* L. Trials
18-61	The Rate, Date and Method of Seeding *Lespedeza daurica schmidae*
19-61	Living Fence Trials
20-61	Plants for Bank Stabilization
21-62	Evaluation of Legumes for Wildlife
23-63	Evaluation of *Phalaris arundinacea* L. 'Ioreed' Reed Canarygrass Strains
24-62	Method of Seeding Creeping Foxtail
25-63	Advanced Evaluation of Plant Materials for Grass Waterways
26-63	Evaluation of Japanese Pagodatree *(Sophoro japonica)* for Posts
27-63	Direct Seeding vs Transplanting Sawtooth Oak, *Quercus acutissima Carruthers*
28-63	Effect of cultural Methods on Crownvetch, *Coronilla varia* L. Seed Production
31-63	Lespedeza capitata Michx. - Roundhead Lespedeza Ecotype Evaluation
34-63	Cultural Methods for Seeding Grasses in Woodland Pastures
35-63	Effect of Cultural Methods on Seed Production of *Phalaris arundinacea* L., 'Ioreed' Reed Canarygrass

Study No.	Title
37-63	Forage Yields and Season of Production for Several Grasses and Legumes Clipped Bi-Weekly at Three Inches and Six Inches at Three Inches and Six Inches
38-64	Advanced Evaluation of Perennial Grasses for Summer Pasture
42 -65	Establishment of Crownvetch and Trefoil in Dead Litter Mulch
44-65	Grasses and Legumes for Goose Browse on the Clarrence Cannon Wildlife Refuge
46-66	Method of Seeding Trials with 'Garrison' Creeping Foxtail
49-69	Seed Yield of Three Panicum virgatum, Switchgrass Selections: Mich 381; Blackwell', M1-5714; and M1-5845, 'Cave-In-Rock'
50-69	Seed Yield and Seed Retention of Four Phalaris arundinacea, Reed Canarygrass Selections: 'Ioreed', 'Rise', 'Frontier', and 'Auburn'
51-A-70	Herbicide Tolerance of Four Waterway Grasses: *Alopecurus arundinaceus*, Garrison' Creeping Foxtail; *Bromus inermis*, smoothbrome; *Phalaris arundinacea*, reed canarygrass; and *Panicum virgatum*, switchgrass
51-B-71	Herbicide Tolerance of New Seeding of *Festuca arundinacea*, Tall Fescue; *Andropogon gerardii*, Big Bluestem, *Sorghastrum nutans*, Indiangrass; and *Panicum virgatum*, Switchgrass
51-C-71	Herbicide Tolerance of New Seedling of Tall Fescue, Big Bluestem , Indiangrass and Switchgrass
29I052W	Growth Rate Study of European Alder on Deep Alluvial Soil
53-72	Growth Rate Study of Poplar (Cottonwood) On a Deep Alluvial Soil
54-72	*Rhizome Development of Two Tall Fescue,* Festuca arundinacea, Selections: M1-6161 and M1-6162
29A055	Evaluations of Sorghastrum nutans, Indiangrass (M17073), Poly-Cross Indiangrass for Leafiness, Disease-Free Characteristics and Seed Production
56-71	Comparative Evaluation of New Lotus Accessions With Names and Used Varieties to Determine Potential as a Long Lived Legume in Three State Area Saved
29I057-72	Growth Rate Study of Poplars (Cottonwood) On a Deep Alluvial Soil Deep Alluvial Soil

Study No.	Title
29A058-72	Evaluation for Naming and Releasing of Elsberry Developed Big Bluestem and Indiangrass
59-72	Sorghum Evaluation as Wildlife Game Feed
29I060-69	Replacement of the American Elm Tree
61-72	Advanced Evaluation of Meadow Foxtail, Alopecurus pratensis, PI-305495, as a Waterway Grass as Compared to 'Garrison' Creeping Foxtail, Alopecurus arundinaceus the Standard for Comparison
29I062J	Trees and Shrubs for Use as Wildlife Food and Cover Plants
29I063	Plants for Use in Critical Area Stabilization
29I064W	Plants for Wood Products
65-78	Plants for Use in Landscape and Beautification
29I066W-72	Developing Winterhardy Nut Bearing Trees and Shrubs for Planting in Parks, Wildlife Areas and Natural Areas
29I067K	Trees for Windbreaks
68-72	Response of Yellow Poplar to Thinning
69-72	Black Cherry Demonstration
70-73	Desmodium for Wildlife Food and Cover
71-73	Evaluation for Naming and Releasing of Elsberry Developed Autumn Olive, M1-6369
72-73	Evaluation of M1-4701, Lonicera maackii, Amur Honeysuckle for Naming and Releasing
73-73	Establishment of Warm-Season Grasses with Herbicides for Weed Control. Herbicides are Not Tested or Have Label Clearance for Warm-Season Grasses
29A074M	Cover Crops in Soybeans
------	NJ-927, Eleagnus umbellata, Autumn Olive for Wildlife Food and Cover
29A075F	Plants for Shoreline and Wetland Stabilization
29I076G-78	Establishment of Warm Season Grasses

Studies	Name
-------	Evaluation of Cold Hardy *Paspalum notatum* Selections
29I077P	Evaluation of Plants for Vegetating Salt Damaged Areas
29I078D	Field Evaluation Planting to Evaluate Plants for Use on Alkali Bearing Soils in Southern Illinois
29I079D	Field Evaluation Planting to Evaluate Species of Plants for Use on Revegetating Acid Coal Mine Spoil in Illinois
29I081D	Field Evaluation Planting to Evaluate Species of Plants for use in Revegetating Acid Coal Mine Spoil in Iowa
29I082D	Field Evaluation Planting to Evaluate Species of Plants for Use in Revegetating Acid Coal Mine Spoil in Illinois
29I083M	Legume Cover Crop for No-Till Corn Production
29I084G	Legumes to Enhance Fescue Pastures
29A085S	Debearding Fluffy Native Grass Seed, (Big Bluestem and Indiangrass)
29I086L	Use of an Absorbant Polymer in Coating Native Grass Seed
29I087D	Plants with Increased Tolerance to Aluminum and Manganese
29A088W	Cooperative Screeing Study of Native and Introduced Sources of Eastern Cottonwood
29I089V	Multiple Use Legume Assembly and Evaluation
29I090G	No-Till Establishment of Warm-Season Grasses in Cool Season Grass Sod
29I091G	Weed Control Treatments for Warm Season Grass Establishment
29I092G	Perennial Grasses as Cover Crops for Use in No-Till Systems
29I093R	Miscellaneous Grass Evaluation
29A094M	Cover Crops in Corn, Soybeans and Milo
29A095M	Field Evaluation Planting to Evaluate Cover Crops - Rochester, Minnesota
29I097G	Assembly and Evaluation of Big Bluestem, *Andropogon gerardii*, vitman.
29I099J	Assembly and Evaluation of Roughleaf Dogwood, *Cornus drummondii*,

Studies	Name
29I100J	Assembly and Evaluation of Blackhaw, *Viburnum prunifolium* L.
29I101J	Assembly and Evaluation of Arrowwood, *Viburnum dentatum* L.
29A105M	Evaluation of Winter Annual Grass for Cover Crops in No-Till Soybeans
29I107G	Assembly and Evaluation of Eastern Gamagrass, *Tripsacum dactyloides* L.
29I108G	Assembly and Evaluation of Low Growing Rhizomatous Switchgrass, *Panicum virgatum* L., for Use in Waterways, Filter Strips and Other Conservation Uses
29I109W	Direct Seeding Methods of *Quercus* sp., Oaks
29I110J	Assembly and Evaluation of Chokecherry, *Prunus virginiana* L.
29A111G	Field Evaluation of Selected Perennial Grasses for Pasture Wildlife Habitat and Erosion Control (Varietal Study)
29I112J	*Assembly and Evaluation of Nannyberry, Viburnum lentago* L.
29I113J	Assembly and Evaluation of Serviceberry, *Amelanchier arobrea* (Michx. F.) Fern.
29I114K	Field Evaluation of Woody Plant Materials in Cooperation with Mineral Area Collete
29A116W	Evaluation of Miscellaneous Trees and Shrub Species
29A117H	Intercenter Strain Trial of Tripsacum dactyloides L., Eastern Gamagarss
29A118G	Field Evaluation of Selected Perennial Grasses for Pasture, Wildlife Habitat and Erosion Control (Varietal Study)
29A121W	Conifer Evaluation for Windbreak Plantings
29A122G	Evaluation of Perennial Warm-Season Grasses as Windbarriers in Southeast Missouri
29A123M	Winter Cover Crop Study for No-Till Soybeans
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
29A125G	Fertility and Harvest Management of Eastern Gamagrass for Forage Production

Study No.	Title
29I126W	Woody Columnar Collection
29A127G	Field Evaluation of Selected Perennial Grasses for Pasture, Wildlife Habitat and Erosion Control
29A128J	*Cornus florida* L., Flowering Dogwood, Interagency Study Between Department of Interior, National parks Service, National Capital Region and the Department of Agriculture
29A130G	Grass Hedges for Control of Runoff and Erosion
29A131O	Treatment of Animal Wastewaters by Constructed Wetlands
29I132O	Miscellaneous Wetland Plant Evaluation
29I133J	Assembly and Evaluation of Gray Dogwood, *Cornus racemosa*
29I134J	Assembly and Evaluation of Eastern Redcedar, *Juniper virginiana* L.
29I135J	Assembly and Evaluation of Hazelnut, *Corylus americana*, Marsh.
29I136J	Assembly and Evaluation of WIld Plum, *Prunus americana*, Marsh.
29A137O	Wetland Riparian Progagation, Establishment and Demonstration
29I138G	Residue Decomposition Trial
29A139G	Field Evaluation of Establishment of Herbaceous Plant Materials on Sand Covered Flooded Areas in Missouri
29A140W	Yellow Poplar Evaluation
29I141G	Assembly and Evaluation of Little Bluestem, *Schizachyrium scoparium*, Michx.
29I142G	Production of Native Missouri Ecotypes of Grasses, Legumes and Forabs for Roadside, Critical Areas, and All Other Vegetative Plantings Where Native Plants are Now Being Planted
29I143G	Seed Coat/Seeding Rates Study
29A144G	Biofuel Study of Different Strains/Varieties of Switchgrass
29A145	Wear Tolerance Demonstration of Vegetation in High Traffic Areas

Herbaceous and Woody Seed and Plant Production at the Elsberry PMC 1998

The plant and seed inventory at the Elsberry PMC is used for field plantings, special plantings, demonstration plantings, research studies and commercial release. The 1998 production of grass and woody seed reflected an average year.

Name	**Seed Inventory as of December 1998 PLS (Pounds)**
Herbaceous	
'Rountree' big bluestem	360 Foundation 90 Certified
'Rumsey' indiangrass	1230 Foundation
'Pete' eastern gamagrass	170 Foundation
'Cave-In-Rock' switchgrass	1000 Foundation
'Svalofs' field brome	122 Common
'Elsberry' smoothbrome	21 Common
OH-370 big bluestem	32 Foundation
'Niagara' big bluestem	35 Common
'Bobwhite' soybean	50 Common
Aroostook rye	1000 Common

Herbaceous and Woody Seed and Plant Production – continued

Name:	Seed Inventory as of December 1998 Bulk (Pounds)
Woody:	
Union tulip tree	0.60
Nicholson Germplasm roughleaf dogwood	0.18
Corinth Germplasm roughleaf dogwood	0.73
Tazewell Germplasm roughleaf dogwood	0.12
Jefferson Germplasm roughleaf dogwood	0.28
American hazelnut (9057168) (Illinois)	3.20
American hazelnut (9057169) (Illinois)	2.70
American hazelnut (9068562) (Illinois)	4.60
American hazelnut (9057188) (Illinois)	9.30
American hazelnut (9068528) (Illinois)	7.90
American hazelnut (9068573) (Missouri)	4.00
American hazelnut (9068574) (Missouri)	4.80
American plum (9068546) (Missouri)	0.36
American plum (9068580) (Missouri)	0.40
American plum (9057088) (Illinois)	0.82
American plum (9062309) (North Dakota)	0.70
American plum (9068545) (Missouri)	1.20
Arrowwood (9062310 (Iowa)	0.25