ELSBERRY PLANT MATERIALS CENTER

2000 TECHNICAL REPORT

Elymus canadensis
Canada wildrye

'Grass Yearbook of Agriculture 1948'

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Elsberry Plant Materials Center

2000

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2000
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 mission of the NRCS Plant Materials Program is to develop and transfer plant materials and plant technology for the conservation of natural resources. In working with a broad range of plant species, including grasses, forbs, trees, and shrubs, the program seeks to address priority needs of field offices and land managers in both public and private sectors. Emphasis is focused on using native plants as a healthy way to solve conservation problems and protect ecosystems.

The objectives of the Elsberry PMC and of the plant materials program 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.

History

The Elsberry Plant Materials Center was established in 1934, which makes it the oldest Center in the nation. During the Center's earlier existence it produced 10,000,000 seedlings for use in windbreaks during the dust bowl era. As early as 1939 the Center began searching for plants to respond to specific conservation problems. The Center is located approximately 60 miles northwest of St. Louis, Missouri, on Highway 79. It includes 243 acres of land of which 60 percent is bottomlands and 40 percent is uplands.

Plant Materials Center Operations

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

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

After several years (10-15) of evaluation, selected accessions are cooperatively released with the USDA-Agricultural Research Service (ARS), State Agricultural Experiment Stations, Conservation Commissions, Universities, 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 54 plants during its 66-year history. Forty-eight of the total numbers of plants released are natives.

CLIMATIC DATA – CALENDAR YEAR 2000

TEMPERATURE (Fahrenheit)

Month	68 Year Monthly High Average	Year 2000 Monthly High Average	Year 2000 Monthly High Departure	68 Year Monthly Low Average	Year 2000 Monthly Low Average	Year 2000 Monthly Low Departure
January	38.02	40.39	+2.37	18.28	19.52	+1.24
February	43.17	52.14	+8.97	22.65	32.21	+9.56
March	53.87	59.55	+5.68	37.30	35.32	-1.98
April	66.53	68.10	+1.57	42.49	41.73	-.76
May	76.59	80.45	+3.86	57.85	57.61	-.24
June	85.46	81.50	-3.86	72.78	60.93	-11.85
July	89.67	86.35	-3.32	65.45	66.00	+.55
August	87.64	88.45	+.81	63.26	68.42	+5.16
September	80.44	81.37	+.94	54.89	55.23	+.34
October	69.61	71.81	+2.20	43.67	48.58	+4.91
November	54.12	48.87	-5.25	32.54	31.90	-.64
December	41.94	26.67	-15.33	22.94	12.16	-10.78

2000	
Last Killing Frost	April 13
First Killing Frost	Nov. 15
Number of Frost-Free Days	201

CLIMATIC DATA – CALENDAR YEAR 1999

Precipitation (Inches)

Month	70 Year Average	2000 Total	Departure
January	1.86	.80	-1.06
February	1.97	1.93	-.04
March	3.18	2.79	-.39
April	3.72	1.81	-1.91
May	3.96	5.51	+1.55
June	3.78	7.73	+3.95
July	3.39	5.83	+2.44
August	3.29	4.73	+1.44
September	3.33	2.60	-.73
October	2.96	4.28	+1.32
November	2.90	2.46	-.44
December	2.47	1.50	-.97
Year Total	36.85	41.97	+5.11

Tours, Visitors and Meetings

The Elsberry Plant Materials Center was visited by 398 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 2000**	**Number of Participants**
Lost Creek Watershed Meeting	February 17	16
Burn Workshop	February 24	14
3-State Tech. Review Meeting	April 11-13	12
Society of Wetland Scientists	April 15	6
Camp Avery	April 25	10
Renew 2000 Group	May 15	11
Elsberry Middle School	May 18	11
Camp Avery	May 24	13
Pike County SWCD	May 31	10
Lincoln County Retired Teachers Association	June 8	13
Elsberry R-II Summer School	June 9	12
Third and Fourth. Grades Summer School	June 9	42
PMC Annual Tour	June 14	34

Groups	**Date 2000**	**Number of Participants**
Kindergarten-Second Grades, Elsberry Elementary School	June 16	34
Elementary Summer School	June 16	16
Missouri Ecotype Meeting	June 27	13
Ehmler Group	July 11	6
Camp Avery	August 15	12
Iowa NRCS Employees	August 22	12
West Technical High School	October 10	8
Daughters of the American Revolution	October 19	12
Lost Creek Watershed Committee Meeting	October 24	7
State Conservationists' Advisory Meeting	October 26	11
Other Visitors	Throughout Year	50

Study: 29I093R

Study Title: Miscellaneous Herbaceous Plant Evaluation.

Study Leader: Bruckerhoff, S. B.

Introduction:

Plants arrive at the Plant Materials Center (PMC) from many sources and for many different purposes. Most of the 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. Plants are brought in by individuals who are interested in an unfamiliar species or a plant with unusual characteristics. 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 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 then assigned a location that best suits its needs for evaluation and planted. Plants are evaluated as necessary. Many plants are left for plant identification sessions or demonstrations for several years.

Discussion:

1984-1990

This study was initiated in April 1984 in the PMC pipeline area. There are approximately 150 different accessions of the following species of plants: indiangrass, switchgrass, big bluestem, purpletop, little bluestem, buffalograss, wheatgrass, fescue, timothy, ryegrass, redtop, orchardgrass, kura clover, blackeyed susan, and lespedeza. Factors involved in 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 (Field Evaluation Planting), variety studies, 29A111G, 29A118G, and 29A127G. Twenty-six were accessions of common cool season grasses and legumes used for pasture and hay in the three state area. These were commonly used for plant identification sessions.

1995-1998

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

1999

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

2000

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

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

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

Study: 29I097G

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

Study Leader: Bruckerhoff, S. B.

Introduction:

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

Problem:

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

Objective:

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

Cooperators:

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

Assembly:

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

Procedure:

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

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

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

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

Discussion:

1987-1989

A Total of 370 accessions (collections) of big bluestem were initially collected during November, 1987 from the targeted areas: 194-Missouri; 85-Arkansas; 82-Oklahoma; and 8-Illinois. Individual plantlets were separated, transplanted into cone-tainers, and grown out in Forrest Keeling Nursery's greenhouse from February until May 1998. More than 4400 individual plantlets were transplanted into a space plant nursery with two replications and six plants per replication. The nursery is located in Field #14 at the PMC and was planted June 1988. The entire nursery was irrigated three times weekly in 1988 to insure good survival. Data collected in 1988 was mostly survival. Data collected in 1989 included survival, vigor, disease resistance, plant size, foliage size and abundance and visual seed production. Accessions from each state were selected from the above criteria. The numbers selected from each state were as follows: Arkansas-14, Missouri-46, and Oklahoma-13. Table #1 shows the 73 accessions selected from the initial space plant nursery located in Field #14 on the PMC. These plants were vegetatively removed from the initial evaluation nursery in November.

1990-1991

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

1992-1993

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

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

1994-1996

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

1997-1998

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

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

1999

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

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

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

2000

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

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

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	

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

Table #1 - continued

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	118	Laedvale

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

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: 29I101J

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

Study Leader: Henry, J.

Introduction:

Arrowwood is an upright bushy 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 in the three states being served by the center.

Objective:

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

Discussion:

1988-1992

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

1993

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

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

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

1994

This project was reestablished April 25, 1994 in Field #11e at the PMC. There was no seed from native collections available at this time so six accessions of plant materials were purchased from nursery production stock. Three accessions were named and three were common stock with origins from Iowa and Illinois.

The summer of 1994 experienced several significant dry periods and although they were hand watered several times, some replanting of the smaller plants was necessary.

1995-1996

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

1997-1999

Accession 9068590, origin Iowa, source, Forrest Keeling Nursery was selected based on the following characteristics: seed production, insect and disease resistance and form. Seed of this accession was harvested in 1997, 1998 and 1999 and propagated in the PMC greenhouse. These plants will be used in field plantings in Iowa starting in the spring of year 2001. Plans are to release this accession as a selected class germplasm in year 2001.

2000

Plans were to release accession 9068590, arrowwood in year 2001 but because of the need for field planting evaluations to support this release; the release date will need to be put off until at least 2002. Nine ounces of seed were harvested from the planting located in Field #11 on the PMC on July 19, 2000. Seed was matured and begun to shatter at the time of harvest. This accession will be evaluated in field plantings only in the state of Iowa.

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

Study*:* 29I107G

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

Study Leader: Bruckerhoff, S. B.

Introduction:

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

Problem:

Eastern gamagrass is high quality forage with few available varieties and none of local origin in the PMC service area. There is 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.

Objectives:

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

Procedure:

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

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

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

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

Discussion:

1989-1990

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

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

1991-1992

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

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

1993

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

1994-1996

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

1997-1998

Based on the evaluations of the 45 plants that were saved, the best 13 (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 were evaluated so additional plants were planted for future consideration.

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

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

1999

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

2000

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

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

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

Study 29I107G - Assembly and Evaluation of Eastern Gamagrass, *Tripsacum dactyloides,* L.

Top Rated Accessions **Table #2**

Percent Protein

Accession Number	Ploidy Level	5/3/96	6/27/96	7/19/96	Regrowth_3/ 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: 29I108G

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

Study Leader: Bruckerhoff, S. B.

Introduction:

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

Problem:

There is a need for an adapted variety of a dense low growing, strongly rhizomatous switchgrass for use in waterways, filter strips, and 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-foot spacing. A border row was planted around the three replications. This study was planted into a clean tilled seedbed with recommended

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

Discussion:

1990-1991

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

1992-1993

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

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

1994-1995

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

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

1996

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

1997-1998

The three accessions (Table #2) of flood tolerant switchgrass were vegetatively increased in the greenhouse. Approximately 250 plants were transplanted April 1997 in Field #7. This is now the breeders' block for the accession 9083170 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 thirty-five plants in 1998 and will be used to make the increase plot size bigger in 1999. The thirty-five selected plants are the breeder's block for the new accession 9083172 that is a composite of the five accessions in Table #3.

1999

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

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

2000

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

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 Choke cherry, *Prunus virginiana L.*

Study Leader: Henry, J.

Introduction:

Choke cherry 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 choke cherry 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 choke cherry for use as wildlife food and habitat in the three states served by the Center.

Objectives:

The objective is to assemble, comparatively evaluate, select and release adapted cultivars/ selections of choke cherry.

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 choke cherry 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.

1999-2000

Table #1 lists the accessions of choke cherry collected, collector's name, state, county, MLRA, and soil type. Table #2 reflects the plants performance for 1999 and 2000. Plans are to continue evaluations for survival, fruit production, height, spread, insect and disease resistance and vigor until selection (s) are made. An Eastern tent caterpillar (*Malacosoma americanum*) infestation was noticed throughout this planting (all accessions), however there was no serious damage recorded on any accession in this assembly. A solution of Malathion (one table spoon per gallon of water) was sprayed on all plants. Control was almost instant.

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 29I110J - Assembly and Evaluation of Chokecherry												Table # 2	
Row 1	**Acc #**	9068183	9068660	9008157	9008107	9068664	9068660	9068664	9068664	9008157	9008107	9068664	
	Year	99 00	99 00	99 00	99 00	99 00	99 00	99 00	99 00	99 00	99 00	99 00	
	Vigor	1 3	3 8	2 3	2 3	2 3	2 2	2 3	3 6	2 7	0	0	
	Ins/Dis	1 2	2 8	1 3	1 2	1 2	1 3	1 2	3 6	1 8	0	0	
	Height	1.5 2.0	2.0 2.5	1.7 2.3	2.0 2.6	1.9 2.5	2.0 2.5	1.9 2.6	1.8 2.5	1.8 2.4	0	0	
Row 2	**Acc#**	9008107	9068668	9068660	9008157	9068664	9068669	9068667	9068183	9008107	9068658	9008107	
	Year	99 00	99 00	99 00	99 00	99 00	99 00	99 00	99 00	99 00	99 00	99 00	
	Vigor	1 2	2 4	1 4	1 3	2 3	1 2	1 1	1 3	4 5	2 1	4 8	
	Ins/Dis	1 4	1 4	1 4	1 4	3 4	2 4	1 4	2 4	4 4	1 4	4 5	
	Height	1.5 2.2	1.3 1.7	2.0 2.4	1.5 2.3	2.0 2.6	2.5 2.8	1.7 2.7	1.4 2.0	1.5 2.0	1.8 2.5	1.0 1.4	
Row 3	**Acc #**	9068664	9068669	9068658	9068664	9068667	9068660	9068183	9068668	9068656	9008107	9068668	
	Year	99 00	99 00	99 00	99 00	99 00	99 00	99 00	99 00	99 00	99 00	99 00	
	Vigor	1 2	1 1	0	1 1	5 7	1 2	1 1	2 7	2 3	2 4	2 5	
	Ins/Dis	3 1	2 2	0	2 2	6 6	3 3	1 1	2 6	1 2	3 2	1 5	
	Height	1.5 2.3	2.4 2.7	0	1.8. 2.7	1.0 1.5	2.0 2.5	2.0 2.3	1.4 1.9	1.7 2.4	1.5 2.2	1.3 1.8	
Row 4	**Acc #**	9008157	9068183	9068664	9068667	9068660	9068669	9068668	9068656	9008107	9008157	9068664	
	Year	99 00	99 00	99 00	99 00	99 00	99 00	99 00	99 00	99 00	99 00	99 00	
	Vigor	2 6	2 4	5 4	3 3	1 1	3 5	2 4	1 3	1 3	3 3	2 4	
	Ins/Dis	3 6	3 3	2 1	5 2	2 4	3 6	2 3	2 4	1 4	3 2	3 2	
	Height	1.6. 2.2	2.0 2.3	1.7 2.6	1.0 1.4	2.0 2.5	2.5 2.9	1.5 1.9	1.5 1.9	1.5 2.2	1.8 2.4	1.8 2.2	
Row 5	**Acc #**	9068660	9008107	9068658	9068669	9068668	9008183	9008157	9068660	9068664	9068667	9068668	
	Year	99 00	99 00	99 00	99 00	99 00	99 00	99 00	99 00	99 00	99 00	99 00	
	Vigor	2 4	1 2	2 3	2 3	1 2	2 5	1 2	2 5	3 3	4 4	3 8	
	Ins/Dis	3 5	3 2	4 4	2 4	2 2	2 5	3 2	2 6	2 4	2 2	3 8	
	Height	2.0 2.3	1.5 2.2	1.5 1.9	2.5 2.9	1.8 2.7	2.0 2.4	1.8 2.3	1.5 1.8	1.5 1.8	1.0 1.4	1.0 1.3	
										North			
Rating for Vigor & Ins/Dis = 1 = Excellent, 9 = Poor													
											East		
Study 29I110J - Assembly and Evaluation of Chokecherry											**Table # 2 - continued**		

Row 6	**Acc #**	9008183		9068667		9068668		9008183		9008107		9008157		9068658		9068669		9068660		9068664		9008107	
	Year	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00
	Vigor	2	5	2	3	4	8	4	8	3	4	2	4	2	4	2	4	1	3	2	2	3	9
	Ins/Dis	2	3	4	3	6	8	2	8	3	2	2	4	2	5	2	2	1	6	2	2	2	9
	Height	2.0	2.4	1.3	1.8	1.0	1.4	1.3	1.7	1.3	1.9	1.9	2.5	1.4	1.8	2.5	2.9	2.0	2.4	2.0	2.5	1.5	1.7
Row 7	**Acc #**	9068664		9068660		9008157		9068669		9068658		9068668		9068667		9008183		9068664		9008107		9068664	
	Year	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00
	Vigor	3	4	2	3	2	3	6	8	4	4	2	1	0		4	7	2	2	3	4	3	6
	Ins/Dis	2	3	2	2	2	4	4	2	2	3	2	3	0		4	7	3	3	3	4	2	7
	Height	2.0	2.4	2.0	2.4	1.9	2.5	1.0	1.5	1.3	1.6	1.5	2.1	0		1.3	1.7	2.0	2.4	1.5	2.2	2.0	2.4
Row 8	**Acc #**	9008107		9068658		9008183		9068660		9008157		9008107		9068668		9068664		9068667		9068669		9068668	
	Year	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00
	Vigor	2	3	4	4	3	3	4	4	3	4	5	5	0		4	3	6	7	4	4	3	5
	Ins/Dis	2	3	4	3	2	6	4	6	2	2	4	5	0		3	3	6	8	5	4	3	7
	Height	1.5	2.0	1.3	1.5	2.0	2.4	2.0	2.4	1.9	2.3	1.5	2.0	0		2.0	2.2	1.0	1.3	2.2	2.6	1.5	2.0
Row 9	**Acc#**	9008157		9008157		9068668		9008107		9068664		9068658		9068183		9068660		9068667		9068668		9008107	
	Year	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00
	Vigor	3	2	4	3	3	4	4	5	5	9	3	8	3	6	4	6	0		2	3	3	5
	Ins/Dis	3	2	3	3	2	5	2	5	3	9	4	9	2	7	3	8	0		2	2	2	5
	Height	1.5	2.3	1.5	2.1	1.6	2.2	1.5	2.0	2.0	2.3	1.3	1.6	2.0	2.3	2.0	2.3	0		1.5	2.3	1.5	1.4
Row 10	**Acc #**	9068660		9068668		9068660		9008157		9068664		9068669		9068667		9008183		9008107		9068658		9068669	
	Year	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00
	Vigor	4	3	6	4	4	4	7	9	5	5	6	4	4	4	3	4	3	2	0		3	3
	Ins/Dis	3	3	7	4	3	5	7	9	3	6	5	4	2	5	3	6	2	3	0		2	4
	Height	2.0	2.4	1.5	2.4	2.0	2.4	1.5	1.8	2.0	2.4	2.2	2.5	1.4	1.9	2.0	2.4	1.5	2.0	0		2.2	2.7
																North							
Rating for Vigor & Ins/Dis = 1 = Excellent, 9 = Poor																							
																		East					
Study 29I110J - Assembly and Evaluation of Chokecherry																				**Table # 2 - continued**			

Row 11	**Acc #**	9008183		9068669		9068658		9068667		9008183		9008157		9008107		9068668		9068668		9068664		9068664	
	Year	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00
	Vigor	5	8	2	2	4	3	0		4	1	3	2	4	7	3	6	4	5	6	8	4	8
	Ins/Dis	3	7	1	1	3	3	0		3	2	4	2	1	8	2	7	5	8	7	8	2	8
	Height	2.0	2.2	2.3	2.7	1.5	2.0	0		2.0	2.5	2.0	2.7	1.5	1.8	2.0	2.4	1.5	2.4	1.8	2.4	2.0	2.4
Row 12	**Acc #**	9068664		9008157		9008167		9068108		9068658		9008107		9008183		9068667		9068664		9068669		9008157	
	Year	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00
	Vigor	3	4	3	8	3	3	4	2	2	2	4	1	2	1	5	4	4	2	4	3	3	4
	Ins/Dis	3	2	2	8	2	2	4	2	2	2	2	3	2	2	7	5	3	1	2	3	2	3
	Height	2.0	2.5	1.5	1.8	2.0	2.6	1.3	1.9	1.5	2.0	1.5	1.9	2.0	2.5	1.3	1.7	1.8	2.4	2.2	2.8	1.5	2.3
Row 13	**Acc #**	9008107		9068108		9008147		9008167		9068108		9008167		9008147		9068108		9068167		9068108		9068668	
	Year	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00
	Vigor	3	4	4	1	3	8	3	3	4	5	6	7	3	4	4	3	3	4	3	5	3	5
	Ins/Dis	2	2	3	2	2	8	3	2	3	7	3	8	2	2	3	5	2	3	2	6	4	3
	Height	1.5	2.0	1.5	2.0	1.5	1.8	2.0	2.6	1.4	1.8	1.3	1.6	1.5	2.0	1.4	1.9	2.0	2.6	1.5	1.9	1.5	2.4
Row 14	**Acc #**	9068660		9068668		9068669		9008183		9008157		9008107		9068664		9068660		9068668		9008107		9008157	
	Year	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00	99	00
	Vigor	0		4	2	4	6	4	3	3	3	3	2	3	4	3	6	4	6	4	2	7	4
	Ins/Dis	0		3	4	4	4	3	3	4	5	2	1	2	5	2	5	2	5	3	2	7	4
	Height	0		1.5	2.5	2.2	2.8	1.4	2.0	1.5	2.0	1.5	2.3	2.0	2.3	1.4	1.9	1.5	2.2	1.5	2.2	1.0	1.4
																North							
Rating for Vigor & Ins/Dis = 1 = Excellent, 9 = Poor																							
																		East					

Study: 29I124G

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

Study Leader: 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 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 project 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 1, 1990, at the beginning of fiscal year 1991 with agreements signed. Seed collections had started earlier in the year and seed was available for increase plots the spring of 1991. Most of the plots started from 1991 to 1993 were destroyed in the start of each year. Progress of species released to growers as ' Source Identified' Germplasm can be seen in Table #2.

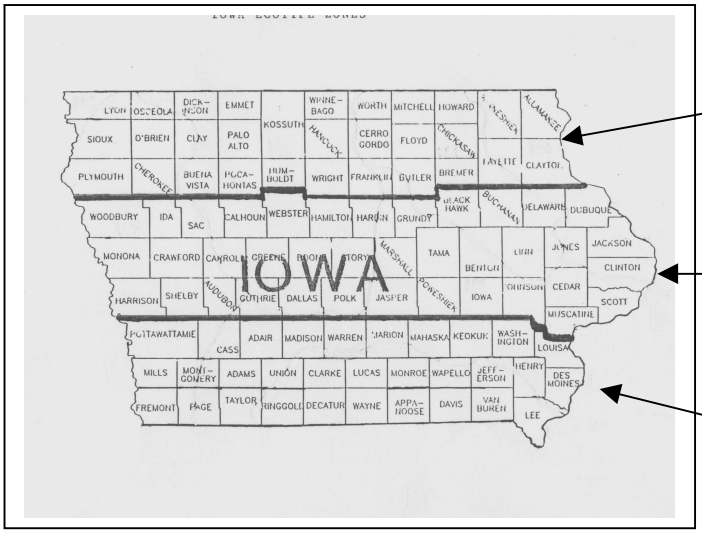
2000

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

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

Study 29I124G – Production of Native Iowa Ecotypes… **Table #1**

IOWA ECOTYPE ZONE MAP



Study 29I124G-Production of Native Iowa Ecotypes of Grasses and Forbs for Roadside, Critical Areas, and All Other Vegetative Plantins Where Native Grasses and Forbs are Now Being Planted (UNI).				Table #2
Project Status				
Common Name		**Accession**		
Genus/Species	**Zone**	**Number**	**Status of Accession**	**Status of Increase Plot**
Big bluestem	1	9068614	Released in 2000	in production
Andropogon gerardii	2	9068615	Released in 1998	in production
	3	9068616	Released in 1999	in production
Sideoats grama	1	9062278	Released in 1994	in production
Bouteloua curtipendula	2	9062279	Released in 1994	in production
	3	9062280	Released in 1994	in production
Purple prairie clover	1	9068608	Released in 1998	Increase plot planted in 1998
Dalea purpurea	2	9068609	Planned release 2001	Increase plot planted in 1999
	3	9068610	Planned release 2001	increase plot planted in 1999
Pale purple coneflower	1	9068611	Planned release 2001	in production
Echinacea pallida	2	9068612	Release in 1998	in production
	3	9068613	Planned release 2001	in production
Canada wildrye	1	9062275	Released in 1994	in production
Elymus canadensis	2	9062276	Released in 1994	out of production
	3	9062277	Released in 1994	out of production
Rattlesnake master	1	9068602	Released in 1998	in production
Eryngium yuccifolium	2	9068603	Released in 1999	in production
	3	9068604	Released in 1999	in production
Oxeye false sunflower	1	9068605	Released in 1997	in production
Heliopsis helianthoides	2	9068606	Released in 1996	in production
	3	9068607	Released in 1997	in production
Junegrass	1	9068620	Planned release for 2003	increase plot planned for 2001
Loeleria macrantha	2	9068621	Planned release for 2003	
	3	9068622	Planned release for 2003	
Round-head bushclover	1	9062281	Released in 1999	in production
Lespedeza capitata	2	9062282	Released in 1996	in production
	3	9062283	Released in 1997	in production
Rough blazing star	1	9068684	Planned release for 2002	increase plot planted in 2000
Liatris asper	2	9068685	Planned release for 2002	increase plot planted in 2000
	3	9068686	Planned release for 2002	increase plot planted in 2000
Blazing star	1	9068626	Released in 1999	in production
Liatris pycnostachya	2	9068627	Released in 1999	in production
	3	9068628	Planned release for 2000	in production
Study 29I124G - Native Iowa Ecotypes				**Table #2 - continued**
Common Name		**Accession**		

Genus/Species	Zone	Number	Status of Accession	Status of Increase Plot
Horsemint	1	9068678		increase plots planted in 2000
Monarda fistulosa	2	9068679		increase plots planted in 2000
	3	9068680		increase plots planted in 2000
Little bluestem	1	9062319	Released in 1999	in production
Schizachyrium	2	9062320	Released in 1997	in production
scoparium	3	9062321	Released in 1999	in production
Compassplant	1	9068675		
Silphium laciniatum	2	9068676		
	3	9068677		
Stiff goldenrod	1	9068617	Released in 1998	in production
Solidago rigida	2	9068618	Planned release for 2001	in production
	3	9068619	Planned release for 2001	in production
Indiangrass	1	9062316	Released in 1997	in production
Sorghastrum nutans	2	9062317	Released in 1996	in production
	3	9062318	Released in 1998	in production
Tall dropseed	1	9062313	Released in 2000	in production
Sporobolus compositus	2	9062314	Released in 1996	in production
	3	9062315	Released in 1997	in production
New England aster	1	9068681	Planned release in 2001	increase plot planted in1999
Aster novae angliae	2	9068682	Planned release in 2001	increase plot planted in1999
	3	9068683	Planned release in 2001	increase plot planted in1999
Butterfly milkweed	1	9068687		
Asclepias tuberosa	2	9068688		
	3	9068689		
Blue lobelia	1	9068696		increase plot planted in 2000
Lobilia siphilitica	2	9068697		increase plot planted in 2000
	3	9068698		increase plot planted in 2000
Switchgrass	1	9068705		
Panicum virgatum	2	9068706		
	3	9068707		
Golden alexanders	1	9068702		
Zizia aurea	2	9068703		
	3	9068703		

Study: 29I1320

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:

1992-1999

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 to deteriorate. The other species reacted less dramatic than the smooth cone sedge to the reduction in water.

Plans are to release the *Carex laericonica*, smooth cone sedge in year 2003.

Table #1 contains information regarding sources for the different collections included in this study.

Table #2 reflects the plants' performance from 1992 – 1999.

2000

Continued evaluations were conducted during year 2000 along with the seed harvest of *Carex laericonica*, soooth cone sedge. Plant performance data can be found in Table #2 for years 1992 –2000.

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
Safittaria 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	Field #7, PMC	Elsberry, Missouri
Typha latifolia Cattail	9083205	County Route #79	Elsberry, Missouri
Ludwigia peplaides Water primrose	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
	Year	Percent	Flower	Seed	End of			Insect	Disease
Genus/Species	Eval.	Survival	Date	Prod.	Season Ht	Spread	Vigor	Resist.	Resist
				\1			\1	\1	\1
Scirpus validus	1992	100	5/19/92	5	50 inches	solid	1	1	1
softstem bulrush	1993	100	5/21/93	5	53 inches	solid	1	1	1
9083201	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
	1999	85	5/10/99	5	50 inches	solid	1	1	1
	2000	75	5/17/00	4	50 inches	solid	2	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
	1999	90	5/21/99	7	72 inches	solid	1	1	1
	2000	85	5/23/00	6	70 inches	solid	2	2	2
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
	1999	90	5/21/99	6	48 inches	solid	1	1	1
	2000	90	5/23/00	7	45 inches	solid	2	2	2
Carex laericonica	1992	100	6/3/92	6	24 inches	solid	4	1	1
smooth cone 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
	1999	50	6/4/99	7	30 inches		3	1	1
	2000	50	6/9/00	5	32 inches		3	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
	1999	100	5/7/99	1	68 inches	solid	1	1	1
	2000	100	5/10/00	2	65 inches	solid	1	1	1

Study 29I1320 Miscellaneous Wetland Plant Evaluation							Table #2 - continued		
	Year	Percent	Flower	Seed	End of			Insect	Disease

Genus/Species	Eval.	Survival	Date	Prod.	Season Ht	Spread	Vigor	Resist.	Resist
				\1			\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
	2000	40	6/29/00	0	4 inches		4	3	3
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 No. 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 are 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 46 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.

1999

Evaluations were made on November 22, 1999 for the following: height, spread, vigor, insect and disease resistance and form; this information was not added to Tables # 2, 3, 4, 5, and 6.

2000

The evaluations documented on November 22, 1999 along with the evaluations made on October 10, 2000 were added to Tables #2, 3, 4, 5 and 6 reflecting plants performance for years 1997, 1998 and 2000.

Accessions of Eastern Redcedar Collected for this Study.

Table # 1

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

Study 29I134J – Assembly and Evaluation of Eastern Redcedar… Table #2-continued

ACCESSION	STATE	COUNTY OR CITY
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
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.

Height in Feet **Table #2**

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

Height measured in feet

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

										Height in Feet										
\				**2000**																
Accession	**Rep 1**	**Rep 2**	**Rep 3**	**Rep 4**	**Rep 5**	**Rep 6**	**Ave.**	**Best**	**Location**											
9068532	11.20	7.00	8.90	7.00	9.30	9.20	8.77	**11.20**	R1											
9068493	8.50	8.90	7.40	9.00	11.00	6.90	8.62	**11.00**	R5											
9068566	9.70	10.80	10.80	9.40	7.10	7.60	9.23	**10.80**	R2,3											
9068583	6.00	9.80	9.30	8.60	8.40	10.70	8.80	**10.70**	R6											
9057198	9.00	10.60	9.20	7.90	8.00	8.90	8.93	**10.60**	R2											
9057106	9.50	7.20	10.50	7.40	8.20	8.50	8.55	**10.50**	R3											
9068486	10.50	8.70	10.20	8.30	7.90	10.50	9.35	**10.50**	R1,6											
9068530	10.50	9.30	8.70	9.30	9.60	9.20	9.43	**10.50**	R1											
9057136	10.30	8.80	9.00	8.40	7.00	7.90	8.57	**10.30**	R1											
9057196	10.30	8.20	6.10	8.30	8.10	9.00	8.33	**10.30**	R1											
9057099	9.50	10.20	7.50	7.50	8.40	7.90	8.50	**10.20**	R2											
9068504	8.50	9.00	8.20	10.20	7.30	8.40	8.60	**10.20**	R4											
9068499	9.30	10.20	7.00	5.40	8.60	8.00	8.08	**10.20**	R2											
9068496	8.50	10.20	8.80	7.00	6.20	5.00	7.62	**10.20**	R2											
9057105	9.00	10.10	7.40	9.20	9.40	9.60	9.12	**10.10**	R2											
9068500	10.10	9.50	9.70	8.80	6.20	8.40	8.78	**10.10**	R1											
9057190	10.00	8.45	7.80	8.50	Dead	9.30	7.34	**10.00**	R1											
9068531	10.00	7.90	7.40	8.30	7.20	7.30	8.02	**10.00**	R1											
9068588	9.80	9.50	6.80	6.50	7.60	9.70	8.32	**9.80**	R1											
9057117	8.40	9.50	7.00	8.00	8.40	8.20	8.25	**9.50**	R2											
9068501	9.40	9.50	9.00	8.50	7.00	8.20	8.60	**9.50**	R2											
9057193	9.00	9.40	8.40	8.50	9.30	8.00	8.77	**9.40**	R2											
9068503	9.20	9.40	8.30	7.10	8.00	9.30	8.55	**9.40**	R2											
9057199	9.30	8.50	7.90	7.10	8.20	8.30	8.22	**9.30**	R1											
9068584	8.00	9.30	6.70	8.90	9.20	7.90	8.33	**9.30**	R2											
9057116	9.20	6.90	7.40	6.50	8.20	9.00	7.87	**9.20**	R1											
9057180	8.40	9.00	9.20	8.50	9.30	8.90	8.88	**9.20**	R3											
9068492	9.20	9.10	6.80	9.20	8.30	7.80	8.40	**9.20**	R1,4											
9068495	8.60	8.50	9.10	6.20	8.10	8.00	8.08	**9.10**	R3											
9068476	7.50	8.40	7.80	8.90	9.00	8.50	8.35	**9.00**	R5											
9057189	8.30	9.00	8.40	9.00	8.30	8.50	8.58	**9.00**	R2,6											
9068502	8.30	9.00	7.20	6.00	7.00	7.80	7.55	**9.00**	R2											
9068554	7.50	7.90	9.00	8.70	9.10	8.20	8.40	**9.00**	R5											
9057115	7.20	5.50	5.90	8.20	6.30	6.50	6.60	**8.20**	R4											
Height measured in feet																				

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

Spread in Feet

				1997												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**
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
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
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
9068476	4.60	6.50	5.70	6.70	5.10	5.30	5.65	**6.50**	R2		9068530	6.80	6.90	6.00	6.50	6.00	5.50	6.28	**6.70**	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
9068530	6.20	6.60	5.70	6.00	5.60	5.00	5.85	**6.60**	R2		9057106	7.00	6.00	7.60	5.40	6.60	5.80	6.40	**7.00**	R1
9068584	5.70	5.50	5.40	5.70	4.20	6.60	5.52	**6.60**	R6		9068476	5.00	7.00	6.30	7.00	5.70	5.90	6.15	**7.00**	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		9068554	7.00	7.00	7.00	6.90	6.90	5.30	6.68	**7.00**	R1,2,3
9068554	6.70	6.80	6.90	6.70	6.60	5.00	6.45	**6.90**	R3		9068584	7.00	6.00	4.90	5.40	5.90	5.20	5.73	**7.00**	R1
9057106	6.70	5.50	7.00	5.00	6.10	5.20	5.92	**7.00**	R3		9068588	7.90	7.30	7.40	5.90	6.60	4.60	6.62	**7.00**	R1,2
9057193	7.00	6.10	5.80	5.80	6.70	5.40	6.13	**7.00**	R1		9068499	6.00	7.20	5.60	6.20	5.90	4.80	5.95	**7.20**	R2
9057116	7.10	5.70	4.80	5.80	6.20	5.20	5.80	**7.10**	R1		9057193	7.50	6.60	6.30	6.50	6.00	5.30	6.37	**7.50**	R1
9057199	5.30	7.10	5.80	6.00	5.90	5.00	5.85	**7.10**	R2		9068504	7.50	7.50	6.80	6.40	5.60	5.70	6.58	**7.50**	R1,2
9068504	7.00	7.10	6.30	6.00	5.00	5.10	6.08	**7.10**	R2		9057116	7.60	6.00	5.30	6.00	6.80	6.00	6.28	**7.60**	R1
9068502	6.60	7.20	5.20	3.10	5.20	5.00	5.38	**7.20**	R2		9057199	6.00	7.60	6.20	6.50	6.30	5.40	6.33	**7.60**	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
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
9057099	7.60	6.50	3.90	6.80	3.80	6.90	5.92	**7.60**	R1		9057180	7.00	6.00	6.20	7.80	7.00	5.90	6.65	**7.80**	R4
9057180	6.60	5.70	5.80	7.60	6.50	5.30	6.25	**7.60**	R4		9068502	7.00	7.80	5.80	3.60	5.70	5.40	5.88	**7.80**	R2
9057189	5.70	7.60	7.40	6.30	5.00	5.90	6.32	**7.60**	R2		9057099	8.00	7.00	4.30	7.10	4.10	7.30	6.30	**8.00**	R1
9068532	7.60	6.20	6.50	6.70	6.50	6.30	6.63	**7.60**	R1		9057189	6.00	7.00	8.00	7.20	5.40	6.20	6.63	**8.00**	R3
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
9068588	7.70	7.00	7.10	5.30	6.20	4.10	6.23	**7.70**	R1		9068532	8.20	6.60	6.80	7.20	6.80	6.80	7.07	**8.20**	R1
9057196	8.00	7.10	5.20	6.10	6.80	4.70	6.32	**8.00**	R1		9068496	7.50	8.40	6.80	4.40	5.30	4.40	6.13	**8.40**	R2
9068496	7.00	8.00	6.30	4.00	4.80	4.00	5.68	**8.00**	R2		9057196	8.50	7.60	6.00	6.60	7.30	5.80	6.97	**8.50**	R1
9068531	8.30	6.50	5.60	6.00	5.50	6.60	6.42	**8.30**	R1		9068583	6.00	8.60	7.20	7.00	5.20	6.00	6.67	**8.60**	R2
9057105	8.50	7.30	5.50	6.60	5.70	6.60	6.70	**8.50**	R1		9068531	8.90	7.00	6.00	6.40	6.00	7.00	6.88	**8.90**	R1
9068486	8.50	5.70	6.70	7.00	5.00	5.40	6.38	**8.50**	R1		9057105	9.00	8.00	6.70	7.00	6.00	7.00	7.28	**9.00**	R1
9057190	8.50	5.70	4.60	5.80	0.00	5.20	5.96	**8.50**	R1		9057117	6.60	9.00	5.80	6.90	5.30	5.70	6.55	**9.00**	R2
9068583	6.80	8.50	7.60	7.00	5.10	6.40	6.90	**8.50**	R2		9068486	9.00	6.20	7.00	7.50	5.70	6.00	6.90	**9.00**	R1
9057136	8.60	5.90	6.50	7.20	6.60	4.80	6.60	**8.60**	R1		9057190	9.00	6.00	5.20	6.00	0.00	5.70	6.38	**9.00**	R1
9057117	6.10	8.80	5.20	6.30	4.80	5.10	6.05	**8.80**	R2		9057136	9.30	7.00	6.50	6.60	5.40	9.00	7.30	**9.30**	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

Spread measured in feet

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

										Spread in Feet											
				2000																	
Accession	**Rep 1**	**Rep 2**	**Rep 3**	**Rep 4**	**Rep 5**	**Rep 6**	**Ave.**	**Best**	**Location**												
9068500	7.00	8.40	7.30	6.40	5.40	3.50	6.33	**3.50**	R6												
9068502	7.70	8.30	6.20	4.30	6.20	6.40	6.52	**4.30**	R4												
9057099	8.70	7.40	5.00	7.70	4.70	8.20	6.95	**4.70**	R5												
9057198	6.40	11.20	6.60	5.40	4.90	6.90	6.90	**4.90**	R5												
9068496	8.00	9.20	7.50	5.00	6.00	5.00	6.78	**5.00**	R4,6												
9068499	6.40	8.00	6.10	6.80	6.40	5.30	6.50	**5.30**	R6												
9057115	5.90	5.70	6.20	6.90	5.40	5.60	5.95	**5.40**	R5												
9068476	5.40	7.60	6.80	7.60	6.30	6.60	6.72	**5.40**	R1												
9068495	7.50	7.20	5.80	5.00	6.90	5.40	6.30	**5.40**	R6												
9068584	7.50	6.40	5.50	6.00	6.40	6.50	6.38	**5.50**	R3												
9057190	9.70	6.50	5.70	6.40	Dead	6.20	5.75	**5.70**	R3												
9068583	6.30	9.00	7.80	7.50	5.70	6.60	7.15	**5.70**	R5												
9057189	6.60	7.50	8.50	7.90	5.80	7.20	7.25	**5.80**	R5												
9068501	6.40	8.40	6.20	6.50	8.30	5.80	6.93	**5.80**	R6												
9068554	7.50	7.50	7.50	7.30	7.40	5.80	7.17	**5.80**	R6												
9057116	8.40	6.60	5.90	6.80	7.40	6.70	6.97	**5.90**	R3												
9057117	7.30	9.70	6.30	7.50	5.90	6.40	7.18	**5.90**	R5												
9068493	7.30	6.00	6.40	6.20	5.90	6.30	6.35	**5.90**	R5												
9057106	7.70	6.50	8.00	6.00	7.20	6.30	6.95	**6.00**	R4												
9057136	10.00	7.80	7.00	7.10	6.00	9.60	7.92	**6.00**	R5												
9057193	8.00	7.20	6.80	7.00	6.00	7.10	7.02	**6.00**	R5												
9068504	8.20	8.00	7.20	7.10	6.00	7.30	7.30	**6.00**	R5												
9068566	8.20	8.60	8.80	7.00	7.10	6.00	7.62	**6.00**	R6												
9068503	7.10	6.50	6.10	6.10	6.80	6.50	6.52	**6.10**	R3,4												
9068486	9.70	6.80	7.50	8.00	6.20	6.50	7.45	**6.20**	R5												
9068588	8.50	8.10	8.20	6.30	7.40	7.70	7.70	**6.30**	R4												
9068531	9.50	7.40	6.50	7.00	6.40	7.70	7.42	**6.40**	R5												
9057105	9.70	8.60	7.30	7.60	6.50	7.70	7.90	**6.50**	R5												
9057180	7.60	6.50	6.90	8.30	7.50	7.30	7.35	**6.50**	R2												
9057196	9.00	8.30	6.50	7.10	8.00	7.50	7.73	**6.50**	R3												
9068530	7.30	7.40	6.50	7.20	6.70	6.90	7.00	**6.50**	R3												
9057199	6.60	8.40	6.80	7.00	6.90	6.80	7.08	**6.60**	R1												
9068492	7.60	6.80	6.90	7.40	7.00	7.10	7.13	**6.80**	R2												
9068532	9.00	7.20	7.40	8.00	7.50	7.50	7.77	**7.20**	R2												
Spread measured in feet																					

Study 29I134J - Assembly and Evaluation of Eastern Redcedar, *Juniper virginia* L.																					Table #4	
										Vigor												
				1997												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	
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	
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		9057196	1.00	3.00	3.00	3.00	3.00	3.00	2.67	**1.00**	R1	
9068584	4.00	2.00	5.00	1.00	3.00	2.00	2.83	**1.00**	R4		9057199	2.00	3.00	3.00	3.00	1.00	2.00	2.33	**1.00**	R5	
9057106	2.00	4.00	3.00	4.00	3.00	3.00	3.17	**2.00**	R1		9068503	3.00	1.00	4.00	3.00	2.00	4.00	2.83	**1.00**	R2,4,5	
9057117	4.00	2.00	5.00	4.00	3.00	3.00	3.50	**2.00**	R2,4,5		9068496	1.00	3.00	3.00	3.00	4.00	4.00	3.00	**1.00**	R1	
9057136	2.00	3.00	2.00	2.00	5.00	4.00	3.00	**2.00**	R1,3,4		9068493	2.00	4.00	3.00	1.00	1.00	4.00	2.50	**1.00**	R4,5	
9057193	4.00	3.00	3.00	3.00	2.00	3.00	3.00	**2.00**	R5		9068566	3.00	3.00	2.00	3.00	3.00	3.00	2.83	**2.00**	R3	
9057196	2.00	2.00	2.00	3.00	3.00	3.00	2.50	**2.00**	R1,2,3		9057106	2.00	4.00	2.00	3.00	3.00	3.00	2.83	**2.00**	R1,3	
9057198	3.00	2.00	2.00	5.00	3.00	4.00	3.17	**2.00**	R2,3		9057117	4.00	3.00	5.00	3.00	2.00	3.00	3.33	**2.00**	R5	
9057199	3.00	3.00	4.00	2.00	2.00	3.00	2.83	**2.00**	R4,5		9057136	3.00	3.00	2.00	3.00	4.00	4.00	3.17	**2.00**	R2,4,5	
9057190	2.00	3.00	4.00	3.00	3.00	3.00	3.00	**2.00**	R1		9057193	3.00	3.00	3.00	3.00	2.00	3.00	2.83	**2.00**	R5	
9068504	3.00	2.00	3.00	2.00	4.00	2.00	2.67	**2.00**	R2,4,6		9057198	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		9057190	2.00	3.00	4.00	3.00	0.00	3.00	3.00	**2.00**	R1	
9068502	2.00	3.00	4.00	4.00	3.00	3.00	3.17	**2.00**	R1		9068504	2.00	3.00	2.00	7.00	4.00	3.00	3.50	**2.00**	R1,3	
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	
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		9068495	2.00	3.00	2.00	4.00	3.00	3.00	2.83	**2.00**	R1,3	
9068495	3.00	2.00	2.00	4.00	3.00	3.00	2.83	**2.00**	R2,3		9068583	4.00	3.00	3.00	2.00	3.00	2.00	2.83	**2.00**	R4,6	
9068493	2.00	3.00	2.00	2.00	2.00	3.00	2.33	**2.00**	R1,3,4,5		9057099	2.00	3.00	6.00	3.00	6.00	5.00	4.17	**2.00**	R1	
9068530	3.00	4.00	3.00	3.00	2.00	2.00	2.83	**2.00**	R5,6		9068476	6.00	2.00	3.00	3.00	3.00	3.00	3.33	**2.00**	R2,4,5	
9068583	3.00	3.00	2.00	4.00	3.00	3.00	3.00	**2.00**	R3		9057189	3.00	2.00	3.00	3.00	4.00	3.00	3.00	**2.00**	R2,4,5	
9057099	3.00	3.00	5.00	3.00	6.00	4.00	4.00	**3.00**	R1,2,4		9068532	2.00	4.00	3.00	7.00	3.00	3.00	3.67	**2.00**	R1	
9057105	3.00	3.00	3.00	3.00	3.00	4.00	3.17	**3.00**	R1,5		9068584	3.00	4.00	4.00	3.00	3.00	3.00	3.33	**3.00**	R1,4,5,6	
9057115	5.00	3.00	4.00	3.00	3.00	4.00	3.67	**3.00**	R2,4,5		9068502	3.00	3.00	4.00	4.00	4.00	3.00	3.50	**3.00**	R1,2,6	
9057116	3.00	5.00	4.00	3.00	4.00	3.00	3.67	**3.00**	R1,4,6		9068530	3.00	5.00	3.00	4.00	3.00	3.00	3.50	**3.00**	R1,3,5,6	
9057180	4.00	5.00	3.00	4.00	3.00	4.00	3.83	**3.00**	R3,5		9057105	3.00	3.00	3.00	3.00	3.00	3.00	3.00	**3.00**	R1,6	
9068476	4.00	3.00	3.00	4.00	3.00	3.00	3.33	**3.00**	R2,3,5,6		9057115	4.00	3.00	4.00	3.00	3.00	4.00	3.50	**3.00**	R2,4,5	
9057189	4.00	3.00	3.00	3.00	6.00	3.00	3.67	**3.00**	R2,3,4,6		9057116	3.00	4.00	3.00	4.00	4.00	3.00	3.50	**3.00**	R1,3,6	
9068492	3.00	3.00	4.00	4.00	3.00	4.00	3.50	**3.00**	R1,2,5		9057180	3.00	3.00	3.00	3.00	3.00	4.00	3.17	**3.00**	R1,5	
9068532	3.00	4.00	4.00	5.00	3.00	3.00	3.67	**3.00**	R1,5,6		9068492	3.00	3.00	4.00	3.00	3.00	4.00	3.33	**3.00**	R1,2,4,5	
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	
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 #4 - continued	
										Vigor												

				2000																	
Accession	**Rep 1**	**Rep 2**	**Rep 3**	**Rep 4**	**Rep 5**	**Rep 6**	**Ave.**	**Best**	**Location**												
9068486	1.00	2.00	2.00	2.00	3.00	2.00	2.00	1.00	R1												
9068554	3.00	4.00	3.00	4.00	1.00	2.00	2.83	1.00	R5												
9068584	4.00	2.00	6.00	1.00	2.00	2.00	2.83	1.00	R3												
9057106	2.00	3.00	3.00	3.00	3.00	3.00	2.83	2.00	R1												
9057117	4.00	2.00	4.00	4.00	3.00	3.00	3.33	2.00	R2												
9057136	2.00	3.00	2.00	2.00	4.00	4.00	2.83	2.00	R1,3,4												
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	R1-3												
9057198	3.00	2.00	2.00	4.00	2.00	3.00	2.67	2.00	R2,3,5												
9057199	2.00	2.00	3.00	2.00	2.00	3.00	2.33	2.00	R1,2,4,5												
9068476	3.00	3.00	3.00	4.00	3.00	2.00	3.00	2.00	R6												
9057190	2.00	2.00	4.00	3.00	3.00	3.00	2.83	2.00	R1,2												
9068504	3.00	2.00	3.00	2.00	4.00	2.00	2.67	2.00	R2,4,6												
9068503	2.00	2.00	3.00	3.00	2.00	4.00	2.67	2.00	R1,2,5												
9068502	2.00	3.00	4.00	4.00	2.00	3.00	3.00	2.00	R5												
9068501	4.00	3.00	2.00	3.00	3.00	2.00	2.83	2.00	R3,6												
9068500	2.00	3.00	3.00	3.00	2.00	5.00	3.00	2.00	R1,5												
9068492	3.00	3.00	4.00	4.00	2.00	4.00	3.33	2.00	R5												
9068499	2.00	3.00	3.00	4.00	6.00	5.00	3.83	2.00	R1												
9068496	2.00	3.00	4.00	3.00	2.00	3.00	2.83	2.00	R5												
9068495	3.00	2.00	2.00	5.00	3.00	4.00	3.17	2.00	R2,3												
9068493	2.00	3.00	2.00	2.00	2.00	3.00	2.33	2.00	R1,3-5												
9068531	3.00	4.00	4.00	4.00	2.00	2.00	3.17	2.00	R5,6												
9068530	3.00	4.00	3.00	3.00	2.00	2.00	2.83	2.00	R5,6												
9068566	3.00	3.00	3.00	3.00	2.00	2.00	2.67	2.00	R5,6												
9068583	3.00	3.00	2.00	5.00	3.00	3.00	3.17	2.00	R3												
9057099	3.00	3.00	4.00	3.00	5.00	4.00	3.67	3.00	R1,2,4												
9057105	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	R1-6												
9057115	4.00	3.00	3.00	3.00	3.00	4.00	3.33	3.00	R2-5												
9057116	3.00	4.00	4.00	3.00	3.00	3.00	3.33	3.00	R1,4,5,6												
9057180	4.00	4.00	3.00	4.00	3.00	4.00	3.67	3.00	R3,5												
9057189	3.00	3.00	3.00	3.00	5.00	3.00	3.33	3.00	R1-4,6												
9068532	3.00	4.00	4.00	6.00	3.00	3.00	3.83	3.00	R1,5,6												
9068588	3.00	4.00	4.00	3.00	3.00	3.00	3.33	3.00	R1,4,5,6												
Vigor Rating: 1= Excellent, 9=Poor																					

Study 29I134J - Assembly and Evaluation of Eastern Redcedar, *Juniper virginia* L.																			Table #5	
										Insect/Disease										
				1997											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
9068588								**0.00**			9068531								**0.00**	
9068486	1.00	2.00	1.00	1.00	2.00	2.00	1.50	**1.00**	R1,3,4		9057099	2.00	1.00	4.00	2.00	3.00	3.00	2.50	**1.00**	R2
9057198	2.00	1.00	2.00	5.00	1.00	2.00	2.17	**1.00**	R2,5		9057106	1.00	3.00	2.00	2.00	3.00	3.00	2.33	**1.00**	R1
9057199	2.00	1.00	3.00	2.00	3.00	1.00	2.00	**1.00**	R2,6		9057193	2.00	2.00	2.00	3.00	1.00	2.00	2.00	**1.00**	R5
9068504	1.00	2.00	2.00	1.00	2.00	2.00	1.67	**1.00**	R1,4		9057196	1.00	2.00	3.00	2.00	3.00	3.00	2.33	**1.00**	R1
9068503	2.00	2.00	3.00	3.00	1.00	3.00	2.33	**1.00**	R5		9057198	2.00	2.00	1.00	7.00	1.00	3.00	2.67	**1.00**	R3,5
9068502	2.00	2.00	1.00	2.00	3.00	3.00	2.17	**1.00**	R3		9057199	1.00	1.00	2.00	2.00	1.00	1.00	1.33	**1.00**	R1,2,5,6
9068501	2.00	2.00	2.00	1.00	2.00	2.00	1.83	**1.00**	R4		9068504	1.00	2.00	2.00	1.00	3.00	1.00	1.67	**1.00**	R1,4
9068500	2.00	2.00	2.00	2.00	1.00	3.00	2.00	**1.00**	R5		9068503	3.00	1.00	3.00	2.00	2.00	3.00	2.33	**1.00**	R2
9068499	1.00	2.00	3.00	2.00	6.00	3.00	2.83	**1.00**	R1		9068502	2.00	2.00	1.00	2.00	3.00	2.00	2.00	**1.00**	R3
9068496	1.00	2.00	4.00	2.00	2.00	2.00	2.17	**1.00**	R1		9068500	1.00	3.00	2.00	2.00	1.00	3.00	2.00	**1.00**	R1,5
9068495	1.00	1.00	1.00	-	2.00	2.00	1.40	**1.00**	R1-3		9068499	1.00	1.00	3.00	2.00	3.00	4.00	2.33	**1.00**	R1,2
9068493	1.00	2.00	3.00	2.00	1.00	2.00	1.83	**1.00**	R1,5		9068496	1.00	3.00	2.00	1.00	1.00	3.00	1.83	**1.00**	R1,4,5
9068554	2.00	4.00	2.00	4.00	1.00	1.00	2.33	**1.00**	R5,6		9068493	1.00	2.00	2.00	2.00	1.00	2.00	1.67	**1.00**	R1,5
9068566	2.00	2.00	1.00	1.00	3.00	3.00	2.00	**1.00**	R3,4		9068554	1.00	3.00	2.00	2.00	1.00	1.00	1.67	**1.00**	R1,5,6
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
9057099	2.00	2.00	4.00	3.00	2.00	2.00	2.50	**2.00**	R1,2,5,6		9068583	5.00	2.00	1.00	1.00	3.00	1.00	2.17	**1.00**	R3,4,6
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
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
9057180	3.00	2.00	3.00	2.00	3.00	3.00	2.67	**2.00**	R2,4		9068486	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		9057180	2.00	3.00	2.00	2.00	3.00	3.00	2.50	**2.00**	R1,3,4
9057196	2.00	2.00	2.00	3.00	4.00	3.00	2.67	**2.00**	R1-3		9068476	6.00	3.00	2.00	3.00	2.00	3.00	3.17	**2.00**	R3,5
9068476	4.00	3.00	2.00	2.00	2.00	2.00	2.50	**2.00**	R3-6		9057190	2.00	2.00	2.00	3.00	0.00	3.00	2.00	**2.00**	R1-3
9057190	3.00	2.00	2.00	2.00	2.00	3.00	2.33	**2.00**	R2,5		9057189	2.00	2.00	3.00	2.00	3.00	3.00	2.50	**2.00**	R1,2,4
9057189	3.00	3.00	3.00	2.00	4.00	3.00	3.00	**2.00**	R4		9068501	2.00	3.00	2.00	2.00	2.00	2.00	2.17	**2.00**	R1,3-6
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
9068532	3.00	2.00	3.00	5.00	2.00	3.00	3.00	**2.00**	R2,5		9068495	2.00	2.00	2.00	2.00	2.00	3.00	2.17	**2.00**	R1-5
9068531	3.00	2.00	2.00	2.00	2.00	4.00	2.50	**2.00**	R2-5		9068532	3.00	2.00	2.00	7.00	2.00	3.00	3.17	**2.00**	R2,3,5
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
9068583	3.00	2.00	2.00	3.00	3.00	3.00	2.67	**2.00**	R2,3		9068566	2.00	3.00	2.00	2.00	4.00	4.00	2.83	**2.00**	R1,3,4
9057106	3.00	3.00	3.00	3.00	3.00	3.00	3.00	**3.00**	R1-6		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 # - 5 continued**		

										Insect/Disease										
					2000															
Accession	**Rep 1**	**Rep 2**	**Rep 3**	**Rep 4**	**Rep 5**	**Rep 6**	**Ave.**	**Best**	**Location**											
9068486	1.00	2.00	1.00	1.00	2.00	2.00	1.50	**1.00**	R1,3,4											
9057193	3.00	1.00	1.00	2.00	2.00	2.00	1.83	**1.00**	R2,3											
9057196	1.00	1.00	2.00	3.00	4.00	3.00	2.33	**1.00**	R1,2											
9057198	2.00	1.00	2.00	4.00	1.00	2.00	2.00	**1.00**	R2,5											
9057199	2.00	1.00	2.00	3.00	1.00	2.00	1.83	**1.00**	R2,5											
9068476	3.00	3.00	2.00	2.00	1.00	2.00	2.17	**1.00**	R5											
9068504	1.00	1.00	2.00	1.00	2.00	2.00	1.50	**1.00**	R1,2,4											
9068503	2.00	2.00	2.00	3.00	1.00	2.00	2.00	**1.00**	R5											
9068502	2.00	2.00	1.00	2.00	2.00	3.00	2.00	**1.00**	R3											
9068501	2.00	2.00	2.00	1.00	2.00	2.00	1.83	**1.00**	R4											
9068500	2.00	2.00	2.00	2.00	1.00	2.00	1.83	**1.00**	R5											
9068499	1.00	1.00	2.00	2.00	4.00	2.00	2.00	**1.00**	R1,2											
9068496	1.00	2.00	3.00	2.00	2.00	3.00	2.17	**1.00**	R1											
9068495	1.00	1.00	1.00	-	1.00	2.00	1.00	**1.00**	R1-3,5											
9068493	1.00	2.00	2.00	2.00	1.00	2.00	1.67	**1.00**	R1,5											
9068554	2.00	3.00	2.00	3.00	1.00	1.00	2.00	**1.00**	R5,6											
9068566	2.00	2.00	1.00	1.00	2.00	2.00	1.67	**1.00**	R3,4											
9068584	2.00	2.00	3.00	1.00	1.00	2.00	1.83	**1.00**	R4,5											
9057099	2.00	2.00	3.00	2.00	2.00	2.00	2.17	**2.00**	R1,2,4,5,6											
9057105	2.00	2.00	2.00	2.00	3.00	4.00	2.50	**2.00**	R1-4											
9057106	2.00	2.00	2.00	2.00	2.00	2.00	2.00	**2.00**	R1-6											
9057115	2.00	2.00	2.00	4.00	2.00	2.00	2.33	**2.00**	R1-3,5,6											
9057116	2.00	2.00	2.00	2.00	2.00	3.00	2.17	**2.00**	R1-5											
9057117	2.00	2.00	2.00	3.00	3.00	3.00	2.50	**2.00**	R1-3											
9057136	2.00	2.00	2.00	2.00	4.00	2.00	2.33	**2.00**	R1-4,6											
9057180	2.00	2.00	3.00	2.00	2.00	3.00	2.33	**2.00**	R1,2,4,5											
9057190	3.00	2.00	2.00	2.00	2.00	2.00	2.17	**2.00**	R2-6											
9057189	3.00	3.00	3.00	2.00	3.00	3.00	2.83	**2.00**	R4											
9068492	2.00	2.00	2.00	2.00	3.00	2.00	2.17	**2.00**	R1-4,6											
9068532	2.00	2.00	2.00	3.00	2.00	3.00	2.33	**2.00**	R1-3,5											
9068531	2.00	2.00	2.00	2.00	2.00	3.00	2.17	**2.00**	R1-5											
9068530	3.00	3.00	3.00	2.00	2.00	2.00	2.50	**2.00**	R4-6											
9068583	2.00	2.00	2.00	2.00	3.00	3.00	2.33	**2.00**	R1-4											
9068588	2.00	2.00	2.00	2.00	3.00	2.00	2.17	**2.00**	R1-4,6											
Insect/Disease Ratings: 1=None, 9=Severe																				

Study 29I134J - Assembly and Evaluation of Eastern Redcedar, *Juniper virginia* L.																					Table #6
											Seed Production										
				1998												2000					
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	9.00	5.00	9.00	9.00	9.00	5.00	7.67	**9.00**	R1,3,-5		9057099	9.00	4.00	9.00	9.00	9.00	5.00	7.50	**9.00**	R1,3,4,5
9057105	9.00	6.00	9.00	9.00	9.00	3.00	7.50	**9.00**	R1,3,-5		9057105	9.00	7.00	9.00	9.00	9.00	3.00	7.67	**9.00**	R1,3,4,5
9057106	6.00	9.00	5.00	9.00	7.00	7.00	7.17	**9.00**	R2,4		9057106	7.00	9.00	5.00	9.00	8.00	8.00	7.67	**9.00**	R2,4
9057115	9.00	8.00	9.00	5.00	5.00	4.00	6.67	**9.00**	R1,3		9057115	9.00	9.00	9.00	4.00	4.00	4.00	6.50	**9.00**	R1,2,3
9057116	9.00	9.00	9.00	6.00	9.00	7.00	8.17	**9.00**	R1-3,5		9057116	9.00	9.00	9.00	7.00	9.00	7.00	8.33	**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		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		9057136	9.00	9.00	3.00	5.00	9.00	9.00	7.33	**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		9068486	9.00	2.00	9.00	5.00	9.00	9.00	7.17	**9.00**	R1,3,5,6
9057180	9.00	5.00	9.00	9.00	9.00	8.00	8.17	**9.00**	R1,3-5		9057180	9.00	4.00	9.00	9.00	9.00	8.00	8.00	**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		9057193	9.00	9.00	9.00	3.00	6.00	9.00	7.50	**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		9057196	9.00	8.00	9.00	9.00	9.00	3.00	7.83	**9.00**	R1,3-5
9057198	5.00	9.00	9.00	6.00	9.00	4.00	7.00	**9.00**	R2,3,5		9057198	4.00	9.00	9.00	6.00	9.00	3.00	6.67	**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		9057199	9.00	5.00	9.00	4.00	1.00	9.00	6.17	**9.00**	R1,3,6
9068476	9.00	9.00	4.00	1.00	4.00	8.00	5.83	**9.00**	R1,2		9068476	9.00	9.00	3.00	1.00	3.00	8.00	5.50	**9.00**	R1,2
9057190	9.00	6.00	2.00	8.00	9.00	9.00	7.17	**9.00**	R1,5,6		9057190	9.00	5.00	2.00	8.00	9.00	9.00	7.00	**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		9057189	9.00	9.00	7.00	9.00	9.00	9.00	8.67	**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		9068504	9.00	9.00	9.00	9.00	9.00	2.00	7.83	**9.00**	R1-5
9068503	9.00	9.00	1.00	4.00	9.00	4.00	6.00	**9.00**	R1,2,5		9068503	9.00	9.00	1.00	4.00	9.00	3.00	5.83	**9.00**	R1,2,5
9068502	9.00	9.00	9.00	9.00	9.00	9.00	9.00	**9.00**	R1-6		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		9068501	9.00	8.00	3.00	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		9068500	7.00	9.00	1.00	3.00	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		9068492	9.00	5.00	9.00	3.00	9.00	9.00	7.33	**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		9068499	7.00	9.00	9.00	9.00	1.00	7.00	7.00	**9.00**	R2,-4
9068496	9.00	6.00	9.00	3.00	6.00	9.00	7.00	**9.00**	R1,3,9		9068496	9.00	5.00	9.00	3.00	5.00	9.00	6.67	**9.00**	R1,3,6
9068495	9.00	9.00	9.00	9.00	9.00	8.00	8.83	**9.00**	R1-5		9068495	9.00	9.00	9.00	9.00	9.00	8.00	8.83	**9.00**	R1-6
9068493	9.00	8.00	9.00	9.00	-	9.00		**9.00**	R1,3,4,6		9068493	9.00	7.00	9.00	9.00	-	8.00	7.00	**9.00**	R1,3,4
9068532	9.00	9.00	6.00	9.00	9.00	3.00	7.50	**9.00**	R1,2,4,5		9068532	9.00	9.00	7.00	9.00	9.00	4.00	7.83	**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		9068531	7.00	9.00	1.00	1.00	2.00	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		9068530	9.00	9.00	2.00	9.00	5.00	9.00	7.17	**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		9068554	7.00	9.00	3.00	9.00	7.00	9.00	7.33	**9.00**	R2,4,6
9068566	6.00	6.00	6.00	3.00	4.00	4.00	4.83	**6.00**	R1-3		9068566	7.00	7.00	7.00	2.00	4.00	4.00	5.17	**7.00**	R1-3
9068584	9.00	8.00	8.00	9.00	6.00	9.00	8.17	**9.00**	R1,6		9068584	9.00	9.00	9.00	9.00	7.00	9.00	8.67	**9.00**	R1-4,6
9068583	9.00	3.00	8.00	3.00	1.00	9.00	5.50	**9.00**	R1,R6		9068583	9.00	5.00	9.00	4.00	1.00	9.00	6.17	**9.00**	R1,3,6
9068588	9.00	9.00	3.00	3.00	8.00	9.00	6.83	**9.00**	R1,2,6		9068588	9.00	9.00	4.00	4.00	9.00	9.00	7.33	**9.00**	R1,2,5,6

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.

1999

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

Nut production for the selected accessions for 1998:

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

Nut production for the selected accession for 1999.

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

2000

Nut production is being harvested from those accessions selected for field plantings in the service area of the PMC (Iowa, Illinois and Missouri). One-tenth of the nut production for each of the selected accessions was left on the shrubs to determine the dates the fruits would fall to the ground. The following chart reflects the selected accessions, fruit production and dates nuts fell to the ground. There was no plant evaluations on the assembly of plants this year.

Accession Numbers	**Nut Production With Husks**	**Date Nut Dropped**
9057169	1.6 Pounds	11/16/00
9057188	1.4 Pounds	11/27/00
9068562	10.3 Pounds	11/27/00
9068574	4.6 Pounds	11/27/00
9068528	12.2 Pounds	11/27/00
9068573	3.7 Pounds	11/27/00
9057168	3.2 Pounds	11/16/00

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

Study 29I135J - Assembly and Evaluation of Hazelnut, *Corylus americana* , Walt. **Table #2**

Height in Feet

				1995													**1997**							
Accession	**Rep 1**	**Rep 2**	**Rep 3**	**Rep 4**	**Rep 5**	**Rep 6**	**Rep 7**	**Rep 8**	**Average**	**Tallest**	**Location**		**Accession**	**Rep 1**	**Rep 2**	**Rep 3**	**Rep 4**	**Rep 5**	**Rep 6**	**Rep 7**	**Rep 8**	**Average**	**Tallest**	**Location**
9068562	1.2	2.5	1.4	1.3	1.5	1.7	2.9	4.0	2.1	**4.0**	R8		9068574	4.9	4.3	3.8	3.9	6.8	3.8	3.2	2.2	4.1	**6.8**	R5
9057188	2.6	4.0	1.6	3.1	2.6	2.0	2.3	2.2	2.6	**4.0**	R2		9068562	3.3	5.2	2.7	2.7	3.4	4.6	4.2	4.5	3.8	**5.2**	R2
9068573	3.6	2.7	3.2	1.5	3.0	2.2	2.5	3.2	2.7	**3.6**	R1		9057188	4.0	5.0	2.9	4.2	5.1	3.7	4.7	4.0	4.2	**5.1**	R5
9068508	2.0	3.0	2.2	2.3	1.3	1.0	1.6	1.5	1.9	**3.0**	R2		9057169	5.0	4.1	3.4	3.5	2.3	3.6	3.2	2.8	3.5	**5.0**	R1
9068574	1.7	2.0	1.7	3.0	2.3	2.2	1.3	2.0	2.0	**3.0**	R4		9057168	3.8	1.2	4.6	2.4	4.3	4.1	3.0	2.0	3.2	**4.6**	R3
9057169	2.9	1.6	1.4	1.7	0.8	1.0	1.4	1.6	1.6	**2.9**	R1		9068573	4.2	4.5	4.0	3.4	4.6	3.1	2.5	3.4	3.7	**4.6**	R4
9068507	1.7	1.0	2.6	Dead	Dead	2.0	1.3	1.8	1.7	**2.6**	R 3		9068528	4.5	4.2	Dead	4.0	3.1	3.2	3.0	2.8	3.5	**4.5**	R1
9068565	2.3	2.6	2.5	2.0	2.4	2.2	1.6	Dead	2.2	**2.6**	R2		9068510	3.1	2.0	3.0	4.5	4.3	2.8	2.0	4.0	3.2	**4.5**	R4
9068558	1.5	2.2	1.7	1.3	2.0	1.5	2.5	Dead	1.8	**2.5**	R7		9068558	3.6	Dead	2.4	3.5	2.8	4.3	3.9	Dead	3.4	**4.3**	R6
9057168	1.3	1.3	2.1	1.0	1.9	2.2	1.4	0.9	1.5	**2.2**	R6		9068507	2.3	Dead	3.5	Dead	Dead	4.0	2.0	2.3	2.8	**4.0**	R6
9068510	0.6	1.3	2.1	1.7	1.5	1.4	0.6	2.2	1.4	**2.2**	R8		9068565	2.7	3.3	2.3	3.0	4.0	2.8	1.6	Dead	2.8	**4.0**	R5
9068528	1.3	1.2	Dead	2.1	Dead	1.7	2.0	1.4	1.6	**2.1**	R4		9068525	3.3	2.3	4.0	3.6	Dead	3.1	Dead	3.2	2.8	**4.0**	R3
9068586	Dead	Dead	1.2	1.7	2.0	2.0	1.0	1.3	1.5	**2.0**	R5,6		9068508	3.2	3.6	3.9	3.3	3.4	2.8	3.5	3.3	3.4	**3.9**	R3
9068525	1.3	1.2	1.0	1.0	1.0	1.5	Dead	1.7	1.2	**1.7**	R8		9068586	Dead	Dead	2.9	2.6	3.7	3.0	2.0	3.1	2.9	**3.1**	R8

				1996													**1998**							
Accession	**Rep 1**	**Rep 2**	**Rep 3**	**Rep 4**	**Rep 5**	**Rep 6**	**Rep 7**	**Rep 8**	**Average**	**Tallest**	**Location**		**Accession**	**Rep 1**	**Rep 2**	**Rep 3**	**Rep 4**	**Rep 5**	**Rep 6**	**Rep 7**	**Rep 8**	**Average**	**Tallest**	**Location**
9057188	3.3	4.1	2.6	3.2	4.1	3.2	3.4	2.9	3.4	**4.1**	R2, 5		9068562	4.7	7.0	4.0	4.6	5.1	4.1	4.6	5.4	4.9	**7.0**	R2
9068562	2.0	3.8	1.7	1.0	2.7	2.8	3.2	4.1	2.7	**3.8**	R2		9068558	4.6	Dead	5.0	4.3	4.1	5.0	6.4	Dead	4.9	**6.4**	R7
9068586	Dead	Dead	2.9	2.6	3.7	3.0	2.0	2.0	2.7	**3.7**	R5		9057188	4.0	5.8	6.0	5.0	6.4	5.8	5.0	5.7	5.5	**6.4**	R5
9068573	2.6	3.7	3.4	2.1	3.6	3.0	2.8	3.3	3.1	**3.7**	R2		9068573	6.3	4.9	5.2	5.0	6.3	5.0	6.0	4.0	5.3	**6.3**	R5
9068574	3.2	2.3	2.4	3.7	3.5	2.6	2.7	2.0	2.8	**3.5**	R5		9068574	5.2	5.3	5.0	4.0	6.3	3.2	3.6	3.0	4.5	**6.3**	R5
9068508	2.3	3.4	3.3	2.5	1.7	1.4	2.5	2.3	2.4	**3.4**	R2		9057169	5.9	5.2	5.0	5.0	3.2	4.4	3.2	3.3	4.4	**5.9**	R1
9057168	2.3	1.3	3.3	1.8	3.3	3.0	1.8	1.3	2.3	**3.3**	R3, 5		9057168	5.0	1.8	5.4	3.8	5.4	5.1	4.2	3.0	4.2	**5.4**	R5
9068528	3.0	3.2	Dead	3.3	Dead	2.5	2.5	2.1	2.8	**3.3**	R4		9068528	5.4	4.4	Dead	4.2	4.0	4.0	4.8	3.2	4.3	**5.4**	R1
9068507	2.1	1.3	3.2	Dead	Dead	2.9	2.0	1.5	2.2	**3.2**	R3		9068510	3.9	4.8	4.0	4.6	5.4	3.0	4.0	4.6	4.3	**5.4**	R5
9068558	2.0	Dead	2.1	2.1	2.4	3.2	2.7	Dead	2.4	**3.2**	R6		9068507	2.3	Dead	4.3	Dead	Dead	5.2	2.8	4.0	3.7	**5.2**	R6
9057169	2.9	3.1	2.3	2.7	1.6	2.2	2.1	1.9	2.4	**3.1**	R2		9068525	4.2	3.5	5.2	4.9	Dead	3.4	Dead	4.6	3.7	**5.2**	R3
9068565	2.3	2.9	2.3	2.3	2.6	2.3	1.4	Dead	2.3	**2.9**	R2		9068586	Dead	Dead	4.2	4.0	5.0	4.6	3.5	4.1	4.2	**5.0**	R5
9068510	1.8	2.2	1.7	2.2	2.7	2.3	1.3	2.7	2.1	**2.7**	R5,8		9068508	3.5	3.8	3.2	4.8	4.7	3.8	4.2	4.0	4.0	**4.8**	R4
9068525	2.2	1.6	1.7	2.5	1.6	1.9	Dead	2.5	2.0	**2.5**	R4,8		9068565	2.9	4.8	3.2	Dead	4.4	4.0	3.4	Dead	3.8	**4.8**	R2

Height Measured in Feet

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

Spread in Feet

				1995													**1997**							
Accession	**Rep 1**	**Rep 2**	**Rep 3**	**Rep 4**	**Rep 5**	**Rep 6**	**Rep 7**	**Rep 8**	**Average**	**Best**	**Location**		**Accession**	**Rep 1**	**Rep 2**	**Rep 3**	**Rep 4**	**Rep 5**	**Rep 6**	**Rep 7**	**Rep 8**	**Average**	**Best**	**Location**
9057188	1.0	0.7	0.6	1.2	1.4	0.9	0.9	2.0	1.1	**2.0**	R8		9068562	3.3	6.5	2.3	2.3	3.8	3.7	3.5	4.2	3.7	**6.5**	R2
9068562	0.4	1.4	0.3	0.4	0.4	0.6	0.4	1.5	0.7	**1.5**	R8		9068573	4.1	3.5	4.3	5.1	5.0	3.6	2.5	2.9	3.9	**5.1**	R4
9068573	1.5	0.6	0.8	0.8	1.0	0.7	0.9	0.3	0.8	**1.5**	R1		9057188	3.6	5.0	4.2	4.7	3.7	4.5	4.0	4.4	4.3	**5.0**	R2
9068574	1.5	0.8	1.0	1.0	0.9	0.9	0.6	0.4	0.9	**1.5**	R1		9057169	3.6	5.0	4.2	4.7	3.7	4.5	4.0	4.4	4.3	**5.0**	R2
9068507	0.6	0.3	1.2	Dead	Dead	1.0	0.3	0.3	0.6	**1.2**	R3		9068574	4.9	4.4	4.6	3.7	4.5	3.2	3.0	2.0	3.8	**4.9**	R1
9068510	0.2	1.2	0.6	0.4	0.9	0.6	0.2	0.8	0.6	**1.2**	R2		9057168	4.4	1.5	4.2	2.0	4.2	3.3	2.5	2.0	3.0	**4.4**	R1
9057168	0.7	0.4	1.1	0.4	1.1	0.8	0.7	0.5	0.7	**1.1**	R3, 5		9068528	3.0	4.4	Dead	3.3	2.9	2.0	3.4	2.3	3.0	**4.4**	R2
9068558	0.3	0.3	0.5	0.7	0.9	1.1	0.7	Dead	0.6	**1.1**	R6		9068508	4.0	Dead	3.2	3.7	3.9	3.0	3.4	3.4	3.5	**4.0**	R1
9068586	Dead	Dead	0.4	0.6	1.0	0.9	0.1	0.2	0.5	**1.0**	R5		9068510	3.0	3.2	3.0	3.3	3.9	2.1	4.0	3.3	3.2	**4.0**	R7
9057169	1.0	0.8	0.6	0.4	0.2	0.5	0.7	0.4	0.6	**1.0**	R1		9068525	4.0	3.3	4.0	3.4	Dead	2.0	Dead	4.0	3.0	**4.0**	R1, 3, 8
9068508	0.5	0.4	0.4	0.8	0.6	0.9	0.8	0.8	0.7	**0.9**	R6		9068586	Dead	Dead	3.7	2.5	3.1	3.5	1.8	2.8	2.9	**3.7**	R3
9068565	0.6	0.4	0.9	0.8	0.5	0.7	0.7	Dead	0.7	**0.9**	R3		9068558	3.2	1.5	3.2	3.0	2.7	3.5	3.3	Dead	2.9	**3.5**	R6
9068528	0.8	0.6	Dead	0.6	Dead	0.5	0.6	0.3	0.6	**0.8**	R1		9068565	2.8	3.5	2.2	2.0	3.1	3.0	1.5	Dead	2.6	**3.5**	R2
9068525	0.4	0.4	0.4	0.3	0.3	0.3	Dead	0.6	0.4	**0.6**	R8		9068507	2.3	Dead	3.0	Dead	Dead	3.2	1.0	1.8	2.3	**3.0**	R3

				1996													**1998**							
Accession	**Rep 1**	**Rep 2**	**Rep 3**	**Rep 4**	**Rep 5**	**Rep 6**	**Rep 7**	**Rep 8**	**Average**	**Best**	**Location**		**Accession**	**Rep 1**	**Rep 2**	**Rep 3**	**Rep 4**	**Rep 5**	**Rep 6**	**Rep 7**	**Rep 8**	**Average**	**Best**	**Location**
9057188	2.4	2.8	2.4	2.6	2.9	3.3	2.3	3.7	2.8	**3.7**	R8		9057188	4.6	7.5	5.4	5.4	7.7	7.0	4.8	6.0	6.1	**4.6**	R1
9068562	1.8	3.6	1.0	0.9	2.2	2.7	1.8	3.3	2.2	**3.6**	R2		9068508	4.4	5.8	4.4	5.2	4.8	5.4	4.6	4.9	4.9	**4.4**	R1, 3, 8
9068574	2.8	3.1	2.8	2.3	2.5	1.9	3.4	1.1	2.5	**3.4**	R 7		9068573	7.0	5.5	5.4	6.0	6.0	5.4	5.7	4.3	5.7	**4.3**	R8
9068573	3.1	2.7	2.3	2.4	3.0	2.2	2.4	1.2	2.4	**3.1**	R1		9068558	4.0	Dead	5.0	4.4	4.0	5.0	5.2	Dead	4.6	**4.0**	R1, 5
9057169	3.1	2.5	3.0	2.4	0.8	2.4	1.3	1.0	2.1	**3.1**	R1		9068528	4.3	4.6	Dead	4.0	4.4	3.4	3.8	4.0	4.1	**3.4**	R6
9057168	2.8	1.0	2.9	1.4	2.8	2.1	2.1	1.2	2.0	**2.9**	R3		9068525	3.4	4.8	5.7	5.2	Dead	3.4	Dead	4.6	3.9	**3.4**	R1,6
9068508	2.0	2.5	2.3	2.2	2.4	1.7	2.8	1.8	2.2	**2.8**	R7		9068562	4.2	7.4	4.0	3.3	5.0	5.5	5.1	5.8	5.0	**3.3**	R4
9068510	1.6	2.7	2.1	1.8	2.6	1.8	1.0	0.6	1.8	**2.7**	R2		9068510	3.4	3.2	4.0	4.2	4.8	3.5	3.5	4.0	3.8	**3.2**	R2
9068586	Dead	Dead	2.6	1.5	1.5	2.0	1.1	1.6	1.7	**2.6**	R3		9057169	4.8	4.6	5.3	5.2	2.8	4.3	3.5	4.0	4.3	**2.8**	R5
9068565	1.0	2.4	1.6	2.0	1.7	2.6	1.0	Dead	1.8	**2.6**	R6		9057168	4.0	2.6	6.0	3.4	7.0	5.0	4.6	3.2	4.5	**2.6**	R2
9068558	1.7	Dead	2.4	2.5	2.0	2.1	2.5	Dead	2.2	**2.5**	R 4,7		9068574	2.4	5.3	5.2	2.6	5.8	3.8	4.5	3.3	4.1	**2.4**	R1
9068528	2.2	2.3	Dead	2.2	1.7	2.4	2.4	1.8	2.1	**2.4**	R6, 7		9068565	4.0	4.6	3.0	Dead	5.0	4.2	2.3	Dead	3.9	**2.3**	R7
9068525	1.7	2.2	2.0	2.0	1.4	2.0	Dead	2.3	1.9	**2.3**	R8		9068586	Dead	Dead	4.9	4.0	3.8	3.5	2.1	4.1	3.7	**2.1**	R7
9068507	1.4	0.8	2.1	Dead	Dead	2.3	1.4	0.6	1.4	**2.1**	R3		9068507	2.7	Dead	5.0	Dead	Dead	6.0	1.3	4.6	3.9	**1.3**	R7

Width Measured in Feet

Study 29I135J - Assembly and Evaluation of Hazelnut, *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
9057188	3.0	4.0	5.0	5.0	5.0	5.0	5.0	2.0	4.3	**2.0**	R8
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
9068507	5.0	7.0	4.0	Dead	Dead	5.0	6.0	6.0	5.5	**4.0**	R3
9057169	4.0	5.0	5.0	8.0	6.0	6.0	6.0	6.0	5.8	**4.0**	R1
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
9068565	5.0	6.0	7.0	5.0	6.0	5.0	7.0	Dead	5.9	**5.0**	R1,4,6
9068528	5.0	5.0	Dead	5.0	Dead	6.0	6.0	6.0	5.5	**5.0**	R1,2,4
9068525	6.0	6.0	5.0	8.0	6.0	8.0	Dead	6.0	6.4	**5.0**	R3
9068586	Dead	Dead	6.0	6.0	7.0	6.0	9.0	8.0	7.0	**6.0**	R3,4,6

1996

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9068573	3.0	4.0	4.0	6.0	4.0	4.0	4.0	5.0	4.3	**3.0**	R1
9057188	3.0	5.0	5.0	4.0	4.0	4.0	4.0	5.0	4.3	**3.0**	R1
9057169	3.0	5.0	6.0	5.0	4.0	5.0	5.0	5.0	4.8	**3.0**	R1
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
9068565	5.0	4.0	6.0	7.0	5.0	6.0	5.0	Dead	5.4	**4.0**	R2
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
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
9068525	5.0	5.0	5.0	6.0	6.0	6.0	Dead	6.0	5.6	**5.0**	R1,2,3,

1997

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
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
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
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
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
9068508	7.0	5.0	5.0	5.0	5.0	7.0	6.0	4.0	5.5	**4.0**	R8
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
9068525	5.0	6.0	7.0	8.0	Dead	8.0	Dead	5.0	6.4	**5.0**	R1,8

1998

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
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
9068558	3.0	5.0	3.0	5.0	3.0	2.0	2.0	Dead	3.3	**2.0**	R6,7
9068574	5.0	2.0	3.0	6.0	5.0	6.0	3.0	5.0	4.4	**2.0**	R2
9057168	5.0	7.0	5.0	5.0	3.0	5.0	5.0	7.0	5.3	**3.0**	R5
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
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
9068565	5.0	5.0	7.0	Dead	5.0	5.0	4.0	Dead	5.2	**4.0**	R7
9068507	7.0	Dead	5.0	Dead	Dead	5.0	7.0	7.0	6.2	**5.0**	R3,6
9068508	Dead	5.0	7.0	5.0	7.0	5.0	6.0	5.0	5.7	**5.0**	R2,4,6,8
9057169	7.0	5.0	7.0	5.0	7.0	5.0	6.0	5.0	5.9	**5.0**	R2,4,6,8
9068525	5.0	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													**1998**								
Accession	**Rep 1**	**Rep 2**	**Rep 3**	**Rep 4**	**Rep 5**	**Rep 6**	**Rep 7**	**Rep 8**	**Average**	**Best**	**Location**		**Accession**	**Rep 1**	**Rep 2**	**Rep 3**	**Rep 4**	**Rep 5**	**Rep 6**	**Rep 7**	**Rep 8**	**Average**	**Best**	**Location**
9057169	2.0	3.0	9.0	9.0	0.0	0.0	0.0	0.0	5.8	**2.0**	R1		9068507	5.0	Dead	5.0	Dead	Dead	2.0	0.0	0.0	4.0	**2.0**	R6
9068562	0.0	7.0	0.0	0.0	0.0	3.0	9.0	7.0	6.5	**3.0**	R6		9068586	Dead	Dead	7.0	7.0	7.0	7.0	5.0	2.0	5.8	**2.0**	R8
9057168	9.0	9.0	3.0	0.0	7.0	9.0	0.0	0.0	7.4	**3.0**	R3		9068562	2.0	2.0	7.0	0.0	7.0	5.0	2.0	2.0	3.9	**2.0**	R1,2,7,8
9057188	3.0	7.0	Dead	9.0	9.0	9.0	7.0	7.0	7.3	**3.0**	R1, R7		9057168	7.0	5.0	2.0	0.0	2.0	5.0	7.0	0.0	4.7	**2.0**	R3,5
9068574	6.0	0.0	0.0	8.0	3.0	0.0	0.0	0.0	5.7	**3.0**	R5		9068558	2.0	Dead	5.0	2.0	0.0	5.0	5.0	Dead	3.8	**2.0**	R2,4
9068573	3.0	6.0	9.0	0.0	6.0	0.0	0.0	0.0	6.0	**6.0**	R2, R5		9068508	5.0	5.0	2.0	5.0	2.0	5.0	2.0	2.0	3.5	**2.0**	R1,2,3,5,7,8
9068528	9.0	6.0	0.0	9.0	0.0	6.0	8.0	0.0	7.6	**6.0**	R2,6		9068573	7.0	2.0	2.0	5.0	2.0	7.0	5.0	7.0	4.6	**2.0**	R2,3,5
9068510	0.0	7.0	0.0	0.0	6.0	0.0	0.0	0.0	6.5	**6.0**	R5		9068565	7.0	7.0	2.0	7.0	0.0	2.0	5.0	0.0	5.0	**2.0**	R3,6
9068507	0.0	Dead	7.0	Dead	Dead	0.0	0.0	0.0	7.0	**7.0**	R3		9057169	7.0	7.0	2.0	7.0	0.0	2.0	5.0	0.0	5.0	**2.0**	R3,6
9068565	8.0	0.0	9.0	7.0	9.0	9.0	0.0	Dead	8.4	**7.0**	R4		9068528	2.0	2.0	Dead	5.0	2.0	5.0	5.0	2.0	3.3	**2.0**	R1,2,5,8
9068508	9.0	Dead	9.0	0.0	9.0	0.0	9.0	8.0	8.8	**8.0**	R8		9068510	7.0	2.0	7.0	7.0	7.0	5.0	0.0	5.0	5.7	**2.0**	R2
9068558	9.0	Dead	0.0	0.0	0.0	0.0	9.0	Dead	9.0	**9.0**	R1, R7		9068574	5.0	7.0	7.0	2.0	2.0	5.0	5.0	0.0	4.7	**2.0**	R4,5
9068525	0.0	0.0	0.0	0.0	0.0	0.0	Dead	9.0	9.0	**9.0**	R8		9068525	5.0	5.0	7.0	7.0	2.0	7.0	Dead	2.0	5.0	**2.0**	R5,8
9068586	Dead	Dead	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-		9057188	7.0	7.0	5.0	7.0	5.0	0.0	0.0	Dead	6.2	**5.0**	R3,5
1=Heavy Fruit Production; 9=Poor Fruit Production													1=Heavy Fruit Production; 9=Poor Fruit Production											

Insect/Disease

			1997													**1998**								
Accession	**Rep 1**	**Rep 2**	**Rep 3**	**Rep 4**	**Rep 5**	**Rep 6**	**Rep 7**	**Rep 8**	**Average**	**Best**	**Location**		**Accession**	**Rep 1**	**Rep 2**	**Rep 3**	**Rep 4**	**Rep 5**	**Rep 6**	**Rep 7**	**Rep 8**	**Average**	**Best**	**Location**
9068586	Dead	Dead	4.0	3.0	4.0	4.0	5.0	4.0	4.0	**2.0**	R2		9068507	4.0	Dead	6.0	Dead	Dead	2.0	9.0	3.0	4.8	**2.0**	R6
9068562	3.0	2.0	4.0	5.0	4.0	2.0	3.0	2.0	3.1	**2.0**	R2		9068586	Dead	Dead	4.0	3.0	3.0	3.0	4.0	2.0	3.2	**2.0**	R8
9057168	3.0	4.0	3.0	3.0	2.0	3.0	4.0	4.0	3.3	**2.0**	R5		9057168	2.0	4.0	3.0	4.0	2.0	2.0	6.0	3.0	3.3	**2.0**	R1,5,6
9068558	2.0	Dead	3.0	5.0	7.0	3.0	3.0	Dead	3.8	**2.0**	R1,3,6		9068558	3.0	Dead	4.0	3.0	3.0	2.0	2.0	Dead	2.8	**2.0**	R6,7
9068508	3.0	3.0	3.0	3.0	2.0	3.0	4.0	5.0	3.3	**2.0**	R5		9068573	5.0	3.0	2.0	3.0	2.0	3.0	3.0	3.0	3.0	**2.0**	R5
9068573	8.0	3.0	3.0	2.0	2.0	3.0	3.0	3.0	3.4	**2.0**	R4, 5		9057188	7.0	3.0	3.0	2.0	3.0	2.0	2.0	4.0	3.3	**2.0**	R4,6,7
9057188	2.0	2.0	2.0	4.0	2.0	6.0	2.0	2.0	2.8	**2.0**	R1,2,3,5,7,8		9057169	2.0	4.0	4.0	3.0	2.0	3.0	2.0	3.0	2.9	**2.0**	R1,5,7
9068565	3.0	2.0	7.0	6.0	3.0	5.0	4.0	5.0	4.4	**2.0**	R2		9068528	3.0	4.0	Dead	3.0	3.0	3.0	2.0	2.0	2.9	**2.0**	R7,8
9057169	2.0	2.0	6.0	2.0	3.0	2.0	3.0	7.0	3.4	**2.0**	R1,2,4,6		9068510	6.0	4.0	3.0	3.0	5.0	3.0	3.0	2.0	3.6	**2.0**	R8
9068510	4.0	4.0	4.0	3.0	4.0	5.0	2.0	2.0	3.5	**2.0**	R7,8		9068574	3.0	6.0	4.0	4.0	3.0	2.0	3.0	3.0	3.5	**2.0**	R6
9068574	3.0	3.0	5.0	4.0	2.0	5.0	3.0	3.0	3.5	**2.0**	R5		9068562	3.0	3.0	5.0	4.0	3.0	4.0	3.0	3.0	3.5	**3.0**	R1,2,5,7,8
9068525	2.0	3.0	2.0	7.0	Dead	3.0	Dead	2.0	3.2	**2.0**	R 1,3,8		9068508	4.0	4.0	3.0	3.0	3.0	4.0	3.0	4.0	3.5	**3.0**	R3,4,5,7
9068507	3.0	Dead	3.0	Dead	Dead	3.0	4.0	4.0	3.4	**3.0**	R1,3,6		9068565	7.0	3.0	4.0	6.0	3.0	4.0	3.0	Dead	4.3	**3.0**	R2,5,7
9068528	3.0	3.0	Dead	3.0	3.0	4.0	4.0	4.0	3.4	**3.0**	R1,2,4,5		9068525	3.0	4.0	3.0	3.0	Dead	3.0	Dead	3.0	3.2	**3.0**	R1,3,4,6,8
1=No Insect/Disease; 9=Severe Insect/Disease													1=No Insect/Disease; 9=Severe Insect/Disease											

Study: 29I136J

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

Study Leader: 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 and a very droughty 1998.

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

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

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

Tables # 2, 3, 4, 5 and 6 reflect the plants' performance from 1995 to 1999. These tables can be found in the 1999 Elsberry Technical Report.

2000

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

Tables #2, 3, 4, 5, and 6 reflect the plants' performance for years 1995 to 1999.

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

Table #1

Accession Number	**Amount of Clean Seed**
9062309	4.9 Ounces
9068580	11.5 Ounces
9068485	5.5 Ounces
9068545	1.7 Ounces
9068546	11.0 Ounces

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

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

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

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

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

Study 29I136J Assembly and Evaluation of Prunus Americana, Wild Plum																							Table #3	
												Spread in Feet												
				1995														1996						
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location		Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9068480	0.60	1.60	0.60	0.40	0.20	Dead	Dead	Dead	0.68	**1.60**	R2		9068480	3.00	2.60	3.70	3.20	3.50	Dead	Dead	Dead	3.20	**3.70**	R3
9057096	0.70	0.30	0.20	Dead	Dead	0.20	Dead	-	0.35	**0.70**	R1		9057096	3.80	4.00	3.40	Dead	Dead	0.60	Dead	-	2.95	**4.00**	R2
9068478	0.90	0.70	1.00	1.00	0.60	0.80	0.50	-	0.79	**1.00**	R3,4		9068478	2.40	3.80	1.80	4.70	4.50	4.50	2.50	-	3.46	**4.70**	R4
9068515	1.00	0.30	0.80	0.60	0.40	0.60	0.40	0.20	0.54	**1.00**	R1		9068515	3.80	2.60	4.00	4.00	4.50	3.70	3.50	2.60	3.59	**4.50**	R5
9062308	0.60	0.60	0.30	0.40	Dead	Dead	0.50	Dead	0.48	**0.60**	R1,2		9062308	3.80	3.00	1.80	3.30	Dead	Dead	3.20	Dead	3.02	**3.80**	R1
9068485	0.30	0.30	0.50	0.30	0.20	Dead	0.10	-	0.28	**0.50**	R3		9068485	3.00	3.20	3.40	3.60	2.30	Dead	2.00	-	2.92	**3.60**	R4
9057088	2.00	1.60	0.80	0.60	0.40	0.60	0.90	0.90	0.98	**1.60**	R2		9057088	5.50	5.00	5.00	2.80	4.40	4.50	4.30	5.80	4.66	**5.80**	R8
9068545	2.30	1.50	0.80	1.00	1.00	Dead	0.40	-	1.17	**2.30**	R1		9068545	7.00	5.00	5.20	5.80	5.00	Dead	2.60	-	5.10	**7.00**	R1
9068543	0.30	0.20	0.60	0.20	Dead	Dead	Dead	-	0.33	**0.60**	R3		9068543	3.00	3.50	4.40	3.40	Dead	Dead	Dead	-	3.58	**4.40**	R3
9068516	1.30	0.20	Dead	0.80	0.60	Dead	Dead	-	0.73	**0.60**	R3		9068516	3.00	3.00	Dead	3.50	3.50	Dead	1.40	-	2.88	**3.50**	R4,5
9068514	0.80	0.70	1.00	0.30	Dead	0.40	0.30	-	0.58	**1.00**	R3		9068514	4.00	3.40	3.30	2.70	Dead	2.80	5.00	-	3.53	**5.00**	R7
9068580	1.80	2.00	1.10	0.80	0.40	0.50	0.40	0.40	0.93	**2.00**	R2		9068580	5.40	6.00	4.80	5.60	3.30	3.00	4.50	4.00	4.58	**6.00**	R2
9057146								0.20		**0.20**	R8		9057146								3.00	3.00	**3.00**	R8
9068546	1.30	1.30	1.40	0.90	0.20	0.40	0.50	0.50	0.81	**1.40**	R3		9068546	4.20	5.00	5.00	4.80	2.60	4.40	3.40	4.00	4.18	**5.00**	R2,3
434240	2.50	2.50	2.00	1.40	0.60	Dead	1.00	-	1.67	**2.50**	R1,2		434240	6.40	5.00	5.20	4.80	3.70	Dead	4.90	-	5.00	**6.40**	R1
ND-286								Dead		**0.00**			ND-286								Dead	-	**0.00**	
9062309	0.50	Dead	0.30	0.10	0.40	0.20	Dead	-		**0.50**	R1		9062309	3.40	Dead	2.70	3.70	3.00	3.30	Dead	-	3.22	**3.70**	R4
9057165	0.60	0.40	0.50	0.30	0.40	-	-	-	0.44	**0.60**	R1		9057165	3.50	2.80	4.20	3.70	2.80	-	-	-	3.40	**4.20**	R3
				1997													1998							
Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location		Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Average	Best	Location
9068480	7.20	6.00	7.40	6.00	6.20	Dead	Dead	4.30	6.18	**7.40**	R3		9068480	7.70	6.50	7.90	6.50	6.50	Dead	Dead	4.75	6.64	**7.90**	R3
9057096	7.60	8.60	7.40	Dead	Dead	3.00	Dead	-	6.65	**8.60**	R2		9057096	8.00	9.10	7.90	Dead	Dead	4.00	Dead	-	7.25	**9.10**	R2
9068478	3.00	6.20	4.00	7.30	Dead	7.80	4.60	-	5.48	**7.80**	R6		9068478	5.00	6.80	5.30	8.10	Dead	8.50	5.70	-	6.57	**8.50**	R6
9068515	8.30	4.00	7.20	7.50	7.80	6.70	7.40	6.80	6.96	**8.30**	R1		9068515	9.10	5.30	8.10	8.50	8.70	7.60	8.10	7.20	7.83	**8.70**	R5
9062308	6.20	2.80	4.30	8.30	Dead	Dead	4.60	Dead	5.24	**8.30**	R4		9062308	7.70	4.90	5.90	9.20	Dead	Dead	5.90	Dead	6.72	**9.20**	R4
9068485	5.00	6.20	5.50	7.50	6.00	Dead	3.20	-	5.57	**7.50**	R4		9068485	6.10	6.90	6.50	8.30	7.10	Dead	5.70	-	6.77	**8.30**	R4
9057088	10.00	6.50	8.30	8.30	8.50	7.50	8.00	11.00	8.51	**11.00**	R8		9057088	11.10	7.30	9.20	8.90	9.10	8.20	8.90	11.80	9.31	**11.80**	R8
9068545	12.80	9.00	9.00	9.30	9.00	Dead	3.90	-	8.83	**12.80**	R1		9068545	13.20	10.10	10.00	10.80	10.00	Dead	5.30	-	9.90	**13.20**	R1
9068543	6.60	9.00	6.40	7.70	Dead	Dead	Dead	-	7.43	**9.00**	R2		9068543	7.40	10.00	7.20	8.10	Dead	Dead	Dead	-	2.03	**10.00**	R2
9068516	6.80	7.00	Dead	7.40	7.50	Dead	3.60	-	6.46	**7.50**	R5		9068516	7.20	8.10	Dead	8.80	8.30	Dead	5.10	-	4.44	**8.80**	R4
9068514	7.20	6.50	7.10	6.50	Dead	6.40	6.50	-	6.70	**7.20**	R1		9068514	8.10	7.30	8.30	7.00	Dead	7.40	7.40	-	3.63	**8.30**	R3
9068580	12.00	10.60	10.10	11.30	7.70	6.20	8.00	8.00	9.24	**12.00**	R1		9068580	13.00	11.90	11.00	12.60	8.60	7.90	9.50	9.40	6.00	**13.10**	R1
9057146								8.10	8.10	**8.10**	R8		9057146								9.30	9.30	**9.30**	R8
9068546	6.00	11.00	8.00	10.00	7.60	6.20	8.00	7.70	8.06	**11.00**	R2		9068546	7.20	12.10	9.30	11.30	8.70	7.40	9.20	8.50	5.64	**11.30**	R4
434240	10.30	7.60	10.00	7.40	7.80	Dead	8.00	-	8.52	**10.30**	R1		434240	10.90	8.30	11.20	8.70	8.90	Dead	9.10	-	4.45	**11.20**	R3
ND-286								Dead	-	**0.00**			ND-286								Dead	Dead	**0.00**	
9062309	8.20	Dead	6.60	7.00	6.40	6.50	Dead	-	6.94	**8.20**	R1		9062309	8.90	Dead	7.30	7.90	7.00	7.20	Dead	-	4.42	**8.90**	R1
9057165	6.20	6.40	7.10	7.30	6.00	-	-	-	6.60	**7.10**	R4		9057165	7.10	7.20	8.30	8.30	7.40	-	-	-	3.14	**8.30**	R3,4
Width measured in feet.																								
Study 29I136J Assembly and Evaluation of Prunus Americana, Wild Plum																								
Table #3 - continued																								

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

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

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

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

Fruit Production

1997

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location
ND-286								Dead		**0.00**	
9068515	4.00	6.00	6.00	0.00	5.00	1.00	6.00	1.00	3.63	**1.00**	R6,8
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
9057165	2.00	7.00	7.00	1.00	7.00	-	-	-	4.80	**1.00**	R4
9068516	2.00	7.00	Dead	5.00	6.00	Dead	0.00	-	4.00	**2.00**	R1
9068580	6.00	5.00	4.00	2.00	7.00	2.00	4.00	-	4.29	**2.00**	R4,6
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
9068485	4.00	4.00	5.00	4.00	4.00	Dead	0.00	-	3.50	**4.00**	R1,2,4,5
9062309	4.00	Dead	5.00	4.00	6.00	4.00	Dead	-	4.60	**4.00**	R1,4,6
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
9068543	5.00	5.00	0.00	5.00	Dead	Dead	Dead	-	3.75	**5.00**	R1,2,4
9068478	0.00	6.00	0.00	6.00	Dead	Dead	0.00	-	2.40	**6.00**	R2,4
9062308	0.00	0.00	5.00	6.00	Dead	Dead	0.00	Dead	2.20	**6.00**	R3
9068514	6.00	7.00	6.00	7.00	Dead	7.00	7.00	-	6.67	**6.00**	R1, 3
9057146								8.00	8.00	**8.00**	R8

1998

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

1999

Accession	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Ave.	Best	Location
ND-286								0.00	0.00	**0.00**	
9068480	7.00	0.00	4.00	0.00	2.00	0.00	0.00	7.00	5.00	**1.00**	R5
9068515	1.00	0.00	0.00	0.00	0.00	0.00	7.00	0.00	4.00	**1.00**	R1
9062308	7.00	0.00	5.00	1.00	0.00	0.00	7.00	0.00	5.00	**1.00**	R4
9068485	7.00	1.00	7.00	1.00	4.00	0.00	0.00	0.00	4.00	**1.00**	R2,4
9057088	0.00	7.00	0.00	7.00	1.00	1.00	0.00	7.00	4.60	**1.00**	R5,6
9068545	1.00	1.00	0.00	1.00	1.00	1.00	7.00	0.00	2.00	**1.00**	R1,2,4,5,6
9068543	7.00	1.00	0.00	7.00	0.00	0.00	0.00	0.00	5.00	**1.00**	R2
9068516	5.00	7.00	0.00	1.00	7.00	0.00	0.00	0.00	5.00	**1.00**	R4
9068580	7.00	0.00	0.00	1.00	6.00	1.00	6.00	0.00	4.20	**1.00**	R4,6
9057146								1.00	1.00	**1.00**	R8
9068546	4.00	0.00	1.00	2.00	4.00	1.00	1.00	0.00	2.17	**1.00**	R3,4,6,7
9057165	6.00	4.00	0.00	1.00	0.00	0.00	0.00	0.00	3.67	**1.00**	R4
434240	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	2.00	**2.00**	R4
9062309	6.00	0.00	7.00	2.00	7.00	6.00	0.00	0.00	5.60	**2.00**	R4
9068514	6.00	7.00	7.00	4.00	0.00	5.00	0.00	0.00	5.80	**5.00**	R4,6
9057096	7.00	7.00	7.00	0.00	0.00	0.00	0.00	0.00	7.00	**7.00**	R1,2,3
9068478	0.00	7.00	0.00	0.00	0.00	0.00	9.00	0.00	8.00	**7.00**	R2

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

Study 29I136J Assembly and Evaluation of *Prunus Americana* , Wild Plum **Table #6**

Insect/Disease Resistance

				1999											
Accession	**Rep 1**	**Rep 2**	**Rep 3**	**Rep 4**	**Rep 5**	**Rep 6**	**Rep 7**	**Rep 8**	**Ave.**	**Best**	**Location**				
ND-286	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**					
9068480	4.00	4.50	4.50	1.00	4.50	0.00	0.00	1.50	3.33	**1.00**	R4, 8				
9068478	4.00	2.50	1.50	0.00	1.00	1.00	1.00	0.00	1.69	**1.00**	R3,5,6,7				
9068515	2.50	3.50	5.50	1.00	4.50	3.00	3.00	0.00	3.29	**1.00**	R4				
9057088	1.50	2.00	1.50	1.00	1.50	1.00	1.00	1.00	1.31	**1.00**	R1,3,4,5,6,7,8				
9068545	2.00	1.00	0.00	2.00	1.50	0.00	0.00	0.00	1.63	**1.00**	R1,2,5				
9068580	2.50	1.00	0.00	1.00	3.00	1.00	1.50	1.50	1.64	**1.00**	R2,4,6,7,8				
9068546	6.00	1.00	1.00	1.00	1.00	1.00	1.00	1.50	1.69	**1.00**	R2,7,8				
9057096	5.50	3.00	1.50	0.00	0.00	0.00	0.00	0.00	3.33	**1.50**	R3				
9062308	6.00	0.00	3.50	1.50	0.00	0.00	2.00	1.50	2.90	**1.50**	R4,7,8				
9068485	5.50	5.50	4.00	1.50	1.50	0.00	3.00	0.00	3.50	**1.50**	R4,5				
9068516	2.50	4.00	0.00	2.50	3.50	0.00	2.00	0.50	2.73	**1.50**	R4,7,8				
9057146	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	1.50	**1.50**	R8				
9062309	3.50	0.00	3.50	1.50	3.50	2.50	0.00	0.00	2.90	**1.50**	R4,6,7,8				
9068543	2.50	4.50	2.00	2.50	0.00	0.00	0.00	0.00	2.88	**2.00**	R1,3,4				
9068514	3.00	3.00	2.00	2.00	0.00	2.50	2.00	0.00	2.42	**2.00**	R3,4,6,7				
9057165	6.00	4.50	2.50	3.00	3.00	0.00	0.00	0.00	3.80	**2.00**	R3,5				
434240	0.00	5.50	5.00	0.00	0.00	0.00	0.00	0.00	5.25	**3.00**	R2,5				

Disease Resistance Rating:
1-Excellent resistance
9-Poor resistance
0=Dead plant

Study: 29I141G

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

Study Leader: Bruckerhoff, S. B.

Introduction:

Little bluestem is a native warm season prairie grass. It was a major component making up as much as 50 percent of the tall grass prairie that was native to much of the Elsberry PMC service area. It can also be a major component of glade areas and mixed grass prairies. Little bluestem can be found in prairies, open woods, dry hills, and fields, 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 were requested. (Approximately 60 collections total.) Field selection of collected plant material was based on forage quantity and plant vigor.

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

Discussion:

1996

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

1997 - 1998

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

1999

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

2000

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

This information will be correlated and the best plant(s) from the top 10-20 percent of the total accessions will be propagated in the greenhouse from clonal material from each individual plant. Plants will be isolated in two locations. A northern zone will contain plants from Iowa, northern Missouri, and northern Illinois. A southern zone will contain plants from southern Missouri and central and southern Illinois. These isolation blocks will receive additional evaluation to remove unwanted plants and the remaining plants will serve as a breeder's block for improved selections.

Study 29I141G - Assemble and Evaulation of Little Bluestem, *Schizachyrium scoarium,* Nichx.					
Little Bluestem					**Table #1**
	REFERENCE				
ACCESSION	**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/	116	Ripley	Missouri
		Jim Hoefer			
9078900	MO-8	Grant P. Butler	N116B	Jefferson	Missouri
9078901	MO-9			Iron	Missouri
9078902	MO-10	Tommy Robins/	116	Carter	Missouri
		Jim Hoefer			
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/	N116A	Washington	Missouri
		Bryan L. Westfall			
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
Study 29I141G - Little Bluestem				**Table #1 - continued**	
	REFERENCE				

ACCESSION	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/	115	Gasconade	Missouri
		Ed Gillmore			
9078944	MO-53	Dennis Shirk/	116	Osage	Missouri
		Ed Gillmore			
9078945	MO-54	Raleigh Redman	112	Henry	Missouri
9078946	MO-55	Dennis Shirk/	116	Maries	Missouri
		Ed Gillmore			
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/	109	Chariton	Missouri
		George L. Pollard			
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/	108	Scott	Iowa
		Shawn Dettman			
9078847	IA-1	Curt Donohue	109	Clarke	Iowa
9078848	IA-27	Curt Donohue	109	Clarke	Iowa
9078849	IA-3	Janet M. Thomas/	107	Cherokee	Iowa
		John P. Vogel			
9078850	IA-4	John P. Vogel	107	Woodbury	Iowa
9078851	IA-5	Henry D. Tordoff	107	West	Iowa
				Pottawattamie	Iowa
9078852	IA-6	Henry D. Tordoff/	107	West	Iowa
		Galen Barrett		Pottawattamie	Iowa
9078853	IA-7	John P. Vogel	107	Woodbury	Iowa
9078854	IA-8	Henry D. Tordoff	107	West	Iowa
				Pottawattamie	Iowa
9078855	IA-9	John P. Vogel	107	Plymouth	Iowa

Study 29I141G - Little Bluestem | | | **Table #1 - continued**

	REFERENCE				
ACCESSION	NUMBER	COLLECTOR	MLRA	COUNTY	STATE
9078856	IA-10	Henry D. Tordoff	107	West	Iowa
				Pottawattamie	Iowa

9078857	IA-11	Julie K. Watkins/	108	Franklin	Iowa
		Charlie E. Kiepe			
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/	105	Whiteside	Illinois
		Mark Kaiser			
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/	110	Will	Illinois
		Steve Hollister			
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/	108	Whiteside	Illinois
		Mark Kaiser			
9078887	IL-15	Timothy P. Dring	108	Mason	Illinois
9078888	IL-16	W. Burke Davies	113	Marion	Illinois
9078889	IL-17	Michael Stanfill/	115	Monroe	Illinois
		Marty Kemper			
9078890	IL-18	Kenton L. Macy	114	Cumberland	Illinois
9078891	IL-19	Martha E. Sheppard	115	Calhoun	Illinois
9078892	IL-20	Michael Stanfill/	113	Washington	Illinois
		Marty Kemper			
9078893	IL-21	Remington T. Irwin	114	Wayne	Illinois

Study 29I141G																			
Little Bluestem																	**Table #2**		
								Plot Layout Map											
								Randomized Complete Block											
								Four Replications											
									Field #1										
					North ↑														
PLT #	1	2 3 4	5 - 28	29 30 31	32 33 34	35 - 58	59 60 61	62 63 64	65 -76	77		78	79 - 90	91 92 93	94 95 96	97 - 120	121 122 123	124	
TIER #																			
I																			
II											R								
III											O								
IV											A								
V											D								
VI			**REP 1**			**REP 2**			**REP 3**		W		**REP 3**			REP 4			
VII											A								
VIII											Y								
IX																			
X																			
XI																			
XII																			
XIII																			
XIV																			
XV																			
									Highway JJ										

Study 29I141G									**Rep #1**		**Table #2 - continued**		
Little Bluestem													
Field #1						**North** ↑							
PLT #	1	2 3 4	5 6 7	8 9 10	11 12 13	14 15 16	17 18 19	20 21 22	23 24 25	26 27 28	29 30 31		
TIER #													
I	j	V V X	X j X	X X X	j X X	j X X	X j X	X W W	W W W	W W W	W W W	I	
II	V	MO-9	IA-11	MO-30	MO-45	MO-31	MO-78	MO-47	IL-8	IA-25	MO-63	II	
III	V	MO-55	IL-21	MO-10	IL-13	MO-6	MO-60	MO-28	MO-36	MO-24	IL-15	III	
IV	V	IA-12	MO-74	MO-51	MO-40	MO-27	MO-57	MO-58	MO-15	IA-17	MO-1	IV	
V	V	MO-42	IA-26	IL-3	MO-77	MO-67	ALDOUS	IA-15	MO-28	MO-50	IA-19	V	
VI	V	IA-7	MO-52	MO-39	MO-35	IL-4	IA-5	MO-23	IA-16	MO-21	MO-33	VI	
VII	i	MO-14	IL-17	MO-13	IA-3	IA-23	MO-65	IA-18	MO-61	IA-24	MO-48	VII	
VIII	V	MO-56	MO-26	MO-69	IL-5	MO-46	IL-20	MO-80	MO-5	MO-7	IL-10	VIII	
IX	i	MO-34	PASTURA	IL-11	MO-4	IL-16	MO-16	MO-37	MO-32	MO-59	IA-22	IX	
X	V	IL-2	MO-8	MO-29	MO-49	MO-81	IA-1	IL-7	IA-27	MO-25	CAMPER	X	
XI	i	IA-10	MO-64	MO-20	MO-66	IA-4	MO-12	MO-22	IL-1	IA-2	MO-54	XI	
XII	V	MO-71	MO-17	IL-14	MO-73	MO-44	CIMMERON	MO-18	MO-53	MO-79	MO-72	XII	
XIII	V	IL-12	MO-41	IA-8	IL-19	IA-20	MO-62	IA-6	MO-68	MO-11	IA-21	XIII	
XIV	T	MO-38	IA-13	MO-43	IA-9	IL-9	IL-6	MO-19	MO-3	IA-14	IL-18	XIV	
XV	T	T T j	j T T	T T T	T j j	T T Y	Y Y Y	Y Y Y	Y Y Y	Y Y Y	Y Y Y	XV	
MO-57 ONLY ONE PLANT					3 PLANTS/PLOT (MO-9)								
IL-8 ONLY ONE PLANT					LETTERS (V, j, ETC.,) ARE SINGLE PLANT BORDER ROWS								

Study 29I141G						**Rep #2**			**Table #2 - continued**		
Little Bluestem											
				North ↑							
PLT #	32 33 34	35 36 37	38 39 40	41 42 43	44 45 46	47 48 49	50 51 52	53 54 55	56 57 58	59 60 61	
TIER #											
I	? ? ?	W W W	W W W	W W b	b b b	b b b	b b b	b b b	b R R	R R R	I
II	MO-34	IL-18	IA-7	MO-31	MO-6	MO-53	MO-2	IA-18	MO-22	MO-48	II
III	MO-71	MO-24	MO-35	IA-14	IA-23	IA-2	MO-74	MO-28	CAMPER	MO-57	III
IV	MO-8	MO-42	MO-67	IL-1	MO-60	MO-33	MO-37	MO-26	IL-21	IL-7	III
V	IA-13	IA-3	MO-9	MO-39	IL-16	IA-8	MO-15	MO-69	MO-14	MO-25	IV
VI	MO-50	CIMMERON	IL-4	MO-59	MO-52	MO-40	MO-51	IA-27	MO-81	IA-16	VI
VII	IA-17	MO-63	MO-66	IL-20	MO-72	IL-19	MO-19	MO-23	IL-11	IL-10	VII
VIII	MO-32	IA-6	MO-4	IA-11	IL-2	MO-54	IA-26	IL-8	MO-41	IA-4	VIII
IX	IA-10	MO-77	IL-5	MO-46	MO-56	MO-64	MO-1	MO-21	MO-65	MO-10	IX
X	IL-14	MO-38	MO-49	MO-27	IL-12	MO-79	IA-19	MO-68	IA-1	ALDOUS	X
XI	MO-61	IA-9	MO-55	IL-15	IA-25	MO-17	MO-7	IA-5	IL-9	IL-3	XI
XII	IA-24	MO-47	MO-78	MO-43	PASTURA	MO-20	MO-73	MO-12	IA-20	MO-13	XII
XIII	MO-30	MO-18	MO-11	IL-6	MO-3	IL-13	IA-12	IA-22	MO-29	MO-44	XIII
XIV	MO-45	MO-62	MO-58	MO-5	IL-17	IA-21	MO-80	MO-16	MO-36	IA-15	XIV
XV	Y Y S	i S S	S S S	S S S	S S S	S S S	h S S	Y h Y	Y Y Y	h J J	XV

Study 29I141G									**Rep #3**				**Table #2 - continued**			
Little Bluestem																
					North											
PLT #	62 63 64	65 66 67	68 69 70	71 72 73	74 75 76		77		78		79 80 81	82 83 84	85 86 87	88 89 90	91 92 93	
TIER #																
I	R R R	R R R	R c c	c c c	c c c		c		a		a a a	a b b	j b b	j j j	R R R	I
II	MO-45	IL-6	MO-71	IA-13	MO-31		B		a		IL-4	MO-63	MO-11	IL-8	IL-11	II
III	MO-61	MO-19	MO-43	MO-50	MO-40		B	***R***	a		IA-21	IL-13	IL-17	MO-68	MO-29	III
IV	IA-9	MO-51	MO-58	IA-17	MO-55		E	***O***	a		MO-47	MO-56	MO-2	MO-13	IL-11	IV
V	MO-35	MO-1	MO-23	IA-24	MO-24		E	***A***	a		IL-5	CAMPER	MO-69	IL-12	MO-25	V
VI	MO-39	MO-28	MO-36	MO-42	MO-53		E	***D***	a		MO-54	IA-26	IA-14	IA-5	IA-15	VI
VII	MO-77	IA-19	CIMMERON	IA-18	MO-64		C	***W***	a		MO-6	MO-33	MO-73	MO-16	IL-3	VII
VIII	MO-9	MO-7	IA-23	IL-20	IA-4		C	***A***	i		MO-32	IA-26	MO-52	MO-22	MO-44	VIII
IX	IA-6	MO-80	IL-2	IA-10	MO-5		G	***Y***	a		IA-7	MO-20	IL-16	MO-48	IA-16	IX
X	MO-8	IA-12	MO-78	MO-30	IA-25		G		a		MO-79	MO-17	MO-59	MO-14	IL-7	X
XI	MO-34	MO-12	MO-46	IA-8	MO-18		I		a		IA-11	IL-21	MO-72	IA-22	PASTURA	XI
XII	IL-14	MO-26	MO-4	IL-19	MO-38		I		a		MO-74	MO-33	MO-21	MO-65	IL-9	XII
XIII	IL-18	IA-27	MO-66	ALDOUS	MO-67		O		a		IA-3	MO-27	MO-81	MO-41	IA-20	XIII
XIV	MO-60	MO-10	MO-37	MO-15	MO-62		O		a		MO-49	IL-15	MO-57	IA-1	IL-10	XIV
XV																
	H H A	A K K	F F D	D L L	M M N		N		a		a c c	c c c	c c c	c c c	h c c	XV
IL-8 only one planted																

Study 29I141G									**Rep #4**		**Table #2 - continued**			
Little Bluestem														
					North									
PLT #	94 95 96	97 98 99	100 101102	103 104 105	106 107 108	109 110 111	112 113 114	115 116 117	118 119 120	121 122 123		124		
TIER #														
I	R i R	a a a	X X X	X X U	i U U	U U U	U U U	W W W	W W W	W W W		d	I	
II	IA-9	IL-18	MO-8	MO-74	MO-40	IA-25	MO-5	MO-42	IA-4	IA-20		d	II	
III	MO-58	IA-19	MO-28	IL-17	MO-53	IL-8	PASTURA	MO-37	IL-10	MO-77		d	III	
IV	ALDOUS	MO-80	IA-21	MO-2	IA-8	MO-26	IA-26	MO-68	MO-14	MO-52		d	IV	
V	MO-51	IA-18	MO-20	MO-46	IL-1	MO-1	MO-62	MO-44	MO-9	MO-34		d	V	
VI	IA-17	IA-10	MO-33	IA-24	MO-43	IL-12	IA-5	MO-81	CIMMERON	MO-19		d	VI	
VII	MO-64	IA-10	CAMPER	MO-3	MO-69	MO-61	IA-16	IL-4	MO-35	MO-21		d	VII	
VIII	IA-27	MO-39	IL-19	MO-57	IL-6	MO-38	MO-67	MO-25	MO-48	IL-14		e	VIII	
IX	MO-60	MO-15	MO-63	IA-7	MO-36	IL-15	MO-49	IA-13	MO-29	MO-30		e	IX	
X	MO-12	MO-41	MO-32	MO-55	IA-12	MO-47	IA-26	IL-21	MO-65	IL-9		e	X	
XI	IL-20	IA-23	IA-11	MO-46	MO-17	IL-2	IL-13	MO-45	IL-11	IA-22		f	XI	
XII	MO-50	MO-6	MO-59	IA-14	MO-31	MO-54	MO-79	IA-3	MO-16	IL-7		f	XII	
XIII	MO-71	MO-78	MO-27	MO-73	MO-18	IA-15	MO-66	MO-72	MO-22	MO-10		f	XIII	
XIV	MO-7	MO-11	IL-16	MO-23	IA-1	IL-5	IA-6	MO-13	IL-3	MO-56		f	XIV	
XV	c R R	MO-24	R h R	R S h	h S S	S S T	h h h	T V V	V h g	g g g		g	XV	

Study 29I141G						Forage Rating: 8/9/99									Table #3	
Little Bluestem																
			1 = High			9 = Low										
														Ave.		
Local	Rep 1			Rep 2			Rep 3			Rep 4			Percent	Living	Best	
Number	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	Survival	Plants	Plant	Location/s
MO-7	2	3	1	3	3	2	2	1	2	5	1	3	100	2.33	1	P 1, 8, 11
MO-12	1	2	1	3	2	2	3	2	2	1	1	1	100	1.75	1	P 1, 3, 12, 11, 12
MO-21	1	2	2	6	2	3	4	3	3	4	4	5	100	3.25	1	P 1
MO-74	3	3	5	4	4	4	5	5	4	1	2	1	100	3.42	1	P 10, 12
MO-80	3	3	x	4	5	5	4	4	2	1	4	3	92	3.45	1	P 10
MO-4	x	5	5	4	8	2	3	4	4	6	x	x	83	4.10	2	P 6
MO-9	4	4	4	3	4	4	3	4	3	2	3	3	100	3.42	2	P 10
MO-14	4	4	3	4	4	4	5	2	2	4	4	3	100	3.58	2	P 8, 9
MO-15	3	2	3	5	4	3	6	4	5	4	3	5	100	3.92	2	P 2
MO-22	4	5	5	3	4	2	5	5	6	x	8	x	83	4.70	2	P 6
MO-23	3	5	6	2	6	8	5	4	5	8	8	3	100	5.73	2	P 4
MO-24	3	x	2	x	4	4	3	4	3	3	4	5	83	3.18	2	P 3
MO-32	4	x	8	6	7	3	3	4	5	2	5	6	92	4.82	2	P 10
MO-34	4	4	4	3	4	3	x	x	4	2	x	5	75	3.00	2	P 10
MO-37	2	4	3	7	5	4	x	5	4	3	4	3	92	3.67	2	P 1
MO-42	5	5	6	4	5	2	4	4	4	5	5	7	100	4.67	2	P 6
MO-50	3	3	4	2	2	2	3	4	6	2	3	4	100	3.17	2	P 4, 5, 6, 10
MO-51	3	3	3	3	4	4	4	6	3	4	3	2	100	3.50	2	P 12
MO-53	4	4	5	5	5	5	2	4	5	5	6	7	100	4.75	2	P 7
MO-56	3	3	2	2	5	4	5	3	3	3	3	3	100	3.25	2	P 3, 4
MO-58	3	3	3	5	4	5	5	5	5	2	2	4	100	3.83	2	P 10, 11
MO-59	2	3	4	4	4	5	3	3	3	3	4	4	100	3.50	2	P 1
MO-66	3	3	x	3	3	3	3	2	4	4	5	5	92	3.45	2	P 8
MO-73	7	4	4	3	3	2	4	5	5	7	8	6	100	4.83	2	P 6
MO-79	2	3	2	5	3	5	3	8	5	4	4	3	100	3.92	2	P 1, 3
MO-2	4	5	3	5	5	5	5	3	3	3	4	3	100	4.00	3	P 3, 8, 9, 10, 12
MO-5	7	3	3	5	5	5	6	8	4	4	5	4	100	4.92	3	P 2, 3
MO-8	6	x	5	5	4	5	7	4	8	3	3	4	92	4.91	3	P 10, 11
MO-10	4	5	5	3	3	5	5	5	5	7	5	4	100	4.67	3	P 4, 12
MO-11	x	7	x	4	5	6	6	6	5	3	3	6	83	4.25	3	P 10, 11
MO-13	5	8	5	5	x	5	4	4	3	6	4	6	100	4.58	3	P 9
MO-16	4	3	8	6	6	54	5	6	4	4	5	100	75	3.00	3	P 2
MO-17	4	4	3	4	3	7	8	6	5	4	5	5	100	4.83	3	P 3, 5
MO-18	3	4	3	7	7	8	x	x	x	5	5	5	75	3.92	3	P 1, 3
MO-19	3	5	5	3	4	3	4	6	5	3	5	4	100	4.17	3	P 1, 4, 6, 10
MO-20	8	7	6	7	6	5	3	4	5	4	8	3	100	6.60	3	P 7, 12
MO-25	3	3	x	5	5	5	5	4	6	5	5	6	92	4.33	3	P 1, 2
MO-26	3	4	4	5	x	4	3	4	4	3	4	5	92	4.30	3	P 1, 7, 10
MO-27	5	6	3	4	5	4	6	5	4	5	5	7	100	5.36	3	P 3
MO-29	4	3	x	4	5	4	4	6	3	3	5	8	92	4.45	3	P 2, 9, 10
MO-30	3	4	5	7	7	x	4	4	7	4	3	4	92	4.73	3	P 1, 11
MO-31	7	3	4	4	4	6	7	8	x	5	5	5	92	5.27	3	P 2
Study 29I141G						Forage Rating: 8/9/99									Table #3 - continued	
Little Bluestem																
			1 = High			9 = Low										

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

IA-16	x	x	4	3	6	5	3	x	1	x	5	5	75	3.56	1	P 9	
IA-27	1	1	3	3	4	5	5	5	4	5	4	2	100	3.50	1	P 1, 2	
IA-6	4	5	6	5	2	4	3	4	3	7	4	5	100	4.33	2	P 5, 6	
IA-8	5	6	3	5	3	5	5	5	5	5	3	2	100	4.33	2	P 12	
IA-12	7	5	7	x	4	5	4	3	2	4	5	5	92	4.64	2	P 9	
IA-15	5	4	5	x	x	x	2	x	5	5	5	6	67	4.63	2	P 7	
IA-23	6	5	5	8	8	6	5	4	x	2	4	6	92	5.36	2	P 10	
IA-1	8	5	5	5	4	4	4	5	x	3	7	3	92	4.82	3	P 10, 12	
IA-2	4	4	4	3	4	4	6	5	5	4	x	6	92	4.45	3	P 4	
IA-3	x	x	8	x	3	3	4	5	4	4	5	4	75	4.44	3	P 5, 6	
IA-4	5	8	4	3	x	3	4	7	5	4	7	5	92	5.00	3	P 4, 6	
IA-5	4	5	4	3	6	8	6	4	4	3	5	x	92	4.73	3	P 4, 10	
IA-7	5	3	3	5	5	5	4	4	6	5	5	5	100	4.58	3	P 2, 3	
IA-9	4	6	7	6	6	6	8	6	6	4	3	4	100	5.50	3	P 11	
IA-11	6	5	6	5	7	3	5	5	6	4	x	5	92	5.18	3	P 6	
IA-13	4	4	6	4	7	x	5	4	x	3	4	3	83	4.40	3	P 10, 12	
IA-17	3	7	4	5	x	4	6	x	6	4	6	5	83	5.00	3	P 1	
IA-19	6	x	x	6	3	3	x	4	4	x	x	x	50	4.33	3	P 5, 6	
IA-20	x	4	x	7	5	5	4	x	4	6	7	3	75	5.00	3	P 12	
IA-24	4	5	3	5	4	4	4	4	5	5	5	4	100	4.33	3	P 3	
IA-25	4	5	6	6	5	6	6	4	5	3	5	3	100	4.83	3	P 10, 12	
IA-26	x	3	4	3	3	6	x	x	4	5	6	x	67	4.25	3	P 2, 4, 5	
IA-10	6	7	7	4	5	5	5	6	7	6	4	x	92	5.64	4		
IA-14	4	6	4	5	5	6	4	5	5	5	7	5	100	5.08	4		
IA-18	5	6	5	6	5	6	5	4	5	4	5	5	100	5.08	4		
IA-21	4	5	4	4	x	6	x	x	6	-	4	5	67	4.75	4		
IA-22	x	x	x	7	x	x	7	6	6	5	8	8	58	6.71	5		
IL-12	8	7	5	3	8	4	5	5	4	4	2	x	92	5.00	2	P 11	
IL-17	3	4	3	2	3	5	3	4	2	2	3	3	100	3.08	2	P 4, 9, 10	
IL-18	5	4	6	3	3	3	5	6	4	3	2	4	100	4.00	2	P 11	
IL-2	6	6	6	4	5	6	5	3	5	4	5	3	100		3	P 8	
IL-5	6	5	7	4	8	3	4	5	5	5	4	5	100	5.08	3	P 6	
IL-7	4	4	3	4	7	6	8	6	8	6	8	8	100	6.00	3	P 3	
IL-8	x	x	5	4	x	8	x	6	4	x	4	3	58	4.86	3	P 12	
IL-11	x	x	3	x	4	x	5	x	6	x	x	x	33	4.50	3	P 3	
IL-14	4	5	x	3	5	x	6	4	7	6	5	6	83	5.10	3	P 4	
IL-16	5	5	4	4	3	3	4	x	3	7	6	4	92	4.36	3	P 5, 6, 9	
IL-19	5	6	7	3	3	3	4	3	4	3	4	3	100	4.00	3	P 4, 5, 6, 8, 12	
Study 29I141G						**Forage Rating: 8/9/99**								**Table #3 - continued**			
Little Bluestem																	
			1 = High			**9 = Low**											
														Ave.			
Local	**Rep 1**			**Rep 2**			**Rep 3**			**Rep 4**			**Percent**	**Living**	**Best**		
Number	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**	**P11**	**P12**	**Survival**	**Plants**	**Plant**	**Location/s**	
IL-20	5	3	3	x	6	5	4	4	4	3	5	3	92	4.09	3	P 2, 3, 10, 12	
IL-21	5	5	4	3	4	4	5	4	4	5	4	4	100	4.25	3	P 4	

IL-1	4	x	4	6	7	6	4	7	7	5	6	5	92	5.55	4		
IL-6	7	7	4	6	5	7	x	x	x	6	5	5	75	5.78	4		
IL-9	6	x	6	x	5	7	6	5	4	4	4	7	83	5.40	4		
IL-10	x	x	x	4	6	7	x	x	7	x	5	7	50	6.00	4		
IL-13	x	7	x	5	7	4	6	6	7	x	8	6	83	5.60	4		
IL-15	8	8	x	x	7	6	4	5	5	5	4	5	83	5.70	4		
IL-3	5	4	x	7	x	x	8	7	6	5	x	x	58	6.00	5		
IL-4	6	7	4	4	6	5	6	5	5	5	5	5	100	5.25	5		
IL-22																	
Aldous	2	3	3	3	3	3	5	4	5	3	2	2	100	3.17	2	P 1, 11, 12	
Cimmeron	2	3	2	4	2	3	3	2	5	3	5	3	100	3.08	2	P 1, 3, 5, 8	
Camper	3	4	5	4	5	6	5	4	5	x	3	5	92	4.45	3	P 1, 11, 12	
Pastura	x	x	5	6	x	6	6	6	x	3	3	x	58	5.00	3	P 10, 11	

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

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

Study 29I141G — **Vigor Rating: 8/9/99** — **Table #4 - continued**

Little Bluestem

1 = High **9 = Low**

Local	Rep 1			Rep 2			Rep 3			Rep 4			Percent	Living	Best	
Number	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	Survival	Plants	Plant	Location/s

IA-3	x	x	5	x	3	2	6	6	7	7	5	5	75	5.11	2	P 6
IA-4	4	5	3	4	x	3	4	6	4	2	5	5	92	4.09	2	P 10
IA-5	6	6	6	4	5	6	6	5	6	2	5	x	92	5.18	2	P 10
IA-9	4	4	4	4	4	5	6	5	5	3	2	5	100	4.25	2	P 11
IA-10	3	4	5	3	4	4	5	5	5	6	2	x	92	4.18	2	P 11
IA-13	2	3	4	3	5	x	5	4	x	4	5	3	92	3.45	2	P 1
IA-15	5	4	4	x	x	x	2	x	6	4	4	5	67	4.25	2	P 7
IA-27	2	2	2	2	3	3	5	6	5	4	3	3	100	3.33	2	P 1, 2, 3, 4
IA-1	6	3	3	5	5	4	4	4	x	4	7	4	92	4.45	3	P 2, 3
IA-2	3	3	3	4	5	5	6	5	5	5	x	6	92	4.55	3	P 1, 2, 3
IA-6	6	4	4	4	3	3	5	4	4	7	3	5	100	4.33	3	P 5, 6, 11
IA-7	3	3	4	3	3	3	3	4	6	4	4	4	100	3.67	3	P 1, 2, 4, 5, 6, 7
IA-8	5	6	3	3	3	4	5	6	5	4	3	4	100	4.25	3	P 3, 4, 5, 11
IA-12	4	5	6	x	5	4	3	5	4	3	3	3	92	4.09	3	P 7, 10, 11, 12
IA-14	6	5	5	3	3	3	5	7	7	4	6	5	100	4.92	3	P 4, 5, 6
IA-16	x	x	4	3	5	4	3	x	5	x	5	6	67	4.38	3	P 4, 7
IA-17	4	6	5	4	x	4	5	x	4	3	5	3	83	4.30	3	P 10, 12
IA-18	5	6	5	5	4	5	4	4	5	3	3	4	100	4.42	3	P 10, 11
IA-23	4	4	4	5	6	6	5	5	x	3	3	4	100	4.08	3	P 10
IA-25	5	5	5	5	4	4	4	5	5	4	4	3	100	4.42	3	P 12
IA-26	x	6	4	3	4	5	x	x	4	4	6	x	67	4.50	3	P 4
IA-11	7	6	7	4	5	4	6	6	7	5	x	5	92	5.64	4	
IA-19	6	x	x	5	4	4	x	4	4	x	x	x	50	4.50	4	
IA-20	x	4	x	7	5	5	5	x	6	5	6	5	75	5.33	4	
IA-21	4	4	5	4	x	5	x	x	4	x	5	4	67	4.38	4	
IA-22	x	x	x	5	x	x	5	4	4	6	8	8	58	5.71	4	
IA-24	5	5	4	6	6	6	7	7	7	6	5	5	100	5.75	5	
IL-8	x	x	6	4	x	5	x	2	3	x	5	3	58	4.00	2	P 8
IL-12	6	6	2	3	5	3	4	4	3	3	2	x	92	3.73	2	P 3, 11
IL-1	7	x	3	5	7	6	5	6	8	6	5	5	92	5.73	3	P 3
IL-2	3	3	4	4	5	3	4	5	5	5	4	4	100	4.08	3	P 1, 2, 6
IL-3	3	7	3	5	x	x	6	7	6	5	x	x	67	5.25	3	P 1, 3
IL-5	5	5	6	5	3	4	5	6	5	5	4	5	100	4.83	3	P 5
IL-6	7	5	4	8	3	5	x	x	x	5	4	7	75	5.33	3	P 5
IL-9	5	x	3	x	4	5	5	3	3	5	4	6	92	3.91	3	P 3, 8, 9
IL-10	4	4	5	5	4	3	x	x	8	x	6	6	100	3.75	3	P 6
IL-11	x	x	3	x	4	x	3	x	5	x	x	x	33	3.75	3	P 3, 7
IL-13	x	5	x	4	5	5	6	6	7	x	6	3	75	5.22	3	P 12
IL-14	5	4	x	3	4	x	5	3	5	5	4	5	83	4.30	3	P 4, 8
IL-15	5	7	x	x	5	4	6	6	5	4	4	3	83	4.90	3	P 12
Study 29I141G						**Vigor Rating: 8/9/99**										**Table #4 - continued**	
Little Bluestem																
			1 = High			**9 = Low**										
Local	**Rep 1**			**Rep 2**			**Rep 3**			**Rep 4**			**Percent**	**Living**	**Best**	
Number	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**	**P11**	**P12**	**Survival**	**Plants**	**Plant**	**Location/s**
IL-16	3	3	4	4	4	5	5	x	6	7	5	4	92	4.55	3	P 1, 2, 6
IL-17	4	4	3	3	3	3	3	3	3	3	3	3	100	3.17	3	P 3, 4, 5, 6, 7, 8, 9, 10,,11, 12
IL-18	4	3	5	4	4	3	5	6	4	4	5	4	100	4.25	3	P 2, 6

IL-19	4	4	6	3	3	3	5	3	4	4	3	4	100	3.83	3	P 4, 5, 6, 8, 11	
IL-20	4	5	4	x	3	4	4	3	4	4	6	3	92	4.00	3	P 5, 8, 12	
IL-21	7	7	7	3	5	4	6	5	5	5	5	5	100	5.33	3	P 4	
IL-4	6	5	5	4	4	4	5	5	5	6	6	5	100	5.00	4		
IL-7	4	4	5	4	5	6	6	5	6	6	7	6	100	5.33	4		
IL-22																	
Cimmeron	2	2	2	2	3	2	3	5	4	3	4	3	100	2.92	2	P 1, 2, 3, 4, 6	
Aldous	4	3	4	3	3	3	5	5	4	3	3	3	100	3.58	3	P 2, 4, 5, 6, 10, 11, 12	
Camper	3	3	3	4	5	5	5	5	6	x	5	5	92	4.45	3	P 1, 2, 3	
Pastura	x	x	5	5	x	7	5	7	x	3	4	x	58	5.14	3	P 10	

Study 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, R.

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.

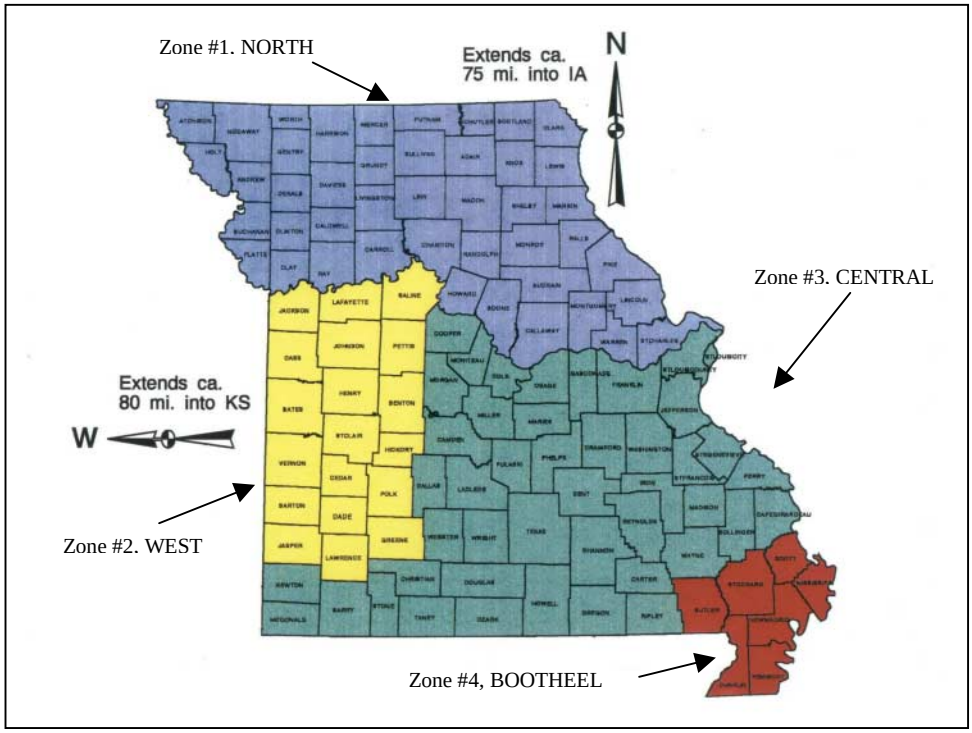
Cooperators:

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. Evaluation and selection or plant breeding procedures has not improved 'Source Identified' seed.

Table #1



Discussion:

1997

The Missouri Ecotype Enhancement Program was officially started as a plant materials study with the signing of the study plan in December of 1997. This plan is an agreement between cooperators and funded by a grant from the 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).

1999

The Missouri Eco-type program continued during 1999 and the species released and seed allocated to seed growers are listed in Table #4.

2000

The Missouri Eco-type program continued through August until funding was depleted. The program was continued under direction of Missouri Audubon Society and Missouri Department of Conservation in cooperation with the NRCS Plant Materials Center.

Study 29I142G				**1997**	**Table # 2**
Missouri Ecotype Collection Summary					
Common Name **Genus/Species**	**Accn. Number**	**Zone**	**Clean Seed (gm)**	**Collection Sites**	**1998 Plot Stand Rating**
Big bluestem	9079000	1	1846	24	good
Andropogon gerardii					
Little bluestem	9079004	1	419	15	poor
Schizachyrium scoparium					
Tick trefoil	9079012	1	133	9	good
Desmodium sp.					
Bush Clover	9079008	1	572	33	failed
Lespedeza capitata					
Blazing star	9079020	1	1162	22	poor
Liatris pycnostachya					
Finger coreopsis	9079028	1	32	9	fair
Coreopsis palmata					
Butterfly Milkweed	9079016	1	111	8	fair
Asclepias tuberosa					
Pale purple coneflower	9079033	1	41	7	poor
Echinacea pallida					

Table #3

Study 29I142G				**1998**
Missouri Ecotype Collection Summary				
Common Name **Genus/Species**	**Accn.** **Number**	**Zone**	**Clean** **Seed (gm)**	**Collection** **Sites**
Big bluestem	9079000	1	6195	29
Andropogon gerardii				
Little bluestem	9079004	1	2576	18
Schizachyrium scoparium				
Virginia wildrye	9079044	1	6586	20
Elymus virginicus				
Indian grass	9079036	1	8332	20
Sorgastrum nutans	9079037	2	5448	18
Tall dropseed	9079040	1	3109	13
Sporobolus asper				
Blazing star	9079020	1	1334	33
Liatris pycnostachya				
Bush Clover	9079008	1	858	24
Lespedeza capitata				
Finger coreopsis	9079028	1	84	7
Coreopsis palmata		2	222	8
Butterfly milkweed	9079016	1	5	13
Asclepias tuberosa				
Pale purple coneflower	9079033	1	487	20
Echinacea pallida	9079034	2	1062	16
Purple prairie clover	9079048	1	198	11
Dalea purpurea	9079049	2	61.5	4
White prairie clover	9079052	1	41.5	5
Dalea candida	9079053	2	34	5
Tick trefoil	9079012	1	66	7
Desmodium sp.				

Releases from the Elsberry Plant Materials Center

Scientific Name	Release Name	Common Name	Accession Number	Cooperating Agency(ies)	Type of Release	Year of Release
Elymus virginicus L.	Northern MO	Virginia wild rye	9079044	MOPMC,UMC,MDC,MODOT	N	1999
Sorghastrum nutans (L) Nash.	Northern MO	indiangrass	9079036	MOPMC,UMC,MDC,MODOT	N	1999
Andropogon gerardii Vitman	Northern MO	big bluestem	9079000	MOPMC,UMC,MDC,MODOT	N	1999
Sorghastrum nutans (L) Nash.	Western MO	indiangrass	9079037	MOPMC,UMC,MDC,MODOT	N	1999
Schizachyrium scoparium, Michx.	Northern MO	little bluestem	9079004	MOPMC,UMC,MDC,MODOT	N	1999

Cooperating Agencies: MOPMC=Missouri Plant Materials; UMC=University of Missouri at Columbia; MDC=Missouri Department of Conservation; MODOT=Missouri Department of Transportation.

N=native releases; collected within the USA, occurring naturally in the USA. Generally refers to a plant which occurs naturally in a particular region, state ecosystem or habitat without direct or indirect human activity.

Nat.=naturalized releases; collected from a population within the USA, but were originally introduced to the USA sometime in the past.

I=introduced; means that the original collection from which the release was made was not from within the USA.

Study: 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 (1 or 2 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 increase 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 project 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. Standard seeding rates are from Missouri Technical Guide, March 1997 (Table #1).

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 feedcups. 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).

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 you want to plant 10# PLS per acre you need to plant 11.7# (10 / .855) BULK. 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# non-viable 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%)	29.9# (59.8%)	3.3#	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 10.0# 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 (see Table #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 (see Tables #5 & #6).

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 a whole lot better than the half rate. This indicates the amount of seed may not be the problem of a week stand.

1999

This study was designed for plots to be established for five consecutive years. Local weather patterns are quite variable from year to year and 1998 and 1999 were no exceptions (See Table #7). 1998 was dryer than average in the spring, was well above average during June and July and barely rained at all in August. Weed control became a problem during the summer. 1999 was about the opposite, starting out wetter than average causing ponding on some of the plots and then becoming very dry during the summer.

Data taken in 1998 and 1999 is in Tables #5 and #6. The legume plots were statistically analyzed and a summarized in Table #8. This summary was done as a whole and specific species have to be compared in the data tables. Further analysis will be done at a later time.

The analysis showed a significant difference between coated and uncoated for 1999 emergence density that is an important criterion. Coated alfalfa is equal or slightly better at standard rates. Red clover is better at the lower rates but the other rates vary both ways. Coating did not show improvement for birdsfoot trefoil and in some cases was a disadvantage. The summary did not show any significant difference between coated and uncoated seed in 1998 indicating that for this year the coating was just as good as having the additional seed.

2000

The plots were again planted the spring of 2000. At the time of this report, no additional evaluation data was available.

Study 29I143G – Seed Coat/Seeding Rates Study			**Table #1**
List of Species Evaluated			
Genus	**Species**	**Common Name**	**Standard Full Seed 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 fesuce	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
Andropogon	*gerardii*	Big bluestem	10.0# PLS/Ac

	STUDY 29I143G		**PLOT LAYOUT**		**PLOT SIZE 15' X 20'**			**Table #2**
		----- county road ------			SUB-PLOT SIZE 5' X 20'			
		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**

LEGUMES planted 5/5/98

YEAR #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 — Plot Size = 5' x 20'

S# is SubPlot Number — Subplot Size = 15' x 20'

Study 29I143G - Seed Coat/Seeding Rates Study — **Table # 3 - continued**

	COOL SEASON GRASSES																			WARM SEASON GRASSES																	
												Y	E	A	R	#	1				Y	E	A	R	#	1	&	2								
R	E	P		#	1																																	
P #		16			18			14			17			15			19				23			21			22			20								
																					99			98			99			98								
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						
		planted 4/23/98																					planted 5/5/98 and 4/21/99														
R	E	P		#	2																																	
P #		16			18			17			14			19			15				21			20			23			22								
																					98			98			99			99								
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								
																					98			99			98			99								
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								
																					98			99			98			99								
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 — Plot Size = 5' x 20'

S # is SubPlot Number — Subplot Size = 15' x 20'

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

LEGUMES Planted 4/13/99

YEAR # 2

R	**E**	**P**		**#**	**1**																																									
P#		5			11			2			4			13			10			8			12			6			1			7			9			3	
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#		12			6			10			5			3			1			9			7			2			13			11			8			4	
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#		6			4			13			1			7			9			5			11			8			12			3			10			2	
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#		10			3			7			12			5			2			1			9			4			6			8			11			13	
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 — Plot Size = 5' x 20'

S# is SubPlot Number — Subplot Size = 15' x 20'

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

COOL SEASON GRASSES planted 4/13/99 **WARM SEASON GRASSES** planted 4/21/99 and 5/5/98

YEAR # 2 **YEAR # 1 & 2**

R	**E**	**P**		**#**	**1**																																	
P #		17			14			19			15			18			16			23			21			22			24			20					
																				98			99			98			99			99					
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	2	1	3			
R	**E**	**P**		**#**	**2**																																	
P #		19			15			18			14			17			16			24			20			23			22			21					
																				99			99			98			98			99					
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	1	3	2			
R	**E**	**P**		**#**	**3**																																	
P #		15			19			16			17			18			14			20			22			21			23			24					
																				99			98			99			98			99					
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	3	1	2			
R	**E**	**P**		**#**	**4**																																	
P #		18			16			15			19			14			17			24			22			21			23			20					
																				99			98			99			98			99					
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	1	2	3			

P # is Plot Number — Plot Size = 5' x 20'

S # is SubPlot Number — Subplot Size = 15' x 20'

Study 29I143G - Seed Coat/Seeding Rates Study				Table #4
Plot	**Sub Plot**	**Forage - Seeds per LB**	**Sub Plot Seeding**	
Number	**Number**	**- full seeding rate \4**	**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 75,000 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

\1 CelPril coated
\2 Seed Biotics coated
\3 See discussion 1998
\4 Rates as per NRCS MOFOTG March 1997

Study 29I143G - Seed Coat/Seeding Rates Study				Table #4 - continued
Plot	**Sub Plot**	**Forage - Seeds per LB**	**Sub Plot Seeding**	
Number	**Number**	**- full seeding rate \4**	**Rates**	**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
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 0.0# 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 (d. tr)	.5 rate	0.9 PLS / Square foot
		7,500 seeds/lb		
"	2	Eastern gamagrass (d. tr)	1.0 rate	1.7 PLS / Square foot
		10.0 # PLS seeds/ac		
"	3	Eastern gamagrass (drytreated)	1.5 rate	2.6 PLS / Square foot

\1 CelPril coated
\2 Seed Biotics coated
\3 See discussion 1998
\4 Rates as per NRCS MOFOTG March 1997

Study 29I143G - Seed Coat/Seeding Rates Study				Table #4-continued
Plot	**Sub Plot**	**Forage - Seeds per LB**	**Sub Plot Seeding**	
Number	**Number**	**- full seeding rate \4**	**Rates**	**PLS/square foot**
21	1	Eastern gamagrass (wettreated)	.5 rate	0.9 PLS / Square foot
"	2	Eastern gamagrass (wettreated)	1.0 rate	1.7 PLS / Square foot
"	3	Eastern gamagrass (wettreated)	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 /	1.0 rate	76.3 PLS / Square foot
"	3	Caucasian bluestem	1.5 rate	114.4 PLS / Square foot
24	1	Big Bluestem 160,000 seeds/lb	.5 rate	18.4 PLS / Square foot
"	2	Big Bluestem 10.0# PLS/Ac	1.0 rate	36.7 PLS / Square foot
"	3	Big Bluestem	1.5 rate	55.1 PLS / Square foot

\1 CelPril coated
\2 Seed Biotics coated
\3 See discussion 1998
\4 Rates as per NRCS MOFOTG March 1997

Study 29I143G - Seed Coat/Seeding Rate Study						1998 Planting			1998 Evaluation						Table # 5	
Plot	**Genus/species**						**Emergence Density**									
Sub-	**Common Name**	**Days to Emerge ***					**(Plants/Row Foot)**			5/27/98		**Percent Stand ****			5/2798	
plot #	**Source**	**R-1**	**R-2**	**R-3**	**R-4**	**Ave**	**R-1**	**R-2**	**R-3**	**R-4**	**Ave**	**R-1**	**R-2**	**R-3**	**R-4**	**Ave**
Legume Plots #1 - #13																
	Planted 5/5/98															
1/1		6	6	6	7	**6.25**	6.33	9.67	3.67	12.00	**4.92**	50	60	60	90	**65.00**
1/2	Alfalfa	6	6	6	7	**6.25**	17.67	11.00	10.67	18.33	**9.84**	85	70	90	90	**83.75**
1/3		6	6	6	7	**6.25**	28.00	17.33	25.33	28.33	**17.67**	90	75	95	90	**87.50**
2/1		6	6	7	7	**6.50**	15.00	8.33	4.33	8.67	**6.92**	50	40	70	30	**47.50**
2/2	Alfalfa	6	6	7	7	**6.50**	11.67	10.00	13.33	10.00	**8.75**	70	80	60	80	**72.50**
2/3	Celpril	6	6	7	7	**6.50**	14.33	19.67	27.00	19.00	**15.25**	75	85	80	85	**81.25**
3/1		3	6	8	7	**6.00**	6.00	5.67	6.00	7.33	**4.42**	35	75	90	50	**62.50**
3/2	Alfalfa	3	6	8	7	**6.00**	9.33	13.33	21.67	17.33	**11.08**	30	90	30	75	**56.25**
3/3	Seed Biotics	3	6	8	7	**6.00**	12.00	16.33	30.00	22.00	**14.58**	30	80	90	80	**70.00**
4/1		6	8	7	7	**7.00**	4.67	7.33	5.33	5.67	**4.33**	40	50	80	50	**55.00**
4/2	Red Clover	6	8	7	7	**7.00**	11.67	12.67	4.00	22.33	**7.09**	80	85	65	80	**77.50**
4/3		6	8	7	7	**7.00**	13.67	14.33	24.33	8.00	**13.08**	80	90	85	40	**73.75**
5/1		8	7	7	7	**7.25**	5.33	8.33	6.67	8.33	**5.08**	10	70	60	50	**47.50**
5/2	Red Clover	8	7	7	7	**7.25**	16.00	14.67	8.67	14.33	**9.84**	20	80	80	35	**53.75**
5/3	Celpril	8	7	7	7	**7.25**	10.33	22.00	13.67	25.67	**11.50**	50	95	80	80	**76.25**
6/1		8	7	7	7	**7.25**	12.33	8.33	3.67	6.33	**6.08**	30	60	50	60	**50.00**
6/2	Red Clover	8	7	7	7	**7.25**	9.33	12.67	17.33	8.00	**9.83**	25	50	80	80	**58.75**
6/3	Seed Biotics	8	7	7	7	**7.25**	14.00	16.33	15.33	15.00	**11.42**	30	80	80	90	**70.00**
7/1		8	8	9	9	**8.50**	7.33	8.67	6.00	7.00	**5.50**	25	60	30	75	**47.50**
7/2	Birdsfoot trefoil	8	8	9	9	**8.50**	10.67	10.00	10.00	17.00	**7.67**	40	60	50	85	**58.75**
7/3		8	8	9	9	**8.50**	10.67	25.00	7.00	22.33	**10.67**	70	75	75	90	**77.50**
8/1		6	8	9	8	**7.75**	4.00	6.67	6.00	4.67	**4.17**	10	25	65	75	**43.75**
8/2	Birdsfoot trefoil	6	8	9	8	**7.75**	7.67	17.00	16.33	11.33	**10.25**	30	75	75	75	**63.75**
8/3	Celpril	6	8	9	8	**7.75**	9.67	11.67	30.00	11.33	**12.84**	20	60	65	75	**55.00**
9/1		9	9	8	9	**8.75**	2.67	9.67	7.67	8.33	**5.00**	30	60	65	30	**46.25**
9/2	Birdsfoot trefoil	9	9	8	9	**8.75**	4.00	14.33	8.33	9.33	**6.67**	20	60	70	50	**50.00**
9/3	Seed Biotics	9	9	8	9	**8.75**	6.00	12.33	20.00	14.00	**9.58**	20	60	80	75	**58.75**
*	Number of days it took, from date planted, for 25 seedlings to emerge in that plot.															
**	Visual rating of percent of plot that has complete rows of plants.															

Study 29I143G - Seed Coat/Seeding Rate Study						1998 Planting			1998 Evaluation				Table # 5 - continued			
Plot	**Genus/species**					**Emergence Density**										
Sub-	**Common Name**	**Days to emerge ***				**(Plants/Row Foot)**						**Percent Stand ****				
plot #	**Source**	**R-1**	**R-2**	**R-3**	**R-4**	**Ave**	**R-1**	**R-2**	**R-3**	**R-4**	**Ave**	**R-1**	**R-2**	**R-3**	**R-4**	**Ave**
10/1		9	9	9	9	**9.00**	1.33	2.33	4.67	3.67	**3.00**	20	30	40	30	**30.00**
10/2	Ladino clover	9	9	9	9	**9.00**	7.67	2.33	5.67	4.67	**5.09**	40	30	35	50	**38.75**
10/3		9	9	9	9	**9.00**	12.00	6.67	6.33	13.00	**9.50**	30	35	25	30	**30.00**
11/1		9	6	10	9	**8.50**	2.00	2.33	3.67	1.67	**2.42**	10	30	20	10	**17.50**
11/2	Ladino clover	9	6	10	9	**8.50**	2.33	4.33	5.67	3.00	**3.83**	10	40	40	10	**25.00**
11/3	Celpril	9	6	10	9	**8.50**	6.33	10.67	12.33	2.67	**8.00**	40	50	40	25	**38.75**
12/1		9	9	9	9	**9.00**	8.00	5.00	1.33	2.00	**4.08**	10	50	10	10	**20.00**
12/2	Ladino clover	9	9	9	9	**9.00**	5.00	11.33	6.33	13.67	**9.08**	15	80	30	40	**41.25**
12/3	Seed Biotics	9	9	9	9	**9.00**	9.67	10.00	5.67	18.00	**10.84**	15	65	40	40	**40.00**
13/1		9	9	9	8	**8.75**	8.33	3.67	7.33	3.33	**5.67**	30	40	25	40	**33.75**
13/2	Annual Lespedeza	9	9	9	9	**9.00**	11.33	19.00	9.00	19.33	**14.67**	50	70	40	60	**55.00**
13/3		9	9	9	9	**9.00**	18.33	10.67	15.33	20.00	**16.08**	60	50	75	40	**56.25**
Cool Season Grasses Plots #14 - #19																
	planted 4 /23 / 98															
14/1		5	5	5	5	**5.00**	16.00	8.67	22.67	10.67	**14.50**	80	55	95	85	**78.75**
14/2	Tall fescue	5	5	5	5	**5.00**	39.67	26.33	17.33	31.33	**28.67**	95	70	95	95	**88.75**
14/3	Endophyte infected	5	5	5	5	**5.00**	44.33	4.37	36.67	49.00	**33.59**	95	90	95	100	**95.00**
15/1		19	19	19	19	**19.00**	2.00	1.33	1.33	1.00	**1.42**	10	5	5	10	**7.50**
15/2	Tall fescue	19	19	19	19	**19.00**	1.67	0.33	0.33	1.00	**0.83**	10	5	5	10	**7.50**
15/3	Endophyte free	19	19	19	19	**19.00**	6.33	0.00	2.00	5.00	**3.33**	10	5	5	25	**11.25**
16/1		8	8	8	8	**8.00**	7.33	14.00	2.67	11.67	**8.92**	80	90	60	80	**77.50**
16/2	Orchardgrass	8	8	8	8	**8.00**	24.00	19.33	11.67	23.00	**19.50**	90	60	75	95	**80.00**
16/3		8	8	8	8	**8.00**	37.33	38.00	39.00	50.67	**41.25**	95	70	90	95	**87.50**
17/1		8	8	8	8	**8.00**	14.33	8.33	8.00	6.67	**9.33**	25	85	70	75	**63.75**
17/2	Smooth brome	8	8	8	8	**8.00**	10.67	12.67	10.67	10.33	**11.09**	80	70	70	85	**76.25**
17/3		8	8	8	8	**8.00**	21.67	18.67	19.33	20.67	**20.09**	80	70	80	85	**78.75**
*	Number of days it took, from date planted, for 25 seedlings to emerge in that plot.															
**	Visual rating of percent of plot that has complete rows of plants.															

Study 29I143G - Seed Coat/Seeding Rate Study						1998 Planting			1998 Evaluation				Table # 5 - continued			
Plot	**Genus/species**					**Emergence Density**										
Sub-	**Common Name**	**Days to emerge ***				**(Plants/Row Foot)**						**Percent Stand ****				
plot #	**Source**	**R-1**	**R-2**	**R-3**	**R-4**	**Ave**	**R-1**	**R-2**	**R-3**	**R-4**	**Ave**	**R-1**	**R-2**	**R-3**	**R-4**	**Ave**
18/1		8	8	8	8	**8.00**	27.67	6.67	13.67	18.67	**16.67**	65	80	65	60	**67.50**
18/2	Timothy	8	8	8	8	**8.00**	35.33	15.33	20.00	42.67	**28.33**	65	75	75	80	**73.75**
18/3		8	8	8	8	**8.00**	55.33	52.00	34.33	48.67	**47.58**	95	85	85	80	**86.25**
19/1		8	8	8	8	**8.00**	4.00	10.67	11.00	4.67	**7.59**	50	95	70	60	**68.75**
19/2	Canada wildrye	8	8	8	8	**8.00**	12.00	17.33	17.67	19.00	**16.50**	75	95	80	80	**82.50**
19/3		8	8	8	8	**8.00**	29.33	19.67	24.33	8.67	**20.50**	90	95	85	90	**90.00**
Warm Season Grasses Plots #20 - #23																
	planted \ 1															
20/1		N/A	N/A	N/A	N/A	**N/A**	3.00	0.33	1.00	0.33	**1.17**	15	15	30	10	**17.50**
20/2	Eastern gamagrass	N/A	N/A	N/A	N/A	**N/A**	1.00	1.33	0.67	0.67	**0.92**	15	15	40	10	**20.00**
20/3	untreated	N/A	N/A	N/A	N/A	**N/A**	2.33	1.33	2.33	0.67	**1.67**	15	15	40	10	**20.00**
21/1		14	18	18	16	**16.50**	1.33	1.00	2.00	1.33	**1.42**	15	25	40	30	**27.50**
21/2	Eastern gamagrass	14	18	18	16	**16.50**	3.00	1.33	2.33	2.00	**2.17**	15	25	60	15	**28.75**
21/3	treated	14	18	18	16	**16.50**	4.00	3.33	3.67	3.33	**3.58**	15	40	50	50	**38.75**
22/1		22	22	19	20	**20.75**	8.67	7.33	12.67	20.00	**12.17**	10	20	30	50	**27.50**
22/2	Switchgrass	22	22	19	20	**20.75**	4.33	9.33	12.67	15.67	**10.50**	5	10	25	60	**25.00**
22/3		22	22	19	20	**20.75**	17.33	19.33	12.33	6.67	**13.92**	20	65	30	30	**36.25**
23/1		23	23	23	23	**23.00**	0.67	10.33	5.33	1.67	**4.50**	5	15	20	5	**11.25**
23/2	Caucasian bluestem	23	23	23	23	**23.00**	0.33	4.00	1.67	3.67	**2.42**	5	15	10	10	**10.00**
23/3		23	23	23	23	**23.00**	1.00	4.33	2.00	1.33	**2.17**	5	5	5	5	**5.00**
\1	Plot # 20 planted 3/26/98															
	Plot # 21 planted 4/23/98															
	Plots # 22 - 23 planted 5/5/98															
*	Number of days it took, from date planted, for 25 seedlings to emerge in that plot.															
**	Visual rating of percent of plot that has complete rows of plants.															

Study 29I143G - Seed Coat/Seeding Rate Study							1999 Planting				1999 Evaluation			Table #5 - continued			
Plot /	**Genus/species**						**Emergence Density**										
Sub-	**Common name**	**Days to Emerge***					**(Plants/Row Foot)**					**Percent Stand ****					
plot #	**Source**	**Rep-1**	**Rep-2**	**Rep-3**	**Rep-4**	**Ave**	**Rep-1**	**Rep-2**	**Rep-3**	**Rep-4**	**Ave**	**Rep-1**	**Rep-2**	**Rep-3**	**Rep-4**	**Ave**
Legume Plots #1 - #13																
	Planted 4/13/99															
1/1		11.00	6.00	14.00	6.00	**9.25**	14.33	47.67	12.33	14.00	**22.08**	75.00	90.00	55.00	75.00	**73.75**
1/2	Alfalfa	6.00	6.00	14.00	6.00	**8.00**	13.67	20.67	12.00	32.33	**19.67**	80.00	95.00	50.00	90.00	**78.75**
1/3		6.00	6.00	14.00	11.00	**9.25**	22.00	24.33	16.00	40.00	**25.58**	95.00	98.00	50.00	95.00	**84.50**
2/1		6.00	14.00	11.00	6.00	**9.25**	11.33	25.67	5.67	30.67	**18.34**	90.00	90.00	95.00	80.00	**88.75**
2/2	Alfalfa	6.00	11.00	11.00	6.00	**8.50**	17.67	30.00	14.00	27.67	**22.34**	95.00	95.00	90.00	90.00	**92.50**
2/3	Celpril	6.00	11.00	11.00	11.00	**9.75**	17.00	13.00	22.67	37.33	**22.50**	98.00	95.00	85.00	95.00	**93.25**
3/1		11.00	6.00	11.00	6.00	**8.50**	0.00	40.33	13.00	18.00	**17.83**	20.00	95.00	75.00	90.00	**70.00**
3/2	Alfalfa	11.00	6.00	11.00	6.00	**8.50**	12.33	76.67	15.67	23.33	**32.00**	75.00	95.00	85.00	96.00	**87.75**
3/3	Seed Biotics	11.00	6.00	11.00	11.00	**9.75**	25.33	23.33	12.33	33.33	**23.58**	90.00	98.00	70.00	95.00	**88.25**
4/1		6.00	6.00	6.00	6.00	**6.00**	18.33	22.33	11.33	15.33	**16.83**	70.00	65.00	65.00	65.00	**66.25**
4/2	Red Clover	6.00	6.00	6.00	6.00	**6.00**	15.67	46.00	15.67	10.67	**22.00**	90.00	60.00	70.00	80.00	**75.00**
4/3		6.00	6.00	6.00	11.00	**7.25**	12.00	12.67	21.33	15.00	**15.25**	85.00	80.00	50.00	85.00	**75.00**
5/1		6.00	6.00	6.00	11.00	**7.25**	7.33	53.00	7.67	19.00	**21.75**	90.00	75.00	85.00	65.00	**78.75**
5/2	Red Clover	6.00	6.00	6.00	11.00	**7.25**	11.67	28.67	18.33	18.33	**19.25**	90.00	90.00	75.00	70.00	**81.25**
5/3	Celpril	6.00	11.00	6.00	11.00	**8.50**	10.00	11.33	27.00	28.00	**19.08**	95.00	95.00	70.00	75.00	**83.75**
6/1		6.00	6.00	11.00	11.00	**8.50**	10.00	54.33	11.33	4.00	**19.92**	55.00	80.00	85.00	35.00	**63.75**
6/2	Red Clover	6.00	6.00	11.00	6.00	**7.25**	13.00	18.33	13.00	4.33	**12.17**	65.00	98.00	90.00	35.00	**72.00**
6/3	Seed Biotics	11.00	6.00	11.00	11.00	**9.75**	17.67	13.00	17.67	11.33	**14.92**	85.00	90.00	65.00	45.00	**71.25**
7/1		14.00	11.00	14.00	14.00	**13.25**	4.67	23.33	11.33	18.67	**14.50**	55.00	80.00	70.00	75.00	**70.00**
7/2	Birdsfoot trefoil	14.00	11.00	6.00	14.00	**11.25**	17.33	40.00	12.07	17.33	**21.68**	60.00	85.00	60.00	70.00	**68.75**
7/3		14.00	11.00	6.00	11.00	**10.50**	16.00	34.00	13.00	15.00	**19.50**	70.00	85.00	65.00	70.00	**72.50**
8/1		11.00	14.00	14.00	11.00	**12.50**	4.00	22.33	10.33	9.67	**11.58**	70.00	70.00	85.00	50.00	**68.75**
8/2	Birdsfoot trefoil	14.00	11.00	14.00	11.00	**12.50**	9.67	3.33	13.67	8.33	**8.75**	75.00	80.00	80.00	40.00	**68.75**
8/3	Celpril	13.00	11.00	14.00	11.00	**12.25**	13.67	3.33	17.67	9.67	**11.09**	80.00	80.00	75.00	40.00	**68.75**
9/1		14.00	11.00	11.00	11.00	**11.75**	2.33	9.67	9.67	7.00	**7.17**	60.00	75.00	65.00	35.00	**58.75**
9/2	Birdsfoot trefoil	11.00	11.00	14.00	11.00	**11.75**	10.67	45.33	14.33	10.00	**20.08**	70.00	85.00	60.00	30.00	**61.25**
9/3	Seed Biotics	14.00	11.00	14.00	11.00	**12.50**	10.33	31.33	18.67	14.00	**18.58**	80.00	85.00	55.00	40.00	**65.00**

* Number of days it took, from date planted, for 25 seedlings to emerge in that plot

** Visual rating of percent of plot that has complete rows of plants

Study 29I143G - Seed Coat/Seeding Rate Study							1999 Planting					1999 Evaluation				Table #5 - continued
Plot /	**Genus/species**						**Emergence Density**									
Sub-	**Common name**	**Days to Emerge***					**(Plants/Row Foot)**					**Percent Stand ****				
plot #	**Source**	**Rep-1**	**Rep-2**	**Rep-3**	**Rep-4**	**Ave**	**Rep-1**	**Rep-2**	**Rep-3**	**Rep-4**	**Ave**	**Rep-1**	**Rep-2**	**Rep-3**	**Rep-4**	**Ave**
10/1		11.00	11.00	14.00	11.00	**11.75**	11.00	41.67	8.33	41.67	**25.67**	40.00	40.00	85.00	70.00	**58.75**
10/2	Ladino clover	11.00	11.00	6.00	11.00	**9.75**	12.33	37.67	20.67	37.67	**27.09**	65.00	65.00	80.00	70.00	**70.00**
10/3		11.00	11.00	6.00	11.00	**9.75**	16.33	28.00	29.00	41.00	**28.58**	55.00	70.00	95.00	70.00	**72.50**
11/1		6.00	14.00	14.00	14.00	**12.00**	5.00	19.00	13.33	7.00	**11.08**	65.00	40.00	80.00	40.00	**56.25**
11/2	Ladino clover	11.00	11.00	6.00	11.00	**9.75**	13.33	5.33	20.67	6.33	**11.42**	75.00	50.00	70.00	40.00	**58.75**
11/3	Celpril	11.00	11.00	6.00	11.00	**9.75**	10.33	15.33	20.00	13.67	**20.00**	85.00	75.00	70.00	35.00	**66.25**
12/1		11.00	11.00	14.00	11.00	**11.75**	4.67	26.67	14.33	17.00	**14.33**	45.00	45.00	85.00	55.00	**57.50**
12/2	Ladino clover	11.00	11.00	14.00	11.00	**11.75**	15.00	45.00	19.67	26.33	**19.67**	65.00	60.00	95.00	60.00	**70.00**
12/3	Seed Biotics	13.00	11.00	14.00	11.00	**12.25**	24.00	53.33	24.67	35.33	**24.67**	70.00	65.00	80.00	65.00	**70.00**
13/1		14.00	14.00	22.00	22.00	**18.00**	5.33	29.00	9.00	4.33	**14.67**	45.00	30.00	90.00	35.00	**50.00**
13/2	Annual Lespedeza	14.00	14.00	14.00	14.00	**14.00**	14.67	2.67	15.33	11.33	**15.33**	50.00	60.00	75.00	10.00	**48.75**
13/3		14.00	14.00	14.00	22.00	**16.00**	18.33	5.00	18.33	4.33	**18.33**	75.00	75.00	85.00	20.00	**63.75**
Cool Season Grasses Plots #14 - #19																
	Planted 4/13/99															
14/1		18.00	18.00	18.00	18.00	**18.00**	26.33	5.67	18.33	12.33	**15.67**	60.00	80.00	70.00	85.00	**73.75**
14/2	Tall fescue	18.00	18.00	18.00	18.00	**18.00**	43.00	17.33	37.33	30.67	**32.08**		90.00	85.00	85.00	**86.67**
14/3	Endophyte infected	18.00	18.00	18.00	18.00	**18.00**	53.00	54.33	25.00	25.67	**39.50**	70.00	90.00	80.00	90.00	**82.50**
15/1		-	-	-	-	**0.00**	-	-	-	-	**0.00**	-	-	-	-	**0.00**
15/2	Tall fescue	-	-	-	-	**0.00**	-	-	-	-	**0.00**	-	-	-	-	**0.00**
15/3	Endophyte free	-	-	-	-	**0.00**	-	-	-	-	**0.00**	-	-	-	-	**0.00**
16/1		21.00	21.00	18.00	18.00	**19.50**	15.67	59.67	3.67	12.33	**22.84**	50.00	75.00	60.00	60.00	**61.25**
16/2	Orchardgrass	18.00	18.00	18.00	18.00	**18.00**	36.33	18.00	11.67	20.67	**21.67**	70.00	70.00	45.00	60.00	**61.25**
16/3		18.00	18.00	18.00	18.00	**18.00**	24.33	10.67	13.00	16.00	**16.00**	85.00	65.00	65.00	70.00	**71.25**
17/1		18.00	18.00	21.00	18.00	**18.75**	28.67	40.67	5.00	12.33	**21.67**	65.00	45.00	20.00	25.00	**38.75**
17/2	Smooth brome	18.00	18.00	18.00	18.00	**18.00**	30.00	45.67	7.33	5.00	**22.00**	75.00	60.00	25.00	50.00	**52.50**
17/3		18.00	18.00	18.00	18.00	**18.00**	21.33	15.00	0.00	12.67	**12.25**	80.00	80.00	40.00	60.00	**65.00**
*	Number of days it took, from date planted, for 25 seedlings to emerge in that plot															
**	Visual rating of percent of plot that has complete rows of plants															

Study 29I143G - Seed Coat/Seeding Rate Study							1999 Planting			1999 Evaluation			Table #5 - continued			
Plot /	**Genus/species**						**Emergence Density**									
Sub-	**Common name**	**Days to Emerge***					**(Plants/Row Foot)**					**Percent Stand ****				
plot #	**Source**	**Rep-1**	**Rep-2**	**Rep-3**	**Rep-4**	**Ave**	**Rep-1**	**Rep-2**	**Rep-3**	**Rep-4**	**Ave**	**Rep-1**	**Rep-2**	**Rep-3**	**Rep-4**	**Ave**
18/1		39.00	27.00	39.00	39.00	**36.00**	18.00	40.67	0.00	9.33	**17.00**	25.00	35.00	10.00	25.00	**23.75**
18/2	Timothy	22.00	22.00	22.00	27.00	**23.25**	4.67	14.67	6.00	7.00	**8.09**	30.00	40.00	20.00	35.00	**31.25**
18/3		22.00	22.00	27.00	22.00	**23.25**	1.00	41.67	4.00	9.67	**14.09**	40.00	35.00	15.00	35.00	**31.25**
19/1		22.00	22.00	22.00	22.00	**22.00**	4.00	2.00	2.33	1.33	**2.42**	25.00	20.00	20.00	10.00	**18.75**
19/2	Canada wildrye	22.00	22.00	22.00	22.00	**22.00**	8.00	3.33	6.00	10.67	**7.00**	30.00	25.00	35.00	20.00	**27.50**
19/3		22.00	22.00	22.00	22.00	**22.00**	3.00	4.67	3.67	3.00	**3.59**	40.00	35.00	30.00	30.00	**33.75**
Warm Season Grasses Plots #20 - #23																
	Planted 4/21/99															
20/1		N/A	43.00	43.00	49.00	**33.75**	5.00	1.33	4.00	12.67	**5.75**	15.00	10.00	20.00	50.00	**23.75**
20/2	Eastern gamagrass	N/A	43.00	43.00	49.00	**33.75**	7.00	3.33	6.67	7.33	**6.08**	20.00	10.00	35.00	20.00	**21.25**
20/3	untreated	N/A	43.00	43.00	49.00	**33.75**	12.00	1.33	2.67	3.33	**4.83**	20.00	10.00	10.00	10.00	**12.50**
21/1		49.00	-	43.00	-	**46.00**	10.00	-	3.33	-	**6.67**	20.00	-	10.00	-	**15.00**
21/2	Eastern gamagrass	49.00	-	43.00	-	**46.00**	3.00	-	3.33	-	**3.17**	10.00	-	20.00	-	**15.00**
21/3	treated - wet	49.00	-	43.00	-	**46.00**	10.33	-	2.00	-	**6.17**	20.00	-	10.00	-	**15.00**
22/1		-	-	43.00	49.00	**46.00**	-	-	0.00	1.00	**1.00**	-	-	10.00	10.00	**10.00**
22/2	Switchgrass	-	-	43.00	49.00	**46.00**	-	-	4.67	1.00	**2.84**	-	-	10.00	10.00	**10.00**
22/3		-	-	43.00	49.00	**46.00**	-	-	1.67	0.33	**1.00**	-	-	10.00	10.00	**10.00**
23/1		49.00	-	-	-	**49.00**	5.00	-	-	-	**5.00**	35.00	-	-	-	**35.00**
23/2	Caucasian bluestem	49.00	-	-	-	**49.00**	4.33	-	-	-	**4.33**	25.00	-	-	-	**25.00**
23/3		49.00	-	-	-	**49.00**	10.00	-	-	-	**10.00**	30.00	-	-	-	**30.00**
24/1		-	-	43.00	-	**43.00**	-	-	0.00	-	**0.00**	-	-	10.00	-	**10.00**
24/2		-	-	43.00	-	**43.00**	-	-	6.00	-	**6.00**	-	-	35.00	-	**35.00**
24/3		-	-	43.00	-	**43.00**	-	-	0.00	-	**0.00**	-	-	10.00	-	**10.00**
*	Number of days it took, from date planted, for 25 seedlings to emerge in that plot															
**	Visual rating of percent of plot that has complete rows of plants															

Study 29I143G - Seed Coat/Seeding Rate Study					1998 Planting		1998 Evaluation			Table # 6	
	Genus/Species										
Plot /	Common Name	Cover Density (stems/row foot)					Percent Cover (Visual Observation)				
Subplot #	Source	Rep-1	Rep-2	Rep-3	Rep-4	Average	Rep-1	Rep-2	Rep-3	Rep-4	Average
											10/12/98
Legume Plots #1 - #13											
	Planted 5/5/98										
1/1		11.67	4	8.33	15	**9.75**	85	60	60	75	**70**
1/2	Alfalfa	11	11.3	8.67	7	**9.4925**	90	75	70	80	**78.75**
1/3		22	4.33	10	26.67	**15.75**	45	65	85	85	**70**
2/1		6.67	7.67	0.67	13	**7.0025**	70	70	5	65	**52.5**
2/2	Alfalfa	11	2.33	1	15.67	**7.5**	80	65	10	75	**57.5**
2/3	Celpril	12.33	4	4	17	**9.3325**	90	60	15	85	**62.5**
3/1		7	10	5	3.33	**6.3325**	10	80	55	60	**51.25**
3/2	Alfalfa	1	9.33	8.33	7.33	**6.4975**	60	70	70	85	**71.25**
3/3	Seed Biotics	2.33	11.33	17.67	10	**10.3325**	10	90	85	90	**68.75**
4/1		66.33	51.67	28.33	26.67	**43.25**	85	90	80	70	**81.25**
4/2	Red Clover	48.67	55.87	55.67	59	**54.8025**	93	95	90	95	**93.25**
4/3		92	51.33	32	43	**54.5825**	98	98	85	80	**90.25**
5/1		19	21	37.33	48	**31.3325**	60	70	80	80	**72.5**
5/2	Red Clover	42.33	27.67	39.33	58.67	**42**	75	75	85	95	**82.5**
5/3	Celpril	41.33	42.67	60.33	62	**51.5825**	85	85	98	98	**91.5**
6/1		22.33	13	19.33	4	**14.665**	60	70	75	40	**61.25**
6/2	Red Clover	29.67	15	39.33	37.67	**30.4175**	75	65	80	75	**73.75**
6/3	Seed Biotics	53.67	2	50.33	40.67	**36.6675**	95	55	85	90	**81.25**
7/1		21.67	10.67	11.33	2	**11.4175**	60	45	15	30	**37.5**
7/2	Birdsfoot trefoil	20.33	12.67	9.33	12.33	**13.665**	65	65	25	60	**53.75**
7/3		26.33	11	12.33	27	**19.165**	75	55	20	70	**55**
8/1		8	2.67	14	4.33	**7.25**	40	30	55	20	**36.25**
8/2	Birdsfoot trefoil	7.33	23.67	10.33	15.67	**14.25**	55	60	70	40	**56.25**
8/3	Celpril	8.33	23.67	10	1.67	**10.9175**	50	40	40	50	**45**
9/1		2	2	26.67	7	**9.4175**	15	60	70	25	**42.5**
9/2	Birdsfoot trefoil	14.67	12.67	20	3.33	**12.6675**	40	75	55	15	**46.25**
9/3	Seed Biotics	7	17.67	20.33	6	**12.75**	25	80	75	35	**53.75**

Study 29I143G - Seed Coat/Seeding Rate Study					1998 Planting		1998 Evaluation		Table #6 - continued		
	Genus/Species										
Plot /	Common Name	Cover Density (stems/row foot)					Percent Cover (Visual Observation)				
Subplot #	Source	Rep-1	Rep-2	Rep-3	Rep-4	Average	Rep-1	Rep-2	Rep-3	Rep-4	Average
10/1		20	19	4.67	20	**15.9175**	45	50	10	40	**36.25**
10/2	Ladino clover	27.3	7.33	3	1.33	**9.74**	55	45	20	35	**38.75**
10/3		44	21.33	4	41.67	**27.75**	70	65	15	65	**53.75**
11/1		34.33	0	7	4.67	**11.5**	55	0	30	5	**22.5**
11/2	Ladino clover	10	0	1	3.67	**3.6675**	65	0	50	5	**30**
11/3	Celpril	81.67	4.33	26	0	**28**	82	10	45	5	**35.5**
12/1		17.67	10.67	5	4.33	**9.4175**	40	55	30	5	**32.5**
12/2	Ladino clover	28	38.67	8.67	5	**20.085**	65	80	60	15	**55**
12/3	Seed Biotics	38.33	21.67	2.67	11.33	**18.5**	80	70	40	25	**53.75**
13/1		2.33	0	0	1.33	**0.915**	10	10	0	5	**6.25**
13/2	Annual Lespedeza	9.33	0	1	1.67	**3**	15	10	5	10	**10**
13/3		9.33	0	1	0.67	**2.75**	5	20	5	10	**10**
Cool Season Grasses Plots #14 - #19											
	Planted 4/23/98										
14/1		18.33	19.67	14	80	**33**	95	85	90	75	**86.25**
14/2	Tall fescue	20.67	22.33	12.33	65.67	**30.25**	90	90	95	85	**90**
14/3	Endophyte infecte	16.33	22.33	22.67	76	**34.3325**	98	97	98	90	**95.75**
15/1		3.33	5.67	0.67	8.67	**4.585**	8	3	5	10	**6.5**
15/2	Tall fescue	4	3.67	5	4	**4.1675**	45	2	5	15	**16.75**
15/3	Endophyte free	6	6.33	4	19.67	**9**	40	5	15	25	**21.25**
16/1		11.33	25.33	15	27	**19.665**	80	65	60	75	**70**
16/2	Orchardgrass	19.33	12	21.67	40	**23.25**	85	75	70	85	**78.75**
16/3		16.33	21.67	21.33	43	**25.5825**	95	80	85	90	**87.5**
17/1		7.33	13	12.67	15.67	**12.1675**	80	80	75	70	**76.25**
17/2	Smooth brome	15.33	10.67	17.33	28.67	**18**	90	75	80	85	**82.5**
17/3		13.33	30.67	15.67	34.33	**23.5**	96	90	85	80	**87.75**

Study 29I143G - Seed Coat/Seeding Rate Study					1998 Planting		1998 Evaluation		Table #6 - continued		
	Genus/Species										
Plot /	Common Name	Cover Density (stems/row foot)					Percent Cover (Visual Observation)				
Subplot #	Source	Rep-1	Rep-2	Rep-3	Rep-4	Average	Rep-1	Rep-2	Rep-3	Rep-4	Average
18/1		15.33	14.33	16	2.67	**12.0825**	65	35	40	35	**43.75**
18/2	Timothy	17.33	11	18.33	44.33	**22.7475**	72	50	50	50	**55.5**
18/3		17.67	20.67	36	14.67	**22.2525**	80	60	60	50	**62.5**
19/1		8.33	5.33	7.67	11	**8.0825**	23	10	45	10	**22**
19/2	Canada wildrye	12.67	5.33	15.67	18	**12.9175**	56	15	60	30	**40.25**
19/3		17.33	12	12	11.67	**13.25**	60	25	55	50	**47.5**
Warm Season Grasses Plots #20 - #23											
	Planted \ 1										
20/1		2.67	3.33	6.33	4.33	**4.165**	5	15	15	25	**15**
20/2	Eastern gamagras	4.33	15.67	3.33	7.33	**7.665**	15	20	35	15	**21.25**
20/3	untreated	5	11	8.33	3.67	**7**	20	20	40	30	**27.5**
21/1		22.67	7.67	5.33	12.33	**12**	15	30	45	65	**38.75**
21/2	Eastern gamagras	31.67	19	12.67	10	**18.335**	45	40	65	70	**55**
21/3	treated	20.33	9	14.33	15.67	**14.8325**	60	45	60	75	**60**
22/1		8	5.33	11.33	11	**8.915**	10	45	30	30	**28.75**
22/2	Switchgrass	3.33	12.33	6.67	10.33	**8.165**	10	50	55	45	**40**
22/3		10.33	3.67	9.67	14	**9.4175**	30	55	60	60	**51.25**
23/1		9.33	54.33	17	14	**23.665**	30	65	65	65	**56.25**
23/2	Caucasian blueste	27.33	37.33	22.33	20	**26.7475**	60	65	70	60	**63.75**
23/3		41	33.67	22.33	26.67	**30.9175**	70	80	80	65	**73.75**
\ 1	Plot # 20 planted 3/26/98										
	Plot # 21 planted 4/23/98										
	Plots # 22 - 23 planted 5/5/98										

Study 29I143G - Seed Coat/Seeding Rate Study					1998 Planting		1999 Evaluation		Table #6 - continued		
	Genus/Species										
Plot /	Common Name	Cover Density (stems/row foot)					Percent Cover (Visual Observation)				
Subplot #	Source	Rep-1	Rep-2	Rep-3	Rep-4	Average	Rep-1	Rep-2	Rep-3	Rep-4	Average
											10/21/99
Legume Plots #1 - #13											
	Planted 5/5/98										
1/1		33.33	24.67	20.00	12.00	**22.50**	80.00	90.00	30.00	65.00	**66.25**
1/2	Alfalfa	31.00	39.33	37.67	23.33	**32.83**	80.00	80.00	60.00	70.00	**72.50**
1/3		30.33	29.67	24.33	13.00	**24.33**	70.00	65.00	40.00	75.00	**62.50**
2/1		24.67	21.67	26.33	23.00	**23.92**	50.00	70.00	60.00	75.00	**63.75**
2/2	Alfalfa	35.67	0.00	30.67	12.33	**19.67**	50.00	30.00	40.00	65.00	**46.25**
2/3	Celpril	27.67	49.33	21.33	24.00	**30.58**	70.00	50.00	55.00	60.00	**58.75**
3/1		46.33	18.67	39.00	11.33	**28.83**	70.00	90.00	90.00	55.00	**76.25**
3/2	Alfalfa	32.67	30.33	33.67	41.00	**34.42**	80.00	90.00	90.00	50.00	**77.50**
3/3	Seed Biotics	15.67	26.67	13.33	26.00	**20.42**	50.00	80.00	95.00	60.00	**71.25**
4/1		51.33	48.00	14.67	3.67	**29.42**	85.00	80.00	70.00	75.00	**77.50**
4/2	Red Clover	74.67	61.00	21.67	8.00	**85.00**	80.00	85.00	65.00	80.00	**77.50**
4/3		63.33	7.23	21.00	8.33	**90.00**	75.00	55.00	90.00	15.00	**58.75**
5/1		82.33	48.00	24.00	8.67	**40.75**	65.00	5.00	60.00	75.00	**51.25**
5/2	Red Clover	68.67	89.67	25.00	23.67	**51.75**	70.00	30.00	70.00	15.00	**46.25**
5/3	Celpril	60.67	62.33	14.00	21.00	**39.50**	65.00	15.00	65.00	80.00	**56.25**
6/1		26.67	105.33	20.00	26.67	**44.67**	70.00	90.00	70.00	85.00	**78.75**
6/2	Red Clover	47.67	87.33	27.00	26.00	**47.00**	65.00	80.00	80.00	70.00	**73.75**
6/3	Seed Biotics	52.67	107.00	17.33	32.00	**52.25**	60.00	85.00	65.00	35.00	**61.25**
7/1		59.00	11.33	65.00	17.67	**38.25**	60.00	80.00	50.00	50.00	**60.00**
7/2	Birdsfoot trefoil	44.33	41.67	54.67	27.33	**50.00**	85.00	65.00	40.00	17.33	**51.83**
7/3		60.33	21.67	47.67	30.33	**40.00**	80.00	70.00	75.00	45.00	**67.50**
8/1		88.67	27.00	14.00	15.00	**36.17**	65.00	75.00	70.00	20.00	**57.50**
8/2	Birdsfoot trefoil	77.33	57.33	10.33	16.00	**40.25**	55.00	80.00	85.00	15.00	**58.75**
8/3	Celpril	39.00	23.00	44.00	11.33	**29.33**	60.00	90.00	70.00	85.00	**76.25**
9/1		56.33	42.00	46.33	11.33	**39.00**	35.00	35.00	20.00	60.00	**37.50**
9/2	Birdsfoot trefoil	93.00	18.67	55.67	7.33	**45.00**	40.00	45.00	50.00	10.00	**36.25**
9/3	Seed Biotics	51.00	31.33	41.67	23.67	**36.92**	60.00	65.00	50.00	65.00	**60.00**

Study 29I143G - Seed Coat/Seeding Rate Study					1998 Planting		1999 Evaluation			Table #6 - continued	
	Genus/Species										
Plot /	Common Name	Cover Density (stems/row foot)					Percent Cover (Visual Observation)				
Subplot #	Source	Rep-1	Rep-2	Rep-3	Rep-4	Average	Rep-1	Rep-2	Rep-3	Rep-4	Average
10/1		78.67	76.67	26.00	7.00	**47.09**	90.00	55.00	70.00	80.00	**73.75**
10/2	Ladino clover	109.67	71.33	28.00	7.00	**54.00**	100.00	50.00	75.00	75.00	**75.00**
10/3		77.00	69.00	17.00	9.33	**43.08**	100.00	55.00	60.00	90.00	**76.25**
11/1		78.33	35.33	111.33	2.00	**56.75**	80.00	65.00	70.00	60.00	**68.75**
11/2	Ladino clover	27.33	35.00	102.67	19.00	**46.00**	90.00	85.00	65.00	45.00	**71.25**
11/3	Celpril	75.00	68.00	116.67	29.33	**72.25**	90.00	60.00	60.00	80.00	**72.50**
12/1		88.33	69.00	56.00	6.67	**55.00**	65.00	40.00	75.00	80.00	**65.00**
12/2	Ladino clover	49.67	44.33	59.00	9.00	**40.50**	60.00	50.00	85.00	50.00	**61.25**
12/3	Seed Biotics	71.67	79.67	94.33	11.00	**64.17**	70.00	50.00	70.00	70.00	**65.00**
13/1		4.00	36.33	0.00	0.00	**10.08**	0.00	75.00	1.00	0.00	**19.00**
13/2	Annual Lespedeza	9.67	1.33	1.00	0.00	**3.00**	0.00	30.00	5.00	0.00	**8.75**
13/3		19.33	57.00	1.33	0.00	**19.42**	1.00	85.00	5.00	0.00	**22.75**
Cool Season Grasses Plots #14 - #19											
	Planted 4/23/98										
14/1		38.00	58.67	53.00	70.67	**55.09**	99.00	95.00	95.00	93.00	**95.50**
14/2	Tall fescue	39.67	38.33	41.00	49.33	**42.08**	95.00	98.00	99.00	85.00	**94.25**
14/3	Endophyte infected	49.67	49.33	38.67	47.67	**46.34**	99.00	99.00	100.00	96.00	**98.50**
15/1		70.00	28.67	29.33	49.67	**44.42**	75.00	20.00	45.00	40.00	**45.00**
15/2	Tall fescue	49.00	41.33	36.33	50.33	**44.25**	70.00	25.00	40.00	60.00	**48.75**
15/3	Endophyte free	40.00	53.00	24.00	31.00	**37.00**	80.00	35.00	75.00	50.00	**60.00**
16/1		45.33	39.00	38.67	43.67	**41.67**	85.00	75.00	60.00	80.00	**75.00**
16/2	Orchardgrass	31.00	50.00	53.00	44.00	**44.50**	80.00	80.00	65.00	99.00	**81.00**
16/3		75.00	39.00	33l.33	58.67	**43.17**	97.00	90.00	89.00	95.00	**92.75**
17/1		76.67	27.33	35.00	38.33	**44.33**	96.00	80.00	99.00	90.00	**91.25**
17/2	Smooth brome	110.33	25.67	60.67	60.00	**64.17**	98.00	85.00	95.00	95.00	**93.25**
17/3		77.67	40.67	25.00	38.33	**45.42**	98.00	95.00	90.00	95.00	**94.50**

Study 29I143G - Seed Coat/Seeding Rate Study					1998 Planting		1999 Evaluation			Table #6 - continued	
	Genus/Species										
Plot /	Common Name	Cover Density (stems/row foot)					Percent Cover (Visual Observation)				
Subplot #	Source	Rep-1	Rep-2	Rep-3	Rep-4	Average	Rep-1	Rep-2	Rep-3	Rep-4	Average
18/1		64.00	24.33	54.67	21.67	**41.17**	65.00	20.00	60.00	45.00	**47.50**
18/2	Timothy	97.67	36.67	66.67	43.00	**61.00**	75.00	30.00	35.00	60.00	**50.00**
18/3		103.33	41.00	36.67	52.00	**58.25**	75.00	50.00	40.00	55.00	**55.00**
19/1		47.00	23.00	21.67	30.67	**30.59**	55.00	35.00	65.00	40.00	**48.75**
19/2	Canada wildrye	60.00	22.33	32.67	16.67	**32.92**	60.00	50.00	70.00	50.00	**57.50**
19/3		78.00	27.33	29.33	13.00	**36.92**	70.00	40.00	70.00	55.00	**58.75**
Warm Season Grasses Plots #20 - #23											
	Planted \ 1										
20/1		69.67	88.33	21.00	34.33	**53.33**	60.00	35.00	70.00	90.00	**63.75**
20/2	Eastern gamagrass	90.33	37.67	74.33	19.00	**55.33**	75.00	40.00	85.00	20.00	**55.00**
20/3	untreated	1.21	47.33	20.33	30.00	**24.72**	75.00	60.00	75.00	50.00	**65.00**
21/1		68.33	25.67	16.00	15.67	**31.42**	85.00	50.00	95.00	65.00	**73.75**
21/2	Eastern gamagrass	134.33	31.00	21.33	25.67	**53.08**	95.00	80.00	90.00	75.00	**85.00**
21/3	treated	73.67	24.33	36.33	62.00	**49.08**	90.00	45.00	95.00	80.00	**77.50**
22/1		13.00	8.67	9.00	34.33	**16.25**	80.00	20.00	80.00	70.00	**62.50**
22/2	Switchgrass	22.00	8.33	18.33	52.67	**25.33**	80.00	25.00	85.00	85.00	**68.75**
22/3		8.33	9.33	12.33	42.67	**18.17**	85.00	15.00	90.00	90.00	**70.00**
23/1		26.33	51.00	56.33	27.00	**40.17**	85.00	15.00	55.00	70.00	**56.25**
23/2	Caucasian bluestem	39.00	36.67	183.00	25.00	**70.92**	100.00	30.00	95.00	90.00	**78.75**
23/3		8.00	19.67	169.33	63.00	**65.00**	100.00	25.00	90.00	85.00	**75.00**
\ 1	Plot # 20 planted 3/26/98										
	Plot # 21 planted 4/23/98										
	Plots # 22 - 23 planted 5/5/98										

Study 29I143G - Seed Coat/Seeding Rate Study					1999 Planting		1999 Evaluation		Table #6 - continued		
	Genus/Species										
Plot /	Common Name	Cover Density (stems/row foot)					Percent Cover (Visual Observation)				
Subplot #	Source	Rep-1	Rep-2	Rep-3	Rep-4	Average	Rep-1	Rep-2	Rep-3	Rep-4	Average
Legume Plots #1 - #13											10/21/99
	Planted 4/13/99										
1/1		12.67	24.33	30.00	21.67	**22.17**	20.00	15.00	10.00	5.00	**12.50**
1/2	Alfalfa	38.00	22.00	50.67	38.00	**37.17**	15.00	20.00	20.00	10.00	**16.25**
1/3		56.00	11.67	32.00	48.67	**37.09**	10.00	30.00	10.00	30.00	**20.00**
2/1		26.67	15.33	16.33	28.67	**21.75**	50.00	60.00	50.00	70.00	**57.50**
2/2	Alfalfa	17.00	31.33	41.00	43.33	**33.17**	35.00	70.00	50.00	60.00	**53.75**
2/3	Celpril	19.67	20.67	26.33	55.67	**30.59**	35.00	65.00	30.00	55.00	**46.25**
3/1		13.33	15.00	30.33	13.67	**18.08**	5.00	30.00	50.00	15.00	**25.00**
3/2	Alfalfa	16.00	15.33	24.67	13.00	**17.25**	10.00	25.00	55.00	25.00	**28.75**
3/3	Seed Biotics	28.00	24.00	31.67	7.67	**22.84**	15.00	45.00	55.00	10.00	**31.25**
4/1		24.00	13.67	41.67	60.67	**35.00**	5.00	50.00	30.00	90.00	**43.75**
4/2	Red Clover	35.67	14.67	35.67	60.00	**36.50**	10.00	45.00	40.00	80.00	**43.75**
4/3		56.00	22.33	54.67	25.67	**39.67**	15.00	55.00	25.00	70.00	**41.25**
5/1		27.00	17.33	51.33	36.00	**32.92**	50.00	50.00	45.00	65.00	**52.50**
5/2	Red Clover	38.00	36.33	33.00	46.67	**38.50**	45.00	55.00	70.00	70.00	**60.00**
5/3	Celpril	33.33	8.33	78.00	33.67	**38.33**	40.00	55.00	60.00	60.00	**53.75**
6/1		36.00	25.00	17.67	40.33	**29.75**	50.00	50.00	35.00	50.00	**46.25**
6/2	Red Clover	39.67	18.00	60.33	42.00	**40.00**	20.00	60.00	60.00	45.00	**46.25**
6/3	Seed Biotics	55.33	32.67	25.33	80.67	**48.50**	35.00	65.00	40.00	55.00	**48.75**
7/1		28.33	26.00	22.67	11.00	**22.00**	20.00	60.00	30.00	25.00	**33.75**
7/2	Birdsfoot trefoil	59.67	36.00	35.33	53.33	**46.08**	15.00	75.00	40.00	35.00	**41.25**
7/3		46.67	52.00	51.33	33.00	**45.75**	15.00	30.00	75.00	20.00	**35.00**
8/1		28.67	12.00	29.00	15.33	**21.25**	25.00	50.00	45.00	60.00	**45.00**
8/2	Birdsfoot trefoil	27.00	25.33	23.67	7.33	**20.83**	30.00	75.00	35.00	25.00	**41.25**
8/3	Celpril	41.33	28.33	20.00	16.33	**26.50**	40.00	75.00	30.00	65.00	**52.50**
9/1		28.00	18.33	24.00	8.33	**19.67**	20.00	60.00	50.00	20.00	**37.50**
9/2	Birdsfoot trefoil	34.00	27.33	40.33	20.00	**30.42**	30.00	65.00	60.00	30.00	**46.25**
9/3	Seed Biotics	44.67	40.67	41.33	11.00	**34.42**	10.00	55.00	60.00	40.00	**41.25**

Study 29I143G - Seed Coat/Seeding Rate Study					1999 Planting		1999 Evaluation		Table #6 - continued		
	Genus/Species										
Plot /	**Common Name**	**Cover Density (stems/row foot)**					**Percent Cover (Visual Observation)**				
Subplot #	**Source**	**Rep-1**	**Rep-2**	**Rep-3**	**Rep-4**	**Average**	**Rep-1**	**Rep-2**	**Rep-3**	**Rep-4**	**Average**
10/1		28.00	43.33	10.00	44.00	**31.33**	20.00	55.00	55.00	20.00	**37.50**
10/2	Ladino clover	29.33	31.33	34.33	9.67	**26.17**	30.00	50.00	40.00	5.00	**31.25**
10/3		33.33	29.67	50.00	22.33	**33.83**	40.00	45.00	30.00	25.00	**35.00**
11/1		28.00	17.00	28.67	16.67	**22.59**	25.00	70.00	5.00	40.00	**35.00**
11/2	Ladino clover	36.33	37.67	23.67	40.38	**34.51**	40.00	40.00	10.00	15.00	**26.25**
11/3	Celpril	53.33	20.33	42.67	28.00	**36.08**	45.00	50.00	15.00	30.00	**35.00**
12/1		28.00	8.00	40.00	23.33	**24.83**	35.00	10.00	10.00	50.00	**26.25**
12/2	Ladino clover	38.67	23.67	44.33	40.33	**36.75**	40.00	30.00	25.00	40.00	**33.75**
12/3	Seed Biotics	45.33	34.33	18.33	49.00	**36.75**	40.00	30.00	20.00	25.00	**28.75**
13/1		13.00	1.00	0.00	17.33	**7.83**	0.00	0.00	0.00	25.00	**25.00**
13/2	Annual Lespedeza	10.00	0.00	6.33	0.00	**4.08**	0.00	0.00	0.00	0.00	**0.00**
13/3		25.00	0.00	0.00	14.33	**9.83**	0.00	0.00	0.00	10.00	**10.00**
Cool Season Grasses Plots #14 - #19											
	Planted 4/13/99										
14/1		32.00	29.33	27.00	54.00	**35.58**	45.00	75.00	65.00	65.00	**62.50**
14/2	Tall fescue	17.67	44.67	37.00	43.33	**35.67**	35.00	80.00	85.00	99.00	**74.75**
14/3	Endophyte infected	36.67	47.00	30.67	51.67	**41.50**	65.00	80.00	70.00	97.00	**78.00**
15/1		0.00	0.00	0.67	0.00	**0.67**	0.00	0.00	55.00	0.00	**55.00**
15/2	Tall fescue	0.00	0.00	4.33	0.00	**4.33**	0.00	0.00	50.00	0.00	**50.00**
15/3	Endophyte free	0.00	0.00	1.33	0.00	**1.33**	0.00	0.00	45.00	0.00	**45.00**
16/1		27.33	35.67	10.33	19.33	**23.17**	80.00	50.00	20.00	60.00	**52.50**
16/2	Orchardgrass	35.67	49.67	11.00	16.33	**28.17**	90.00	70.00	35.00	75.00	**67.50**
16/3		30.67	34.00	28.67	20.33	**28.42**	95.00	85.00	45.00	70.00	**73.75**
17/1		30.67	32.33	15.67	6.67	**21.34**	30.00	45.00	20.00	15.00	**27.50**
17/2	Smooth brome	19.00	20.00	6.33	14.67	**15.00**	45.00	30.00	30.00	10.00	**28.75**
17/3		15.00	66.33	9.00	13.67	**26.00**	65.00	75.00	25.00	5.00	**42.50**

Study 29I143G - Seed Coat/Seeding Rate Study					1999 Planting		1999 Evaluation		Table #6 - continued		
	Genus/Species										
Plot /	Common Name	Cover Density (stems/row foot)					Percent Cover (Visual Observation)				
Subplot #	Source	Rep-1	Rep-2	Rep-3	Rep-4	Average	Rep-1	Rep-2	Rep-3	Rep-4	Average
18/1		3.33	0.00	4.00	18.33	**6.42**	50.00	50.00	20.00	1.00	**30.25**
18/2	Timothy	0.00	0.00	1.33	6.00	**1.83**	45.00	35.00	5.00	5.00	**22.50**
18/3		7.33	0.33	0.00	15.67	**5.83**	60.00	60.00	10.00	2.00	**33.00**
19/1		0.00	1.67	6.33	5.00	**3.25**	50.00	45.00	20.00	10.00	**31.25**
19/2	Canada wildrye	1.00	4.67	3.00	5.00	**3.42**	45.00	55.00	30.00	40.00	**42.50**
19/3		0.00	15.00	10.67	2.67	**7.09**	45.00	65.00	50.00	45.00	**51.25**
Warm Season Grasses Plots #20 - #23											
	Planted 4/21/99										
20/1		0.00	15.33	13.33	0.00	**14.33**	0.00	15.00	60.00	5.00	**26.67**
20/2	Eastern gamagrass	0.00	13.33	3.67	5.33	**7.44**	0.00	30.00	35.00	60.00	**41.67**
20/3	untreated	0.00	6.67	2.67	0.00	**4.67**	0.00	30.00	40.00	40.00	**36.67**
21/1		7.67	0.00	13.67	3.00	**8.11**	80.00	0.00	20.00	30.00	**32.50**
21/2	Eastern gamagrass	4.33	0.00	31.00	3.00	**12.78**	50.00	0.00	40.00	10.00	**25.00**
21/3	treated - wet	3.00	0.00	6.67	1.67	**3.78**	75.00	0.00	10.00	10.00	**23.75**
22/1		8.00	32.67	5.67	13.00	**14.84**	60.00	40.00	15.00	65.00	**45.00**
22/2	Switchgrass	11.00	33.33	6.00	5.67	**14.00**	65.00	55.00	10.00	50.00	**45.00**
22/3		9.00	30.67	13.00	5.33	**14.50**	60.00	40.00	25.00	70.00	**48.75**
23/1		38.67	5.33	4.00	6.00	**13.50**	50.00	5.00	20.00	10.00	**21.25**
23/2	Caucasian bluestem	17.00	2.33	8.67	1.33	**7.33**	60.00	5.00	40.00	10.00	**28.75**
23/3		22.67	15.00	1.67	8.67	**12.00**	60.00	10.00	50.00	25.00	**36.25**
24/1	Big bluestem	6.00	2.33	15.00	0.33	**5.92**	30.00	30.00	80.00	10.00	**37.50**
24/2		6.00	6.33	25.00	4.33	**10.42**	75.00	35.00	80.00	15.00	**51.25**
24/3		1.33	19.67	30.67	9.33	**15.25**	25.00	40.00	60.00	5.00	**32.50**

Study 29I143G - Seed Coating / Seeding Rates Study								Table # 7
Weather Data			**Monthly Precipitation (Inches)**					
		Year		**Year**		**Year**		
Month		**1998**		**1999**		**2000**		
April		3.32		4.18		0.84		
May		2.21		4.05		7.19		
June		5.57		2.00		6.23		
July		5.74		2.03		2.91		
August		0.31		0.45		6.01		
September		4.07		1.15		3.36		
October		2.7		1.88		3.3		
Total		**20.6**		**11.56**		**29.84**		

Study 29I143G - Seed Coating / Seeding Rates Study			Table # 8
	Areas Showing Significant Difference		
Analysis of legume plots only			
Reference NO.	**Evaluation Criteria**	**Significantly Different**	
		1998-1998	
1	Emergence Density	Rate	
2	Emergence Density	Treatment x Rate	
3	Stand Percent	Species	
4	Stand Percent	Rate	
5	Stand Percent	Species x Treatment x Rate	
6	Cover Density	Species	
7	Cover Density	Species x Treatment	
8	Visual Percent	Species	
9	Visual Percent	Rate	
		1998-1999	
10	Cover Density	Species	
11	Visual Percent	Species x Rate	
		1999-1999	
12	Emergence Date	Species	
13	Emergence Density	Species	
14	Emergence Density	Treatment	
15	Stand Percent	Species	
16	Stand Percent	Rate	
17	Cover Density	Species	
18	Cover Density	Rate	
17	Visual Percent	Species	
18	Visual Percent	Treatment	

Interpretation: The table above is a general summary of the analysis that shows where there is a significant difference between seeding rates, species, and treatment (coating) for the different evaluation criteria. In reference to seed coating, significant differences showed up in Numbers 14 and 18. Significant difference of seeding rates is expected and areas of no difference are important. Significant difference between species is expected in most instances.

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 - 1999

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. An evaluation was made in November 1999 which reflected 100% for all accessions included in this study. All plants exhibited good to excellent vigor with the majority rating excellent. There were little differences noted in the growth rate at this time; 5 - 5.5 feet.

Study Summary 2000

This study was initiated in Field # 7 on the PMC in April 1982. It was a cooperate effort between the Natural Resources Conservation Service (NRCS) and the Missouri Department of Conservation Service (MDC) Forestry Division. A total of sixty-three accessions of cottonwood were included in this study. Forty-two accessions came from MDC, 15 came from the U. S. Forest Service and six came from the NRCS. The objectives of the study were four-fold: 1. Document growth rate and pest resistance of each accession, 2. Obtain a research block of *Populus* sources for cultural, weed, and pest control research, 3. Provide materials for teaching and other educational purposes, such as demonstrations during field days, and finally 4. Release a superior selection(s) exhibiting fast growth, disease and insect resistance and adaptation.

Twelve out of the 63 initial accessions were selected as being the best performing plants in this assembly (See Table #1). Cuttings were taken from these accessions and provided to the Missouri State Nursery (MSN) in December 1996 for propagation and later sharing with the Elsberry Plant Materials Center (PMC) for further evaluation. In April of 1998 the MSN sent ten cuttings each of the selected accessions of cottonwood to the PMC for planting and further evaluations. These cuttings were planted in Field #7 on the PMC in April 1998. An evaluation on survival was made in November 1998. This evaluation reflected 100 percent survival on all 12 accessions. A final evaluation was made again in November 1999 which reflected good to excellent vigor with the majority of plants rating excellent. There were little differences noted in the growth rate of the different accessions at this time. The height ranged from 5 to 5.5 feet, spread ranged from 1.5 to 2.5 feet.

The State Conservationists' Advisory Committee for the Plant Materials Center approved the termination of this study on April 26, 2000, because private industry has become very interested in cottonwood to the degree of developing their own new cultivars.

The highest rating trees are still being maintained in Field #7 on the PMC.

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:

1994-2000

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. Presently there are 29 different species included in this study. Twenty-two of the total of 29 are exhibiting 100 percent survival. Five species have failed to survive. For more information regarding plant performances refer to Table #2.

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

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

Table #2 reflects the plants' performance for years 1990, 1991, 1992, 1998, 1999 and 2000.

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	4/69

Common			**Accession**	**Alternate**		**Date**

Name	**Genus**	**Species**	**Number**	**Number**	**Source**	**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			**Accession**	**Alternate**		**Date**

Name	**Genus**	**Species**	**Number**	**Number**	**Source**	**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*	*pennsylvanica*	548966		Cape May PMC	5/93
Wildwood bayberry	*Myrica*	*pennsylvanica*	434150		Cape May PMC	5/93
Wildwood bayberry	*Myrica*	*pennsylvanica*	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 - Evaluation of Miscellaneous Trees and Shrubs																								Table #2	
Tree							Date	No.	No. Survived						Ave. Ht. (Ft.)							Ave. Wd. (Ft.)				
No.	Common Name	Genus	Species	Accn #	Alt. No.	Source	Plt.	Plt.	90	91	92	98	99	OO	90	91	92	98	99	OO	90	91	92	98	99	OO
1	Densehead mt. ash	Sorbus	alnifolia		7761	F.K. Nursery	Nov-65	2	2	2	2	2	2	2	21	22	22	25	25.5	25.7	8.2	8.2	8.2	12	12.4	12.9
						(Elsberry, MO)																				
2	Ruby' redosier dog.	Cornus	stolonifera	443229		Big Flats, NY	5/9/89	4	4	4	4	4	4	4	0.7	3.7	3.9	4	4.7	4.7	1.8	3.6	4.8	3.5	4	4.2
3	Late lilac	Syringa	villosa	9006228		Bismark, ND	5/9/89	4	4	4	3	0	0	0	0.4	0.7	2.3	0	0	0	1.2	1.3	2.4	0	0	0
4	Redstone' cornelian	Cornus	mas	9055585		Elsberry, MO	5/9/89	3	3	3	3	3	3	3	1.4	1.9	2.8	4.5	5	5	0.4	0.8	1.4	4.5	5	5.5
	cherry dogwood																									
5	Roselow' sargent	Malus	sargentii	477986		Roselake, MI	5/9/89	3	3	3	3	0	0	0	2	2.7	2.9	0	0	0	1	1.7	2.6	0	0	0
	crabapple																									
6	Elsmo' lacebark elm	Ulmus	parvifolia	9004438		Elsberry, MO	5/9/89	2	2	2	2	2	2	2	5.4	9.6	11.8	27	27.4	27.6	3.3	6.4	7.4	16	16.5	17
7	Blueleaf honeysukle	Lonicera	korolkowi	9062152		Nebraska	5/9/89	6	6	6	6	6	6	6	4	6.8	8	12	12.4	12.4	5.6	8.8	9.8	13	13.3	13.8
8	Birch	Betula	species	502295		Ames, IA	4/16/90	3	1	1	1	1	1	1	3.4	3.4	4.1	6	6.5	6.8	1.5	1.9	2.8	5	5.7	6
9	Willow oak	Quercus	phellos		4723	Ames, IA	4/16/90	4	4	4	4	4	4	4	1.7	2.6	4.1	23	23	23	1	1.8	3.7	12	12.5	12.9
10	Fragrant epaulettetree	Pterostyra	hispida		A-8079	Ames, IA	4/16/90	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	Bradford pear	Pyrus	calleryana		19173	F.K. Nursery	4/21/69	2	2	2	2	2	2	1*	27	27	27	29	29.7	17*	20	20	21	33	33.6	15*
						(Elsberry, MO)																				
12	Prairie rose	Rosa	setigera	495616		Ames, IA	4/16/90	2	2	2	2	2	2	2	1.5	3.7	4.7	6.6	7	7	1.6	5.5	5.9	10	10.4	10.7
13	Ural falsespirea	Sorbaria	sorbifolia		7778	Ames, IA	4/16/90	7	7	7	7	7	7	7	1	1.8	2.3	5	5	5	0.6	1.8	2.1	6	6.5	6.9
14	Weeping lilac	Syringa	pekinensis	478008		Ames, IA	4/16/90	3	2	2	2	2	2	2	1	1	1.5	7	7.3	7.7	0.7	1	2	7.5	7.8	8
15	Flameleaf sumac	Rhus	copallina		7764	Ames, IA	4/16/90	4	2	2	2	2	2	2	1.6	2.9	5.3	7	7.7	7.9	0.8	2.8	5.3	8	8.3	8.5
16	Western paper birch	Betula	occidentalis	495882		Ames, IA	4/16/90	3	2	2	2	2	2	2	1.3	4.5	3	8	8.8	9.1	0.3	2.4	3.9	5	5.6	5.9
17	Honeysuckle	Lonicera	maackii	477998		Ames, IA	4/16/90	4	3	3	3	3	3	3	0.7	1.5	2.7	7.8	7.9	7.9	0.6	1.2	2.7	4.5	5	5.5
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	0	0	0	0	0	0
19	Blackhaw	Viburnum	prunifolium		2813	Ames, IA	4/16/90	4	2	2	2	2	2	2	2.6	2.7	3.4	8	8.5	8.7	0.7	1.3	2.4	5	5.3	5.5
20	Largeleaf dogwood	Cornus	macraphylla		10178	Ames, IA	4/18/90	3	3	3	3	3	3	3	1.7	2.2	3	7.5	7.9	8	0.5	0.9	1.7	4.5	5	5.4
21	Border privet	Ligustrum	obtusifolium	477010		Ames, IA	4/18/90	4	0	0	0	0	0	0	1.4	2.4	2.6	0	0	0	0.8	2.3	2,3	0	0	0
22	Willow oak	Quercus	phellos		4724	Ames, IA	4/18/90	4	4	4	4	4	4	4	1.3	3.1	4.4	13	13.3	13.5	0.8	2.4	3.8	12	12.4	12.7
23	Arrowwood	Viburnum	dentatum			Lovelace	Apr-91	5	4	4	4	4	4	4	2	4.3	4.5	7	7	7	0.5	2	2.4	4.5	4.7	4.9
						Seed (Elsberry, MO)																				
24	Redbud	Cercis	canadensis	496399		Ames, IA	5/8/91	3	3	3	3	3	3	3	0.5	3.2	3.7	11	11.4	11.6	0.25	0.5	2.7	10	10.5	10.8
25	Birch	Betula	nigra	14942		Ames, IA	5/8/91	5	3	3	3	3	3	3	0.5	0.7	1.4	11	11.3	11.7	0.4	0.4	1.4	7	7.4	7.9
26	Wichita' osage orange	Maclura	pomifera			Kansas	Apr-92	1	1	1	1	1	1	1	0.5	0.5	1	13	13.2	13.5	0.25	0.25	2.5	13	13.2	13.7
27	Denmark osage orange	Maclura	pomifera			Denmark, IA	6/19/92	1	1	1	1	1	1	1	0.5	0.5	1	13	13.2	13.5	0.25	0.25	0.5	7	7.3	7.7
28	Autumn olive	Eleagnus	umbellata			Americus, GA	4/26/99	5				5	5	5				2.5	3	3			1.5	2	3	3.4
29	Austree willow	Salix Matsudana X Alba				Colorado	4/14/95	2			2	2	2	2			3.5	30	31	31			2	10	10.5	11
	*Severe Wind Damage																									

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.

1994-1999

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.

2000
Study Summary

This study was initiated in Field #3 on the PMC on April 19, 1991. The objective of this study was to evaluate growth and survivability of selected coniferous species for possible use in Missouri, Illinois, and Iowa Technical Guides for use in windbreaks. Because of severe insect damage to the four plant species initially planted, this study was reestablished on April 21 and 28, 1993 in Field #3. Twenty-three coniferous species of pine, spruce, fir, larch, cedar and hemlock were planted. Two additional species was planted in April 1994, Canadian hemlock and jack pine, this made a total of 25 different species assembled in this study. Six species failed to survive probably due to drought years, competition and mechanical damage: jack pine, Canadian hemlock, noble fir, alpine fir, black spruce, and western hemlock. The best surviving species in this study is the Norway spruce followed by the ponderosa pine, red and white pines, northern white cedar and balsam fir. The trees reaching the greatest heights were the European larch (10' 8"), Port Orford cedar (8'5"), hybrid larch (8'3"), white pine (8'3") and the Ponderosa pine 8' 3"). For more detailed information regarding plants' performance refer to Table #1.

The State Conservationists' Advisory committee for the Elsberry Plant Materials Center approved the termination of this study on April 26, 2000.

Study 29A121W - Conifer Evaluation for Windbreak						Plant Performance Data for 1995-2000												Table #1				
Plant						Date	No.	No. Survived					Ave. Ht. (ft)					Ave. Wd. (ft)				
No.	Common Name	Genus	Species	Acc. No	Source	Plted	Plted	95	96	98	99	2000	95	96	98	99	2000	95	96	98	99	2000
1	Jeffrey pine	Pinus	jeffreyi	9083176	Lawyer Nur.	4/21/93	12	10	7	4	4	4	0.77	1.52	4.18	4.5	4.9	1.75	2	2.42	2.7	3.1
2	Noble fir	Abies	procera	9083177	Lawyer Nur.	4/21/93	12	1	0	0	0	0	1	0	0		0	1	0	0	0	0
3	White spruce	Picea	glauca	9083178	Lawyer Nur.	4/21/93	12	6	6	5	5	5	1.68	2	3.53	4	4.3	1.5	2	2.37	3	3.4
4	Engleman spruce	Picea	englemanni	9083179	Lawyer Nur.	4/21/93	12	9	8	4	4	4	1.27	1.13	2.85	3.3	3.5	0.8	1.25	1.9	2.2	2.5
5	Alpine fir	Abies	lasiocarpa	9083180	Lawyer Nur.	4/21/93	12	4	3	0	0	0	0.5	0.67	0	0	0	0.5	0.7	0	0	0
6	Incense cedar	Calocedrus	decurrens	9083181	Lawyer Nur.	4/21/93	12	11	3	3	3	3	2.69	3.01	5.5	6	6.5	1.8	2.2	2.57	3.3	3.6
7	Balsam fir	Abies	balsamea	9083182	Lawyer Nur.	4/21/93	12	9	9	8	8	8	1.93	2.78	6.03	6.4	6.8	2.5	3.2	3.14	3.5	3.9
8	Port Orford cedar	Chamaecyparis	lawsonian	9083183	Lawyer Nur.	4/21/93	12	10	9	7	7	7	3.43	5.07	7.66	8	8.5	3	3.9	5	5.5	6.1
9	Norway spruce	Picea	abies	9083184	Lawyer Nur.	4/21/93	12	12	12	12	12	12	2.2	2.73	5.83	6.2	6.7	3	3.5	4.37	4.7	5.2
10	West Coast D. fir	Pseudotsuga	menziesii	9083185	Lawyer Nur.	4/21/93	12	10	7	5	5	5	1.72	1.9	5.72	5.9	6.1	1.5	2.25	2.78	3	3.4
			glauca																			
11	Oriental spruce	Picea	orientalis	9083186	Twin Brook	4/21/93	12	12	11	8	8	8	1.4	1.59	3.03	3.3	3.6	1	1.5	2.13	2.3	2.5
					Plantation																	
12	Limber pine	Pinus	flexilis	9083187	Lawyer Nur.	4/21/93	12	7	1	1	1	1	0.64	2.5	3.25	3.5	3.7	1	1.5	1.87	2.2	2.4
13	Lodgepole pine	Pinus	contorta	9083188	Colorada	4/21/93	12	11	7	6	6	6	1.8	2.1	5.2	5.5	5.8	2	2.7	3.3	3.7	4.1
			latifolia																			
14	Hybrid larch	Larix x	eurolepsis	9083189	Lawyer Nur.	4/21/93	12	8	7	7	7	7	2.45	3.74	7.29	7.7	8.3	2.5	3	3.51	4	4.4
15	Ponderosa pine	Pinus	ponderosa	9083190	Lawyer Nur.	4/21/93	12	11	11	10	10	10	2.21	3.21	7.36	7.9	8.2	3.5	4.9	5.95	6.5	6.9
16	Black spruce	Picea	mariana	9083191	Lawyer Nur.	4/28/93	12	1	1	1	1	1	1.5	2	7.6	0	0	3	4.5	6.4	0	0
17	Red pine	Pinus	resinosa	9083192	MO State Nur.	4/28/93	12	12	11	10	10	10	1.55	1.99	5.06	5.3	5.5	2.75	3.5	4.27	4.5	4.8
18	White pine	Pinus	strobus L.	9083193	Van Pines Nur.	4/28/93	12	12	11	10	10	10	1.96	2.81	6.98	7.8	8.3	2	3.5	4.73	5.4	6.2
19	Western hemlock	Tsuga	heterophylla	9083194	Lawyer Nur.	4/28/93	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	Northern W. cedar	Thuja	occidentalis	9083195	Lawyer Nur.	4/28/93	12	12	12	9	9	9	2.85	3.75	8.09	8.7	9	3.5	4.25	5.95	6.6	7.1
21	Grand fir	Abies	grandis	9083196	Lawyer Nur.	4/28/93	12	6	5	4	4	4	1.33	1.4	3.55		4.1	1	1.85	2.13	2.4	2.7
22	Fraser pine	Abies	fraseri	9083197	Lawyer Nur.	3/28/93	12	6	5	2	2	2	1.4	1.82	5	5.3	5.9	1	1.75	2.45	3.8	4.3
23	European larch	Larix	decidua	9083198	Lawyer Nur.	3/28/93	12	10	6	4	4	4	3.28	4.2	10.4	10.5	10.8	3.9	4.8	6.78	7.1	7.4
24	Canadian hemlock	Tsuga	canadensis	9083199	Lawyer Nur.	3/28/94	12	8	0	0	0	0	0	0	0	0		0	0	0	0	0
25	Jack pine	Pinus	banksiana	9083200	Lawyer Nur.	3/28/94	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Study 29A121W - Conifer Evaluation for Windbreak **Table #2**

Plant Layout Map **Field #3**

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: 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 anthranose, 12 to 15 plants from three specified parks for a period of 30 to 40 years.

C. Provide, upon request, a report on the status of the plants maintained by NRCS.

D. Provide a study coordinator for all activities performed by NRCS under the terms of the Interagency Agreement.

E. Provide seed to the NCR upon request.

Discussion:

1994 - 1999

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 four to four and a half feet; spread ranges from three to three and a half feet. Vigor is excellent along with its resistance to insects and diseases. There have been no indications of the anthranose disease affecting these plants.

2000

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

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 - 1999

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, March 1996 and again in November of 1999.

Table #1 reflects the measurements taken in 1992, 1994, 1996 and 1999.

Table #2 reflects the summary of deposition at the different locations for 1992, 1994, 1996 and 1999.

2000
Study Summary

Established in May 1991 in Field #2 on the PMC, this study encompassed one-quarter mile of vege-terrace using eight inch squared pieces of 'Cave-In-Rock' switchgrass sod. These pieces of sod were placed one foot apart. In the concentrated flow areas the sod was placed leaving no space between them. Six iron posts were placed throughout the terraces to mark the locations the measurements would be obtained year after year. Measurements of sedimenet deposition were taken at the six locations in 1994, 1996 and 1999. The average sediment depositions for each of the six locations are as follows:

Northeast Location:	.1296	Southeast Location	.1574
North Central Location	.2704	South Central Location:	.3241
Northwest Location:	.1444	Southwest Location:	.1685

The greatest location deposition measured was 0.75 foot at the South central location in 1999. The lease location deposition measured was 0.000 foot at the Southeast location in 1994.

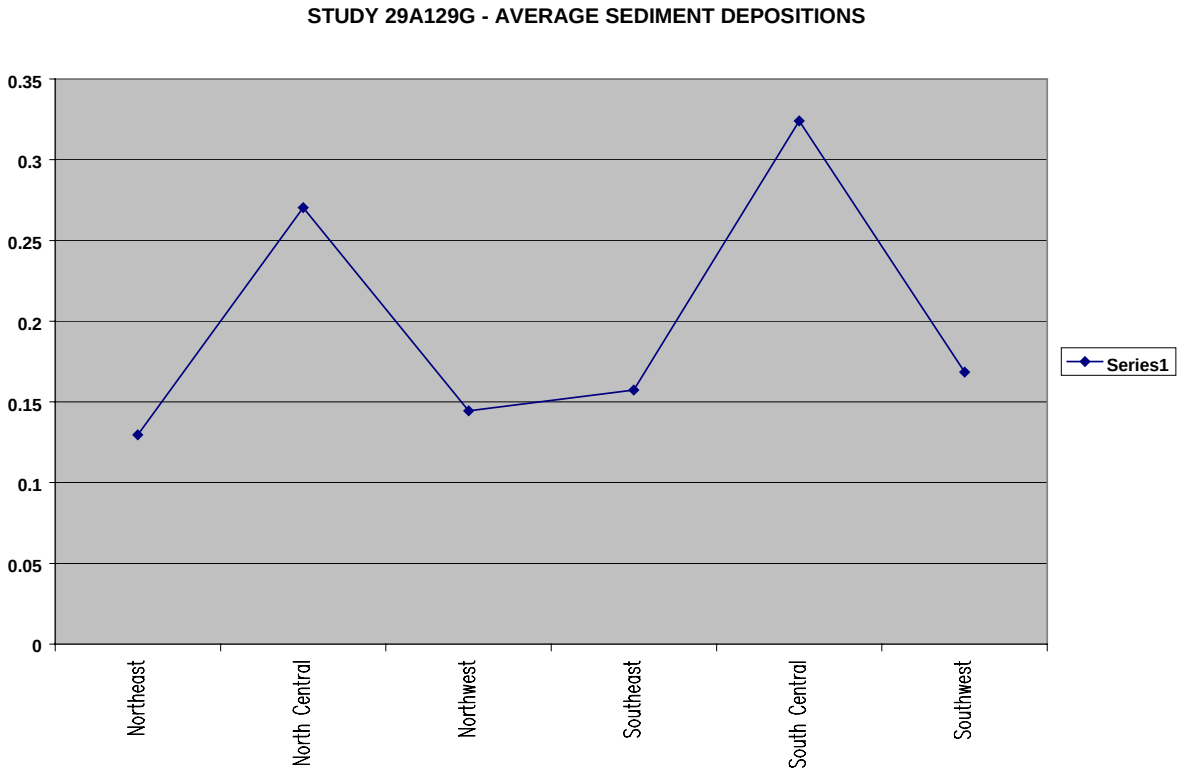
The following Graph #1 reflects the average depositions in 1994, 1996 and 1999.

Grass hedges can be a relatively economical means to slow runoff water and reduce soil loss. There are several factors that will influence the success of grass hedge establishment including grass selection, seed quality, seedbed preparation, planting procedures, timing, and management practices during the following establishment. Failure to consider any of these factors may jeopardize the success of grass hedge establishment. Grass hedge establishment is not simple or easy, but the rewards from a well-established grass hedge should offset the effort.

A paper entitled 'Guidelines for establishing warm season grass hedges from erosion control' was published in the Journal of Soil and Water Conservation in the January – February 1996 issue.

Additional information regarding grass hedges can also be found in the minutes of the National Grass Hedge Conference held on October 17 and 18, 1994.

Graph#1


STUDY 29A129G - AVERAGE SEDIMENT DEPOSITIONS
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Northeast
North Central
Northwest
Southeast
South Central
Southwest
Series1

Study: 29A1370

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 - 1999

A large wetland was constructed in Field #4 on the Plant Materials Center in July 1994. Selected plant materials were planted with the intent of evaluating these plants for flood tolerance. The PMC has been working with a flood tolerant switchgrass since 1991. As a result, it was placed in this wetland for further testing along with six accessions of eastern gamagrass which were found growing in wet conditions: accessions 9078842, 9078844 and 9078843 were collected in Atchison County Missouri, 9078845 collected in Holt County Missouri, 9078840 collected in Chariton County Missouri and 9078846 was collected in Clinton County Missouri. Local collections of bermudagrass and swamp milkweed were planted in the spring of 1998. Two collections of prairie cordgrass (Cuivre Island and Lost Creek) were also planted in this wetland. The switchgrass, eastern gamagrass and the prairie cordgrass were planted in 1997. All plants in this wetland were given time to establish prior to the beginning of the flooding operation which took place in October 1999. The wetland was flooded to a depth of 40 inches. This water remained in the wetland until early spring of 2000. Once the water is drained out of the wetland and enough time elapses for plant regrowth, evaluations on survival will take place.

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

2000

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

Study 29A1370 - Wetland Species in Wetland at Elsberry PMC							Table #1
Plugs Planted 5-2-97 (Eastern Gamagrass)					Date Evaluated: 9/19/00		
2000 Data: Flood Event from 11-3-1999 - 3-30-2000							
	Total #	Active	Weed	Disease/	Developed		
	Planted	Growing	Comp.	Insect	Seed Head	Vigor	Ave. Ht.
Eastern Gamagrass 9078840 Chariton, Missouri. 5' spacing, planted 5/2/97.							
						25 plants planted	
Date Eval.							
7/9/98	20	20	severe	moderate	yes	good	2'5"
9/29/99	20	20	moderate	slight	yes	good/exc	3'5"
5/11/00	19	17	moderate	moderate	none	poor	6"
9/19/00	13	13	mod/sev	slight rust	none	good	2' 5"
Percent surviving as of 9/19/00 was 52%							
Eastern Gamagrass 9078844 Atchison, Missouri. 7' spacing, planted 5/2/97.							
						18 plants planted	
Dave Eval.							
7/9/98	12	12	severe	moderate rust	yes	poor	2'5"
9/29/99	12	12	moderate	moderate rust	yes	fair	2'5"
5/11/00	12	10	moderate	moderate	none	poor	6"
9/19/00	13	13	severe	slight rust	Yes	fair	2' 0"
Percent surviving as of 9/19/00 was 72%							
Eastern Gamagrass 9078842 Atchison, Missouri. 15' spacing, planted 5/2/97.							
						9 plants planted	
Date Eval.							
7/9/98	5	5	severe	none	yes	fair	2'0"
9/29/99	5	5	severe	none	yes	fair	2'5"
5/11/00	5	3		none	0	poor	6"
9/19/00	4	4	severe	none	none	fair	20"
Percent surviving as of 9/19/00 was 44%							
Rating for Vigor: 1=Excellent; 9=Poor							
Rating for Weed Competition and Dis/Insect: 1=Excellent; 9=Severe							
Study 29A1370 - Wetland Species in Wetland at Elsberry PMC						Table #1-continued	

	Total #	Active	Weed	Disease/	Developed		
	Planted	Growing	Comp.	Insect	Seed Head	Vigor	Ave. Ht.
Eastern Gamagrass 9078846 Clinton, Missouri. 8' spacing, total planted 5/2/97.							
						16 plants planted	
Date Eval.							
7/9/98	11	11	severe	none	yes	good	2'0"
9/29/99	11	11	moderate	none	yes	good	2'5"
5/11/00	8	8	moderate	none	none	poor	7"
9/19/00	10	10	severe	slight rust	none	fair	2' 0"
Percent surviving as of 9/19/00 was 63%							
Eastern Gamagrass 9078843 Atchison, Missouri. 15' spacing, planted 5/2/97.							
						9 plants planted	
Date Eval.							
7/9/98	13	13	severe	none	yes	poor	2'5"
9/29/99	13	13	moderate	none	yes	moderate	3'0"
5/11/00	5	5		none	none	poor	7"
9/19/00	10	10	severe	slight rust	none	fair	2' 0"
Percent surviving as of 9/19/00 was 100%							
Eastern Gamagrass 9078845 Holt, Missouri. 8' spacing, planted 5/2/97.							
						16 plants planted	
Date Eval.							
7/9/98	12	12	severe	none	yes	good	3'5"
9/29/99	12	12	severe	none	yes	good	3'0"
5/22/00	12	9	severe	none	none		8"
9/19/00	16	16	severe	slight rust	yes	good	2' 5"
Percent surviving as of 9/19/00 was 100%							
Rating for Vigor: 1=Excellent; 9=Poor							
Rating for Weed Competition and Dis/Insect: 1=Excellent; 9=Severe							
Study 29A1370 - Wetland Species in Wetland at Elsberry PMC						**Table #1-continued**	
	Total	**Active**	**Weed**	**Disease/**	**Developed**		
	Plant #	**Growing**	**Comp.**	**Insect**	**Seed Head**	**Vigor**	**Ave. Ht.**
Pete Eastern Gamagrass 5' spacing, 25 total planted 5/2/97.							

						25 plants planted	
Date Eval.							
7/9/98	21	21	severe	light	21/21	good	3' 5"
9/29/99	21	21	severe	light	21/21	good	3'0"
5/11/00	21	20		light		fair	10"
9/19/00	21	21	severe	light rust	17/21	excellent	3' 0"
Percent surviving as of 9/19/00 was 84%							
Rating for Vigor: 1=Excellent; 9=Poor							
Rating for Weed Competition and Dis/Insect: 1=Excellent; 9=Severe							

Study 29A1370 - Wetland Species in Wetland at Elsberry PMC							Table #2	
Plugs Planted 6-24-97 (Flood Tolerant Switchgrass)								
2000 Data: Flood Event from 11-3-1999 to 3-30-2000								
	% Cover/	Active	Weed	Disease/	Developed			
	Plant #	Growing	Comp.	Insect	Seed Head	Vigor	Ave. Ht.	
Switchgrass 9062213 3' spacing, 41 total planted (plugs) 6/24/97.								
Date Eval.								
7/9/98		35 plants	moderate	none	all plants	poor/fair	2'.0"	
9/29/99		35 plants	moderate	none	all plants	fair	2'.5"	
4/26/00		35 plants	moderate	none	none	exc.	5" regrowth	
9/19/00	85% row	85% row	moderate	none	all plants	exc.	4'.5"	
Percent surviving as of 9/19/00 was 85%								
Switchgrass 9062235 4' spacing, 31 total planted (plugs) 6/24/97.								
Date Eval.								
7/9/98		22 plants	moderate	none	all plants	poor/fair	5'.5"	
9/29/99		22 plants	moderate	none	all plants	fair	5'.0"	
4/26/00		26 plants	moderate	none	none	exc.	6.5"	
9/19/00		26 plants	moderate	none	All plants	exc.	4' 5"	
Percent surviving as of 9/19/00 was 84%								
Switchgrass 9062193 5' spacing; 25 total planted (plugs) 6/24/97.								
Date Eval.								
7/9/98		17 plants	moderate	none	all plants	fair	3'5"	
9/29/99		17 plants	moderate	none	all plants	good	4'5"	
4/26/00		21 plants	moderate	none	all plants	exc.	6'5"	
9/19/00		21 plants	moderate	none	all plants	exc.	5'0"	
Percent surviving as of 9/19/00 was 84%								
Study 29A1370 - Wetland Species in Wetland at Elsberry PMC						Table #2 - continued		
	% Cover/	Active	Weed	Disease/	Developed			

	Plant #	Growing	Comp.	Insect	Seed Head	Vigor	Ave. Ht.	
Evaluation Date:		September 19, 2000						
Cave-In-Rock Switchgrass 23 plants planted.								
Date Eval.								
4/18/00	23	23	severe	none	none	good	5"	
9/19/00	9	growing	severe	none	6/1	poor	2'. 0"	
		weak						
Percent surviving as of 9/19/00 was 39%								
Flood Tolerant Switchgrass, seeded 50' row plus 3' wide.								
Date Eval.								
Seeded 6/1/00 50' x 40" plot - .0038 ac. Rate 6# PLS/ac.								
9/19/00	15%-	fair	moderate	none	6/5 5%	good	8"	
	20% of							
	50' row							
Flood tolerant switchgrass plugs block, 63 plants planted 5/25/99.								
Date Eval.								
4/26/00	92%	58 plants	none	none	6/5 100%	exc.	6'5"	
9/19/00	95%	95%	none	none	6/5 100%	exc.	4' 5"	
Bermudagrass block plugs, planted 5/25/99.								
Date Eval.								
9/28/99	35%	100%	light	none	50%	exc.	3"	
4/26/00		100%	light	none	none	exc.	3-5"	
9/19/00	100%	100%	light	none	100%	exc.	9"	

	% Cover/	Active	Weed	Disease/	Developed			
	Plant #	Growing	Comp.	Insect	Seed Head	Vigor	Ave. Ht.	
Swamp milkweed block 8 rows plugs, 1' center planted 5/25/99.								

Date Eval.								
9/28/99	8 plants		severe foxtail	none	none	poor	9"	
5/11/00	46 plants		moderate	none	none	poor	8"	
9/19/00	30%	30%	moderate	none	30%	fair	14"	

Study 29A1370 - Wetland Species in Wetland at Elsberry PMC							**Table #3**		
Prairie Cordgrass									
2000 Data: Flood Event from 11-3-1999 - 3-30-2000									
		Active					**Ave. Ht.**	**Average**	
	Total #	**Growing**	**Weed**	**Disease/**	**Developed**		**Seed**	**Forage**	
	Planted	**Spreading**	**Comp.**	**Insect**	**Seed Head**	**Vigor**	**Head**	**Height**	
							10' x 10'		
Prairie Cordgrass Collection, planted 9/29/97							3 | 2 | 1		
East ⟶							6 | 5 | 4		
							9 | 8 | 7		
7/9/98	9	6" average	severe	none	NA	exc.	-	-	
8/1/99	9	30" average	moderate	none	9/9	good	-	-	
9/19/00	9	4'.5" ave.	none	none	9/9	exc.	6'.5"	5'.0 forage	
Percent surviving as of 9/19/00 was 100%									
Cuivre Island Prairie Cordgrass Collection, planted 5/15/98						▲	3' x 3'		
					North		4 |3 | 2| 1		
							8 | 7| 6| 5		
7/9/98	8	5.'5"	severe	none	6 plants	good/exc.	4'.0"	4'.0"	
5/25/99	8	1'.5" each	moderate	none	none	exc.	none		
		direction							
Lost Creek Prairie Cordgrass Collection, planted 5/15/98							3'x3'		
							12|11|10|9		
							16|15|14|13		
7/9/98	8	6"	severe	none	4 plants	good/exc.	4'.0"	4'.0"	
5/25/99	8	1'.5" each	moderate	none	none	exc.	none		
		direction							
9/19/00									
Total block for both collections			none	none	35%	exc.	6' 0"	5' 0"	
								More lodging Cuivre	
								Island collection	
9/19/00									
14' x 13'5" total spread of blocks			none	none	35%	exc.	6'.0"	More lodging Cuivre	
								Island collection	
9/19/00									
3' x 3' block is filled in total									
prairie cordgrass			none	none	35%	exc.	6'.0"	More lodging Cuivre	
								Island collection	
Rating for vigor, Dis/Ins Weed Competition: 1=Excellent; 9=Poor									

Study Number: 29A145

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

Study Leader: Bruckerhoff, S. B.

Introduction:

Fort Leonard Wood, Missouri is a United States Army military training base. It is located in south central Missouri in Pulaski County. Soils in areas of intense training have become compacted and denuded of vegetation resulting in erosion problems. This demonstration will aid in the selection of vegetation which is the most tolerant to wear by vehicle or troop traffic. Selection criteria of evaluated species are known or thought to have resistance to wear. This study could also be applicable to similar problem areas in parks, recreational areas and playgrounds.

Background:

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 re-vegetate denuded corridors or newly developing high traffic areas in their area of effectiveness. Native species that are low maintenance and in most cases low growing are highest priority.

Description of Area:

Fort Leonard Wood is located in Pulaski County in south central Missouri approximately 125 miles southwest of St. Louis. It is in Major Land Resource Area (MLRA) 116A, Ozark Highland and plant hardiness zone 5. The climate is hot in the summer and cool in the winter. Rainfall is fairly heavy and well distributed throughout the year. The average frost-free period is April 1to April 15 through October 15 to October 31. The average frost-free season is190 to 205 days.

Most of the soils in the area are uplands and vary in texture and natural drainage. Most are formed in material weathered from cherty or chert-free limestone or in a thin layer of loess and the underlying cherty limestone residuum.

Site #1, Barracks, was mapped as a Lebanon silt loam with a taxonomic classification of Fine, mixed, mesic Typic Fragiudalfs. This site was disturbed during construction and compacted from use during training.

Site #2, TA-244, was mapped as Viraton silt loam with a taxonomic classification of Fine-loamy, siliceous, mesic Typic Fragiudalfs with inclusions of Clarksville very cherty silt loam with a taxonomic classification of Loamy-skeletal, siliceous, mesic, Typic Paleudults. This site was disturbed by clearing of trees and compacted during training operations with equipment.

Site #3, Shooting Range, was mapped as Udorthents with a taxonomic classification of Mixed, mesic Udorthents and also has inclusions of Clarksville. This site was disturbed and compacted by the construction of the shooting range.

Site #4, Bivouac, was mapped as Lebanon with inclusions of Clarksville as described above. This site was compacted from very concentrated use by troops.

V. 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 written information were the Agriculture Handbook No. 170, Grass Varieties of the United States, Agriculture Research Service, National Turfgrass Evaluation Program, U. S. Golf Association, and the Turfgrass and Environmental Research Summary. A summary of this information is in Table #2. Other information was received from the Natural Resources Department at Fort Leonard Wood, University of Missouri at Columbia, and other USDA Natural Resources Conservation personnel.

VI. MATERIALS AND METHODS. . .

A. Species

Typically tall fescue is one of the main species being used for critical area stabilization. In many instances it is successful, but cool season grasses like tall fescue struggle as the climate gets hotter and dryer and are placed on droughty soils. Fort Leonard Wood is in a transition zone between cool season and warm season species where both perform good or bad depending on the soil, use, and weather conditions. See Table #3 for the list of species used in this study.

B. Site Description

This study was conducted on four different locations on Fort Leonard Wood described below.

Site No.	Site Name.	Description	Problem
1	Specker Barracks	Upland Lawn used for training. Full Sun. Compacted.	Intense wear from foot traffic.
2	TA-244	Upland. Full Sun. Compacted	Heavy vehicle traffic.
3	Shooting Range	Sloping upland. Full sun. Compacted	Maintenance traffic and small arms damage.
4	Bivouac	Upland. Heavy shade. Compacted.	Heavy foot traffic.

Site #1 is the lawn between two barracks that gets considerable use for troop training. It has slopes of 3 to 7 percent and is reseeded often due to lack of vegetation causing the lawn to be unsightly and causing an erosion hazard. The soil is droughty due to compaction, rocks, disturbance and clay content.

Site #2 is an upland ridgetop used for heavy equipment training. The site has full sun and slopes of 1 to 5 percent. This site is very droughty due to soils with low water holding capacity and also from compaction. Lack of vegetation on these types of sites cause erosion problems especially as the slopes get steeper.

Site #3 is an upland hillside used as a firing range. The site has full sun with west facing slopes from 5 to 15 percent. This site is droughty due to low water holding capacity gravelly soils, slope and exposure. Lack of vegetation on this type of site causes erosion problems.

Site #4 is an upland ridgetop used as training area for bivouac. The site has moderate to heavy shade with slopes from 2 to 5 percent. This site is droughty due to compaction, the soil, and competition from trees. This site has concentrated foot traffic that destroys the under story and causes erosion problems.

C. Experimental Design

Site #1 is a randomized complete block, split plot design. Each plot was split in half the summer following establishment. A fence was used to contain the inner half of each plot and the area between replications 1, 2 and 3, 4. The next year the fence was moved again to split the half plot that did not have traffic. This resulted in a half plot that received traffic two years, a fourth of a plot that received traffic in one year only, and a fourth of a plot that received no traffic. First year foot traffic started July 15, 1999, with approximately 35 soldiers running ten laps a day, five days a week. The second year new traffic started May 1, 2000, with approximately the same intensity. Usage was sporadic at times and it was not possible to monitor it completely. When the fences were moved for the second year traffic to start, the area opened the first year was also subject to usage but the most intensive use was closest to the fence in the second year part of the plot.

Site #2 is a randomized complete block, split plot design. Each plot was split into seven subplots of varying degrees of traffic. The subplots included a check with no traffic, low, medium and high intensity tire traffic from a 3/4 ton 4x4 pickup, and low, medium, and high intensity traffic from an ACE (Armored Combat Earthmover) tank-like vehicle. Plots were exposed to traffic on the following dates: August 27, 1999, May 17, 2000, June 20,2000, and August 2, 2000. Intensities were 12, 24, and 36 passes for low, medium, and high tire traffic and 8, 18, and 26 passes for low, medium, and high track traffic.

Site #3 is a Latin square design with split plots and five replications. The plots are on a firing range where they are exposed to small arms fire. Each plot was split into thirds as intensity decreased considerably the farther from the target and bullet path the plot became. The firing range was used almost on a daily basis during good weather.

Site #4 is a randomized complete block with four replications. The plots are on a bivouac site that normally gets a high concentration of foot traffic. A change in military use patterns at the fort resulted in this area not being used during the study time period. The plots were evaluated but results will be interpreted for shade tolerance rather than wear tolerance.

D. Plot Installation and Maintenance

Seed and/or plants were purchased from commercial sources, donated by seed companies, or secured through the plant materials program. Any existing vegetation was destroyed from each site by chemicals, tillage or both. A total of 133 plots were planted the spring of 1998 and a couple of failures were replanted in 1999. 1998 was an establishment year with no traffic applied until 1999. The exception was the shooting range where control of its use was not possible. Chemical weed control, primarily 2,4-D, and fertility were used to enhance establishment but weed control problems were still encountered. Each
Site had a soil test prior to establishment.

E. Treatment Applications

Site #1, barracks lawn, had foot traffic as treatments for wear tolerance. Foot traffic started the year after establishment on or around July 5, 1999, with approximately 35 soldiers running ten laps a day, five days a week, crossing all plots each lap. The second year after the establishment year, new traffic was started on an unused portion of the plot. This new traffic was started on or around May 1, 2000, with approximately the same total intensity as the year before but the troops could spread out into both the new traffic and old traffic areas. The new traffic area received most of the use with the old traffic area getting less than the year before. Usage was sporadic at times and it was not possible to monitor it completely.

Site #2, TA-244, had tire traffic and track traffic as treatments for wear tolerance. The tire traffic came from a 3/4 ton 4x4 pickup truck at low, medium, and high intensity defined as 12, 24 and 36 passes across each subplot. The track traffic came from an ACE that weighs approximately 17 tons. It has 16-inch wide tracks and an 8-inch wide raised rubber section in the middle of the track. Traffic was applied at low, medium and high intensity defined as a total of 8, 18, and 26 passes across each subplot. Traffic was applied August 27, 1999, May 17, 2000, June 20, 2000, and August 2, 2000.

Site #3, Shooting Range had bullet traffic during most days beginning the day of establishment. Intensity was greatest closest to and in line with the targets.

Site 4, Bivouac, never received any wear but was evaluated in relation to shade tolerance and adaptation to a compacted site.

F. Evaluations

All sites were tested for compaction with a soil compaction-metering rod. Due to the rockiness of the soils along with previous compaction, it did not work well and the meter rated every site highly compacted before traffic was applied.

All plots and/or subplots were evaluated for percent stand, stand density, and vigor. Evaluations were visual estimates of percent stand and numerical ratings for plant density and vigor. Evaluations were taken once and/or twice a month during the growing season on sites with continuous use. Evaluations were taken before and after traffic events on sites where use was controlled.

Results/Conclusions/Recommendations . . .

A. Site 1 Barracks

Evaluations for Percent Ground Cover can be found in Table #2, Plant Density can be found in Table #3 and Vigor can be found in Table #4.

Summaries of the best plots in each category are as follows:

	No Traffic	**First Traffic (1999 and 2000)**	**Second Traffic (2000 Traffic Only)**
	Percent Cover		
Warm Season			
Best	'Tufcote' bermudagrass	'Tufcote' bermudagrass	'Tufcote' bermudagrass
Good	'MO-Buff' buffalograss		
Cool Season			
Best	'Adobe' tall fescue	'Adobe' tall fescue	'Adobe' tall fescue
Good	'KY-31' tall fescue	'Rebel Jr.' tall fescue	'Chieftain II' tall fescue 'Rebel Jr.' tall fescue
	Plant Density		
Warm Season			
Best	'Tufcote' bermudagrass	'Tufcote' bermudagrass	'Tufcote' bermudagrass
Good	'MO-Buff' buffalograss		
Cool Season			
Best	'KY-31' tall fescue	'Rebel Jr.' tall fescue	'Finelawn 5' GL tall fescue
Good	'Chieftain II' tall fescue 'Adobe' tall fescue	'Finelawn 5 GL' tall fescue	'KY-31' tall fescue 'Rebel Jr.' tall fescue 'Adobe' tall fescue
	Vigor		
Warm Season			
Best	'MO-Buff' buffalograss	'Tufcote' bermudagrass	'Mirage' bermudagrass
Good	'Tufcote' bermudagrass	'Mirage' bermudagrass	'Tufcote' bermudagrass
Cool Season			
Best	'KY-31' tall fescue	'KY-31' tall fescue	'Finelawn 5 GL' tall fescue
Good	'Finelawn 5 GL' tall fescue	'Rebel Jr.' tall fescue	'Chieftain II' tall fescue 'Adobe' tall fescue

The plot with the best wear tolerance was by far the 'Tufcote' bermudagrass and should be considered for high traffic areas where it cannot spread into areas where it could become

undesirable. These plots actually increased in size into adjoining plots. This can be good if it is desired to vegetate adjoining ground, but bad if it invades areas where not desired. Other concerns are not being native, and that it is established by sprigs or plugs, not seed. Since it is warm season, it does go dormant and turn brown in the winter. The 'Mirage' burmudagrass did not perform nearly as well as the Tufcote, but was established the second year rather than the first so was at a disadvantage. It is a seeded variety that would be simpler to establish. 'MO-Buff' buffalograss is a species native to Missouri that is low growing, appears to be low maintenance, and could be considered for areas with less use.

The cool season species performed poorly on this site. The dry summer in 1999 and extremely dry and hot summer in 2000 was a big disadvantage to cool season species. The better performing cool seasons, all being tall fescues, are 'Adobe', 'Rebel Jr.', 'Chieftain II' and 'Finelawn 5GL'.

B. Site #2 TA-244

Evaluations for Percent Ground Cover can be found in Table #5, Plant Density can be found in Table #6 and Vigor can be found in Table #7.

A summary of the best plots in each category is as follows:

	Percent Cover	**Plant Density**	**Vigor**
No traffic (CK)	Little bluestem	Switchgrass Indiangrass	No difference
Low tire	No difference	Little bluestem	Little bluestem Indiangrass
Medium tire	Little bluestem	Little bluestem Tall fescue	No difference
High tire	Little bluestem	Little bluestem Tall fescue	Little bluestem Tall fescue
Low track	No difference	Switchgrass	Switchgrass Tall fescue
Medium track	No difference	No difference	No difference
High track	No difference	No difference	No difference

Little bluestem provided the most cover and rated best for tire traffic. None of the species held up under the track traffic. If these plants had a better establishment opportunity the results could have been better. Plants were not well developed when traffic was applied.

Neither of the *lespedeza* species that were planted germinated and therefore not included in the test.

C. Site #3 Shooting Range

Evaluations for Percent Ground Cover, Plant Density, and Vigor can be found in Table #8.

The species rank in the order below taking into consideration the above evaluation criteria. On this steeper site, percent ground cover was given twice the importance as the other factors.

'Top Gun' buffalograss and *Lespedeza daurica schimidae*
'TifBlair' centipedegrass
'Cimarron' little bluestem
'Guymon' bermudagrass

Buffalograss is a species native to Missouri although the origin of Top Gun is probably outside the state. This species is low growing and does well on this poor site. Top Gun is a seeded variety.

Lespedeza daurica schimidae is an introduced, prostrate growing plant. It is very slow starting with very few plants detected until the second year after establishment. It appears adapted and has continued to increase in plant density through the third year. Potential spreading problems have not been determined.

Centipedegrass is not native to Missouri but is common in the southern U. S. It is very low growing and needs little fertility.

Little bluestem appears adapted to this site but is slow to provide ground cover.

Bermudagrass does not appear adapted to this site.

D. Site #4 Bivouac

Evaluations for Percent Ground Cover, Plant Density, and Vigor can be found in Table #9.

This site was not used so the evaluations pertain to site adaptation in relation to shade tolerance, soils, and climate.

The best performing plots were 'Covar' sheep fescue and 'SR-3100' hard fescue. Both of these varieties are *Festuca ovina*.

Red fescues have generally been used on this type of site because of their shade tolerance. The shade tolerant tall fescues and bluegrass out performed red fescue in some replications and should also be as or more wear tolerant.

A seeding mixture of tall, hard, and red fescues and possibly even shade and drought tolerant bluegrass should be tried on these sites with diverse soils and shade intensities.

Study 29A145-Wear Tolerance Demonstration						Table #1
No. of	**No. of**					**Site**
Access.	**Species**	**Genus**	**Species**	**Variety**	**Common Name**	**Numbers**
1	1	*Festuca*	*arundinacea*	Rebel Jr.	tall fescue	1, 3
2		*Festuca*	*arundinacea*	Leprechaun	tall fescue	1
3		*Festuca*	*arundinacea*	Fine Lawn 5GL	tall fescue	1,4
4		*Festuca*	*arundinacea*	Jaguar	tall fescue	1
5		*Festuca*	*arundinacea*	Chieftain II	tall fescue	1,4
6		*Festuca*	*arundinacea*	Fine Lawn Petite	tall fescue	4
7		*Festuca*	*arundinacea*	Kentucky 31	tall fescue	1,2
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	3
14	5	*Buchloe*	*dactyloides*	MO-Buff	buffalograss	1
15		*Buchloe*	*dactyloides*	Top Gun	buffalograss	3
16	6	*Lespedeza*	*thunbergii*	VA-70	shrub lespedeza	2
17	7	*Lespedeza*	*daurica schimadae*		daurica schimadae	2, 3
18	8	*Panicum*	*virgatum*	Cave-In-Rock	switchgrass	2
19	9	*Phalaris*	*arundinacea*	Ioreed	reed canarygrass	*
20	10	*Schizachyrium*	*scoparium*	Cimarron	little bluestem	2,3
21	11	*Zoysia*	*japonica*	Meyer	zoysia grass	1
Study 29A145-Wear Tolerance Demonstration					**Table #1-continued**	
No. of	**No. of**					**Site**

Access.	Species	Genus	Species	Variety	Common Name	Numbers
22	12	*Elymus*	*lanceolatus*	Sodar	streambank	*
					wheatgrass	
23	13	*Elymus*	*elymoides*		bottlebrush	3
					squirrel tail	
24	14	*Eremochloa*	*ophiuroides*	TifBlair	centipedegrass	5
25	15	*Poa*	*pratense*	Unique	Kentucky	1, 4
					bluegrass	
26	16	*Sorghastrum*	*nutans*	Rumsey	indiangrass	2
27	17	*Lolium*	*perenne*	Divine	perennial rye	1, 4
* Tried on fifth site but failed.						

Study 29A145 - Wear Tolerance Demonstration — **Table #2**

SITE #1 Barracks — Per Cent Ground Cover \1

No Traffic

Plot	4/7	5/13	6/9	7/9	7/30	8/12	9/22	10/20	11/30	Plot	3/14	4/19	5/1	5/17	6/6	6/20	7/5	8/2	8/15	8/30	9/18	9/25	Plot
# \2	1999	1999	1999	1999	1999	1999	1999	1999	1999	# \2	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	# \2
1	80.0	80.0	80.0	80.0	85.0	84.0	**99.0**	66.3	70.0	**1**	96.0	88.0	80.0	82.5	83.0	90.0	95.0	95.0	91.0	95.0	**95.0**	95.0	**4**
7	100.0	98.8	95.8	96.8	97.0	97.0	**97.0**	96.5	96.5	**7**	64.0	63.0	76.0	76.3	76.0	91.0	90.0	91.0	83.0	88.0	**91.0**	91.0	**5**
4	100.0	90.0	91.3	90.0	94.5	92.0	**96.0**	95.8	95.8	**4**	97.0	88.0	90.0	90.0	90.0	94.0	93.0	85.0	79.0	85.0	**85.0**	85.0	**7**
5	39.0	27.5	30.0	33.8	30.0	30.0	**78.0**	63.8	63.8	**5**	61.0	51.0	53.0	52.5	53.0	75.0	86.0	73.0	73.0	60.0	**74.0**	74.0	**8**
12	58.0	67.5	77.5	81.3	81.3	79.0	**76.0**	72.5	72.5	**12**	68.0	74.0	80.0	80.0	80.0	68.0	78.0	71.0	71.0	71.0	**71.0**	71.0	**9**
11	68.0	75.0	72.5	81.3	85.0	84.0	**74.0**	56.3	56.3	**11**	59.0	85.0	74.0	78.8	71.0	65.0	83.0	70.0	70.0	70.0	**70.0**	70.0	**11**
9	49.0	52.5	60.0	66.3	65.0	68.0	**71.0**	62.5	62.5	**9**	71.0	88.0	85.0	85.0	85.0	65.0	81.0	68.0	68.0	74.0	**68.0**	68.0	**1**
10	65.0	52.5	70.0	68.8	73.3	88.0	**69.0**	66.3	66.3	**10**	65.0	78.0	70.0	68.8	70.0	63.0	79.0	66.0	64.0	68.0	**68.0**	68.0	**10**
3	54.0	62.5	67.5	68.8	75.0	73.0	**66.0**	60.0	60.0	**3**	73.0	79.0	86.0	86.3	86.0	78.0	83.0	68.0	65.0	68.0	**68.0**	68.0	**12**
8	-	30.0	50.0	52.5	68.8	68.0	**63.0**	60.0	60.0	**8**	55.0	79.0	71.0	71.3	71.0	55.0	70.0	63.0	63.0	65.0	**65.0**	65.0	**2**
6	73.0	80.0	80.0	77.5	78.8	74.0	**60.0**	46.3	46.3	**6**	64.0	86.0	71.0	71.3	71.0	68.0	80.0	63.0	63.0	63.0	**63.0**	63.0	**3**
2	41.0	40.0	57.5	68.8	61.3	63.0	**59.0**	53.8	53.8	**2**	46.0	70.0	78.0	77.5	78.0	60.0	73.0	60.0	55.0	60.0	**60.0**	60.0	**6**

1st Year Traffic

Plot	4/7	5/13	6/9	7/9	7/30	8/12	9/22	10/20	11/30	Plot	3/14	4/19	5/1	5/17	6/6	6/20	7/5	8/2	8/15	8/30	9/18	9/25	Plot
# \2	1999	1999	1999	1999	1999	1999	1999	1999	1999	# \2	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	# \2
7	100.0	98.8	96.5	96.0	96.0	96.0	**96.0**	78.8	71.3	**7**	78.0	20.0	58.0	53.8	68.0	80.0	94.0	93.0	93.0	93.0	**93.0**	88.0	**4**
4	100.0	92.5	91.3	86.3	90.3	90.0	**94.0**	90.0	82.5	**4**	45.0	51.0	59.0	48.8	41.0	49.0	53.0	43.0	46.0	46.0	**46.0**	31.0	**11**
11	69.0	72.5	75.0	71.3	78.3	78.0	**61.0**	47.5	42.5	**11**	48.0	50.0	53.0	55.0	44.0	46.0	55.0	49.0	45.0	45.0	**45.0**	30.0	**1**
1	81.0	80.0	77.5	77.5	60.0	80.0	**60.0**	52.5	45.0	**1**	28.0	40.0	50.0	45.0	41.0	36.0	50.0	40.0	36.0	36.0	**36.0**	23.0	**3**
9	50.0	52.5	60.0	57.5	67.5	65.0	**59.0**	48.8	78.8	**9**	36.0	41.0	46.0	48.8	41.0	44.0	43.0	44.0	34.0	41.0	**34.0**	30.0	**10**
10	65.0	47.5	67.5	75.0	70.0	70.0	**50.0**	47.5	40.0	**10**	26.0	34.0	48.0	47.5	39.0	35.0	41.0	38.0	34.0	34.0	**34.0**	20.0	**12**
12	59.0	70.0	77.5	78.8	75.5	75.0	**49.0**	43.8	40.0	**12**	31.0	48.0	48.0	52.5	43.0	40.0	48.0	35.0	31.0	31.0	**31.0**	19.0	**6**
3	54.0	65.0	68.8	71.3	69.5	64.0	**49.0**	42.5	37.5	**3**	29.0	40.0	43.0	47.5	38.0	30.0	38.0	33.0	30.0	30.0	**30.0**	14.0	**9**
2	45.0	50.0	57.5	58.8	58.8	59.0	**48.0**	40.0	32.5	**2**	24.0	36.0	45.0	32.5	38.0	28.0	34.0	34.0	34.0	34.0	**29.0**	13.0	**2**
8		30.0	50.0	51.3	66.3	69.0	**43.0**	42.5	37.5	**8**	20.0	9.0	18.0	13.8	14.0	13.0	22.0	25.0	9.0	24.0	**24.0**	21.0	**5**
6	75.0	77.5	77.5	81.3	68.8	71.0	**38.0**	43.8	40.0	**6**	63.0	4.0	13.0	15.0	15.0	19.0	19.0	27.0	34.0	24.0	**24.0**	10.0	**7**
5	39.0	27.5	25.0	27.5	22.5	24.0	**15.0**	58.8	43.8	**5**	8.0	0.0	4.0	6.8	8.0	4.0	7.0	16.0	8.0	11.0	**13.0**	6.0	**8**

\1 Based on planted species only.

\2 Plots were ranked best to worst for the late season percent groundcover; ratings taken 9/22/99 and 9/18/00

Study 29A145 - Wear Tolerance Demonstration — **Table #2 - continued**

SITE #1 Barracks — Per Cent Ground Cover \1

2nd Year Traffic

Plot # \2	4/7 1999	5/13 1999	6/9 1999	7/9 1999	7/30 1999	8/12 1999	9/22 1999	10/20 1999	11/30 1999	Plot # \2	3/14 2000	4/19 2000	5/1 2000	5/17 2000	6/6 2000	6/20 2000	7/5 2000	8/2 2000	8/15 2000	8/30 2000	9/18 2000	9/25 2000	Plot # \2
											96.0	88.0	80.0	80.0	81.0	88.0	83.0	84.0	81.0	84.0	**84.0**	78.0	**4**
											61.0	51.0	40.0	50.0	58.0	48.0	50.0	43.0	35.0	36.0	**35.0**	13.0	**8**
											59.0	85.0	79.0	67.5	60.0	58.0	55.0	38.0	35.0	35.0	**35.0**	9.0	**11**
											65.0	78.0	73.0	57.5	53.0	55.0	58.0	34.0	29.0	31.0	**33.0**	18.0	**10**
											71.0	88.0	85.0	66.3	60.0	53.0	58.0	58.0	34.0	33.0	**33.0**	10.0	**1**
											73.0	79.0	89.0	73.8	68.0	60.0	60.0	38.0	33.0	33.0	**33.0**	10.0	**12**
											68.0	74.0	80.0	65.0	63.0	50.0	55.0	40.0	33.0	33.0	**33.0**	8.0	**9**
											64.0	86.0	71.0	60.0	54.0	49.0	55.0	35.0	31.0	31.0	**31.0**	8.0	**3**
											46.0	70.0	73.0	66.3	53.0	50.0	53.0	31.0	26.0	28.0	**26.0**	11.0	**6**
											97.0	88.0	90.0	42.5	48.0	76.0	38.0	26.0	24.0	32.0	**24.0**	13.0	**7**
											55.0	69.0	96.0	50.0	53.0	48.0	41.0	28.0	26.0	26.0	**23.0**	13.0	**2**
											64.0	63.0	69.0	52.5	63.0	68.0	48.0	26.0	5.0	19.0	**19.0**	13.0	**5**

\1 Based on planted species only.

\2 Plots were ranked best to worst for the late season percent groundcover; ratings taken 9/22/99 and 9/18/00

Study 29A145 - Wear Tolerance Demonstration — **Table #3**

Site #1 - Barracks — Plant Density — (1=High 9=Bare Ground)

No Traffic

Plot #	4/7/99	5/13/99	6/9/99	7/9/99	7/30/99	8/12/99	9/22/99	10/20/99	11/30/99	Plot #	3/14/00	4/19/00	5/1/00	5/17/00	6/6/00	6/20/00	7/5/00	8/2/00	8/15/00	8/30/00	9/18/00	9/25/00	Plot #
7	1.8	1.0	1.0	1.0	1.0	1.8	**2.5**	2.3	4.8	**7**	6.8	3.5	4.5	4.5	4.5	6.3	4.8	4.8	4.5	4.5	**4.5**	4.5	**4**
4	2.0	2.0	1.5	2.5	1.8	1.8	**3.8**	2.3	3.8	**4**	6.3	3.5	5.8	5.8	5.8	7.8	6.3	5.0	5.0	5.0	**5.0**	5.0	**5**
11	4.0	3.5	3.3	3.3	4.0	3.8	**4.3**	6.3	6.3	**11**	5.3	4.0	5.0	5.0	5.0	7.0	5.0	5.5	5.5	5.5	**5.3**	5.3	**12**
9	5.3	5.0	4.3	4.0	3.3	3.8	**4.5**	6.3	5.8	**9**	6.5	4.5	7.0	7.0	7.0	7.5	6.5	5.5	5.5	5.5	**5.5**	5.5	**7**
3	4.5	4.0	3.8	3.5	3.3	3.5	**4.8**	6.5	6.5	**3**	6.8	4.5	5.0	5.0	5.0	6.5	5.3	5.5	5.5	5.5	**5.5**	5.5	**9**
12	4.8	3.8	3.5	3.3	3.5	3.5	**4.8**	6.3	6.3	**12**	6.3	4.0	5.3	5.3	5.5	6.5	5.3	5.5	5.5	5.5	**5.5**	5.5	**11**
1	3.3	3.0	3.5	3.5	3.8	3.8	**5.0**	5.8	6.5	**1**	3.0	5.5	4.5	4.5	4.5	6.5	5.3	5.8	5.8	5.8	**5.8**	5.8	**1**
2	4.0	5.5	4.3	3.8	3.5	3.5	**5.0**	5.8	6.3	**2**	2.3	4.8	5.3	5.3	5.3	6.8	4.8	5.8	5.8	5.8	**5.8**	5.8	**3**
10	4.5	4.3	3.8	3.0	4.0	3.0	**5.3**	5.3	6.0	**10**	6.3	4.8	7.0	7.0	7.0	7.3	5.0	5.8	5.8	6.3	**5.8**	5.8	**8**
8		7.0	5.5	4.3	3.5	3.3	**5.8**	6.3	6.8	**8**	6.3	4.8	5.8	5.8	5.8	6.5	4.8	5.8	5.8	5.8	**5.8**	5.8	**10**
5	7.0	5.3	6.3	6.5	6.8	5.8	**6.0**	5.5	6.5	**5**	5.5	5.8	5.8	5.8	5.8	6.8	5.5	6.0	6.0	6.0	**6.0**	6.0	**2**
6	4.0	3.3	3.3	3.3	3.3	4.3	**6.3**	6.8	6.5	**6**	5.5	6.8	5.3	5.0	5.0	7.0	6.0	6.8	6.8	6.8	**6.8**	6.8	**6**

1st Traffic

Plot #	4/7/99	5/13/99	6/9/99	7/9/99	7/30/99	8/12/99	9/22/99	10/20/99	11/30/99	Plot #	3/14/00	4/19/00	5/1/00	5/17/00	6/6/00	6/20/00	7/5/00	8/2/00	8/15/00	8/30/00	9/18/00	9/25/00	Plot #
7	1.8	1.0	1.0	2.0	1.8	2.0	**6.0**	5.8	7.0	**7**	7.8	5.8	6.3	7.3	7.0	6.5	5.8	4.8	4.8	4.8	**4.8**	5.8	**4**
4	2.0	2.0	1.5	3.3	2.3	2.5	**6.0**	6.0	5.3	**4**	5.8	7.3	6.0	7.0	7.3	7.3	6.3	6.5	6.8	6.8	**6.5**	8.3	**1**
11	4.3	3.3	3.5	4.3	3.3	4.0	**6.8**	6.5	7.0	**11**	8.3	8.0	6.8	7.3	7.8	8.0	6.8	7.0	7.3	7.3	**7.3**	8.5	**3**
9	5.3	4.8	4.3	5.3	4.0	4.5	**7.0**	5.8	7.0	**9**	6.5	8.0	6.8	7.0	7.5	8.0	7.3	7.3	7.5	7.5	**7.5**	8.5	**12**
12	4.3	3.8	3.3	4.3	4.3	4.5	**7.3**	6.5	7.5	**12**	8.0	6.0	6.5	7.3	7.3	7.5	6.8	7.0	7.5	7.5	**7.5**	7.8	**10**
2	4.8	5.8	4.5	5.8	5.0	5.0	**7.3**	6.5	7.3	**2**	8.8	9.0	7.0	8.0	7.3	8.3	7.0	7.3	7.8	7.5	**7.8**	8.5	**2**
1	3.3	3.0	3.5	4.3	4.0	4.8	**7.3**	6.5	7.3	**1**	8.0	6.3	6.8	7.3	7.5	8.5	7.3	7.5	7.8	7.5	**7.8**	8.3	**6**
3	4.5	4.0	4.3	4.8	4.5	4.5	**7.5**	6.8	7.3	**3**	7.5	6.0	7.0	7.8	8.3	8.3	7.0	7.3	7.8	7.8	**7.8**	8.0	**9**
10	4.5	4.5	3.5	4.5	4.0	4.3	**7.5**	6.8	6.3	**10**	7.5	5.8	6.0	7.3	7.5	7.3	6.5	6.8	6.8	6.8	**7.8**	7.0	**11**
6	4.0	3.0	3.0	3.8	4.7	5.0	**7.8**	6.8	7.3	**6**	8.0	6.3	8.8	9.0	8.8	8.5	8.0	8.0	8.3	8.3	**8.3**	8.3	**7**
8		7.0	5.5	5.0	4.3	4.3	**8.0**	5.8	7.3	**8**	7.8	6.0	9.0	8.8	8.5	9.0	8.8	8.3	9.0	9.0	**8.5**	8.3	**8**
5	7.0	5.3	6.5	6.5	6.8	6.8	**8.5**	5.8	5.8	**5**	8.0	6.3	8.3	8.0	8.8	8.8	7.3	8.3	8.8	8.8	**8.8**	8.3	**5**

Study 29A145 - Wear Tolerance Demonstration **Table #3 - continued**

					Site #1 Barracks					Plant Density					(1=High 9=Bare Ground)									
								2nd Traffic																
Plot										Plot														Plot
#	4/7/99	5/13/99	6/9/99	7/9/99	7/30/99	8/12/99	9/22/99	10/20/99	11/30/99	#		3/14/00	4/19/00	5/1/00	5/17/00	6/6/00	6/20/00	7/5/00	8/2/00	8/15/00	8/30/00	9/18/00	9/25/00	#
												6.8	3.5	4.5	5.8	5.8	6.8	6.5	5.3	5.3	5.3	**5.3**	5.5	**4**
												3.0	5.5	5.3	6.8	6.8	7.3	6.8	7.5	7.8	7.5	**7.5**	8.5	**3**
												2.3	4.8	4.5	6.0	6.3	7.0	6.8	7.3	7.5	7.5	**7.5**	8.5	**12**
												6.3	4.8	4.5	6.8	7.0	7.0	7.5	7.5	7.8	7.5	**7.5**	8.3	**1**
												5.3	4.0	5.3	6.8	7.0	6.8	6.5	7.0	7.5	7.5	**7.5**	8.3	**11**
												6.8	4.5	8.3	7.5	7.5	8.0	7.5	7.0	7.8	7.8	**7.8**	8.3	**8**
												6.3	4.0	5.0	6.8	7.0	7.5	6.3	7.5	7.8	7.8	**7.8**	8.3	**9**
												6.3	3.5	5.8	7.5	7.5	7.0	6.8	7.5	7.8	7.8	**7.8**	8.0	**10**
												5.5	5.8	5.8	7.3	6.8	7.5	7.0	7.5	8.0	8.0	**8.0**	8.5	**2**
												6.3	4.8	5.0	6.5	7.5	8.0	6.8	7.8	7.8	7.5	**8.0**	8.3	**6**
												6.5	4.5	7.0	8.3	8.3	7.8	8.0	8.3	8.5	8.5	**8.5**	8.3	**7**
												5.5	6.8	5.8	7.5	7.3	8.3	7.0	8.5	9.0	8.5	**9.0**	8.8	**5**

Study 29A145 - Wear Tolerance Demonstration — **Table #4**

SITE #1 Barracks — Vigor (1=Excellent 9=Poor)

No Traffic

Plot #	4/7/99	5/13/99	6/9/99	7/9/99	7/30/99	8/12/99	9/22/99	10/20/99	11/30/99	Plot #	3/14/00	4/19/00	5/1/00	5/17/00	6/6/00	6/20/00	7/5/00	8/2/00	8/15/00	8/30/00	9/18/00	9/25/00	Plot #
11	4.0	3.0	3.0	3.3	4.5	4.3	**3.8**	5.8	6.8	**11**	9.0	7.3	6.8	6.0	4.5	1.8	1.5	5.5	5.3	4.3	**4.5**	4.5	**8**
9	5.0	4.0	4.0	3.8	4.0	4.3	**3.8**	5.8	6.3	**9**	9.0	6.5	6.3	5.5	4.0	1.3	1.3	6.3	5.0	5.3	**5.3**	5.3	**4**
12	4.0	3.0	3.0	3.0	3.5	4.5	**3.8**	6.0	6.0	**12**	8.5	6.3	5.5	7.5	5.5	2.0	1.3	3.5	5.8	5.5	**5.5**	5.5	**5**
1	4.0	3.0	3.0	4.0	4.3	3.8	**4.0**	5.8	6.3	**1**	5.0	3.0	6.5	8.0	5.8	2.5	1.0	3.8	5.5	6.3	**5.5**	5.5	**12**
6	5.0	3.0	3.0	3.3	4.5	4.5	**4.3**	5.8	6.3	**6**	4.8	3.0	5.3	8.0	5.5	1.8	1.3	4.0	6.0	6.5	**5.8**	5.8	**3**
3	4.0	3.0	3.0	3.0	4.0	4.0	**4.5**	6.0	6.3	**3**	4.8	3.0	5.8	7.8	6.3	1.8	1.0	4.0	5.3	7.0	**5.8**	5.8	**10**
2	5.0	4.0	4.0	3.3	4.0	4.3	**4.5**	6.0	6.0	**2**	5.5	2.5	6.3	8.0	6.0	2.0	1.5	4.3	6.0	7.3	**6.3**	6.3	**2**
10	5.0	3.0	3.0	3.3	4.3	4.3	**4.5**	6.0	6.0	**10**	5.3	3.0	5.8	7.3	5.5	1.8	1.3	4.0	5.0	7.0	**6.3**	6.3	**6**
7	8.0	2.0	3.0	2.0	2.5	2.3	**5.3**	5.8	7.5	**7**	5.3	2.8	6.3	8.0	6.8	2.5	1.0	4.0	5.8	7.3	**6.3**	5.0	**11**
8	-	3.0	2.0	2.8	2.8	3.0	**6.5**	5.8	7.0	**8**	4.8	3.3	6.5	8.0	7.0	1.8	1.3	4.0	6.0	7.5	**6.8**	6.8	**9**
4	7.0	2.0	2.0	2.0	2.3	2.8	**6.5**	6.0	6.8	**4**	5.0	3.3	5.8	8.0	7.0	3.0	1.3	4.3	6.0	7.5	**7.0**	7.0	**1**
5	6.0	4.0	5.0	5.5	5.5	5.5	**7.0**	5.8	7.8	**5**	9.0	7.8	8.3	8.0	7.3	3.8	4.8	3.8	5.8	7.5	**7.3**	7.3	**7**

1st Traffic

Plot #	4/7/99	5/13/99	6/9/99	7/9/99	7/30/99	8/12/99	9/22/99	10/20/99	11/30/99	Plot #	3/14/00	4/19/00	5/1/00	5/17/00	6/6/00	6/20/00	7/5/00	8/2/00	8/15/00	8/30/00	9/18/00	9/25/00	Plot #
6	5.0	3.0	3.0	3.3	4.8	4.8	**5.8**	7.0	7.5	**6**	8.8	6.8	5.3	5.8	6.3	2.5	3.3	3.5	6.5	6.8	**6.3**	7.5	**4**
11	4.0	3.0	3.0	4.0	5.3	4.5	**6.5**	6.3	7.3	**11**	9.0	9.0	7.3	8.0	7.5	4.3	7.0	5.3	7.5	7.0	**6.8**	8.0	**8**
12	4.0	3.0	3.0	3.8	5.0	4.8	**6.5**	6.3	7.3	**12**	8.5	7.8	7.5	8.0	7.5	5.0	5.8	6.3	7.3	7.3	**6.8**	7.8	**5**
3	4.0	3.0	3.0	3.8	4.5	4.5	**7.0**	6.0	7.3	**3**	7.0	6.3	5.5	6.8	6.8	4.5	5.5	4.8	7.0	7.5	**7.0**	8.5	**12**
9	5.0	4.0	4.0	4.3	4.5	4.3	**7.0**	6.3	7.3	**9**	6.5	4.8	5.5	7.0	6.5	4.0	5.3	5.5	7.5	8.3	**7.0**	8.0	**1**
1	4.0	3.0	3.0	3.3	5.3	4.8	**7.3**	6.5	7.5	**1**	7.0	5.5	5.8	7.3	6.8	3.5	5.8	5.8	6.8	7.8	**7.0**	8.0	**9**
2	5.0	4.0	4.0	4.8	4.5	4.8	**7.3**	5.8	7.0	**2**	7.0	5.3	5.0	6.5	6.5	3.8	5.3	5.3	7.0	7.8	**7.3**	8.5	**3**
10	5.0	3.0	3.0	3.5	4.8	4.3	**7.3**	6.3	7.0	**10**	6.8	5.3	5.3	7.0	7.0	3.5	5.8	5.5	6.8	8.0	**7.3**	8.0	**10**
4	7.0	2.0	2.0	3.5	2.3	2.8	**7.5**	6.0	7.5	**4**	6.8	4.8	5.3	6.8	6.8	3.3	5.3	5.5	6.8	8.0	**7.3**	8.0	**11**
7	8.0	2.0	3.0	2.8	2.8	2.5	**7.8**	7.3	7.8	**7**	7.0	5.8	5.8	6.8	7.0	3.5	6.0	5.5	7.3	8.0	**7.5**	8.5	**2**
5	6.0	4.0	5.0	5.0	5.5	5.8	**8.0**	6.5	7.5	**5**	9.0	8.0	7.5	7.8	7.5	6.3	6.3	6.3	7.0	7.5	**7.5**	8.3	**7**
8	-	3.0	3.0	3.3	3.8	3.0	**8.0**	6.0	7.5	**8**	6.8	4.8	5.3	7.0	7.0	3.8	5.3	4.3	7.3	7.8	**7.8**	8.3	**6**

						SITE #1 Barracks							Vigor (1=Excellent 9=Poor)										
								2nd Traffic															
Plot										Plot													Plot
#	4/7/99	5/13/99	6/9/99	7/9/99	7/30/99	8/12/99	9/22/99	10/20/99	11/30/99	#		3/14/00	4/19/00	5/1/00	5/17/00	6/6/00	6/20/00	7/5/00	8/2/00	8/15/00	8/30/00	9/18/00	9/25/00	#
												9.0	7.3	7.0	7.8	6.5	3.3	6.8	4.8	6.8	6.3	**6.5**	8.0	**8**
												9.0	6.5	6.3	6.8	5.3	3.3	4.3	5.3	6.5	6.8	**6.5**	7.5	**4**
												8.5	6.3	6.5	7.3	6.8	5.0	6.0	6.5	7.5	7.3	**7.0**	8.5	**5**
												4.8	3.0	6.0	7.8	7.3	3.5	5.8	6.3	7.0	7.3	**7.3**	8.5	**3**
												5.0	3.0	6.3	8.0	6.5	3.8	5.3	5.5	7.0	7.8	**7.3**	8.5	**12**
												4.8	4.8	7.0	8.0	6.8	2.8	5.8	6.0	7.0	8.0	**7.3**	8.3	**9**
												5.3	2.8	6.3	8.0	6.8	3.3	5.5	6.3	7.0	8.0	**7.3**	8.3	**11**
												5.0	3.3	5.8	8.0	7.0	4.3	5.5	6.0	7.3	8.3	**7.3**	8.0	**1**
												5.5	2.5	6.3	6.5	7.3	3.5	5.0	6.0	7.3	8.0	**7.5**	8.5	**2**
												9.0	7.8	8.3	7.8	7.5	6.3	6.8	6.3	7.0	8.3	**7.5**	8.3	**7**
												4.8	3.0	5.8	8.0	6.8	3.5	5.5	6.3	7.0	8.0	**7.5**	8.0	**10**
												5.3	3.0	5.5	7.5	6.8	4.0	5.0	5.3	7.0	7.8	**7.8**	8.3	**6**

Study 29A145 - Wear Tolerance Demonstration **Table # 5**

SITE #2 TA-244 — Percent Cover

Plot #1/	4/7 1999	5/25 1999	6/18 1999	7/22 1999	8/26 1999		8/27 1999	10/21 1999	4/18 1999	5/16 1999		5/17 1999	6/19 1999		6/20 1999	8/1 1999		8/2 1999	8/29 1999	9/25 1999	Plot #1/
Low Tire Traffic																					
6	1	41	16	20	43		43	45	50	48		48	35		58	36		45	**45**	45	**6**
3		20	20	24	38	**Traffic**	38	11	5	8	**Traffic**	8	19	**Traffic**	36	38	**Traffic**	45	**45**	45	**3**
5	49	70	71	73	65	**Event**	65	14	16	18	**Event**	18	23	**Event**	48	43	**Event**	43	**43**	43	**5**
1		44	48	50	53	**1st**	53	25	21	21	**2nd**	20	25	**3rd**	38	38	**4th**	50	**41**	44	**1**
Medium Tire Traffic																					
6	5	53	20	21	38		38	35	29	29		28	36		68	48		53	**53**	53	**6**
5	25	68	66	56	61		61	18	11	13		13	13		38	29		35	**35**	35	**5**
3		24	24	26	23		23	6	4	5		5	23		24	25		33	**30**	30	**3**
1		46	49	48	49		44	16	21	16		16	16		18	19		23	**23**	23	**1**
High Tire Traffic																					
6	7	41	25	26	49		49	35	40	48		48	45		50	30		29	**24**	24	**6**
5	30	68	68	70	56		56	5	4	13		13	20		19	15		20	**19**	19	**5**
1		50	51	52	57		53	18	21	21		20	15		13	16		18	**18**	18	**1**
3		21	20	24	35		35	9	9	8		6	20		15	8		10	**10**	10	**3**
Check																					
6	1	44	11	16	24		24	34	38	35		35	40		40	68		68	**68**	68	**6**
3		28	29	28	21		21	7	6	9		9	29		29	63		63	**63**	63	**3**
5	40	69	69	70	60		58	16	21	21		21	25		25	53		53	**53**	53	**5**
1		61	63	63	61		61	28	25	20		20	25		25	43		43	**43**	43	**1**

1/Plots are ranked best to worst for the late season percent ground cover evaluation taken 8/29/00.

Study 29A145 - Wear Tolerance Demonstration **Table # 5 - continued**

Plot #1=indiangrass
Plot #3=switchgrass
Plot #5=tall fescue
Plot #6=little bluestem

SITE #2 TA-244 Percent Cover

Plot #1/	4/7 1999	5/25 1999	6/18 1999	7/22 1999	8/26 1999		8/27 1999	10/21 1999	4/18 1999	5/16 1999		5/17 1999	6/19 1999		6/20 1999	8/1 1999		8/2 1999	8/29 1999	9/25 1999	Plot #1/ 1/
								Low Track Traffic													
6	2	48	18	19	35		30	31	24	30		14	18		10	15		12	**11**	12	**6**
5	30	55	59	63	46	**Event**	46	12	14	15	**Event**	9	8	**Event**	25	21	**Event**	10	**10**	10	**5**
1		63	61	75	70	**1st**	70	24	18	18	**2nd**	13	13	**3rd**	6	11	**4th**	8	**6**	8	**1**
3		43	41	49	41	**Traffic**	39	3	3	3	**Traffic**	1	9	**Traffic**	3	14	**Traffic**	6	**6**	6	**3**
								Medium Track Traffic													
3		28	26	31	38		38	7	6	9		2	4		3	18		3	**1**	1	**3**
5	18	34	35	48	40		39	8	13	13		8	9		5	13		0	**1**	1	**5**
6	5	51	28	30	36		36	31	26	31		9	14		6	3		1	**1**	1	**6**
1		38	40	44	44		41	12	6	20		10	8		1	8		0	**0**	0	**1**
								High Track Traffic													
5	33	45	43	44	39		79	9	10	11		5	4		3	9		3	**2**	2	**5**
3		41	43	37	51		44	5	7	8		1	4		0	9		1	**1**	1	**3**
1		44	49	49	91		46	11	8	21		3	5		0	4		0	**0**	1	**1**
6	8	46	24	29	36		35	31	34	35		8	16		1	3		0	**0**	0	**6**
								Check													
6	1	44	11	16	24		24	34	38	35		35	40		40	68		68	**68**	68	**6**
3		28	29	28	21		21	7	6	9		9	29		29	63		63	**63**	63	**3**
5	40	69	69	70	60		58	16	21	21		21	25		25	53		53	**53**	53	**5**
1		61	63	63	61		61	28	25	20		20	25		25	43		43	**43**	43	**1**

1/Plots are ranked best to worst for the late season percent ground cover evaluation taken 8/29/00.

Plot #1=indiangrass
Plot #3=switchgrass
Plot #5=tall fescue
Plot #6=little bluestem

Study 29A145 - Wear Tolerance Demonstration																	Table # 6			
			SITE #2 TA-244					Plant Density			Rating 1-9 (1=Best 9=Worst)									
Plot #	5/25/99	6/18/99	7/22/99	8/26/99		8/27/99	10/21/99	4/18/00	5/16/00		5/17/00	6/19/00		6/20/00	8/1/00		8/2/00	8/29/00	9/25/00	Plot #
1/																				1/
						Low Tire Traffic														
1	6.5	6.8	6.8	7.3	1st	6.3	7.5	7.8	7.3	2nd	7.3	7.0	3rd	7.3	6.5	4th	7.0	**7.5**	7.5	1
3	7.8	7.5	7.3	6.3	Traffic	7.5	7.5	8.3	8.0	Traffic	8.0	8.0	Traffic	7.5	7.5	Traffic	7.7	**8.3**	8.3	3
5	4.5	5.8	6.0	6.5	Event	6.8	8.0	7.8	7.5	Event	7.5	7.3	Event	7.0	6.8	Event	7.8	**7.8**	7.8	5
6	7.8	8.0	7.5	7.5		7.5	7.3	6.5	6.3		6.3	6.8		6.0	6.5		7.3	**7.3**	7.3	6
						Medium Tire Traffic														
1	6.5	7.0	7.3	7.8		7.3	8.0	7.8	7.5		7.0	7.8		8.5	7.8		8.5	**8.5**	8.5	1
3	7.3	7.0	7.0	7.5		7.3	8.0	8.3	8.0		8.0	8.3		8.0	8.3		8.0	**8.8**	8.8	3
5	4.8	5.5	5.3	7.0		7.0	8.3	8.0	7.8		7.8	7.8		7.8	8.0		7.7	**8.0**	8.0	5
6	7.3	7.8	7.3	7.5		7.5	7.5	7.3	6.8		6.3	7.3		6.8	7.0		7.7	**8.0**	8.0	6
						High Tire Traffic														
1	6.0	6.5	5.8	7.3		6.5	8.0	7.8	7.5		7.5	7.8		8.5	7.3		8.3	**8.3**	8.3	1
3	7.0	7.3	7.3	6.3		7.3	8.0	8.0	8.0		8.0	8.0		8.5	8.5		8.0	**8.8**	8.8	3
5	4.8	5.8	5.3	7.3		7.0	8.0	8.3	7.8		7.5	7.8		7.8	8.3		8.0	**8.0**	8.0	5
6	7.8	7.8	8.0	6.8		7.0	7.5	6.8	6.0		6.5	6.3		7.0	6.5		7.8	**8.0**	8.0	6
						Check														
1	5.8	6.3	5.8	8.3		6.5	7.5	7.5	7.5		5.8	7.3		7.3	4.8		4.8	**4.8**	4.8	1
3	7.0	7.0	7.0	6.5		7.8	8.3	8.0	8.0		8.0	7.3		7.3	4.5		4.5	**4.5**	4.5	3
5	4.8	6.0	6.0	7.5		7.3	8.0	7.5	7.3		7.3	7.0		7.0	6.3		6.3	**7.8**	6.3	5
6	8.0	8.0	8.0	8.3		7.8	7.3	7.0	6.8		6.8	6.5		6.5	5.5		5.5	**6.0**	5.5	6
1/Plots are ranked best to worst for the late season percent density evaluation taken 8/29/00.																				
Study 29A145 - Wear Tolerance Demonstration																	Table # 6 - continued			

Plot #1=indiangrass
Plot #3=switchgrass
Plot #5 = tall fescue
Plot #6=little bluestem

			SITE #2 TA-244					Plant Density			Rating 1-9 (1=Best 9=Worst)								
Plot #	5/25/99	6/18/99	7/22/99	8/26/99		8/27/99	10/21/99	4/18/00	5/16/00		5/17/00	6/19/00		6/20/00	8/1/00		8/2/00	8/29/00	9/25/00	Plot #
1/																				1/
						Low Track Traffic														
1	5.3	5.8	6.0	7.3	1st	7.3	8.0	7.8	7.5	2nd	7.7	7.8	3rd	8.3	7.8	4th	8.3	**8.5**	8.3	1
3	5.5	6.3	6.5	6.5	Traffic	7.5	8.5	8.5	8.5	Traffic	8.0	8.3	Traffic	8.5	8.5	Traffic	8.0	**8.0**	8.5	3
5	5.5	5.3	6.3	7.5	Event	8.0	8.0	8.3	7.8	Event	7.3	8.3	Event	7.8	8.5	Event	8.0	**8.5**	8.5	5
6	7.5	7.5	7.5	7.5		7.5	7.5	7.0	7.3		7.5	7.5		8.0	8.3		8.0	**8.8**	8.5	6
						Medium Track Traffic														
1	6.8	6.8	6.5	7.8		8.0	8.5	8.3	7.3		8.0	8.0		8.8	8.8		9.0	**9.0**	9.0	1
3	7.3	7.0	7.3	7.0		7.5	8.3	8.0	7.8		8.0	8.0		8.5	8.3		8.0	**9.0**	9.0	3
5	6.8	6.8	6.5	8.0		8.0	8.3	8.3	8.3		7.0	8.3		8.8	8.0		9.0	**9.0**	9.0	5
6	7.3	7.5	7.0	7.0		7.3	7.5	7.3	7.3		7.3	7.8		8.3	8.3		8.0	**9.0**	9.0	6
						High Track Traffic														
1	6.3	6.8	6.0	7.5		8.0	8.3	8.3	7.5		8.0	8.3		9.0	8.8		9.0	**9.0**	8.3	1
3	6.0	6.5	6.3	8.0		8.3	8.3	8.0	8.3		8.0	8.3		9.0	8.8		9.0	**9.0**	9.0	3
5	6.3	7.3	6.0	7.8		7.8	8.5	8.3	8.0		7.5	8.5		8.5	8.5		9.0	**9.0**	9.0	5
6	7.3	7.3	7.0	7.0		7.0	7.5	6.8	7.0		7.3	7.5		8.8	9.0		9.0	**9.0**	9.0	6
						Check														
1	5.8	6.3	5.8	8.3		6.5	7.5	7.5	7.5		5.8	7.3		7.3	4.8		4.8	**4.8**	4.8	1
3	7.0	7.0	7.0	6.5		7.8	8.3	8.0	8.0		8.0	7.3		7.3	4.5		4.5	**4.5**	4.5	3
5	4.8	6.0	6.0	7.5		7.3	8.0	7.5	7.3		7.3	7.0		7.0	6.3		6.3	**7.8**	6.3	5
6	8.0	8.0	8.0	8.3		7.8	7.3	7.0	6.8		6.8	6.5		6.5	5.5		5.5	**6.0**	5.5	6

1/Plots are ranked best to worst for the late season percent density evaluation taken 8/29/00.

Plot #1=indiangrass
Plot #3=switchgrass
Plot #5 = tall fescue
Plot #6=little bluestem

Study 29A145 - Wear Tolerance Demonstration																	Table #7			
			SITE #2 TA-244					Vigor			Rating 1-9 (1=Best 9=Worst)									
Plot #	5/25/99	6/18/99	7/22/99	8/26/99		8/27/99	10/21/99	4/18/00	5/16/00		5/17/00	6/19/00		6/20/00	8/1/00		8/2/00	8/29/00	9/25/00	Plot #
1/																				1/
						Low Tire Traffic														
6	6.5	6.5	6.5	5.5	**1st**	5.0	7.3	5.3	2.3	**2nd**	2.3	1.0	**3rd**	4.8	4.3	**4th**	6.0	**7.3**	7.0	**6**
1	3.5	4.3	4.3	5.0	**Traffic**	4.8	7.0	5.7	3.8	**Traffic**	3.8	3.5	**Traffic**	6.3	4.3	**Traffic**	6.0	**7.3**	6.8	**1**
5	3.3	3.8	3.8	6.0	**Event**	6.0	7.8	5.0	3.0	**Event**	2.8	4.3	**Event**	6.5	4.5	**Event**	6.0	**7.5**	6.5	**5**
3	6.3	6.3	5.5	5.8		5.8	7.8	7.7	5.0		5.0	4.5		6.5	4.3		6.0	**8.0**	8.0	**3**
						Medium Tire Traffic														
6	6.0	5.8	6.5	5.5		5.3	7.5	5.8	3.0		2.7	2.8		6.5	5.0		6.0	**7.7**	7.0	**6**
1	4.0	4.3	4.8	5.0		5.0	8.0	6.7	3.3		3.3	4.5		8.5	4.5		6.0	**8.0**	7.5	**1**
3	6.3	6.5	5.8	6.3		6.3	8.0	7.0	4.5		4.5	4.8		7.7	4.0		6.0	**8.0**	8.0	**3**
5	3.5	4.0	4.0	5.8		5.8	7.8	4.3	4.3		4.3	4.3		7.3	5.0		6.3	**8.0**	7.7	**5**
						High Tire Traffic														
5	3.5	4.0	3.8	6.5		6.5	7.8	5.7	4.3		4.3	5.3		7.0	5.5		6.3	**7.5**	6.8	**5**
6	5.8	6.3	6.3	4.8		5.0	7.5	5.3	1.8		1.8	1.8		6.3	5.0		6.0	**7.5**	7.3	**6**
1	5.5	4.5	5.3	5.0		5.0	7.3	5.8	4.8		4.8	4.8		8.5	4.0		6.0	**8.0**	7.5	**1**
3	6.5	6.8	6.0	5.5		5.5	7.5	5.7	4.0		4.0	3.5		8.0	5.0		6.0	**8.0**	8.0	**3**
						Check														
1	4.3	3.3	3.8	4.5		4.5	7.5	6.3	3.5		3.5	1.5		1.5	1.3		1.3	**6.8**	7.3	**1**
3	6.3	6.3	6.5	7.0		7.0	7.8	6.3	3.3		3.3	2.8		2.8	1.5		1.5	**6.8**	7.3	**3**
6	6.5	7.3	7.3	5.3		5.3	7.3	5.0	2.8		2.8	1.0		1.0	1.5		1.5	**6.8**	7.0	**6**
5	3.5	4.0	4.0	6.8		6.8	8.3	5.0	3.3		3.0	2.8		2.8	2.8		2.8	**7.3**	6.3	**5**

1/Plots are ranked best to worst for the late season vigor evaluation taken 8/29/00.

Study 29A145 - Wear Tolerance Demonstration **Table #7 - continued**

Plot #1=indiangrass
Plot #3=switchgrass
Plot #5=tall fescue
Plot #6=little bluestem

			SITE #2 TA-244					Vigor			Rating 1-9 (1=Best 9=Worst)								
Plot #	5/25/99	6/18/99	7/22/99	8/26/99		8/27/99	10/21/99		5/16/00		5/17/00	6/19/00		6/20/00	8/1/00		8/2/00	8/29/00	9/25/00	Plot #
1/																				1/
						Low Track Traffic														
3	4.3	4.5	4.5	6.5	Traffic	6.8	8.0		3.0	Traffic	5.0	3.7	Traffic	8.0	4.5	Traffic	7.0	**7.0**	7.5	3
5	4.3	3.3	3.5	6.8	Event	7.3	8.3		3.7	Event	3.7	6.0	Event	8.0	5.5	Event	6.5	**7.0**	7.0	5
1	3.0	3.3	3.3	4.5	1st	6.5	7.3		3.0	2nd	3.0	4.0	3rd	8.5	5.0	4th	6.3	**8.0**	7.3	1
6	6.0	6.3	6.5	4.8		6.8	7.5		3.3		3.3	3.5		8.0	4.3		7.0	**8.0**	7.0	6
						Medium Track Traffic														
1	4.5	4.3	4.3	5.3		6.5	8.3		3.3		3.3	5.0		8.8	5.0					1
3	5.3	5.5	4.8	5.5		6.8	8.0		3.5		1.5	4.3		8.0	4.7		6.5		8.0	3
5	5.3	5.3	5.3	7.0		7.8	8.0		4.0		3.0	6.7		7.5	5.5					5
6	5.5	5.8	5.5	4.3		6.8	7.8		3.5		4.5	3.5		8.0	6.0		6.0			6
						High Track Traffic														
1	4.5	4.0	4.0	5.3		6.8	8.3		3.8			5.7			5.5					1
3	4.5	5.0	4.5	5.5		7.3	8.0		2.0		2.3	5.0			5.5				8.0	3
5	4.5	5.0	4.8	7.0		7.5	8.5		5.3		4.0	7.0		8.0	5.5					5
6	5.3	5.5	5.5	4.8		6.5	7.5		2.3		2.7	2.8		7.0	6.0					6
						Check														
1	4.3	3.3	3.8	4.5		4.5	7.5	6.3	3.5		3.5	1.5		1.5	1.3		1.3	**6.8**	7.3	1
3	6.3	6.3	6.5	7.0		7.0	7.8	6.3	3.3		3.3	2.8		2.8	1.5		1.5	**6.8**	7.3	3
6	6.5	7.3	7.3	5.3		5.3	7.3	5.0	2.8		2.8	1.0		1.0	1.5		1.5	**6.8**	7.0	6
5	3.5	4.0	4.0	6.8		6.8	8.3	5.0	3.3		3.0	2.8		2.8	2.8		2.8	**7.3**	6.3	5

1/Plots are ranked best to worst for the late season vigor evaluation taken 8/29/00.

Plot #1=indiangrass
Plot #3=switchgrass
Plot #5=tall fescue
Plot #6=little bluestem

Study 29A145 - Wear Tolerance Demonstration											Table #8
				Site #3 Shooting Range							
			Percent Ground Cover								
Plot # 1/											**Plot # 1/**
	4/28/99	**5/27/19**	**6/24/99**	**7/23/99**	**9/22/99**	**10/21/99**	**3/13/00**	**4/17/00**	**5/18/00**	**9/18/00**	
4-Buffalograss	38.0	45.3	49.0	46.3	48.0	49.0	49.0	50.0	**47.0**	43.0	**4-Buffalograss**
5-Centipede grass	42.0	44.3	44.0	41.3	44.0	41.0	39.0	39.0	**44.0**	46.0	**5-Centipede grass**
2-Lespedeza daurica schimadae	-	20.0	26.0	24.3	30.0	31.0	21.0	17.0	**33.0**	33.0	**2-Lespedeza daurica schimadae**
1-Little bluestem	36.7	27.3	26.0	22.9	16.0	17.0	17.0	15.0	**15.0**	16.0	**1-Little bluestem**
3-Bermuda grass	29.3	24.6	27.0	23.4	10.0	10.0	10.0	10.0	**18.0**	8.0	**3-Bermuda grass**
			Density								
	4/28/99	**5/27/19**	**6/24/99**	**7/23/99**	**9/22/99**	**10/21/99**	**3/13/00**	**4/17/00**	**5/18/00**	**9/18/00**	
2-Lespedeza daurica schimadae	-	6.7	7.3	7.7	7.1	7.8	9.0	5.8	**4.4**	6.0	**2-Lespedeza daurica schimadae**
1-Little bluestem	4.8	5.9	6.6	6.9	7.9	8.2	9.0	5.0	**5.0**	7.1	**1-Little bluestem**
5-Centipede grass	2.9	4.9	7.2	5.7	6.5	7.6	9.0	5.3	**5.3**	6.4	**5-Centipede grass**
4-Buffalograss	4.0	6.8	7.0	5.4	6.1	7.3	9.0	4.8	**5.3**	6.0	**4-Buffalograss**
3-Bermuda grass	4.0	6.3	6.7	7.0	8.0	8.3	9.0	6.3	**6.7**	7.6	**3-Bermuda grass**
			Vigor								
	4/28/99	**5/27/19**	**6/24/99**	**7/23/99**	**9/22/99**	**10/21/99**	**3/13/00**	**4/17/00**	**5/18/00**	**9/18/00**	
2-Lespedeza daurica schimadae	-	5.0	6.0	6.3	6.0	7.7	9.0	5.8	**4.4**	4.2	**2-Lespedeza daurica schimadae**
1-Little bluestem	4.8	4.6	5.3	6.0	6.0	8.0	9.0	5.0	**5.0**	5.6	**1-Little bluestem**
5-Centipede grass	2.9	3.9	4.8	7.5	7.0	7.4	9.0	5.3	**5.3**	5.3	**5-Centipede grass**
4-Buffalograss	4.0	4.1	4.4	5.3	7.0	8.0	9.0	4.8	**5.3**	6.0	**4-Buffalograss**
3-Bermuda grass	4.0	4.8	6.1	6.3	7.9	8.0	9.0	6.3	**6.7**	6.4	**3-Bermuda grass**
1/Plots are ranked best to worst for the evaluation taken 5/18/00											

Plot #1 'Cimarron' little bluestem
Plot #2 Lespedeza daurica schimadae
Plot #3 'Guymon' bermudagrass
Plot #4 'Top Gun' buffalograss
Plot #5 'Tif Blair' centipedegrass

Study 29A145 - Wear Tolerance Demonstration **Table #9**

SITE #4 Bivouac

Percent Cover

Plot #	3/4/99	4/21/99	5/19/99	6/10/99	7/9/99	8/5/99	9/23/99	10/20/99	Plot #	3/14/00	4/17/00	5/2/00	6/20/00	8/2/00	9/19/00	Plot #
\1									\1							\1
4	82.5	81.3	77.5	80.0	82.5	85.0	**87.5**	85.0	**4**	71.3	66.3	66.3	40.0	40.0	**40.5**	**3**
2	81.3	82.5	77.5	77.5	81.3	83.5	**86.3**	80.0	**2**	65.0	73.8	72.5	37.5	35.0	**37.5**	**4**
1	90.0	87.5	75.0	77.5	81.3	82.5	**85.0**	83.8	**1**	68.8	55.0	55.0	26.3	28.8	**25.0**	**5**
5	85.0	82.5	82.5	77.5	83.8	80.0	**73.8**	75.0	**5**	62.5	50.0	50.0	25.0	20.0	**23.8**	**7**
3	81.3	80.0	67.5	75.0	80.0	82.5	**71.2**	75.0	**3**	67.5	60.0	60.0	25.0	20.0	**22.5**	**2**
7	77.5	81.3	75.0	80.0	85.0	82.3	**70.0**	46.3	**7**	58.8	57.5	57.5	23.8	23.8	**22.5**	**8**
8	81.3	80.0	71.3	75.0	78.8	77.5	**65.0**	42.5	**8**	55.0	47.5	47.5	18.8	18.8	**18.8**	**6**
9	77.5	72.5	70.0	75.0	76.3	68.8	**51.3**	56.3	**9**	81.3	52.5	57.5	18.0	18.0	**18.0**	**1**
6	72.0	67.5	67.5	75.0	76.3	75.0	**46.3**	42.5	**6**	65.0	47.5	47.5	16.3	16.3	**16.3**	**9**

Plant Density **(1=High Density 9=Bare Ground)**

Plot #	3/4/99	4/21/99	5/19/99	6/10/99	7/9/99	8/5/99	9/23/99	10/20/99	Plot #	3/14/00	4/17/00	5/2/00	6/20/00	8/2/00	9/19/00	Plot #
\1									\1							\1
4	3.3	4.0	4.0	3.8	3.5	3.0	**3.0**	4.5	**4**	5.1	6.5	5.5	7.3	7.3	**7.3**	**3**
2	3.3	3.8	3.5	3.5	3.3	3.3	**3.8**	4.0	**2**	5.5	5.8	5.3	7.3	7.3	**7.3**	**4**
1	3.0	3.8	4.0	3.5	3.3	2.8	**3.8**	4.3	**1**	6.0	7.3	7.0	6.8	7.3	**7.5**	**7**
5	3.3	4.0	3.5	3.5	3.8	3.8	**4.3**	4.5	**5**	6.3	7.8	7.3	7.5	7.5	**7.5**	**6**
3	3.5	3.5	4.5	4.3	3.5	3.5	**4.5**	5.0	**3**	5.5	7.0	6.3	7.5	7.5	**7.8**	**8**
7	4.0	3.8	4.0	3.8	3.8	3.0	**4.8**	6.0	**7**	6.3	7.3	7.0	7.5	7.5	**7.8**	**5**
8	3.5	3.8	4.0	3.8	3.8	3.5	**5.3**	6.3	**8**	6.3	6.3	6.0	8.0	7.3	**8.0**	**1**
9	4.5	4.8	4.3	4.3	4.3	4.5	**6.3**	5.8	**9**	6.5	7.3	6.3	8.0	8.0	**8.0**	**9**
6	4.5	5.3	4.5	4.0	3.8	4.3	**6.3**	7.3	**6**	5.5	6.5	6.0	7.8	7.8	**9.0**	**2**

\1 Plots are arranged from high to low from ratings done 9/23/99 and 9/19/00.

Plot #1 'Shademaster II' red fescue
Plot #2 'Flyer' red fescue
Plot #3 'Covar' sheep fescue
Plot #4 'SR-311' hard fescue
Plot #5 'Unique' Kentucky bluegrass
Plot #6 'Chieftain II' tall fescue
Plot #7 'Finelawn 5 GL' tall fescue
Plot #8 'Finelawn Petite' tall fescue
Plot #9 'Divine' perennial rye

Study 29A145 - Wear Tolerance Demonstration **Table #9 - continued**

SITE #4 Bivouac

Vigor **(1= Excellent 9=Poor)**

Plot #	3/4/99	4/21/99	5/19/99	6/10/99	7/9/99	8/5/99	9/23/99	10/20/99	Plot #	3/14/00	4/17/00	5/2/00	6/20/00	8/2/00	9/19/00	Plot #
\1									\1							\1
4	3.8	4.0	4.0	3.5	3.3	3.5	**4.5**	4.8	**4**	7.3	5.3	4.0	5.3	5.5	**6.0**	**4**
2	4.0	4.3	3.5	3.0	3.0	3.5	**4.8**	5.0	**2**	7.3	5.8	4.8	6.0	6.0	**6.8**	**3**
3	4.0	4.0	4.3	3.5	3.5	3.3	**4.8**	5.8	**3**	7.3	7.0	4.8	5.0	4.8	**7.0**	**6**
7	4.5	4.5	4.8	3.3	3.5	3.5	**5.5**	5.3	**7**	8.0	6.8	5.5	6.0	6.0	**7.0**	**8**
5	4.0	4.0	3.3	3.3	3.5	3.8	**5.5**	5.5	**5**	7.0	6.0	4.5	6.8	6.8	**7.3**	**1**
8	4.3	4.3	4.3	3.5	3.5	3.8	**5.5**	5.8	**8**	7.0	7.0	6.3	5.5	5.8	**7.3**	**5**
1	3.8	3.8	4.0	3.3	3.3	4.3	**6.0**	6.0	**1**	8.0	6.3	4.3	5.8	6.0	**7.3**	**7**
6	4.8	5.0	4.3	3.5	3.3	4.5	**6.0**	6.0	**6**	7.5	6.8	5.0	5.3	7.0	**7.8**	**9**
9	4.5	5.0	4.3	3.8	4.3	4.3	**6.3**	6.0	**9**	7.8	5.5	4.3	6.0	5.8	**8.0**	**2**

\1 Plots are arranged from high to low from ratings done 9/23/99 and 9/19/00.

Plot #1 'Shademaster II' red fescue	Plot #4 'SR-311' hard fescue		Plot #7 'Finelawn 5 GL' tall fescue
Plot #2 'Flyer' red fescue	Plot #5 'Unique' Kentucky bluegrass		Plot #8 'Finelawn Petite' tall fescue
Plot #3 'Covar' sheep fescue	Plot #6 'Chieftain II' tall fescue		Plot #9 'Divine' perennial rye

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

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

Study Leader: Henry, J.

Description:

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

Objective:

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

Materials and Methods:

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

Discussion
2000

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

Refer to Table #1 for collection information.

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

Table # 1

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

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

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

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

Study Leader: Henry, J.

Description:

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

Objective:

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

Materials and Methods:

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

Discussion:
2000

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

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

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

Table #1

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

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

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

Study Leader: Bruckerhoff, S. B.

Introduction:

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

Problem:

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

Objectives:

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

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

Cooperators:

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

Procedure:

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

Discussion:

2000

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

Field #9 **Table #1**
Pipeline D and E

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

Plot Size: 9’ x 18’ Planted 6/28/00, 7/12/00

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

\1 Southeast plant in plot was substituted with Pete because proper accession was not available.
\2 Above plots consisted of ten plants each for seed production information.

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

Releases from the Elsberry Plant Materials Center

Scientific Name	Release Name	Common Name	Accession Number	Secondary Agency(ies)	Type of Release	Year of Release
Sporobolus compositus (Poir.) Merr.	**Northern Iowa**	**tall dropseed**	**9062313**	**UNI, IARV, IAT, ICIA**	**N**	**2000**
Andropogon gerardii	**Northern Iowa**	**big bluestem**	**9068614**	**UNI,IARV,IAT,ICIA**	**N**	**2000**
Liatris pycnostachya, Michx	**Southern Iowa**	**prairie blazing star**	**9068628**	**UNI, IARV, IAT, ICIA**	**N**	**2000**
Lespedeza capitata Michx.	**Northern Iowa**	**roundhead lespedez**	**9062284**	**UNI, IARV, IAT, ICIA**	**N**	**2000**
Andropogon gerardii Vitman	Southern Iowa	big bluestem	9068616	UNI, IARV, IAT, ICIA	N	1999
Schizachyrium scoparium, Michx.	Northern Iowa	little bluestem	9062319	UNI, IARV, IAT, ICIA	N	1999
Eryngium yaccifolium Michx.	Southern Iowa	rattlesnake master	9068604	UNI, IARV, IAT, ICIA	N	1999
Eryngium yaccifolium Michx.	Central Iowa	rattlesnake master	9068603	UNI, IARV, IAT, ICIA	N	1999
Schizachyrium scoparium, Michx.	Southern Iowa	little bluestem	9962321	UNI, IARV, IAT, ICIA	N	1999
Liatris pycnostachya, Michx	Northern Iowa	prairie blazing star	9068626	UNI, IARV, IAT, ICIA	N	1999
Liatris pycnostachya, Michx	Central Iowa	prairie blazing star	9068627	UNI, IARV, IAT, ICIA	N	1999
Elymus virginicus L.	Northern MO	Virginia wild rye	9079044	UMC,MDC,MODOT	N	1999
Sorghastrum nutans (L) Nash.	Northern MO	indiangrass	9079036	UMC,MDC,MODOT	N	1999
Andropogon gerardii Vitman	Northern MO	big bluestem	9079000	UMC,MDC,MODOT	N	1999
Sorghastrum nutans (L) Nash.	Western MO	indiangrass	9079037	UMC,MDC,MODOT	N	1999
Schizachyrium scoparium, Michx.	Northern MO	little bluestem	9079004	UMC,MDC,MODOT	N	1999
Andropogon gerardii Vitman	Central Iowa	big bluestem	9068615	UNI,IARV,IAT,ICIA	N	1998
Dalea purpurea	Central 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

Scientific Name	Release Name	Common Name	Accession Number	Secondary Agency(ies)	Type of Release	Year of Release
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 or habitat without direct or indirect human activity.

Nat.=naturalized releases; collected from a population within the USA, but were originally introduced to the USA sometime in the past.

I=introduced; means that the original collection from which the release was made was not from within the USA.

	Studies/Projects at the Elsberry Plant Materials Center	
	Studies 1958 through 2000	
Study/Project 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/Project 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/Project	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	
29A058-72	Evaluation for Naming and Releasing of Elsberry Developed Big Bluestem	
	and Indiangrass	

Study/Project	Title	
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	
-------	Evaluation of Cold Hardy *Paspalum notatum* Selections	
29I077P	Evaluation of Plants for Vegetating Salt Damaged Areas	

Study/Project	Name	
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 Screening 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*	
29I100J	Assembly and Evaluation of Blackhaw, *Viburnum prunifolium* L.	
29I101J	Assembly and Evaluation of Arrowwood, *Viburnum dentatum* L.	

Study/Project	Name	
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 College	
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	
29I126W	Woody Columnar Collection	

Study/Project	Title	
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	
MOPMC-P-0001	Assembly, Evaluation and Selection ofBur Oak, *Quercus macrocarpa* , Michx.	
WO,WL,WE		
MOPMC-P-0002	Assembly, Evaluation and Selection of False Indigo Bush,.	
WE, WL	*Amorpha fruticosa* , L.	
MOPMC-P-0003	Evaluation and Release of Eastern Gamagrass,*Tripsacum dactyloides* , L.	
PA, WL		

Herbaceous and Woody Seed and Plant Production at the Elsberry PMC 2000

The plant and seed inventory at the Elsberry PMC is used for field plantings, special plantings, demonstration plantings, research studies and commercial release. The 2000 production of grass, legume, forb, and woody seed reflected a below average year.

Name	Seed Inventory as of December 2000 PLS (Pounds)
Herbaceous	
'Rountree' big bluestem *Andropogon gerardii*	337 Foundation 90 Certified
'Rumsey' indiangrass *Sorghastrum nutans*	1600 Foundation
'Pete' eastern gamagrass *Tripsicum dactyloides* L.	1480 Foundation
'Cave-In-Rock' switchgrass *Panicum virgatum*	1584 Foundation
'Svalofs' field brome *Bromus arvensis*	230 Non-Certified
'Elsberry' smoothbrome *Bromus inermis*	21 Non-Certified
OH-370 big bluestem *Andropogon gerardii*	32 Foundation
'Niagara' big bluestem *Andropogon gerardii*	35 Non-Certified
'Bobwhite' soybean *Glycine species*	50 Common
'Aroostook' rye *Secale cereale*	1000 Common

Herbaceous and Woody Seed and Plant Production – continued

Name:	Seed Inventory as of December 1999 Bulk (Pounds)
Union tulip tree *Liriodendron tulipifera*	0.60
Nicholson Germplasm roughleaf dogwood *Cornus drummondii*	1.18
Corinth Germplasm roughleaf dogwood *Cornus drummondii*	1.43
Tazewell Germplasm roughleaf dogwood *Cornus drummondii*	0.12
Jefferson Germplasm roughleaf dogwood *Cornus drummondii*	1.38
American hazelnut (9057168) (Illinois) *Corylus americana*	3.20
American hazelnut (9057169) (Illinois) *Corylus americana*	2.70
American hazelnut (9068562) (Illinois) *Corylus americana*	4.60
American hazelnut (9057188) (Illinois) *Corylus americana*	9.30
American hazelnut (9068528) (Illinois) *Corylus americana*	7.90
American hazelnut (9068573) (Missouri) *Corylus americana*	4.00
American hazelnut (9068574) (Missouri) *Corylus americana*	4.80
American plum (9068546) (Missouri) *Prunus americana*	0.93
American plum (9068580) (Missouri) *Prunus americana*	4.50
American plum (9057088) (Illinois) *Prunus americana*	2.23
American plum (9062309) (North Dakota) *Prunus americana*	2.57
American plum (9068545) (Missouri) *Prunus americana*	1.74
Arrowwood (9062310 (Iowa) *Viburnum dentatum*	0.85

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