USGA PROGRESS REPORT - 1988

Breeding, Evaluation and Culture of Buffalograss for Golf Course Turf

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A USGA/GCSAA/University of Nebraska Research Project
Initiated in 1984

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October 28, 1988

USGA EXECUTIVE REPORT - 1988

Breeding, Evaluation and Culture of Buffalograss for Golf Course Turf

1. Commercialization of New Turf Type Buffalograsses

At the present time, there is interest in a vegetative release of buffalograss by 5 companies and interest from 7 companies for a release of a seeded variety. Our group feels it is important to make our initial release of a vegetative cultivar during 1989.

2. Buffalograss Evaluations

Oklahoma State University, Stillwater, OK: Dr. Joel Barber established improved buffalograss cultivars in 1987. The buffalograss did not exhibit any insect infestation or disease , however, competition with bermuda grass was a problem. Cultivars which rated high for color, quality and percent cover were; 84-409, 84-415, 85-364, 85-129, 84-5-2, 85-152-1 and 85-478-2.

Nuckolls County Ext. Service, Nelson, NE: Mr.Chet Hawley established several improved buffalograss cultivars in 1987. Cultural practices were kept to a minimum with infrequent mowing and little or no irrigation or fertilizer. Cultivars which produced favorable turf-type qualities were 84-609, 84-104 and 84-514. The Ne 84-315 selection exhibited symptoms similar to those found at the Mead facility.

Texas A&M University, Dallas, TX: Dr. M. Engelke has evaluated several improved buffalograss selections and found initially several to have good performance.

3. Cultivar Development - Seed

Farmers Marketing Corporation: Is interested in continuing their efforts with buffalograss. They have had discussions with Arrow Seed (Nebraska) and Johnson Seed (Oklahoma) about the possibility of cooperatively producing seed of a proprietary cultivar at several locations.

Lofts Pedigreed Seed - Madris, Oregon: A small planting of experimental clones and Texoka were made in Madris during 1987. Observations this year suggest that buffalograss can grow and possibly produce very good seed (burrs) in these dry land production areas.

4. Synthetic Planting/Harvest plans for 1989

Female plants in this synthetic study were harvested during late September and early October. This seed will be processed over the winter for 1989 research and used for further seed development projects.

5. Plans for F1 Seeded Variety

Following discussions with Dr. Robert Ahring, retired Oklahoma State University professor in buffalograss seed production, the following plan for development of a seeded variety was made: Select several combinations of both male and female materials to produce either an F1 or a synthetic variety.

6. Evaluation of Time and Storage on Buffalograss

High germination of the caryopses stored at room temperature will encourage further study into removal of the caryopses from the burr.

7. Image Analysis

The method of image analysis reduces the time spent on collecting and analyzing rooting data and increases the accuracy of root information obtained. This method will be useful to researchers when studying rooting characteristics of cultural and breeding practices.

8. Problems/NE 84-315

During the summer of 1988, the buffalograsses performed quite well through the middle of July, even though we were under a severe drought and no irrigation had been applied to any of the advanced buffalograss plots. However, in the middle of July several of the clones of buffalograss including NE 84-315 had a severe drop-off in turf quality. After extensive work by Dr Baxendale, it was concluded that the mealybug was causing the damage in the turf. The mealybug is a microscopic insect that seems to live in the sheath of the plant and suck juices from the individual stems. Hopefully, this was a one-year problem that may not occur again, but it is helpful to have this knowledge as we go forward on this project.

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1. BUFFALOGRASS COLLECTION AND PROPAGATION

A. Collection

Buffalograss was collected in Nebraska from 17 south central and western counties, including Scottsbluff, on July 11-13, 1988. Turf-type ecotypes of buffalograss were collected from cemeteries, parks, golf courses, industrial sites, and native range areas. During a trip to Urbana, Illinois, July 25-28, side trips were made looking for buffalograss in western, central and southern Iowa as well as western Illinois. Buffalograss was observed in older cemeteries throughout central and eastern Iowa. The drought was so severe it was impossible to determine superior types. Cool season grasses in the cemeteries were dormant or dead. Repeat trips to these areas will be made next year to reselect turf-type buffalograss.

The buffalograss ecotypes collected in Nebraska were planted at the Agricultural Research and Development Center near Mead, Nebraska. They will be carefully evaluated during the summer of 1989.

B. 1987 Buffalograss Vegetative Increase

The purpose of this planting is to increase plant material of superior buffalograss clones which showed turf type characteristics selected from the 1986 and 1987 evaluation areas.

One hundred plugs of each of 10 selected plants were planted on five foot centers in 10,000 sq. ft. plots on May 12, 1987. New clones have been added throughout the 1988 growing season. Data taken on the plots includes color, density, cover, survival and an overall turfgrass quality. This area will be used to provide plant material for breeding, advanced testing and maintenance and cultural practice studies planned for the future. Plots also provide material sent to other universities for evaluation.

C. Buffalograss Demonstration Plots

a) University of Nebraska Sites

Lincoln, NE: Six selections of buffalograss including Texoka, were planted at a Lincoln Public Library nature center location. The cultivars will be evaluated periodically for color and turfgrass quality.

University of Nebraska-Lincoln Animal Science: Five selections of buffalograss were planted at the new Animal Science building located on the University of Nebraska, East Campus in cooperation with the UNL grounds department. Plots will be evaluated periodically for color and turfgrass quality.

b) Other Universities Sites

i) Established Studies

Oklahoma State University, Stillwater, OK: Dr. Joel Barber established improved buffalograss cultivars in 1987. Cultural practices included: 1) mowing once a week at 1 1/2 inches, 2) irrigating once a week and 3) application of an 1 lb. on nitrogen fertilizer in early spring and summer. The buffalograss did not exhibit any insect infestation or disease , however, competition with bermuda grass was a problem. Cultivars which rated high for color, quality and percent cover were; 84-409, 84-415, 85-364, 85-129, 84-5-2, 85-152-1 and 85-478-2.

Nuckolls County Ext. Service, Nelson, NE: Mr. Chet Hawley established several improved buffalograss cultivars in 1987. Cultural practices were kept to a minimum with infrequent mowing and little or no irrigation or fertilizer. Cultivars which produced favorable turf-type qualities were 84-609, 84-104 and 84-514. The Ne 84-315 selection exhibited symptoms similar to those found at the Mead facility, therefore, did not produce a quality turf stand. Dr. Fred Baxendale monitored plots throughout the summer for insect infestation. Refer to Section 5F, page 11 for further explanation of the selections decline in turf quality. At the close of the season, cultivars 84-609, 84-104 and 84-514 continued to perform well with high percentages of the stand remaining green while other cultivars went dormant.

Texas A&M University, El Paso, TX: Dr. Garald Horst has evaluated a number of the improved buffalograss selections in his salt tolerance screening procedures. This information will be reported in his USGA report.

Texas A&M University, Dallas, TX: Dr. M. Engelke has evaluated several improved buffalograss selections and found initially several to be quick in establishment and high in turf quality performance. Further data analysis will be available this winter.

ii) Recently Established Studies

The following cooperators were sent three replications of five buffalograss cultivars. They will evaluate the selections for adaptability in their location.

Colorado State Univ., Fort Collins, CO: Dr. Robin Cuany
Iowa State Univ., Ames, IA: Dr. Nick Christians
Univ. of Arizona, Tucson, AZ: Dr. Charles Mancino
Rutgers University, New Brunswick, NJ: Dr. Reed Funk
Cornell Univ., Ithaca, NY: Dr. Norman Hummel
North Carolina State U., Raleigh, NC: Dr. Art Bruneau
Antelope County Ext. Service, Neligh, NE: Gary Zoubek
Chadron State College, Chadron, NE: Jay Drucker

iii) Future Studies

The following have expressed an interest in evaluating improved buffalograss cultivars. Selections will be sent according to locations planting periods.

California State Coll., Bakersfield, CA: Dr. L. Brilman
Univ. of California, Riverside, CA: Stephen Cockerham

c) Non University Sites

i) Established Studies

Farmer's Marketing Corporation - Yuma, Arizona: Although the experimental planting at Yuma has not been observed by anyone from the Buffalograss Research Project Staff, all information indicates that the experimental cultivars in this test are doing well. The plots are flood irrigated when necessary and are mowed at two mowing heights (1" and 3"). Some scalping has occurred at the low mowing height.

Seed (burrs) has been harvested off of all plots and yield per acre calculated. Highest yielding plot was 400 lbs/acre. The burrs have been received by Nebraska for evaluation of caryopses yield, germination, and seed set.

At the present time, Farmers Marketing Corporation is interested in continuing their efforts with buffalograss. They have had discussions with Arrow Seed (Nebraska) and Johnson Seed (Oklahoma) about the possibility of cooperatively producing seed of a proprietary cultivar at several locations. They will be submitting a proposal in the near future in this regard.

Lofts Pedigreed Seed - Madris, Oregon: A small planting of experimental clones and Texoka were made in Madris during 1987. Observations this year suggest that buffalograss can grow and possibly produce very good seed (burrs) in these dry land production areas.

Based upon these initial observations, a test planting using one male and one female was made in order to determine the feasibility of producing F1 hybrid seed. Lofts is also planting a small acreage of Texoka to evaluate buffalograss seed production in Oregon.

O. M. Scott & Sons - Cleveland, Texas: A single planting of three buffalograss experimentals was made in Cleveland, Texas, (outside Houston) during 1988. Observations later during the growing season suggest that buffalograss can grow in Houston, but the high humidity may cause a problem with leaf diseases.

Omaha, NE: Six selections of buffalograss including Texoka, were planted at the Field Club Golf Course in Omaha, Nebraska on May 18, 1988. In addition, 5000 Texoka plugs purchased by the Field Club for trial purposes on their course. These materials will be evaluated periodically for their potential use on golf courses.

ii) Recently Established Studies

The following cooperators recently received improved buffalograss cultivars for evaluation at their location.

Bluestem Seed Co., Prairie Village, KS: George Gates
Coastal Plain Exp. Sta., USDA-ARS, Tifton,GA: W. Hanna

iii) Future Studies

The following have expressed interest in evaluating improved buffalograss cultivars. Plant material will be sent during the locations optimum planting period.

R & D Sod Farm, Okeechobee, FL: Edward Davis
Denver Botanic Gardens, Denver, CO: Gayle Weinstein
Douget Sod Farm, Bay City, TX: David Douget

2. BUFFALOGRASS PLANT BREEDING

A. Buffalograss Female\Male Sex Ratios

Three hundred plants from ten selected buffalograss lines showing superior characteristics for color and turf quality were planted at the Mead Research Facility to evaluate heritability of turf quality and sex ratio characteristics in the progeny. The objective of this research is to develop a superior buffalograss line which would be female-biased and also require reduced amounts of water and fertilizer to maintain an acceptable turf.

B. Synthetic Planting/Harvest plans for 1989

Plants in the July 1987 synthetic planting grew well during the dry 1988 season with no apparent affect on seed production. This area remained unmowed until harvest.

Female plants in this synthetic study were harvested during late September and early October. This seed will be processed over the winter for 1989 research and used for further seed development projects. Since many of the female plants produced the burr well down in the turf, harvest was made in the following way: Each plant was first mowed with a rotary mower set at 3 inches and the clippings were removed from the grass catcher and screened to determine if any burrs were present in this material. The plot was then vacuumed with a shop vac to harvest any burrs that had either shattered or were still attached to the plant. This procedure seemed to do quite well in removing most burr material from the plot.

The following procedures will be implemented with the harvested seed: 1) approximately 100 seedlings will be started in the greenhouse from each female line and field planted for progeny evaluation, 2) seed from the females will be used to establish turfgrass plots for evaluation of turf quality and 3) an equal number of seeds from each of the female clones will be used to produce a turf plot for evaluation.

C. Plans for F1 Seeded Variety

Following discussions with Dr. Robert Ahring, retired Oklahoma State University professor in buffalograss seed production, the following plan for development of a seeded variety was made: Select several combinations of both male and female materials to produce either an F1 or a synthetic variety. This

F1 will include a single male and female plant while a synthetic may include two to three males and three to four female clones. Vegetative propagation will be used to provide both multiple numbers of each genotype and four replications. Three replications of 8 x 20' plots will be planted both at Mead, Nebraska, and with contracted cooperators in possibly Oklahoma, Oregon and in Yuma, Arizona. Plantings would be made in early spring 1989.

3. EVALUATION: TIME AND STORAGE CONDITIONS ON BUFFALOGRASS

Introduction: Traditionally buffalograss is stored in the burr, often under cool, dry conditions. With present work at UNL on the removal of the caryopses from the burr, storage of the caryopses and their viability over time has been a concern. Commercially obtained KNO_3 treated and untreated burrs and caryopses removed from these burrs were stored at room temperature and in cold storage for 3, 9, and 15 month intervals to determine the effects of storage time and conditions.

Objectives: The objectives of this study are 1) to determine the effect of storage time on germination of treated and untreated buffalograss burrs and caryopses, and 2) to determine the effect of storage conditions.

Materials & Methods: Fifteen hundred KNO_3 treated burrs and non-KNO_3 treated burrs were counted out by hand and placed in cold storage and under room temperature conditions. At the same time, 3000 KNO_3 treated burrs and 3000 non-KNO_3 treated burrs were processed in a barley pearler to separate the caryopses from the burr. The remaining material was put through a blower and a series of screens to separate the chaff from the caryopses. From each treatment, 1500 of the individual caryopses were placed in cold storage and 1500 were placed at room temperature. The burrs and caryopses were put in marked paper sacks to prevent accumulation of moisture and premature germination. Treatments were assigned as follows:

TRT 1 = Treated burrs at room temperature
TRT 2 = Untreated burrs at room temperature
TRT 3 = Treated caryopses at room temperature
TRT 4 = Untreated caryopses at room temperature
TRT 5 = Treated burrs in cold storage
TRT 6 = Untreated burrs in cold storage
TRT 7 = Treated caryopses in cold storage
TRT 8 = Untreated caryopses in cold storage

Analyses were made at 3, 9 and 15 months. Three months was chosen to determine a base testing germination, nine months was chosen because of federal seed testing requirements and fifteen months was chosen to test shelf life from harvest one season to the planting season of the following year. Each treatment consists of four replications with 125 caryopses or burrs per petri dish.The petri dishes were put in a growth chamber where light requirements of 16 hours and temperature requirements of a minimum 70° and a maximum 95° F were met. Seedling counts were taken at 4, 7 and 14 days.

Discussion: The caryopses in cold storage had a slightly lower germination than those stored at room temperature. The difference was negligible in the first 9 months, but at 15 months it became more apparent, possibly showing a trend towards decreased germination under long-term cold storage. Burrs in cold storage had better germination than those stored at room temperature. The burrs showed a very large drop in germination at 9 months indicating the possibility that long term storage of burrs is unfavorable. High germination of the caryopses stored at room temperature will encourage further study into removal of the caryopses from the burr. A second test is under progress and will be completed in 1989. Similar trends are being found in this test. When completed the data from both years will be compiled and analyzed to determine the best storage conditions.

4. BUFFALOGRASS VEGETATIVE ESTABLISHMENT

A. Prerooting/Plastic Study

On March 23, 1988, 32 plugs were harvested from a dormant buffalograss turf, placed in flats, put under black plastic and kept outside the research facility for prerooting. Thirty two more plugs were harvested and placed outdoors in flats under clear plastic. Another set of 32 plugs were harvested and put in the greenhouse for prerooting. At the same time and 8 x 4 foot area of dormant buffalograss sod was covered with black plastic and another area of the same size was covered with clear plastic. On April 20, 1988, 96 plugs were harvested. Thirty-two plugs each were placed in flats under black plastic and clear plastic outside the research facility. The remaining 32 plugs were placed in the greenhouse for 4 weeks of prerooting. On May 18, 1988, 32 plugs were harvested as non-prerooted plugs from a buffalograss sod area and transplanted to

the study site. Thirty-two plugs each from the various plastic treatments were also planted to the field. Data was taken weekly on color, percent cover and number of stolons. Data indicates that the plugs prerooted under the clear plastic for four and eight weeks are comparable to the results from plugs prerooted for four and eight weeks in the greenhouse.

B. Sod Conversion with NE 84-315

On June 2, 1988, prerooted and non-prerooted plugs of NE 84-315 were planted as follows: 1) in tall fescue sprayed with Roundup prior to planting and 2) in tall fescue treated with Simazine after planting. The objective of this study was to determine the establishment efficiency of a turf-type buffalograss in existing eradicated turf. Results from this study will not be complete until the summer of 1989. However, trends suggest that the host turf was killed, allowing the buffalograss stand to quickly establish.

C. Buffalograss/Tall Fescue Interplugging

This study was initiated to determine if prerooted and non-prerooted buffalograss plugs would produce stolons in a killed tall fescue thatch and to determine if a suitable turf would establish in the thatch. This is the second test of this study, the first study was done in 1987 using perennial ryegrass as the killed thatch. Plugs were planted on either one-foot or two-foot centers. Trends indicate that prerooted plugs at 12 inch centers initially had more stolon growth and covered more quickly than the other three treatments.

D. Sod Thatch/Seeding Rate Study

On July 14, 1988, a buffalograss seeding rate study was planted in an area of killed tall fescue. Seeding rates of 1/2 lb. and 3/4 lb. of caryopses and 2 lb. of KNO_3 treated burrs were planted in 5 x 5 foot plots. Data taken included color, density and turfgrass quality. This study will not be completed until the summer of 1989. Trends indicate that seeding into a dead thatch is an acceptable way to establish buffalograss and control potential erosion problems.

E. Seeding Rate Study

On July 14, 1988, a seeding rate study was planted into a clean seedbed. Seeding rates of 1/8, 1/4, 1/2, 3/4 and 1 lb. of caryopses and 2 lb. of burrs were planted. Data was taken weekly on seedling counts, color and percent cover. Trends indicate that the 1/2 and 3/4 lb. seeding rates of caryopses have more seedlings germinating sooner than with the 2 lbs. of burrs and that the resulting turfgrass quality of the 1/2 and 3/4 lb. rate are comparable to the 2 lb. seeding rate of burrs. By using caryopses for seeding purposes instead of the burrs, conventional turf seeding equipment can be used.

F. Carbohydrate Analysis

Field replication of treatments for the carbohydrate study were completed this fall. All samples will be tested to assess non-structural carbohydrate storage in roots, top growth and crowns, and stolons.

5. CULTURAL PRACTICES

A. 1986 Advanced Evaluation Area

The purpose of this area is to evaluate outstanding male and female clones selected during 1985. During 1988 the plots were maintained at two mowing heights, 2 1/2 inches and 1 inch. Data was taken in the early spring and dormancy colors were recorded into late fall. This data was used to select superior plants which have been added to the breeding program and other increase areas for further evaluation. During the 1989 season this area will also be maintained at two fertility levels.

B. 1987 Advanced Evaluation Area

The purpose of this planting is to evaluate 50 outstanding male and female clones selected during 1986 and spring of 1987 for turf type characteristics. During 1988 the plots were maintained at two mowing heights, 2 1/2 inches and 1 inch. Data was taken in the early spring and dormancy colors were recorded into late fall. This data aided in selection of superior plants which have been added to the breeding program and other increase areas for further evaluation. This area will also be maintained at two fertility levels during the 1989 season.

C. Water Use Rates

Six varieties of buffalograss showing superior turf characteristics were evaluated, using six replications of each variety. The lysimeters, surrounded by a Texoka turf of 15 sq. ft., were mowed at 2 1/2 inches once a week. Lysimeter weight readings and vertical elongation rates were measured five times throughout the growing season with measurements made over a 48 hour period. An additional measurement was also made after the grass became dormant. Illustration of buffalograss' lower water requirement in comparison to other turfgrasses is the objective of this research.

D. Fertilizer Rate and Application Studies

Fall/Spring fertilizer application study: This study is designed to evaluate the effects of fall and spring application of nitrogen fertilizer on established buffalograss. Objectives of study are to: 1) observe effects of fall and spring fertilizing schedules on early spring greenup and fall color retention, 2) evaluate competitive response of buffalograss and kentucky bluegrass and 3) observe cool and warm season weed population.

Fertilizer rate and application sequence study: This study is designed to evaluate fertilizer application rates and time sequence of application on established buffalograss turf. Objectives of study are to: 1) observe effects of varying amounts of fertilizer applied at different intervals, 2) evaluate competitive response of buffalograss and kentucky bluegrass and 3) observe cool and warm season weed population.

E. Image Analysis

a) Established Studies

Introduction: Research involving the root/soil biosystem, traditionally labor intensive and destructive in nature, is simplified with computer technology. Acquiring rooting data *in situ* from rhizotron cells entailed manual tracing of roots on grided acetate sheets and counting the number of roots intersecting the grids. By using black and white infrared photography and digital image analysis, the intensive manual input is reduced. The purpose of this study was two-fold: 1) compare accuracy of the methods in measuring rooting parameters and 2) determine time

efficiency between the computer aided technique and the line intersect method.

Methods: Buffalograss, vegetatively established in mini rhizotron cells, was used to study rooting parameters. The line intersect technique was accomplished by placing a 5 cm^2 grided acetate sheet on the plexiglass surface and tracing the roots. The grids on the sheet were 1 mm^2. Manual counting of roots intersecting the 1 mm^2 grids was performed on 30-5 cm^2 areas and the root number inserted in the line intersect equation to obtain the root length. The root area measurement was accomplished by multiplying root lengths by the average root diameter. Average root diameter was obtained by measuring roots harvested from boxes. Roots were measured using a micrometer accurate to .1 mm.

The computer aided technique utilized black and white infrared photographs of the 30- 5 cm^2 areas. These negatives were converted to digital format through use of Earth Resources Data Analysis Systems (ERDAS) software. The digital images (512 x 512) pixels were analyzed using ERDAS image processing programs which classified each pixel into similar spectrally distinct classes (groups). The resulting classes were then visually interpreted for spectral similarity and reduced to two classes: 1) roots and 2) Soil media. The root area value is derived through the processing package. Root length is calculated by using the average root diameter found from core sampling.

Results: Preliminary results indicate the digital images were as accurate as the line intersect method. It is felt that due to inherent difference of resolution between methods, the computer method will be found more accurate with further investigation. The digital image is made up of 90,000 (300 x 300) pixels and the tracings are 2500 (50 cm x 50 cm) square (`pixels') is size. One square (1 mm^2) of the tracing image makes up 36 pixels in the digital image. Time efficiency results indicate a 25-50% reduction in time and manual labor requirements using the computer aided technique. Processing of data by computer also reduces error variation.

Assessment of overall accuracy of the computer technique will be determined in a study using several operators. The operators will begin the procedure from root tracing and follow through to the computer technique. This study is designed to insure the method is not biased by an operator.

Summary: In summary, the method of image analysis reduces the time spent on collecting and analyzing rooting data and increases the accuracy of root information obtained. This method will be useful to researchers when studying rooting characteristics of cultural and breeding practices.

b) Future Studies

A study utilizing the deep mini rooting cells and improved buffalograss cultivars will be established. The objectives of this study are: 1) detect and determine rooting differences of buffalograss cultivars and 2) evaluate root growth during the active growth periods.

F. Problems/NE 84-315

During the summer of 1988, the buffalograsses performed quite well through the middle of July, even though we were under a severe drought and no irrigation had been applied to any of the advanced buffalograss plots. However, in the middle of July several of the clones of buffalograss including NE 84-315 had a severe drop-off in turf quality. At this time, all cooperators from the various pesticide areas were called in to look at the turf and to determine possible causes. It was observed that the health and vigor of the plant was very poor and rooting inadequate to support healthy growth. Our initial assumption was that the use of pendimethalin had affected root pegging, placing stress on the turf plots. This is still a possibility and may relate to the problem that I will mention shortly. However, in 1989 we will evaluate our use of herbicides more closely through replicated studies and we will also be more conservative and probably go back to use of Simazine for routine maintenance.

As the summer progressed, increased insect activity was observed on the poorer performing plots. Fred Baxendale, our entomology cooperator who had been surveying buffalograss for possible insect problems, at this time identified several insects in the plots that possibly could be causing damage. After extensive work by Fred, it was concluded that one of the species of insects, called a bigeye bug, was a predator on another insect, the mealybug, which was causing the damage in the turf. The mealybug is a microscopic insect that seems to live in the sheath of the plant and suck juices from the individual stems. Since the problem was not identified until the end of the growing season, we were not in a position to make treatments to remedy

the problem. However, in 1989 we plan to watch closely for this problem and to treat certain areas to try to correct the problem if it occurs. It is possible that this problem was caused by an interaction between the drought and our herbicide treatments. Hopefully, this was a one-year problem that may not occur again, but it is helpful to have this knowledge as we go forward on this project.

6. COMMERCIALIZATION OF NEW TURF-TYPE BUFFALOGRASS CULTIVARS

At the present time, there is interest in a vegetative release of buffalograss by 5 companies and interest from 7 companies for a release of a seeded variety. Our group feels it is important to make our initial release of a vegetative cultivar as soon as possible. In this regard, the first step has been made by meeting with Dr. Bill Splinter, Associate Vice Chancellor in charge of sponsored research. Bill is responsible for development of release contracts. I told Dr. Splinter that we were interested in releasing these grasses vegetatively and would like to make a formal announcement of their availability. I showed him a copy of the announcement of formal release and he shared several ideas on items to be included. A copy of the formal announcement and specification list will be sent to the USGA upon completion and approval by UNL. This information will be sent out in letter form after approval, approximately November 1. We will also at this time start developing a plant patent and a final contract which would be entered into with both producers of vegetative and seeded cultivars.

7. PRESENTATIONS

a) Poster presentations at the American Society for Horticultural Sciences Annual Meeting, August 1988:

Vegetative Buffalograss Establishment in Perennial Ryegrass Thatch. J.L. Svoboda, T.P. Riordan, E.J. Kinbacher, R.C. Shearman

Evaluation of Late Season Buffalograss Establishment. D.J. Schwarze, T.P. Riordan, J.L. Svoboda, E.J. Kinbacher, R.C. Shearman

b) Oral presentation to the 11th North American Prairie Conference, August 1988:

Buffalograss--A Native Warm-Season Grass for Residential and Commercial Use. E.J. Kinbacher, J.L. Svoboda, T.P. Riordan, R.C. Shearman, D.J. Schwarze

c) Poster Presentations to the American Agronomy Society, November 1988:

Breeding Approaches to the Development of Turf-Type Buffalograss Cultivars. T.P. Riordan, E.J. Kinbacher, R.C. Shearman

Buffalograss Sex Expression and Correlation with Turf-type Characteristics. S.J. Browning, J.L. Svoboda, T.P. Riordan, E.J. Kinbacher, R.C. Shearman

A New Turf-Type Buffalograss: NE 84-315. J.L. Svoboda, T.P. Riordan, E.J. Kinbacher, and R.C. Shearman.

Recommendations for Vegetative Establishment for Turf-Type Buffalograss Cultivars. D.J. Schwarze, T.P. Riordan, J.L. Svoboda, E. J. Kinbacher, R.C. Shearman

d) Oral Presentations to the American Agronomy Society, November 1988:

Digital Image Analysis for Turfgrass Root Area Measurements. S.A. de Shazer,R.C. Shearman,D.C. Rundquist and T.P. Riordan