EXECUTIVE SUMMARY

Breeding, Evaluation and Culture of Buffalograss for Golf Course Turf

NE 84-609 - Patent rights and sod certification have been obtained for the cultivar NE 86-609 ('609'). First official sales of '609' were made September 9, 1991 by the Crenshaw & Doguet Turfgrass Corporation. Production, marketing, sublicensing and research are continuing on this cultivar.

CRENSHAW & DOGUET TURFGRASS CORPORATION - Aggressive production of '609' has increased the acreage from 1.5 acres in May 1990 to 90 acres as of September 1991. Marketing of this cultivar has likewise been aggressive. Crenshaw & Doguet intend on continuing with their present course of production and marketing of '609'.

'609' SUBLICENSES - Currently, California, Arizona and Oklahoma have been granted '609' sublicenses by Crenshaw & Doguet with the stipulation that they meet the certification standards developed in Texas.

ROYALTIES - Royalties from the 1991 season are likely not to be significant, however, projections for 1992 indicate that royalties should be of significant worth.

ADDITIONAL RELEASES - Two Nebraska experimentals (NE 84-315 and NE 85-378) are advanced enough in the program that patent right information is currently being assembled for submission this winter. Additional experimentals are concurrently being advanced for release in 1992.

NATIVE TURF DEVELOPMENT GROUP (NTDG) - The NTDG has made significant progress in the development of seeded buffalograss. Four test sites were established with 2000 nursery plants to assess sex ratios and performance of the five potential cultivars developed by the group. The five cultivars have been entered into the National Turfgrass Evaluation Programs' newest trial entitled "National Buffalograss Evaluation Trial". The release of these five cultivars is projected for 1993.

INSECT RESEARCH - Research on insect pests of buffalograss continues with emphasis on the "buffalograss mealybug" and chinch bug. This research is important for a complete understanding of buffalograss management.

USGA PROPOSAL - The University of Nebraska will submit a USGA proposal following up on our breeding and development work with buffalograss. This proposal will call for an enhancement of the project, specifically in the breeding and management areas. It is hoped that a portion of this project can be financed with anticipated USGA royalty income.

BREEDING, EVALUATION AND CULTURE OF BUFFALOGRASS

FOR GOLF COURSE TURF

NE 84-609 UPDATE

On September 6, 1991, a patent was filed for NE 84-609 buffalograss. Concurrently, the University of Nebraska formally went through the process to release this cultivar. During the summer, NE 84-609 was certified for sod production by the Texas Department of Agriculture. First sales of '609' were officially made on September 9, 1991, by the Crenshaw & Doguet Turfgrass Corporation. A variety release statement for '609' is included with this report (Appendix A, page 6).

Crenshaw & Doguet Turfgrass - After planting an initial foundation area of 1½ acres during May of 1990, Crenshaw & Doguet has increased this material to approximately 90 acres. They are very pleased with the appearance and performance of '609'. Although they are also growing Prairie buffalograss, they are being very aggressive with the production and marketing of '609'.

Sublicenses - Sublicenses have been granted in California, Arizona and Oklahoma. Production totals approximately 20 acres in these sites. These growers will have plant material for the 1992 spring market. It is anticipated that all three sublicensees will be visited by UNL staff during spring 1992 to assess progress. Crenshaw & Doguet is requiring that all growers meet the certification standards that have been developed for '609' in Texas.

'609' - California - Currently 10 acres of '609' have been planted in the Palm Springs area by Foster Turfgrass. We have had reports that '609' has not performed well in the University of California-Riverside turfgrass plots and therefore, have a question about the potential of '609' in California. However, David Doguet reports that a half acre planting of '609' in the Palm Springs area is performing quite well. It is important that the performance of '609' in California be determined in the near future before '609' becomes available other than for testing.

Royalties - Since some sales of '609' have occurred in 1991, there should be a small royalty payment paid to the USGA and the University of Nebraska in 1992. It is unlikely that this will be a significant number of dollars. According to David Doguet, if sales go as planned in 1992, the royalty payment in 1993 should be significant.

Photographs - Key photographs of '609' production and performance have been included in this report (Appendix B, page 20).

NATIVE TURF DEVELOPMENT GROUP

Progress - The Native Turf Development Group (NTDG) has made significant progress in the development of seeded buffalograss cultivars. During 1991 the four companies each established a nursery of 2000 plants at their locations. This was done in order to assess sex ratios and performance of the five potential cultivars. Visits to three of the sites indicate excellent progress and potential for seed production in the three northern locations. Information from Arizona indicates that there is potential for seed production there as well. At Enid, Oklahoma, Dr. Robert Ahring has established a test area of approximately 10 acres which includes nurseries, turf plots, and breeder production plots. He has developed an excellent program and is the major reason for the success of this cooperative effort.

Anticipated Releases - The Native Turf Development Group has moved up their schedule for release of a new seeded buffalograss to the spring of 1993. The production fields will be planted in the spring of 1992 using vegetative material that was increased in 1991. It is possible that they will have several new cultivars coming on line, and they are interested in sublicensing to other companies who are interested in a buffalograss for marketing.

SHARP BROTHERS SEED

Progress - Progress with the Sharp Brothers project has been less than expected. They have not developed a contact person, such as Bob Ahring, to guide the project. The project has been basically on the back burner during the entire 1991 season. Discussions have been held with the owner of the company in an effort to try to move the project along. Some progress has been made on this front. A meeting will be held with the concerned parties within the next few months to initiate a more progressive project during 1992.

ADDITIONAL RELEASES

National Turfgrass Evaluation Program - Five seeded entries from NTDG and five Nebraska vegetative selections have been included in the National Turfgrass Evaluation Program buffalograss test. This test will evaluate the adaption and potential of buffalograss as a turfgrass. If '609' buffalograss is successful, it will probably make it much easier to develop and release other buffalograsses in other areas of the country.

NE 84-315 and NE 85-378 - These two vegetative females are the most advanced in our program to date. It is anticipated that during the winter of 1991 plant patents and variety releases will be developed for them. They will then be made available to growers throughout the United States. Although they will be proprietary, it is likely that multiple growers will handle the production of the grasses.

Test Lawn and Golf Course Planting - Cultivar '609' and experimentals '315', and '378' have been included in a major home lawn test in McCook, Nebraska, and in golf course plantings in Lincoln, Nebraska. The home lawn test has done quite well and indicates that turf-type buffalograsses will provide a quality turf under home lawn situations. This information is important since home owners often will run into problems that researchers do not. The golf course plantings are young and performance data will not be obtained until next year. These replicated plantings should provide information which would suggest how these buffalograsses will do in very low maintenance rough situations where little or no cool season turf or weeds are surviving.

DEVELOPMENT OF SEEDED BUFFALOGRASS

Continuation in the development of seeded turf-type buffalograss has included several experiments that have contributed to the multiple trait selection process. After fall, the 1991 data will consist of five years of genotypic performance for turfgrass quality, two seasons of water use comparisons by mini-lysimetry, five runs of root initiation, and two seasons of seed yield comparisons. Seed yield of 1991 is up approximately 35-40% from 1990 for the population under open pollinated conditions. Turfgrass quality performances are indicating significant genotype by year interaction, and variation among genotypes persists with regard to root initiation performance and field evapotranspiration. Because of the inherent variation and segregating performances in the buffalograss entries, truncated selection will begin in the spring of 1992. The selections will provide genotypic combinations that will produce superior early generation cultivars compared to commercially available seed propagated buffalograss. Progeny performance evaluations have begun. Results of progeny performance will be additive over time in the breeding program and will be part of the continuing selection process.

BUFFALOGRASS INSECT RESEARCH

Relatively little is known about the insects and mites associated with buffalograss. Initial research at the University of Nebraska has focused on identifying potential pests of buffalograss in Nebraska and investigating the biology, ecology and management of these pest. Potentially serious pests of buffalograss identified so far in Nebraska are two grass infesting mealybugs, *Tridiscus spsoroboli* and *Trionymus* sp., and a short-winged species of chinch bug, *Blissus* sp. Information is needed concerning the biology, ecology and seasonal activity of the buffalograss arthropod complex. This knowledge is essential for the development of effective integrated management program for the insect and mite pests of buffalograss.

Mealybug Research - "Buffalograss mealybugs" were first discovered infesting buffalograss turf in 1988. Subsequently, they have been found associated with new and established buffalograss lawns and pastures, as well as seeded and vegetatively propagated buffalograss stands. At most sampled locations, infestations were relatively light (2-25 per ft^2). While buffalograss mealybugs have been found throughout much of Nebraska, serious injury to buffalograss has been confined to only a few isolated situations.

Chinch Bug Research - For the past few summers, chinch bugs (*Blissus* sp.) have been doing damage to numerous buffalograss lawns in southeastern Nebraska and on the UNL campus. In an effort to determine if buffalograss selections differ in their resistance or tolerance to chinch bugs, a small test was initiated in July 1991. Four-inch plugs of six buffalograss selections (Texoka, Prairie, 609, NE 84-315, NE 84-378, and NE 84-45-3) were planted into a Texoka turf at the UNL Law College. This turf had severe chinch bug damage and high chinch bug populations in 1990 and again in 1991. By placing the plugs into this heavy population of chinch bugs (approximately 93 per sq. ft.), we hoped to be able to screen the six selections for their resistance.

GRADUATE STUDENTS

Currently four graduate students are in the final stages of their programs. Three of these students, Katie Kerner, Susan de Shazer, and Jeff Klingenberg, will be completing their degrees in 1992 and are presenting papers at the Agronomy meeting relating to their research projects on buffalograss.

One new student, Jennifer Johnson-Cicalese, joined our program last August and will be working on a Ph.D. project relating to buffalograss plant breeding and/or insect resistance in buffalograss. Jennifer received her M.S. degree under Dr. Reed Funk working with the bluegrass billbug.

The following theses were completed and sent to the USGA:

1. Hilton, Robin J., 1991. Functional evaluation of a Mechanical Plugger for Buffalograss Turf, M.S. Thesis.
2. Moore, ronald, 1991. The In Vitro Culture of *Buchloe dactyloides* (Nutt.). Englem., M.S. Thesis.
3. Schwarze, Debra J., 1991. The Influences of Prerooting of Plugs on the Establishment of Buffalograss, M.S. Thesis.
4. Svoboda, Jeana L. Frogge, 1991. Seedling germination and Establishment of Buffalograss Caryopses vs. Burs, M.S. Thesis.

BUDGET

The increase in funding in 1991 has put the buffalograss breeding and development project in a very stable financial situation for the first time. The

university budgeting situation often has allowed us to run this project at a deficit. However, currently the project has a balanced budget. With the reduction in graduate students during the next few months, the project will be able to be terminated at the end of 1992, if necessary. The only major personnel affected would be Susan de Shazer, and every effort will be made to keep her funded if our project is not continued.

USGA PROPOSAL

The University of Nebraska will submit a USGA proposal following up on our breeding and development work with buffalograss. This proposal will call for an enhancement of the project, specifically in the breeding and management areas. It is hoped that a portion of this project can be financed with anticipated USGA royalty income.

SUMMARY

The USGA/UNL Buffalograss Breeding and Development Project has made excellent progress during 1991. The first marketing of '609' buffalograss was made approximately seven years after the first discussions of this project. It is hoped that this cultivar, and others to follow, will meet the initial objectives of this project which were to reduce by 50% the water and energy going into the golf course turf. Hopefully, 1992 will be an excellent year for the production and marketing of '609' buffalograss, and the United States Golf Association will be rewarded both financially and politically for their promotion of these low maintenance native grasses.

APPENDIX A

OFFICIAL RELEASE STATEMENT

Release of Buffalograss (*Buchlöe dactyloides* (Nutt.) Engelm. '609'
[Breeding Line NE 84-609])

T.P. Riordan, S.A. de Shazer, E.J. Kinbacher,
J.F. Svoboda, F.P. Baxendale, M.E. Engelke, and L.A. Wit, Jr.

Institute of Agriculture and Natural Resources
University of Nebraska - Lincoln
July, 1991

I. Name: '609'

II. Introduction: Buffalograss, a dioecious species native to the Central Great Plains, requires less water, fertilizer, pesticides and mowing than other turfgrass species. Currently, the only available cultivars are those developed for pasture use and are not well adapted for turf. In 1984 the United States Golf Association (USGA) funded a research project to explore the potential of this species for use in golf course roughs. The objectives of this project were to reduce by 50% the water and other inputs required for golf course management. During the last few years there has been increased concern about the water, fertilizer and pesticides used to maintain a turf. It is anticipated that future environmental concerns will dramatically change the level of management used on lawns or professional turf areas in many parts of the United States. Turf-type buffalograsses with the advantages of the native species and improvements in turf quality would seem to be a logical solution to the conflict between a clean, safe environment and an aesthetic turf. '609' is the first buffalograss release from the USGA funded project. This cultivar has been licensed to the Crenshaw & Doguet Turfgrass, Inc., who have planted 20 hectares for sod evaluation and further testing.

III. Origin: '609' is a new and distinct buffalograss selected in 1984 from an abandoned germ plasm collection of buffalograsses made by Soil Conservation

Service and evaluated at the Texas A&M Agricultural Research Center at Renner, Texas. '609' was found in selection 1321.1, originally collected in Austin, Texas. This new selection was evaluated at the John Seaton Anderson Turfgrass Research Facility as experimental NE 84-609. This female genotype was propagated vegetatively by stolons and plugs to provide material for studying performance.

IV. Evaluations: '609' was evaluated at several locations throughout the southern half of the United States. '609' was compared to 'Texoka', a commercial standard, 'Prairie', a new release from Texas A&M, and other experimentals which will also be considered for release.

V. Establishment: '609' had an excellent rate of establishment (Tables 1, 2, and 3). The Texas A&M-Dallas trial shows that '609' and 'Prairie', both well adapted to the deep south, had better establishment than 'Texoka' or other Nebraska selections. The Southern Illinois study indicated that '609' showed slower establishment than the better adapted northern selections, and was more sensitive to over applications of Princip® (Table 3). Stolon production and stolon length at Texas A&M-Dallas showed that '609' produced more stolons and larger stolons than 'Texoka' or other Nebraska selections (Table 4). At Nebraska '609' exhibited excellent establishment in all plantings, including increases of material for plant breeders' nurseries and experimental plot areas. David Doguet of Crenshaw & Doguet Turfgrass, Inc., reported that '609' showed slightly faster establishment than 'Prairie' buffalograss under sod farm conditions.

VI. Turfgrass Green-up and Color: Buffalograss is a warm season species and will green-up later and go dormant earlier than cool season species such as Kentucky bluegrass. Although this characteristic may be a negative in the northern part of the United States, buffalograss may have a longer growing season than other warm season turfgrasses in the south. Spring green-up has been evaluated at both the University of Nebraska and at Texas A&M-Dallas. '609' had a spring green-up rate similar to 'Texoka' in Nebraska and similar to 'Prairie' in Texas (Tables 5 and 6). Although an earlier spring green-up and a later dormancy in the north would be advantageous, it is possible that cold hardiness would be lost. '609' may have slightly less cold hardiness than 'Texoka' when grown in the

North.

Turfgrass color is an important component of turfgrass quality. At Texas A&M-Dallas and at Nebraska, '609' had color ratings superior to the commercial standards 'Texoka' and 'Prairie', respectively (Tables 7 and 8).

VII. Turfgrass Quality: Turfgrass quality is a rating used to indicate the aesthetic value of a turf cultivar. This characteristic is very important in buffalograss because its turf characteristics have been overlooked in the past. '609' had outstanding turfgrass quality at each location in the south (Tables 9, 10, 11 and 12). In each location '609' had quality comparable or superior to 'Prairie', 'Texoka' and Nebraska experimentals. At the University of Nebraska '609' had turfgrass quality ratings comparable to 'Texoka' and Nebraska experimentals in the spring and higher ratings during the summer (Table 13). At the Crenshaw & Doguet Sod Farm '609' had an excellent, high quality sod.

VIII. Water Use and Drought Tolerance: Water use and drought stress avoidance are important characteristics of the drought resistant buffalograss contributing to its lower cost maintenance. '609' has been shown to have drought stress tolerance at University of Arizona (Table 14), Texas A&M-College Station (Table 15 and 16), and at the University of Nebraska (Table 17). Water use rates of '609' have been comparable to 'Texoka' and 'Prairie' in Nebraska (Table 18). The water use rates of all three cultivars are less than those of other turf species.

IX: Pest Problems: At this time no pest problems of '609' have been identified. Potential insect pests will continue to be monitored by Dr. Fred Baxendale, Department of Entomology, UNL.

X: Turfgrass Density: Density is an important component of turfgrass quality. In studies at the University of Arizona and at the University of Nebraska, '609' had turfgrass density ratings equal or better that 'Prairie' and 'Texoka' (Tables 19). This density has permitted '609' sod to be harvested three months after planting at the Crenshaw & Doguet sod farm.

XI: Summary Statement: '609' is a female clone of buffalograss with excellent turfgrass color, rapid rate of establishment, high density and drought resistance. Vegetative establishment permits maintenance of a stable genotype, with no genetic variation.

XII: Availability: Breeders fields of '609' have been established at the John Seaton Anderson Turfgrass Research Facility at ARDC near Mead, NE, and at the Crenshaw & Doguet Turfgrass, Inc. sod farm at Bastrop, TX. Breeders' material is available from the breeder in the Department of Horticulture at the Institute of Agriculture and Natural Resources at UNL. Foundation and certified sod, plugs and stolons of '609' are available through Crenshaw & Doguet, 609 Castleridge, Austin, TX, 78746, phone (512) 328-0884. A plant patent application will be prepared for this cultivar.

ACKNOWLEDGEMENTS

A long term research grant from the USGA in support of this project contributed significantly to the research progress of this project. Research grants were also received from Crenshaw & Doguet Turfgrass, Inc., and Farmers Marketing Corp. All of these grants in support of this research are greatly appreciated by the breeder and cooperators. Financial and administrative support from Dr. Paul Read, Head, Department of Horticulture, were very critical to the development of this cultivar.

We appreciate the support of the Turfgrass Science Team and the cooperation of researchers Dr. Charles Mancino, Arizona State University; Dr. Bridget Ruemmele, University of Rhode Island; Dr. Wayne Hanna, University of Georgia; and Dr. Robert Shearman, University of Nebraska.

Table 1: Establishment Vigor: 1990 Colorado State Buffalograss Trial Fort Collins, Colorado[1] (Est. 9/89)

	Establishment Vigor[2]		
Experimental	May	July	% 6/13 Sprig Survival
609	2.7[1]	3.3	92
Prairie	1.7	1.7	33
Texoka	3.0	3.7	100
NE 84-315	2.3	3.0	100
NE 85-378	3.0	4.0	100
LSD (.05)	0.9	-	-

[1]Data taken by Dr. R. Cuany
[2]1 to 4 scale with 4 best establishment vigor
LSD (.05)

Table 2: Percent Cover: Buffalograss Regional Trial,Dallas, TX[1] (Est. 5/17/88)

Experimental	6/23/88	7/26/88	3/25/89	4/8/89
609	19.3 ab*	41.3 ab	87.7 a	88.3 a
Prairie	21.0 a	56.7 a	96.7 a	100.0 a
Texoka	12.3 bc	21.0 c	78.3 ab	85.0 ab
NE 84-315	7.3 c	18.0 c	60.0 b	70.0 b
NE 85-378	7.3 c	19.3 c	80.0 a	86.7 ab

*Means within a column followed by the small letter and not significantly different using the Waller-Duncan multiple comparison procedures (K=100)
[1]Data taken by Dr. B. Ruemmele

Table 3: Establishment Percent Cover 1990: Southern Illinois Buffalograss Trial Carbondale, Illinois[1] (Est. 5/34/90)

	Establishment Percent Cover				
Experimental	6/12	7/17	8/15[2]	9/17	10/18
609	25.0 a*	53.3 d	5.0 b	33.3 b	55.0 b
Texoka	20.7 a	83.3 abc	63.3 a	86.7 a	91.7 a
NE 84-315	25.0 a	98.3 a	83.3 a	98.7 a	99.7 a
NE 85-378	17.3 a	90.0 ab	78.3 a	96.0 a	96.7 a

*Means within a column followed by the small letter and not significantly different using the Waller-Duncan multiple comparison procedures (K=100)
[1]Data taken by Dr. K. Diesburg
[2]Herbicide Damage Occurred
LSD (.05)

Table 4: Stolon Production and Length 1988: Buffalograss Regional Trial, Dallas, TX[1] (Est. 5/17/88)

Experimental	# Stolons	Stolon Length cm.		
	49 days	49 days	57 days	70 days
609	10.7 ab*	6.1 a	8.0 a	10.6 a
Prairie	17.1 a	5.4 ab	7.5 ab	9.5 ab
Texoka	4.1 b	2.5 c	4.9 cde	6.5 d
NE 84-315	8.1 b	2.6 c	3.5 e	5.1 d
NE 84-378	4.0 b	2.2 c	4.4 de	6.1 d

*Means within a column followed by the small letter and not significantly different using the Waller-Duncan multiple comparison procedures (K=100)
[1]Data taken by Dr. B. Ruemmele

Table 5: Spring Greenup: JSA Buffalograss Trial, Mead, Nebraska 1989 (Est. June 1987)

	Spring Greenup		
Experimental	4/25	5/4	5/11
609	3.5 a*	6.6 a	7.0 a
Texoka	3.5 a	7.0 a	7.6 a
NE 84-315	1.8 b	4.8 b	5.5 b
NE 85-378	1.8 b	4.4 b	5.5 b

Spring greenup is rated 1-9, with 9 = most green

*Means within a column followed by the small letter and not significantly different using the Waller-Duncan multiple comparison procedures (K=100)

Table 6: Percent Spring Greenup: Buffalograss Regional Trial, Dallas, Texas[1] (Est. 5/17/88)

	Percent Spring Greenup				
Experimental	3/15/89	3/22/89	3/29/89	4/5/89	4/15/89
609	20.0 c*	40.0 a	83.3 b	96.3 ab	99.0
Prairie	40.0 b	40.0 b	73.3 b	93.3 b	99.0
Texoka	20.0 c	50.0 ab	95.0 a	97.7 a	99.0
NE 84-315	8.0 c	43.3 b	98.3 a	99.0 a	99.0
NE 85-378	18.0 c	50.0 ab	91.7 a	97.7 a	99.0

* Means within a column followed by the small letter and not significantly different using the Waller-Duncan multiple comparison procedures (K=100)

[1]Data taken by B. Ruemmele

Table 7: Turfgrass Color 1989-90 Buffalograss Regional Trial
Dallas, Texas (Est. 5/17/88)

Turfgrass Color[2]

	1989				1990			
Entry	20 Jun	10 Aug	13 Sep	21 Sep	31 Oct	23 Nov	04 Jan	24 Jan
609	6.7	7.0	7.0	7.3	7.3	7.0	2.3	1.0
Prairie	5.0	3.7	4.3	3.3	4.3	5.0	2.3	1.0
Texoka	6.7	4.3	1.3	1.3	1.7	1.3	1.7	1.0
NE 84-315	7.3	8.7	1.7	2.7	1.3	1.0	1.0	1.0
NE 85-378	6.7	7.7	1.3	2.0	1.0	1.0	1.0	1.0
C.V.	21.5	16.0	25.9	31.7	24.8	30.2	22.3	0.0

[1]Data taken by Dr. B. Ruemmele
[2]Turfgrass color is rated 1-9, with 1 = brown, 5 = med green, and 9 = dark green

Table 8: Turfgrass Color: 1990 Season Buffalograss Clonal Evaluation
John Seaton Anderson Facility, Mead, Nebraska (Est. 1986)

Turfgrass Color[1]

Experimental	6/8	6/15	7/30	8/10	9/13	AVG
609	6.0	5.8	7.3	6.8	7.3	6.6
Texoka	5.5	5.8	6.8	6.3	7.0	6.3
NE 84-315	8.0	7.3	6.8	6.3	7.3	7.1
NE 85-378	7.8	7.0	5.3	7.3	7.1	6.9
MEANS	6.8	6.5	6.6	6.7	7.2	6.7
LSD (0.05)	1.2	1.4	1.1	1.2	1.1	-

[1]Turfgrass color is rated 1-9, with 1 = brown, 5 = med green, and 9 = dark green.

Table 9: Turfgrass Quality: 1990 University of Arizona Buffalograss Trial[1]
(Est. 9/4/88)

	Turfgrass Quality[2]									
Experimental	5/9	5/29	6/13	6/24	7/29	9/6	10/31	11/15	11/25	12/20
609	5.3 a*	6.9 a	8.3 a	8.0 a	7.0 a	5.7 a	5.3 a	5.7 a	4.7 a	4.7 a
Prairie	3.7 ab	6.8 a	8.0 a	8.0 a	7.0 a	4.0 abc	4.0 b	5.3 a	4.3 a	3.0 bc
Texoka	5.0 a	4.3 b	5.3 b	5.3 b	3.7 bc	3.7 bcd	1.7 c	2.3 b	2.0 b	2.0 cd
NE 84-315	5.3 a	6.8 a	7.3 a	7.3 a	3.3 c	2.0 d	2.0 c	1.7 bc	2.0 b	2.0 cd
NE 85-378	5.0 a	6.6 a	8.0 a	8.0 a	4.3 b	2.7 cd	2.0 c	2.3 b	2.0 b	2.0 cd

[1]Data taken by Dr. C. Mancino

[2]Turfgrass quality is rated 9 to 1 with 9 best

*Means within a column followed by the small letter and not significantly different using the Waller-Duncan multiple comparison procedures (K=100)

Table 10: Turfgrass Quality: Buffalograss Regional Trial, Dallas, Texas[1]
(Est. 5/17/88)

	Turfgrass Quality$_2$												
	1989									1990			
Entry	08 Apr	06 May	27 May	20 Jun	10 Aug	13 Sep	21 Sep	31 Oct	23 Nov	04 Jan	24 Jan	25 Feb	12 Date Avg
609	6.3[2]	7.3	8.0	7.3	9.0	7.7	8.7	9.0	8.7	7.0	6.0	5.7	7.6
Prairie	6.0	7.3	7.0	8.0	7.7	7.3	7.7	8.3	8.3	7.0	6.0	5.7	7.2
Texoka	4.7	6.0	6.3	6.0	6.3	4.0	4.7	4.0	4.7	4.3	4.0	3.7	4.9
NE 84-315	6.0	7.3	6.0	5.7	6.3	3.3	3.7	3.3	3.3	3.3	3.0	3.0	4.5
NE 84-378	5.3	7.7	7.3	7.0	7.0	4.0	4.7	5.0	4.3	4.3	4.3	3.3	5.4
MSD[3]	2.4	n.s.[4]	1.6	1.5	1.8	0.9	1.0	1.7	1.3	1.0	0.5	1.0	0.5

[1]Data taken by Dr. B. Ruemmele

[2]Turf quality is rated 1-9, 9 = best

[3]MSD = Minimum significant Difference to separate classes within each column using the Waller Duncan K ratio T Test (K ratio = 100).

[4]n.s. indicates dates where no significant differences were determined among the means.

Table 11: Turfgrass Quality Buffalograss Regional Trial,[1] 1990, Dallas, Texas
(Est. 5/17/88)

Turfgrass Quality[2]

	May 9	May 29	June 24	July 29	Sep 24	Oct 31	Nov 15	Nov 25	Dec 20	Dec 20
609	5.3 a[3]	8.3 a	8.0 a	7.0 a	5.7 a	5.3 a	5.7 a	4.7 a	4.7 a	5.7 a
Prairie	3.7 ab	8.0 a	8.0 a	7.0 a	4.0 abc	4.0 b	5.3 a	4.3 a	3.0 bc	5.0 ab
Texoka	5.0 a	5.3 b	5.0 b	3.7 bc	3.7 bcd	1.7 c	2.3 b	2.0 b	2.0 cd	3.3 c
NE 84-315	5.3 a	7.3 a	5.7 b	3.3 c	2.0 d	2.0 c	1.7 bc	2.0 b	2.0 cd	3.0 c
NE 85-378	5.0 a	8.0 a	5.3 b	4.3 b	2.7 cd	2.0 c	2.3 b	2.0 b	2.0 cd	3.0 c

[1]Data taken by Dr. B. Ruemmele

[2]Turfgrass quality is sum of color and density. For Dec 20 dates, first quality includes density for green tissue and second quality includes density of all tissue (ground coverage). Density 1-9, 9 = densest - for green tissue only except second Dec 20 date which is density of all tissue regardless of color.

[3]Means within a column followed by the small letter are not significantly different using the Waller-Duncan multiple comparison procedures (K=100)

Table 12: Turfgrass Quality 1990: University of Georgia, Tipton, GA[1]

Turfgrass Quality[2]

Experimental	6/14	7/7	9/15	10/24
609	-	2.0	6.0	6.0
Prairie	3.0	2.0	6.5	6.5
Texoka	2.0	4.5	5.5	4.5
NE 84-315	-	3.5	6.5	7.0
NE 85-378	-	3.5	6.5	6.0
LSD (.05)	.8	1.1	1.8	1.5

[1]Data taken by Dr. W. Hanna

[2] Turfgrass Quality: 1-9, 9=best

Table 13: Turfgrass Quality: 1990 Season Buffalograss Clonal Evaluation John Seaton Anderson Facility, Mead, Nebraska (Est. 1986)

	Turfgrass Quality[1]					
Experimental	6/8	6/15	7/30	8/10	9/13	AVG
609	3.3	3.0	5.0	6.5	7.0	5.0
Texoka	3.8	3.8	4.3	5.3	5.0	4.4
NE 84-315	6.3	6.5	5.3	4.8	5.5	5.7
NE 85-378	7.3	5.8	5.8	5.5	4.8	5.8
LSD (0.05)	1.3	1.5	1.3	1.4	2.4	-

[1]Turfgrass Quality is rated 1-9, 9 = best.

Table 14: Summer Stress: 1990 University of Arizona Buffalograss Trial[1] (Est. 9/4/89)

	Summer Stress[2]			
	June 24----------→July 29, 1990			
Experimental	Stress 1	Stress 2	Stress 3	Stress 4
609	8.0 a[3]	8.0 a	7.0 a	6.7 a
Prairie	8.0 a	8.0 a	7.3 a	6.3 a
Texoka	6.3 b	6.7 b	5.3 b	5.0 b
NE 84-315	6.3 b	5.7 c	4.0 c	3.0 c
NE 85-378	6.3 b	4.7 d	3.7 c	2.3 c

[1]Data taken by Dr. C. Mancino.

[2]Summer Stress is rated 9 to 1 with 9 = no stress and 1 dormant

[3]Means within a column followed by the small letter are not significantly different using the Waller-Duncan multiple comparison procedures (K=100)

Table 15: Comparative Dehydration Avoidance, as Accessed by Percent Fixing, of Buffalograss Observed During 48 days of Drought Stress During the Summer of 1989 College Station, Texas[1]

Dehydration Avoidance

Experimental	Dehydration Avoidance Rating[2]
609	Very High
Prairie	Low
NE 84-315	Very High
NE 85-378	Very High

[1]Data taken by Dr. J. Beard
[2]Dehydration Avoidance Rating: Very High, High, Medium, Low

Table 16: Comparative Drought Resistance, evaluated as shoot recovery of buffalograss observed 30 days following rewetting, after 48 days of drought stress in 1989, College Station, Texas[1]

Comparative Drought Resistance

Experimental	Comparative Drought Resistance[2]
609	High[2]
Prairie	Low
NE 84-315	High
NE 85-378	High

[1]Data taken by Dr. J. Beard
[2]Comparative Drought Resistance: High, Medium, Low

Table 17: Turfgrass Stress and Dormancy: 1990 Late Season Buffalograss Clonal Evaluation
John Seaton Anderson, Mead, Nebraska
(Established 1986)

Experimental	Stress rating[1] 9/13	Stress rating 10/2	Dormancy rating[2] 10/2
609	2.5	3.8	2.7
Texoka	3.5	5.5	3.8
NE 84-315	4.8	8.3	7.8
NE 85-378	6.0	8.0	7.5
Means	4.2	6.4	5.5
LSD (0.05)	1.7	1.3	2.0

[1]Stress is rated 1 to 9, 9 = plot desiccation, 5 = partial plot desiccation, 1 = no plot desiccation (desiccation rated as amount of leaf firing and pale-green to brown spots forming on turf canopy).
[2]Dormancy is rated 1 to 9, 9 = completely dormant turfgrass with no green color or signs of plant growth, 5 = partially dormant turfgrass, 1 = non-dormant turfgrass.

Table 18: Water Use Rates 1990
John Seaton Anderson Buffalograss Research Trial

	Water Use Rates[1]			
Experimental	7/3-5	7/16-18	8/7-9	8/28-30
609	401.6	342.4	265.6	330.2
Prairie	454.5	359.1	269.0	323.8
Texoka	434.2	375.3	281.3	337.5
LSD (0.05)	56.1	43.1	17.3	92.8

[1]Water use rate is a three day total water use measured by grams water lost through evapotranspiration.

Table 19: Turfgrass Density: 1990 Season Buffalograss Clonal Evaluation
John Seaton Anderson, Mead, Nebraska
(Established 1986)

Turfgrass Density[1]

Experimental	6/8	6/15	7/30	8/10	9/13	AVG
84-609	2.5	3.8	4.3	6.3	6.8	4.7
Texoka	3.0	3.0	3.5	4.8	4.8	3.8
84-315	5.8	7.3	5.8	5.3	4.8	5.8
85-378	6.8	6.0	5.8	6.5	6.0	6.2
MEANS	6.8	6.5	6.6	6.7	7.2	6.7
LSD (0.05)	1.3	1.9	1.2	1.2	1.7	-

[1]Turfgrass Density is rated 1 - 9, 9 = most dense

B:Tables.pat

APPENDIX B

Figure 1: '609' Sod production - Crenshaw/Doguet, Bishop, Texas.

Figure 2: '609' Home Lawn - Austin, Texas.