

# 1985 ANNUAL RESEARCH REPORT

## DEVELOPMENT OF DRYLAND WESTERN TURFGRASS CULTIVARS

by the

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## EXECUTIVE SUMMARY

Western grasses grow successfully in arid regions on poor soil without the addition of water and fertilizer. Some of these grasses are adaptable to turf use. Changing economic conditions and water shortages have made it desirable to improve promising species to produce low maintenance turfgrasses for golf courses, parks, and lawns. The species which are receiving research attention at Colorado State University are alkaligrass (Puccinellia spp.), inland saltgrass (Distichlis stricta), blue grama (Bouteloua gracilis), and fairway wheatgrass (Agropyron cristatum).

Field evaluation of these species is being conducted in spaced-plant nurseries composed of individuals representing the genetic diversity of up to eight western states and five foreign countries. Individual plants are being evaluated on their important characteristics in a selective breeding program for improved turf performance. Accessions are being evaluated for performance in turf plots under low maintenance conditions. Elite individual plants will be selected, cloned and moved to replicated isolated cross pollination plots to produce the next generation of improved progenies. This cycle of field evaluation of individuals followed by production of an advanced generation from selected parents will be continued until significant improvement is achieved. At that time improved varieties will be released for turf use.

## ANNUAL REPORT

I. Overview

Principle financial support for this project from the U.S. Golf Association allowed the work which was begun in 1984 to be expanded significantly during 1985. The four species receiving attention this year were alkaligrass (Puccinellia spp.), inland saltgrass (Distichlis stricta), fairway wheatgrass (Agropyron cristatum) and blue grama (Bouteloua gracilis).

Several collecting trips were made to secure seed and vegetative germplasm from promising native stands of alkaligrass and inland saltgrass in seven of the western states. Correspondence with other researchers and agencies added seeds from other states and foreign countries. Seeds were planted in the greenhouse and new seedlings and vegetative collections were added to the spaced-plant field evaluation nurseries at the Fort Collins Agronomy Research Center. Nurseries of the four species were maintained by handweeding, herbicide application and irrigation to allow maximum growth of individuals. The individual plants were evaluated for important turf characteristics. Where possible, seed was harvested from individual plants in the spaced-plant nurseries for use in progeny turf plantings in 1986.

The turf plantings at the Horticulture Research Centers were maintained and expanded with the addition of an experimental fall planting designed to evaluate seeding rates and strain performance of fairway wheatgrass and three species of alkaligrass.

During the year we were able to show and explain the research work and plots to a number of interested people including our cooperator on blue grama, Dr. Terry Riordan of the University of Nebraska, and our USGA research committee liaison person, Dr. James Watson.

## II. Progress by Species

### A. Alkaligrass

Our alkaligrass collection was significantly expanded this year by several collecting trips and correspondence with researchers and U.S. Plant Introduction Stations. We now have 114 accessions represented by vegetative material from six western states and five foreign countries in Europe and Asia. The western states accessions plants were selected because of their appearance and ability to grow in harsh sites. We visited many golf courses and found plants growing adjacent to buildings and service roads where soil is compacted by frequent foot and vehicle traffic. In native stands the plants were secured predominantly from saline soils at the margins of low water accumulation areas.

The new accessions were propagated in the greenhouse and transplanted in August to a spaced-plant field evaluation nursery of 1021 individuals at the Fort Collins

Agronomy Research Center. As this is the first year of establishment for the field evaluation nursery, we are making only preliminary evaluations this fall such as plant color and date of fall dieback. In late October all of the plants were still green and growing vigorously and showing no signs of dieback. Seed was harvested from some of the new collections which produced seed in the greenhouse in spite of being disturbed by transplanting. That seed can be used for progeny testing in 1986 in potted greenhouse trials or turf plantings.

A new experimental turf planting was made in early September at the Horticulture Research Center with three species of alkaligrass (Puccinellia airoides, P. lemmoni and P. distans "Fults"). Two seeding rates (288 and 576 pure live seeds per square foot) were used to test establishment ability. The plots are establishing well after emergence on the eighth day.

#### B. Inland Saltgrass

Our inland saltgrass collection was expanded this year by the addition of 35 more accessions to the 13 accessions established in 1984. Forty of these accessions have now been put into the spaced-plant field evaluation nursery at the Fort Collins Agronomy Research Center, and the remainder (all collected in late summer) will be moved there from the greenhouse in the spring when weather is more conducive for warm season grasses. The total collection of 48 accessions composed of 535 individual plants now represents genetic diversity from eight western states. The collections were

selected discriminately to represent plants exhibiting the best turf characteristics and growing successfully in salt affected soils. Plants which were planted 5 feet apart in 1984 have spread to touch each other.

The individuals in the nursery were rated this year for greenup date, spread, stand density, growth habit, color, seed production and date of fall dormancy. Seed set was poor. This indicates that some work next year will be directed toward testing vegetative propagation methods. New accessions were planted 7 1/2 feet apart in 1985. They started to develop strong rhizomes within a month or two of transplanting. This winter, work is being done to determine if inland saltgrass can be taken from the field in the fall, propagated in the greenhouse and then established in a cross-pollination nursery in the spring.

Plugs of inland saltgrass were planted in a turf plot on one foot centers in August 1984. This year they had spread to completely cover the plot area by July. This turf was mowed at 2 1/2 inches height most of the 1985 growing season and the plants produced a turf which was rated for stand density.

#### C. Fairway Wheatgrass

The fairway wheatgrass spaced-plant evaluation nursery of 17 accessions (comprised of 650 individual plants) has been maintained and evaluated for greenup date, color, leaf width and height, growth habit, tiller spread, rhizomatous spread, disease resistance, flowering dates, and production

of seed heads and resistance to lodging. Many of the plants, now in their second growing season, spread to a basal diameter of 12 inches with rhizomatous shoots another 2 to 4 inches from the main plant. Many of the plants show better rhizome spread than "Ephraim" crested wheatgrass, a cultivar known for rhizome production.

A turf evaluation planting of "Ruff" and "Ephraim" wheatgrass at two seeding rates (288 and 576 pure live seeds per square foot) was started in early September. This planting will be kept under dryland conditions next year. This will provide information about required seeding rates, as a previous turf planting at lower rates did not result in a suitably dense stand. The seedlings emerged in six days and are establishing well this fall.

#### D. Blue Grama

Our blue grama spaced-plant evaluation nurseries were maintained this year and rated for greenup date, flowering date, seed head production, leaf height, basal area and fall dieback. The 19 original accessions were supplemented by several individual plants from our "geographic types" collection which showed good turf appearance and by seed collected from 70 plants with good appearance in cycle 2 of our forage breeding evaluation nursery. Many of the plants being evaluated are showing an encouraging amount of spread as well as good seed production. Seed was harvested from the plants for use in a turf planting progeny test planned for spring 1986.

### III. Activity Plan for 1986

The work planned for 1986 will center around various nurseries and turf plots at the Fort Collins research sites. The germplasm collection is now essentially complete so major effort will focus on turf evaluation and breeding with appropriate coordination with others in the USGA Turfgrass Network. Plans to add a graduate student to the project will be postponed until 1987 in hopes that additional funding will be available.

The performance of the plants in 1985 has begun to suggest groupings of types for habit and turf desirability, such as those that are fine leaved, have good spreading characteristics, and exhibit early greenup. Seeded turf plots will be established in 1986 for evaluation of accessions and individuals of blue grama and inland saltgrass using seed harvested from the 1985 field evaluation nurseries. Concentrated effort will be applied to gather evaluation data for all growth characteristics and performance of plants in the spaced-plant nurseries and the maintained turf plots. Such characteristics as greenup date, spreading ability, density, color, height, disease resistance, climatic tolerance, seed production, dieback date, and sex (of the dioecious saltgrass plants) will be evaluated. Seed from individual plants within the various accessions in the evaluation nurseries will be harvested for testing and for planting alkaligrass progeny tests in 1987.



Information collected in 1986 and previous years will be integrated and will serve as the basis for selection of certain plants in the fall. These will serve as parents in isolated cross-pollination nurseries that will produce the first generation of polycross progenies. We should be able to make that type of selection for crested wheatgrass, inland saltgrass and blue grama (if not accomplished during the 1985-86 winter) and possibly for alkaligrass, if enough data is collected during the growing season. Selected parents will be cloned in the greenhouse if necessary to provide enough plant material for one or more replicated crossing block nurseries for each species in the spring of 1987. The make-up of the crossing blocks will be revised in consideration of winterhardiness and spring behavior of the turf-management plots from November 1986 to May 1987.

IV. Itemization of Expenditures

U.S. Golf Association

Funding of 2/25/85 - 2/24/86

## PERSONNEL

G. Thor - Salary \$5,312

G. Thor - PERA, 16.3% 866

Hourly Employees 2,226

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TOTAL PERSONNEL

\$8,404

MATERIALS AND SUPPLIES

6

6

TRAVEL

211

211

INDIRECT COST, 16% TDC

1,379

1,379

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TOTAL EXPENDITURES

\$10,000