

# TURF CULTURE

Published by the United States Golf Association Green Section in the Interest  
of Better Turf for Golf Courses, Lawns, Parks, Recreation Fields and Cemeteries

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APRIL, 1939

Volume I

Number 2



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# TURF CULTURE

*Published by*

UNITED STATES GOLF ASSOCIATION GREEN SECTION



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THE UNITED STATES GOLF ASSOCIATION GREEN SECTION

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# TURF CULTURE

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Volume I

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## NEW VARIETIES OF KENTUCKY BLUEGRASS

JOHN MONTEITH, JR.\*

Kentucky bluegrass is the most widely used turf grass in this country. It is planted under a great variety of soil and climatic conditions to produce turf for various purposes. In some instances it is used merely to provide a ground cover while in others it is expected to develop a dense, lush mat of grass which may be classed as a thing of beauty. In other areas it is expected to provide a tough sod which will endure almost continuous trampling and be able to recover quickly from scars such as those caused by the clubs of golfers, the cleats of football players, or even the shoes of polo ponies.

In spite of all the special purposes for which this grass is planted and the great assortment of soils and environments to which it is subjected there are at present no commercial varieties especially suited to meet particular requirements. Kentucky bluegrass seed purchased for turf to be grown for a particular purpose under a specific set of conditions is taken from the same stock used elsewhere for entirely different turf needs. It also comes from the same stock which farmers plant to produce forage for live stock.

The absence of specialized varieties of this grass to meet particular requirements is not due to any lack of variability within

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\*Director of the United States Golf Association Green Section.

the species. It is merely because no improvement work on a commercial scale has been carried on with lawn grasses.

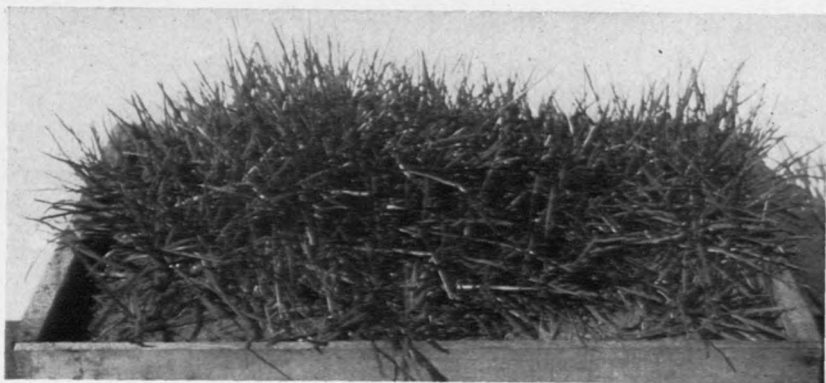
### SELECTION IN GRASSES

In recent years attempts have been made to develop improved strains of grasses for pasture and hay. As a result of this work, notably in Norway and Sweden, seed of varieties of Kentucky



Variations in strains of Kentucky bluegrass. This strain and the two shown on the opposite page were all planted vegetatively in the same manner and at the same time. They were grown in similar flats of soil in the greenhouse. Note the different types of growth in these three strains. The strain shown here is early flowering and less dense than the others.

bluegrass is now available. In other countries, particularly at the Welsh Plant Breeding Station at Aberystwyth, special varieties of other grasses have been developed, including ryegrass,



A low-growing, upright, rapid-spreading type of Kentucky bluegrass which has many of the characteristics sought in turf grasses.



A vigorous leafy strain of Kentucky bluegrass growing under identical conditions as the two others shown on this and the opposite page.

orchard grass, timothy and fescue. These varieties have been developed for hay or forage. While they are generally unsuitable for turf they serve to indicate what may be expected from a program of grass improvement for special purposes.

For many years it has been recognized that selected varieties of creeping bent have had distinct advantages for turf purposes over the commercial stock. Strains or varieties of creeping and velvet bents for turf purposes have been selected and tested by the Green Section for about 20 years. This work has resulted in the development at the Arlington Turf Garden of such widely used strains as Washington and Metropolitan creeping bents.

The encouraging results obtained from these selections of creeping bent have served to stimulate interest in the possibilities of developing superior strains of other turf grasses. Although not exhibiting the many striking variations that are common in such species as creeping bent, Kentucky bluegrass nevertheless is obviously variable and consequently offers possibilities for improvement as a turf grass.

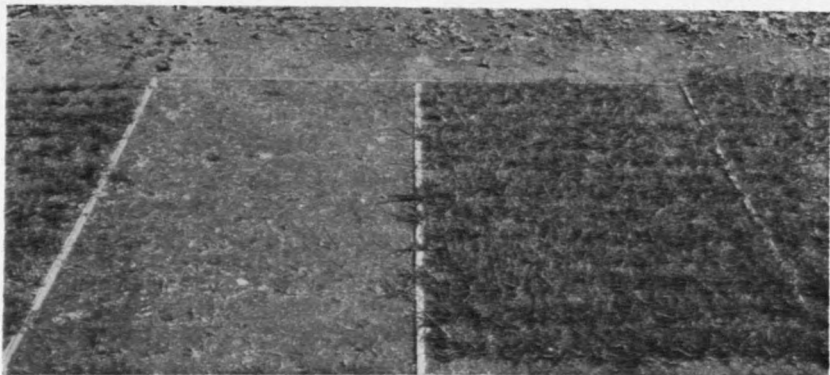
Selection in Kentucky bluegrass for turf purposes is particularly directed toward securing strains notable for their ability to spread and to form a dense turf of a reasonably fine texture; for a low-growing habit; for durability under heavy trampling; for ability to withstand heat, drought and close mowing; for resistance to leafspot and other diseases; for vigorous, continuous growth to heal scars and to compete successfully with clover and other weeds; for ability to retain good color throughout the season; and for other characteristics of a good turf grass.

### METHODS OF SELECTION

Selections are made in different parts of the country from old established turf which has been subjected for a long time to particularly trying conditions such as too close mowing, excessive wear, poor drainage, shade, drought or starvation. In any



such turf there are often individual plants which have successfully withstood these adverse conditions. These plants frequently are the sole survivors of thousands of plants that started together in the same area many years ago. By selecting promising individuals from such survivors full advantage is taken of severe competition and the resulting natural selection that has taken place over a period of years in turf subjected to abuse.



Varieties of Kentucky bluegrass growing in a low, partly shaded and poorly drained area unsuited to this grass. Planting was with the vegetative method in spring and all strains started evenly. Picture made in late summer shows the damage to one strain chiefly by leafspot disease, while the three other strains shown were highly resistant and continued to grow satisfactorily throughout the summer.

Samples of these selections are transplanted to flats in the greenhouse or to the turf nursery. There they are isolated in soil free from other grass and are permitted to grow until the resulting clump is sufficiently large to divide vegetatively. In the meantime care is taken to prevent the grass from producing seed which might fall to the ground and contaminate the parent stock.

When the individual plants are large enough they are divided and planted in duplicate 8- by 4-foot plots, or in other series in plots 4 feet square. These plots are on soil in which turf

grasses have not recently been growing, and care is taken to prevent seed from falling onto the plots. This is to prevent the introduction of another grass plant into an otherwise pure planting from one individual plant.

### METHOD OF RATING

The development of the grass on these duplicate small plots is followed carefully, observations being made on the rapidity with which the stand is established, as compared with that on check plots planted vegetatively at the same time with random samples of bluegrass taken from an old lawn. The plots also are rated systematically at intervals throughout the growing season for such characteristics as color, density and texture. These ratings are made numerically, 10 in each case representing the ideal for Kentucky bluegrass.

At the end of the season the several ratings made throughout the year are added and the percentage of a perfect score on the scale used, is calculated. These figures represent the scores for the season and make it possible readily to compare the performance of the several strains under test.

These varieties must be compared over a period of several years and under different soil and climatic conditions before their relative values can be determined. The results thus far seem to show striking differences in the turf-producing qualities of the several strains.

In the accompanying table are given the ratings for density and texture of a few of the highest and the lowest ranking strains in one of the series. This particular series of plots was planted in May, 1937, and there was a uniform stand in all



plots in the early summer of 1937. The ratings in the table were recorded during the growing season of 1938

KENTUCKY BLUEGRASS RATINGS FOR 1938

<i>Strain Number</i>	<i>Density</i>	<i>Texture</i>
12.....	95	70
30.....	91.25	61.25
5.....	90	53.75
1.....	90	66.25
27.....	83.75	50.13
35.....	68.75	68.75
36.....	67.50	62.50
18.....	63.75	56.25
Check.....	60	56.25

In a few cases diseases (chiefly leafspot caused by *Helminthosporium vagans* Drechsl.) had so damaged the grass during the summer of 1937 that bare areas were left the following spring. Most of the plots however were well covered in the spring, so the density ratings largely indicate the behavior of the grass in 1938.

The rating of strain number 12 shows that a dense cover of turf was maintained throughout the season on practically the entire area in the duplicate plots. It will be noted that four strains had ratings of 90 percent or better, in contrast with four strains having ratings lower than 70 percent. The check in this case was planted vegetatively in the same manner as other plots using planting material obtained from a collection of small samples dug up at random on the old lawn of Arlington farm. This random stock therefore represented better than average bluegrass stock, as it came from plants that had survived many years of competition under turf conditions.

In studying this table it should be borne in mind that these strains were not selected with a view to showing extreme variability of the species but because they all demonstrated ability to produce good turf under adverse conditions. Even among these strains some are far superior to others under the conditions at the turf garden.

The term "texture" designates primarily the fineness of the individual leaves. The highest rating represents the finest leaves. The texture ratings are naturally affected by density, for when turf becomes thin the plants spread out and the leaves are coarser, and conversely, where turf is crowded the leaves are more upright and narrow.

The strains are rated also for color, and records are kept on their response to diseases and other characteristics, for these must also be considered in any final evaluation of turf grasses. For the present report, however, the ratings of density are of most interest and importance. Since density is influenced by the general vigor of the grass, disease attacks, ability to withstand mowing or unfavorable weather, clover invasion, and other factors, this rating is of greatest practical significance.

#### PROPAGATION OF BLUEGRASS STRAINS BY SEED

Both self-pollinated and open-pollinated seed has been obtained from some of the selected strains growing in nursery rows. The plants obtained from this seed resemble to a remarkable degree the parent plant. It appears likely that there is asexual production of seed in the case of some of these strains. Such production of seed without fertilization in Kentucky bluegrass has been reported in Sweden and the work has been

reviewed in this issue in the section, "What Others Write on Turf."

These results illustrate the possibilities which the bluegrasses offer to the plant breeders and those interested in better turf. Selection work among the bluegrasses combined with breeding programs to improve these selections will undoubtedly lead to new and vastly improved commercial strains available for the many different needs for which these grasses are to be used.

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## A DRY-LAND TURF GRASS

L. E. KIRK \*

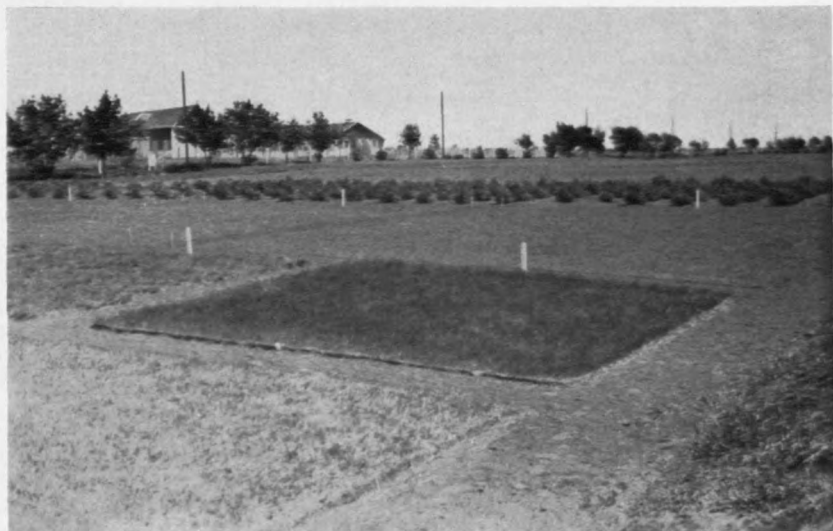
There has long been a demand for a suitable turf grass for semi-arid and sub-humid districts. Such a grass is required for lawns on farms and in small towns where a water supply is not available. The same is true for golf course fairways, school playgrounds, ball parks and other places that are used for sports.

In most of Saskatchewan and southern Alberta there has never been available until recently a species of turf grass which could be recommended with any degree of confidence. This statement probably applies as well to western North and South Dakota, Montana, eastern Washington and parts of Nebraska. This need, however, is now being met in a satisfactory manner with crested wheatgrass, *Agropyron cristatum* (L.) Beauv., and its use is steadily increasing.

Crested wheatgrass is noted for its great drought resistance and also for its winter-hardiness. It grows best during the cool

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\* Dean of the Faculty of Agriculture, University of Saskatchewan, Saskatoon, Saskatchewan.



Plot of Fairway strain of crested wheatgrass (center) in experimental lawn at Saskatoon, Saskatchewan. Note thrifty appearance of Fairway strain as compared with grass in other plots

weather of the spring and fall months, the growth being retarded or inhibited by hot weather, when the foliage may turn brown. Nevertheless it is never permanently injured by drought and quickly turns green with the advent of moisture and cooler weather.

This grass develops a remarkably strong root system which takes complete possession of the soil. The fibrous roots extend laterally close to the surface and effectively compete with weeds. It is the root system which is largely responsible for its turfing qualities.

For turf, crested wheatgrass is limited in its range of adaptation to northern latitudes (or high altitudes) and relatively dry areas. The former insures a cool climate and the latter a low humidity, both of which seem to be most favorable for





A seed crop of Fairway strain, crested wheatgrass in Saskatchewan, June, 1938

normal growth of this grass. In more humid parts of the country its competitive efficiency in relation to other species of plants is not so great, but in such areas more desirable turf grasses can be used. Likewise relatively high summer temperatures act as a limiting factor to its usefulness at the southern extremity of its natural range of adaptation.

Where turf of fine quality is required and provision has been made for artificial watering, one hesitates to recommend crested wheatgrass even in the area where it is best adapted. With special attention to management and watering, a finer turf of more pleasing appearance can be obtained from Kentucky bluegrass or a mixture of Kentucky bluegrass and Colonial bent. Crested wheatgrass can be used successfully under similar conditions but there is always the danger that too much water will be applied. This is detrimental to the grass, and weeds are not so well controlled. For people who desire a good grass

cover on city lawns, parks and playgrounds, which can be left without attention for weeks at a time crested wheatgrass is worthy of consideration. Experience has shown that the grass may be cut short even after it is fully grown without materially affecting the appearance of the turf when growth is resumed.

Not all strains of crested wheatgrass are equally suitable for turf purposes. Most of them contain a high proportion of plants which are strongly tufted in habit of growth. By far the best as a turf grass is the "Fairway" strain, a variety developed by the author at the Provincial University, Saskatoon, Saskatchewan, Canada. The merits of this strain consist in its fine stems and leaves, its non-tufted habit of growth and especially in its ability to thicken into a relatively close turf. As compared with the taller growing and more tufted strains, the "Fairway" variety is also the best for hay and pasture under Saskatchewan conditions.

Seed of Fairway crested wheatgrass is now available in Canada at approximately 10 cents a pound. One pound of seed of this variety contains about twice as many seeds as an equal weight of other strains.

By the use of crested wheatgrass many farmers throughout Saskatchewan have been able for the first time to establish and maintain good lawns about their homes. Dwellers in towns that have no facilities for artificial watering are finding in this grass a valuable means of providing lawns and suitable turf for sport fields and playgrounds. The Dominion Experimental Station at Scott, Saskatchewan, which maintains extensive grounds, has discarded other grasses for crested wheatgrass. In the city of Saskatoon it is used as the most suitable species for grassing the steep southern exposure of a river bank. This city



Crested wheatgrass lawn at Scott, Saskatchewan

now grows its own seed in quantity for seeding boulevards and playgrounds.

In order to produce a close turf it is desirable to use plenty of seed and to have it distributed evenly. Spots that are missed are difficult to fill in later when once the roots of surrounding plants have occupied the soil. A rate not less than 4 pounds of seed to 1,000 square feet is recommended. This amount will provide more plants than are really necessary but the number of seedlings becomes reduced by competition to the required density of stand.

A well prepared and firm seed bed is highly desirable. The seed should be broadcast evenly and raked into the top half inch of soil. Crested wheatgrass seed will not germinate if planted deeper than 1 inch. One-quarter to one-half inch in depth is better.

When fairways and playgrounds, which comprise a considerable area, are to be sown, seeding with a double disc drill is

often preferred to broadcasting. In this case firmness of the soil is doubly important because of the danger of too deep seeding. In order to promote shallow seeding all pressure should be removed from the seeder discs. Clean crested wheatgrass seed will run through the seeder without being mixed with any other material, but the drill should be watched closely to see that none of the feeder cups become clogged.

Seeding should be done very early in the spring. This is often an important factor in successfully establishing this grass. The seed germinates at low temperatures and the seedlings become established much better in cool weather. When the roots have penetrated to 3 or 4 inches the plants are safe, but the seedlings readily succumb at an early stage of growth if the tiny rootlets become dried out in the top inch of soil. For this reason water, if available, may be used sparingly during establishment. Where water is not available, early seeding is the best insurance of success.

Crested wheatgrass will tolerate frequent clipping without injury. The first experimental lawn was laid down at the University of Saskatchewan 9 years ago. The condition of this lawn is as good as it ever was and no weeds can be found in it although dandelions have surrounded it each year. Experimental lawns of other strains of crested wheatgrass have not excluded the dandelions so successfully. There is also a marked difference in the quality of the sward, that of the Fairway strain being free from tuftiness and conspicuously superior in other respects.

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A theory in practical turf maintenance, as in science, is a valuable servant but a poor master. Control your theories; don't let them control you.



SEED PRODUCTION OF TURF GRASSES ON THE  
PACIFIC COAST

H. A. SCHOTH \*

The production of seed of turf grasses on the Pacific Coast for use on golf courses, parks, recreation fields, lawns and cemeteries began in 1924 with the harvesting of natural stands of seaside bent, *Agrostis palustris* Huds., in southwestern Oregon. In 1926 the first seed of Astoria Colonial bent, *Agrostis tenuis* Sibth., was harvested in northwestern Oregon from natural stands. The first seed of highland Colonial bent, *Agrostis tenuis*, also from natural stands was harvested in 1928 near Yoncalla, Oreg.

The production of bent grass seed increased rapidly until 1936 when a crop of considerably over a half million pounds of all kinds was harvested. Since that time production has been rather stationary with an annual out-put of close to one-half million pounds.

Up to 1934 most of the production of bent grass seed was from natural stands. Many of the fields that were harvested for several years declined in production as weeds and other plants increased. As a result of this reduced yield from native stands and continued good demand for seed, several extensive seedings have been made on cultivated lands. Most plantings have been in the Lower Columbia River and Klamath Lake sections of Oregon and consist of seaside, Astoria and Highland bents.

Bent grass seed production on the Pacific Coast is centered in western Oregon but considerable amounts are also produced

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\* Agronomist, Division of Forage Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture.



Threshing colonial bent seed in Astoria, Oregon

in western Washington and small amounts in northwestern California.

The highland Colonial bent, *Agrostis tenuis*, was apparently introduced so early that it behaves as a native in western Oregon and Washington. While the first seed was harvested in 1928 it has been only during the past 4 years that the amount of seed available for market has assumed sizeable proportions. It is versatile in adaptation and under Pacific Northwest conditions is better suited to soils that are low in fertility and get very dry in summer, than any of the other species of bent

grass. It spreads rapidly by rhizomes and develops a tough sod. On cultivated land it is often considered a weed. Up to this time most of the seed has been harvested from more or less natural stands occurring for the most part on lands that are wet in the winter and dry in the summer. A small acreage has been seeded in the Klamath Lake region. It is considered a good pasture plant and an excellent sod former.

Seed yields generally are low, seldom being above 50 to 75 pounds to an acre with a total production of about 30,000 pounds. Most of this seed is used locally for either pasture or lawn purposes.

Velvet bent, *Agrostis canina* L., has been grown under cultivation on a small acreage for a number of years for seed production. The seed produced has been for the most part used on golf courses near the place of production and little has reached market channels.

During the past 5 years there has been increasing activity in production of seed of a number of turf grasses other than the most common bents. The outstanding one is Chewings fescue.

#### FESCUE

The acreage of Chewings fescue harvested for seed has increased from about 5 in 1932 to close to 500 in 1938. Over 90 percent of this acreage is in western Oregon in the Willamette Valley with the remainder distributed equally between eastern Oregon and in the Grand Ronde Valley and western Washington. The acreage is increasing rapidly in all sections.

Seedings of Chewings fescue have been made on a wide range of soil types and degrees of fertility. Stands are comparatively easy to secure and maintain on practically any well

drained soils where there is moisture enough for fair growth most of the year. For seed production, soils having good drainage, fair supplies of moisture during fall, spring and early summer and fertility enough to put them into the class that will produce good crops of red clover and winter wheat, are most desirable. On lands of low fertility Chewings fescue makes good vegetative growth but seed production is low. Under heavily shaded conditions the vegetative growth is usually good, but little seed is produced.

Chewings fescue makes fairly satisfactory growth on soils that become dry during summer and fall, but for seed production the plants should not suffer from lack of moisture before seed maturity. Where soil moisture is low before seed maturity, yields are reduced and the seed is light and inclined to be chaffy.

Field cutting for seed begins when the early heads are at the point of shattering, except in areas near the coast in Oregon and Washington where climatic conditions are fairly cool and humidity is high. Then the crop may be left standing without shattering until almost mature.

Yields of Chewings fescue seed vary from 50 to 600 pounds an acre with an average of about 150 pounds. The lower yields are generally from seedings on low, wet and poor lands or on lands that dry out early. The higher yields are on the best lands.

Some seedings are in cultivated rows. Under favorable conditions such seedings outyield solid seedings. Production costs are also higher. An extremely high quality of seed is usually secured.

During the past 2 years small seedings of creeping red fescue, *Festuca rubra* L. have been made in western Oregon for seed





Harvesting Chewings fescue seed in Oregon 1938. This 20 acre field planted in cultivated rows yielded 600 pounds an acre.

production. Only small amounts of seed have been harvested so far but indications are that within the next few years the acreage will increase rapidly. This fescue shows considerable promise for pasture as well as turf as it is hardy, grows under a wide range of conditions and requires less care than some of the other turf grasses. The practices in growing and handling are similar to those for Chewings fescue.

#### RYEGRASSES

The production of ryegrass seed in the United States is concentrated in the Pacific Northwest with 90 percent in the

Willamette Valley of Oregon and the remainder in western Washington. Annual production has varied from 3½ to 14 million pounds with an average of between 7 and 8 million pounds. Ninety percent is of the Italian type (*Lolium multiflorum*) and the remainder perennial (*Lolium perenne*).

Italian ryegrass is considered an annual although some plants may live over into the second year. Perennial ryegrass plants usually live from 4 to 6 years.

The ryegrasses for seed production are mostly grown on low rather wet soils. Seedings are practically always made in the fall using 20 to 25 pounds of seed an acre.

Italian ryegrass produces its one crop of seed the first summer after seeding. English ryegrass also produces some seed the first year after seeding, but the second and third years crops are the best. Harvesting is similar to that of small grains.

Seed yields vary from 1,200 to 1,500 pounds an acre on the better soils to 200 or 300 pounds on poor soils with average yields of from 600 to 700 pounds an acre.

### BLUEGRASSES

Until 1933 the Pacific Coast was not considered as having worthwhile possibilities of commercial production of seed of Kentucky bluegrass, *Poa pratensis* L. This grass has been used for many years for forage purposes, but from the seed production standpoint it was given little consideration until 1936 as generally it produced little seed and market prices were low. Since that year 60 to 70 thousand pounds of high quality seed have been harvested each year, mostly in the Klamath Lake section.

*Poa trivialis* L. grows well in the Pacific Northwest and some

interest has developed in seed production. While a few small seedings have been made, yields have been low and it has been hard to get high quality seed free from mixture.

*Poa bulbosa* L. is produced in the Rogue River Valley of southern Oregon. The "seeds" are really bulblets and are secured by threshing the first cutting of alfalfa hay. Production depends largely on market prospects and varies from 20 to 50 tons a year.

#### MISCELLANEOUS GRASSES

The Fairway strain of crested wheatgrass *Agropyron cristatum* (L.) Beauv., is used to some extent as a turf grass in regions of comparatively low rainfall. The production of seed on the Pacific Coast has been largely in the dry farming sections of the Northwest. The demand for turf purposes has been small. The main outlet for seed has been for pastures. The handling of the Fairway strain for seed is the same as that of the regular crested wheatgrass.

Several seedings have been made of the low growing semi-creeping type of timothy. The first commercial lot of seed was harvested in 1938. The practices in growing and harvesting are the same as for the regular timothy.

Some interest has developed in the possible use of Lemmon's alkali grass *Puccinellia lemmoni* (Vasey) Scrib. for turf purposes. It shows promise on heavy alkali soil where other grasses do not grow well. Small amounts of seed are being harvested, but yields are low and the quality of the seed is variable.

#### HARVESTING

Harvesting, threshing and cleaning operations are carried out on a field scale. Farm mowers or other forms of large

harvesting machinery are used. In some cases the combine, used so much in the Northwest to cut and thresh at one operation, can be used. Rarely are bent fields so located that mowers cannot be used, and then, if labor is plentiful, harvesting may be done with sickles.

As a rule operations are on a large enough scale to warrant the use of the most modern machinery, either horse or tractor drawn.



Large scale threshing of bent seed in Coos County, Oregon. Here three machines are operating in a 100-acre field of seaside creeping bent

Grain threshers are used for threshing but are equipped with appropriate screens and the parts are adjusted for handling bent seed, fescue or ryegrass as required.

### PROFITABLE BUSINESS DEVELOPED

With the development of the culture of turf grasses for seed production in this region a rather profitable business has developed. Growers and distributors have taken a keen interest and as a consequence the majority of seed sold is of high quality both as to purity and germination. Certification is practised extensively for all of the bent grasses. This industry has made necessary a number of improvements in harvesting and cleaning equipment.

In the early stages of production of seed of turf grasses many growers handled their own crops. During recent years, however, there has been a decided trend toward larger seed concerns assuming control of acreages and taking care of all harvesting, cleaning and distributing of the seed. Individual growers not connected with seed companies generally market their seed through local concerns.

Because of the extremely good growing conditions in this region and wide diversity of production possibilities, there are indications of a continually expanding acreage of turf grasses for seed production. There is always interest in securing new strains, varieties and species and the majority of people interested in this kind of seed production sense the possibilities of possible market changes so want to be in a position to take advantage of new or improved plants.

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Crabgrass and other weed seed is common in most hay. In this manner seed gets into the manure, and when fresh manure is used on turf an infestation of crabgrass and other weeds may result. Composting the manure for six months or more will kill most of the weed seed.

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Rolling of turf is an important operation but it can be overdone on heavy land. This is especially true when a very heavy roller is used or when the ground is too wet. On sandy soil excessive rolling does no harm unless done when the ground is almost saturated. The time to roll is early in spring as soon as the ground is fairly dry and the grass has commenced to grow. This will compact the surface soil which has become loosened from freezing and thawing and will smooth the turf.

## COMMON NAMES OF TURF GRASSES

A. J. PIETERS and F. F. DAVIS \*

Our ordinary plants usually have two names; the botanical and the common name. The botanical name is in Latin and serves readily to identify the plant, no matter what the native tongue of the writer or reader. Common names can have no such universality as they vary with the language. Also there are often several different common names in one language. When a plant grows in widely separated countries even though the same language is spoken there are likely to be many common names for it. Some of these names are naturally of native origin but have been adopted by the English speaking population.

The well known turf grass to which, in this country, we most commonly refer as Bermuda grass, is known in English speaking countries under a great variety of names. In Australia it is known under the names of couch or Indian couch, doob, and kweek. In Africa it is called doob or dub, couch, kweek, quick or fine quick, and Scotch. In India the names given it are doob or dhoob, Durba or Durva, creeping panic grass and hariali. In Cuba it is known as Caña maza, and yerba fina. In Egypt it is called Neguil. In Hawaii it is referred to as manienie. In the Malay States it is known as serangoon.

Even in one country there may be a large assortment of common names for the same species of grass. In the United States, for instance, our common Bermuda grass is referred to under different common names. In California and along the Gulf

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\* Principal Agronomist and Botanist, respectively, of the United States Golf Association Green Section.

States it is frequently called devil's grass. In the northern limits of its range it is commonly known as wire-grass. Elsewhere in limited districts in this country it is referred to as Bahama, dogstooth, reed grass, Scotch, and scutch grass.

Not only are there several common names used for the same species of plant but often the same common name in separate districts may designate distinctly different species. The name herds grass, for instance, is applied in the southern United States to the species which is designated in the following list as redtop. In New York and New England it is frequently used to designate the species listed as timothy. In England it frequently designates the grass listed as velvet grass.

A variety of common names for any one grass may serve a useful purpose and may not be misleading when each name is restricted to local use. With modern increased interest in turf grasses, however, and the wider distribution of information on them, there is certain to be increased confusion due to the rising tower of Babel of common names applied to various species used for turf in different parts of the world. With the more general exchange of seed not only between different sections of this country but also between widely separated countries, this confusion has become significant economically.

It not infrequently happens that a buyer purchases a variety of grass under a name to which he is accustomed, only to learn after the seed has been planted that the grass he meant to buy and the one the seed dealer designated by the same name were two different species. Often this works out to the disappointment of the customer and consequently to the disadvantage of the seed dealer.

Botanists have attempted to make the names of plants of universal application. To this end they have given each plant



a Latin name by which it may be known the world over, regardless of language. The individual plants have been described as species; the closely related species have been grouped together into genera (singular, genus). The botanical name by which the plant is designated consists therefore of two names (binomial system); first, the name of the genus, and second, the name of the species. This system is comparable to listing the names of individuals in a telephone directory, with the family name first. The scientific classification of plants and the binomial system which are used today originated with the noted Swedish botanist, Linnaeus, in 1753.

### BOTANICAL CLASSIFICATION

Any effort to classify nature, however, leads to difficulties. The system works effectively for plants which exhibit clean-cut characteristics placing them unquestionably in species or pigeon holes by themselves as distinct from more or less closely related species. Nature, however, does not draw sharp lines and frequently border-line plants are found which do not fit into any previously established pigeon hole. One botanist may therefore believe it wise to place it in one pigeon hole; another, in some closely related species or pigeon hole; while still another may think the variations are sufficient to justify building still another pigeon hole in which to place the plant.

When a botanist describes a plant as belonging to a new species or variety he must publish an accurate description of it. In addition, the particular specimen which he has described must be pressed, dried and filed in an herbarium (a collection of preserved plants). This is called the type specimen. His re-

sponsibility for the botanical name is indicated by his name, its abbreviation or his initial following the name of the species; for example, the L. so frequently attached to botanical names refers to Linnaeus.

Descriptions, no matter how carefully made at the time, may later be misleading. Adjectives such as long, tall, etc., unless accompanied by actual measurements are frequently meaningless. In a critical study of scientific names it is therefore desirable not only to read the author's original description but also to study the plant from which this description was made. The original specimen can usually be borrowed from the herbarium in which it is filed since it is the practice for each herbarium to loan its specimens to workers in other herbaria, just as libraries loan their books to other libraries.

### CONFUSION IN BOTANICAL NAMES

Botanical names have been subject to confusion for several reasons. In some cases one author may describe a plant as being a new species without knowing that the same species had been described previously by another author. For instance, Kentucky bluegrass was described by Schreber as *Poa viridis* and by Elliott as *Poa angustifolia*. When however, botanists discovered that the grasses described by Schreber and by Elliott were identical with the *Poa pratensis* described earlier by Linnaeus the use of the later names was discontinued. The name under which a plant was described by the first author is accepted as the correct scientific name and all other names under which it may have been described subsequently are listed as synonyms.

In other cases the same Latin name has been used for different

species, usually by men who did not know of the earlier use of the name. For instance, Pollick, not realizing that Linnaeus had described Kentucky bluegrass under the name *Poa pratensis*, described an entirely different species of *Poa* under the same name. Here again the scientific name must be used for the plant which is first described under that name. So in this case *Poa pratensis* L. is the correct scientific name for Kentucky bluegrass. When, therefore, a botanist writes *Poa pratensis* L. the plant described by Linnaeus is meant and not the plant described by Pollick under the same name.

Other cases of confusion arise when one worker considers a form sufficiently distinct to warrant making a new species of it, whereas another botanist, working with the same plant considers the differences so small as to warrant making only a new variety and not a new species.

### SOURCES OF COMMON NAMES

It is possible, therefore, to trace the botanical names to their source and to decide which shall be considered the correct name. In the case of common names, however, such decisions usually are not possible. Many of our common names are of ancient origin, long antedating the binomial system of Latin names devised by Linnaeus.

Oftentimes in the history of the use of a word there has been a gradual change in its meaning, so that at the present time the name is used in a sense entirely different from the original. For instance, as first used in England, the term "bent" meant a grassy field. It was used in this sense by north European writers from the time of the earliest appearance of Northern literature.

Even rushes, the stalks and the heads of plantain, and sedges, have been called bents. Then the term became restricted in its use first to the various grasses and eventually in this country to those grasses belonging to the genus *Agrostis*.

Common names also may originate from the locality in which the plants are grown. Such, for instance, is the case with Kentucky bluegrass, *Poa pratensis*. This species was introduced early into the United States and became established in many regions. It attracted most attention in pastures in Kentucky and soon became known as Kentucky bluegrass. In our country this name has replaced the old English name, smooth-stalked meadow grass. The name Kentucky bluegrass is now also used by seedsmen in South Africa, Australia and New Zealand, but not in England.

Common names are frequently descriptive of the plant. They may refer to its vegetative characteristics, such as smooth-stalked meadow grass; the characteristics of the flower heads, as redtop, in which case the name refers to the reddish tinge of the flower heads when seen in mass; the characteristics of the growth habits such as creeping bent; the length of life such as annual bluegrass or perennial ryegrass. Such terms may be confusing because other related species may show the same characteristics. Such is the case with the name creeping bent, which name has been widely applied to *Agrostis palustris* Huds. although other species of *Agrostis* also "creep" by means of stolons.

In some cases the common names include words that show a botanical relationship. In England the term meadow grass has long been used to designate the various species of *Poa*, as, for instance, smooth-stalked meadow grass, rough-stalked meadow grass, flat-stalked meadow grass, and wood meadow

grass. Smooth-stalked meadow grass became famous in Kentucky and soon became generally recognized in this country as Kentucky bluegrass. It was natural therefore to use the term bluegrass for the other species of *Poa* grown here. Although bluegrass is not an ideal term since the color of the grass is not blue the name is in such general use that it would be impractical to substitute another for it.

TURF CULTURE has, therefore, accepted the term bluegrass for all of the species of *Poa*. This indicates the botanical relationship between them as, for instance, annual bluegrass, Canada bluegrass, wood bluegrass, and trivialis bluegrass. The latter name will be used by TURF CULTURE for *Poa trivialis*. Objections have been raised repeatedly by dealers and others to the various names which include the word "rough" in connection with this species as in turf it is distinctly not rough. *Poa trivialis* is now frequently referred to simply as trivialis. As this name has been found to be convenient in common usage, has no objectionable implications and, unlike other common names that have been suggested, does not misrepresent the range of usefulness of the species, TURF CULTURE will adopt as its common name, trivialis bluegrass (pronounced with a long "a").

#### COMMON NAMES MAY BE FIXED

Some of the confusion among common names may be avoided if a deliberate effort is made to encourage the use of a single name in any one country for one species.

Before 1930 a number of names were used for the grasses of the Colonial bent type. Besides other names it was called

Colonial bent, Rhode Island bent, Astoria bent and browntop. In the interest of those buying and selling seed of turf grasses the United States Golf Association Green Section in 1930 took up with seedsmen, greenkeepers and others interested, the question of the name preferred for the grass commonly called Colonial bent, browntop, Rhode Island bent and other names. The ballot was almost unanimous for the use of the name Colonial bent to displace all others.

Common names cannot be universal since they vary with the language, but it is desirable that a certain common name be accepted as the name for one and only one species or variety wherever that plant is known to people speaking one language. With English speaking peoples widely scattered over the globe it is not probable that complete uniformity in the use of common names will ever be attained. Local usage will develop local names, but it is hoped that the publication of the lists in this paper may lead to some greater uniformity in the use of the common names of widely used species.

In the first list are given the botanical names of grasses used for turf in the English speaking countries. TURF CULTURE uses those botanical names accepted by the United States Department of Agriculture and the National Herbarium of the Smithsonian Institution. Most of these are listed in the Manual of Grasses of the United States by the late A. S. Hitchcock, agrostologist representing both of these organizations.

Following the botanical name for each grass is given a list of common names used for that species in English speaking countries. The name which TURF CULTURE will adopt is given first in heavy type. The fact that a name is chosen does not mean that it is considered the best possible name, but rather

that it is the most widely used and at the present time at least appears to be the most convenient one.

In the second list the common names are arranged alphabetically with an appropriate reference to the species to which they belong. While there are perhaps local names not found, the lists are believed to represent most of the common names used in seed catalogs and recent literature of the English speaking countries. Certain names, chiefly old ones, have been omitted as it is not possible at present to be certain of the species to which they have been applied.

TURF CULTURE would welcome from its readers any other names of turf grasses that may be in common use but which do not appear in these lists.

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#### LIST OF BOTANICAL NAMES FOR TURF GRASSES

SCIENTIFIC NAME	COMMON NAMES
<i>Agropyron cristatum</i> (L.) Beauv.	crested wheatgrass, desert wheatgrass.
<i>Agrostis alba</i> L.	redtop, English bent, fiorin, herds grass, marsh bent, southern bent, white bent, whitetop.
<i>Agrostis canina</i> L.	velvet bent, brown bent, brown creeping bent, dog bent.
<i>Agrostis nigra</i> With.	black bent, black couch.
<i>Agrostis palustris</i> Huds.	creeping bent, carpet bent, Coos Bay or Coos County bent, fiorin, sea-side bent.
<i>Agrostis tenuis</i> Sibth.	Colonial bent, bent, browntop, Burden's grass, dew grass, English bent, English browntop, fine bent, furze top, New Zealand bent, Prince Edward Island bent, purple bent, Rhode Island bent, South



	German browntop, Waipu bent, Waipu browntop.
<i>Andropogon annulatus</i> Forsk.	Angleton grass
<i>Axonopus affinis</i> Chase	narrow-leaved carpet grass, carpet grass.
<i>Axonopus compressus</i> (Schwartz) Beauv.	broad-leaved carpet grass, carpet grass, Louisiana carpet grass.
<i>Buchlöv dactyloides</i> (Nutt.) Engelm.	buffalo grass.
<i>Cynodon bradleyi</i> Stent	Bradley grass.
<i>Cynodon dactylon</i> (L.) Pers.	Bermuda grass, Bahama grass, common couch grass, couch grass, creeping panic grass, devil's grass, dhoob grass, dogtooth grass, doob grass, dub, Durba grass, fine quick, hariali, Indian couch grass, kweek grass, manienie, Neguil, quick grass, reed grass, Scotch grass, scutch grass, serangoon, wiregrass, yerba fina.
<i>Cynodon transvaalensis</i> Burt Davy	Germiston grass, African Bermuda grass.
<i>Cynosurus cristatus</i> L.	crested dogtail, dogtail grass.
<i>Dactyloctenium aegyptium</i> (L.) Richt.	Durban grass.
<i>Deschampsia flexuosa</i> (L.) Trin.	wavy hairgrass, crinkled hairgrass.
<i>Digitaria didactyla</i> Willd.	blue couch.
<i>Eremochloa ophiuroides</i> (Munro) Hack.	centipede grass.
<i>Festuca capillata</i> Lam.	hair fescue, fine-leaved fescue.
<i>Festuca elatior</i> L.	meadow fescue, English bluegrass.

<i>Festuca ovina</i> L.	sheep fescue.
<i>Festuca ovina</i> var. <i>duriuscula</i> (L.) Koch.	hard fescue.
<i>Festuca rubra</i> L.	red fescue, creeping red fescue, sea washed fescue.
<i>Festuca rubra</i> var. <i>commutata</i> Gaud.	Chewings fescue.
<i>Festuca rubra</i> var. <i>heterophylla</i> (Lam.) Mut.	various-leaved fescue, shade fescue.
<i>Hilaria belangeri</i> (Steud.) Nash.	curly mesquite.
<i>Holcus lanatus</i> L.	velvet grass, fog, herds grass, meadow soft grass, Yorkshire fog.
<i>Holcus mollis</i> L.	creeping soft grass, creeping velvet grass.
<i>Lolium multiflorum</i> Lam.	Italian ryegrass, annual ryegrass, Australian ryegrass, domestic ryegrass, Poverty Bay ryegrass.
<i>Lolium perenne</i> L.	perennial ryegrass, English bluegrass, English ryegrass, ray grass.
<i>Muhlenbergia porteri</i> Scribn.	bush muhly, hoe grass, mesquite grass.
<i>Opizia stolonifera</i> Presl.	Acapulco grass.
<i>Paspalum conjugatum</i> Berg.	yellow grass, sour grass.
<i>Paspalum distichum</i> L.	water couch, common couch grass, joint grass, knotgrass.
<i>Pennisetum clandestinum</i> Chiou.	kikuyu grass.
<i>Phleum pratense</i> L.	timothy, cat's tail, herds grass.
<i>Poa annua</i> L.	annual bluegrass, annual meadow grass, annual spear grass, common

- meadow grass, dwarf spear grass, goosegrass, low spear grass, spear grass, walk grass, winter grass.
- Poa bulbosa*, L.      bulbous bluegrass, bulbous meadow grass, winter bluegrass.
- Poa compressa* L.      Canada bluegrass, flat-stalked meadow grass, joint grass, wire-grass.
- Poa nemoralis* L.      wood bluegrass, fine-leaved bluegrass, shady lawn bluegrass, wood meadow grass.
- Poa pratensis* L.      Kentucky bluegrass, English meadow grass, June grass, smooth-stalked meadow grass.
- Poa trivialis* L.      trivialis bluegrass, bird grass, rough bluegrass, rough meadow grass, rough stalked bluegrass, rough stalked meadow grass, shady land bluegrass, shady lawn bluegrass, trivialis.
- Puccinellia lemmoni* (Vasey) Scribn.      Lemmon's alkali grass.
- Puccinellia maritima* (Huds.) Parl.      sea Poa.
- Stenotaphrum glabrum* Trin.      Australian buffalo grass, couch grass, quick grass.
- Stenotaphrum secundatum* (Walt.) Kuntze.      St. Augustine grass, buffalo grass, caña maza, coarse quick, giant carpet grass, matgrass.
- Zoysia japonica* Steud.      Korean lawngrass, Japanese lawn-grass.
- Zoysia matrella* (L.) Merr.      Manila grass.
- Zoysia tenuifolia* Willd.      Mascarene grass, Korean velvet grass.

## LIST OF COMMON NAMES FOR TURF GRASSES

COMMON NAMES	SCIENTIFIC NAME
ACAPULCO GRASS	<i>Opizia stolonifera.</i>
AFRICAN BERMUDA GRASS	See Germiston grass.
ALBERT PARK BENT	Strain of creeping bent propagated by stolons in Victoria, Australia.
ANGLETON GRASS	<i>Andropogon annulatus.</i>
ANNUAL BLUEGRASS	<i>Poa annua.</i>
ANNUAL MEADOW GRASS	See annual bluegrass.
ANNUAL RYEGRASS	See Italian ryegrass.
ANNUAL SPEAR GRASS	See annual bluegrass.
ASTORIA BENT	A variety of Colonial bent grown in Oregon.
ASTORIA CREEPING BENT	See Astoria bent.
ATLANTA BERMUDA GRASS	Fine strains of Bermuda grass were propagated vegetatively in Atlanta several years ago. The term has since been erroneously used to designate any fine strain of Bermuda grass. Although sometimes offered, there actually are no stolons or seed available of the Atlanta strain of Bermuda grass.
AUSTRALIAN BUFFALO GRASS	<i>Stenotaphrum glabrum.</i>
AUSTRALIAN RYEGRASS	See Italian ryegrass.
BAHAMA GRASS	See Bermuda grass.
BENT GRASS	Species of <i>Agrostis</i> , usually refers to Colonial bent.

BERMUDA GRASS	<i>Cynodon dactylon.</i>
BIRD GRASS	See <i>trivialis</i> bluegrass.
BLACK BENT	<i>Agrostis nigra.</i> Sometimes found in German mixed bent.
BLACK COUCH	Name applied to black bent in England.
BLUE COUCH	<i>Digitaria didactyla.</i>
BRADLEY GRASS	<i>Cynodon bradleyi.</i>
BROAD-LEAVED CARPET GRASS	<i>Axonopus compressus.</i>
BROWN BENT	Name applied to velvet bent in Australia and in England.
BROWN CREEPING BENT	See brown bent.
BROWNTOP	Name commonly used in New Zealand, Australia, and England for Colonial bent. It has been used incorrectly for velvet bent.
BUFFALO GRASS	Name used in the United States for <i>Buchloë dactyloides</i> ; also used in Australia for <i>Stenotaphrum secundatum</i> .
BULBOUS BLUEGRASS	<i>Poa bulbosa.</i>
FULBOUS MEADOW GRASS	See bulbous bluegrass.
BURDEN'S GRASS	Name at one time applied to Colonial bent in Rhode Island.
BUSH MUHLY	<i>Muhlenbergia porteri.</i>
CANA MAZA	Name used in Cuba for St. Augustine grass.
CANADA BLUEGRASS	<i>Poa compressa.</i>

CANADIAN BLUEGRASS	See Canada bluegrass.
CARPET BENT	See creeping bent.
CARPET GRASS	Name applied to <i>Axonopus affinis</i> and <i>Axonopus compressus</i> .
CAT'S TAIL	Name applied to timothy in New South Wales, Australia.
CENTPEDE GRASS	<i>Eremochloa ophiuroides</i> .
CHEWINGS FESCUE	<i>Festuca rubra</i> var. <i>commutata</i> .
COARSE QUICK	Name applied to St. Augustine grass in South Africa.
COCOOS BENT	A brand name under which seaside bent has been sold.
COLONIAL BENT	<i>Agrostis tenuis</i> .
COLUMBIA BENT	A strain of creeping bent at one time propagated by stolons.
COMMON COUCH GRASS	See couch grass. Sometimes also used for water couch in Australia.
COMMON MEADOW GRASS	Name used for annual bluegrass in England.
COOS BAY OR COOS COUNTY BENT	Refers to seaside bent seed grown in Coos County, Oreg.
COUCH GRASS	Name applied to Bermuda grass in Africa and Australia. Also to Australian buffalo grass in South Africa.
CREEPING BENT	<i>Agrostis palustris</i> .
CREEPING PANIC GRASS	Name used for Bermuda grass in India.
CREEPING RED FESCUE	See red fescue.

CREEPING SOFT GRASS	<i>Holcus mollis.</i>
CREEPING VELVET GRASS	Name applied to creeping soft grass in Australia.
CRESTED DOGTAIL (crested dog's tail)	<i>Cynosurus cristatus.</i>
CRESTED WHEATGRASS	<i>Agropyron cristatum.</i> Fine strains are suitable for turf.
CRINKLED HAIRGRASS	See wavy hairgrass.
CURLY MESQUITE	<i>Hilaria belangeri.</i>
DESERT WHEATGRASS	Name used for crested wheatgrass in Australia.
DEVIL'S GRASS	Name applied to Bermuda grass in India and western United States.
DEW GRASS	See Colonial bent.
DHOOB GRASS	Name applied to Bermuda grass in India.
DOG BENT	Name applied to velvet bent in Australia.
DOGSTOOTH GRASS	See Bermuda grass.
DOGTAIL GRASS (dog's tail)	See crested dogtail.
DOMESTIC RYEGRASS	Mixture of Italian ryegrass with some perennial ryegrass, grown in Pacific Northwest.
DOOB GRASS	Name applied to Bermuda grass in India, Africa and Australia.
DRYLAND BROWNTOP	A New Zealand variety of Colonial bent practically the same as highland.
DUB	Name applied to Bermuda grass in S. Africa.



DUNCAN'S 23	See Albert Park bent.
DURBAN GRASS	<i>Dactyloctenium aegyptium</i> .
DURBA GRASS (Durva grass)	Name applied to Bermuda grass in India.
DWARF SPEAR GRASS	See annual bluegrass.
ENGLISH BENT	Name sometimes applied to redtop and sometimes to Colonial bent.
ENGLISH BLUEGRASS	Name applied to meadow fescue and occasionally to perennial ryegrass.
ENGLISH BROWNTOP	Name used for Colonial bent in New Zealand.
ENGLISH MEADOW GRASS	Name applied to Kentucky bluegrass in Australia.
ENGLISH RYEGRASS	See perennial ryegrass.
FAIRWAY STRAIN, CRESTED WHEAT-GRASS	Strain for turf purposes developed in Saskatchewan.
FINE BENT	Name used for Colonial bent in Australia.
FINE-LEAVED BLUEGRASS	See wood bluegrass.
FINE-LEAVED FESCUE	See hair fescue.
FINE QUICK	Name used for Bermuda grass in South Africa.
FIORIN	Name sometimes applied in England to redtop and sometimes to creeping bent.
FLAT-STALKED MEADOW GRASS	English name for Canada bluegrass.
FLORIDA GRASS	A strain of Bermuda grass used in South Africa.

FLOSSMOOR BENT	Same as Washington bent.
FOG	Name used in England for velvet grass.
FURZE TOP	Name used in Australia for Colonial bent.
GERMAN BENT	See German mixed bent.
GERMAN CREEPING BENT	See German mixed bent.
GERMAN MIXED BENT	A mixture of bents, seed of which is obtained from Germany. It consists of varying proportions of Colonial bent, velvet bent, creeping bent, redtop and sometimes black bent.
GERMISTON GRASS	<i>Cynodon transvaalensis</i> .
GIANT CARPET GRASS	Name applied to St. Augustine grass in Australia.
GOLF-A-LAWN BENT	A trade name used for Astoria bent.
GOOSEGRASS	Name used for <i>Poa annua</i> . The same name is applied also to the weed, <i>Eleusine indica</i> .
HAIR FESCUE	<i>Festuca capillata</i> .
HARD FESCUE	<i>Festuca ovina</i> var. <i>duriuscula</i> .
HARIALI	Name used for Bermuda grass in India.
HEIDELBERG BENT	A strain of creeping bent propagated by stolons in Victoria, Australia.
HERDS GRASS	See redtop. Also formerly used for timothy in New England and for velvet grass.

HIGHLAND BENT	A variety of Colonial bent.
HOE GRASS	See bush muhly.
INDIAN COUCH GRASS	Name used for Bermuda grass in Australia and New Zealand.
INVERNESS BENT	A strain of creeping bent which at one time was propagated by stolons.
ITALIAN RYEGRASS	<i>Lolium multiflorum</i> .
IVANHOE BENT	A strain of creeping bent propagated by stolons in Victoria, Australia.
JAPANESE LAWN GRASS	See Korean lawngrass.
JOINT GRASS	See Canada bluegrass. Also used for water couch in California.
JUNE GRASS	See Kentucky bluegrass.
KENTUCKY BLUEGRASS	<i>Poa pratensis</i> .
KERNWOOD BENT	A strain of velvet bent propagated by stolons.
KIKUYU GRASS	<i>Pennisetum clandestinum</i> .
KNOTGRASS	See water couch.
KOREAN LAWN GRASS	<i>Zoysia japonica</i> .
KOREAN VELVET GRASS	See Mascarene grass.
KWEEK GRASS	Name used for Bermuda grass in Australia.
LEMMON'S ALKALI GRASS	<i>Puccinellia lemmoni</i> .
LOUISIANA CARPET GRASS	Name used for broad-leaved carpet grass in Hawaii.

LOW SPEAR GRASS	Name used for annual bluegrass in Hawaii.
MANIENIE	Name used for Bermuda grass in Hawaii.
MANILA GRASS	<i>Zoysia matrella.</i>
MARSH BENT	Name used for redtop in Australia.
MASCARENE GRASS	<i>Zoysia tenuifolia.</i>
MATGRASS	See St. Augustine grass.
MEADOW FESCUE	<i>Festuca elatior.</i>
MEADOW SOFT GRASS	Name applied to velvet grass in Hawaii.
MESQUITE GRASS	See bush muhly.
METROPOLITAN BENT	A strain of creeping bent propagated by stolons.
NARROW-LEAVED CARPET GRASS	<i>Axonopus affinis.</i>
NEGUIL	Name used for Bermuda grass in Egypt.
NEW BRUNSWICK CREEPING BENT	Name used for seaside creeping bent harvested in New Brunswick, Canada.
NEW ZEALAND BENT	Colonial bent grown in New Zealand.
NEW ZEALAND BROWNTOP	Colonial bent grown in New Zealand.
NEW ZEALAND DRYLAND BROWNTOP	A New Zealand variety of Colonial bent practically the same as highland.

NORTH WOODS BENT	A strain of creeping bent propagated by stolons.
OLD ORCHARD BENT	A strain of creeping bent propagated by stolons.
OLYMPIC BRAND BENT	A trade name used for what is claimed to be a selection of Colonial bent.
OREGON BENT	Name previously used for the high-land variety of Colonial bent.
OREGON RYEGRASS	See domestic ryegrass.
PACEY'S RYEGRASS	A variety of perennial ryegrass.
PERENNIAL RYEGRASS	<i>Lolium perenne</i> .
PIPER BENT	A strain of velvet bent propagated by stolons.
POVERTY BAY RYEGRASS	Name used for Italian ryegrass in Australia.
PRINCE EDWARD ISLAND BENT	See Colonial bent.
PURPLE BENT	Name applied to Colonial bent in Australia.
QUICK GRASS	Name applied to Bermuda grass and to Australian buffalo grass in South Africa.
RAY GRASS	See perennial ryegrass.
RED FESCUE	<i>Festuca rubra</i> .
REDTOP	<i>Agrostis alba</i> .
REED GRASS	See Bermuda grass.

RHODE ISLAND BENT	See Colonial bent.
ROUGH BLUEGRASS	See <i>trivialis</i> bluegrass.
ROUGH MEADOW GRASS	See <i>trivialis</i> bluegrass.
ROUGH-STALKED BLUEGRASS	See <i>trivialis</i> bluegrass.
ROUGH-STALKED MEADOW GRASS	See <i>trivialis</i> bluegrass.
ROYAL CAPE COUCH	Name for a South African strain of Bermuda grass.
SAINT AUGUSTINE GRASS	<i>Stenotaphrum secundatum</i> .
SAINT LUCIE GRASS	A variety of Bermuda grass.
SCOTCH GRASS	Name applied to Bermuda grass in South Africa.
SCUTCH GRASS	See Bermuda grass.
SEA POA	<i>Puccinellia maritima</i> .
SEASIDE BENT	See creeping bent.
SEA WASHED FESCUE	See red fescue.
SERANGOON	Name used for Bermuda grass in the Malay States.
SHADE BLUEGRASS	See <i>trivialis</i> bluegrass.
SHADY BLUEGRASS	See <i>trivialis</i> bluegrass.
SHADE FESCUE	See various-leaved fescue.
SHADY LAND BLUEGRASS	See <i>trivialis</i> bluegrass.
SHADY LAWN BLUEGRASS	See <i>trivialis</i> bluegrass. Sometimes also applied to wood bluegrass.
SHEEP FESCUE (sheep's fescue)	<i>Festuca ovina</i> .

SMOOTH-STALKED MEADOW GRASS	See Kentucky bluegrass.
SOUR GRASS	Name used in Australia for <i>Paspalum conjugatum</i> . It should not be confused with the name as used in this country for <i>Trichachne insularis</i> and for the weeds, sheep's sorrel and wood sorrel.
SOUTH GERMAN BROWNTOP	See Colonial bent.
SOUTH GERMAN CREEPING BENT	See German mixed bent.
SOUTH GERMAN MIXED BENT	See German mixed bent.
SOUTHERN BENT	Name used for redtop in Australia.
SPEAR GRASS	See annual bluegrass.
SYDNEY BENT	A strain of creeping bent propagated by stolons in Australia.
TIMOTHY	<i>Pbleum pratense</i> . Fine strains are suitable for turf.
TRIPLE A BENT	A trade name used for Astoria Colonial bent.
TRIVIALIS BLUEGRASS	<i>Poa trivialis</i> .
VARIOUS-LEAVED FESCUE	<i>Festuca rubra</i> var. <i>heterophylla</i> .
VELVET BENT	<i>Agrostis canina</i> .
VELVET GRASS	<i>Holcus lanatus</i> .
VERMONT BENT	A strain of creeping bent which at one time was propagated by stolons.
VICTORIAN BROWNTOP	See dryland browntop.



VIRGINIA BENT	A strain of creeping bent which at one time was extensively propagated by stolons.
WAIPU BENT (Waipu browntop)	Name applied to Colonial bent in New Zealand.
WALK GRASS	Name applied to annual bluegrass in South Africa.
WASHINGTON BENT	A strain of creeping bent propagated by stolons.
WATER COUCH	<i>Paspalum distichum</i> . Used in Victoria, Australia.
WAVY HAIRGRASS	<i>Deschampsia flexuosa</i> .
WHITE BENT	See redtop.
WHITETOP	A name applied to redtop in Australia.
WINTER BLUEGRASS	See bulbous bluegrass.
WINTER GRASS	A name applied to annual bluegrass in Australia.
WIRE-GRASS	A local name for Bermuda grass in the United States. Also sometimes used for Canada bluegrass.
WOOD BLUEGRASS	<i>Poa nemoralis</i> .
WOOD MEADOWGRASS	See wood bluegrass.
YELLOW GRASS	<i>Paspalum conjugatum</i> Berg.
YERBA FINA	Name applied to Bermuda grass in Cuba.
YORKSHIRE FOG	Name used in England for velvet grass.

## WHAT OTHERS WRITE ON TURF

In this department will be given the substance of research in the various fields of scientific investigation which seems to have a definite bearing on turf improvement. The articles will summarize results of recent investigations made in various parts of the world. They are not published here as recommendations but simply as information for our readers and as suggestions which may have practical applications in many situations. Where the Green Section's tests or the information it has obtained from other reliable sources in this country substantiates or contradicts the results obtained by other investigators, comments to that effect may be included as a guide for our readers. In all other cases the reader will receive in brief the results and conclusions as given in the original papers.

## SEED PRODUCTION IN BLUEGRASS

Kentucky bluegrass (*Poa pratensis*) is highly prized in northern Europe as well as in the United States. In Sweden new strains have been developed, the distribution of which depends on local production of seed. Åkerberg has studied the question of seed setting and seed production in Sweden and his paper has been translated for Herbage Reviews.

He found that in Kentucky bluegrass no fertile shoots were produced the first year and that in subsequent years the proportion of fertile to sterile shoots varied with the method of sowing, fertilizer treatment and the strain of grass.

His present investigations confirm earlier work in Sweden, which has demonstrated that in various strains of Kentucky bluegrass, seed is produced without fertilization. In such cases the pollen must reach the

stigma in order to stimulate seed production, but since fertilization does not take place, the characteristics of the progeny are the same as those of the mother plant.

The production of seed without fertilization was found to be common in Kentucky bluegrass. In fact, in an extensive study of Kentucky bluegrass selections, Åkerberg found only four types which he could characterize on the basis of the appearance of the progeny as sexually produced plants. On the contrary, *Poa trivialis* seed appears to be entirely produced by sexual means.

It has been shown in an earlier paper by Nilsson, Åkerberg and Nissen that seed setting ability is readily influenced by external conditions but this sensitiveness is largely a strain characteristic, some strains of Kentucky bluegrass being extremely variable with changing

conditions and others showing only slight and purely accidental variations. It should be possible, therefore, to select plants which set seed without fertilization and uniformly well under different conditions.

Another variation in the seed of Kentucky bluegrass which was studied was the weight of 1,000 seed. He found this weight to vary from .15 to .20 grams in some of his types to .60 to .65 in others, with that for the majority of plants being between .3 and .5 grams. He found some of the Swedish bred strains to have a considerably higher 1,000-grain weight than did American seed which was imported by Sweden.

This ability of certain types of Kentucky bluegrass to set seed without fertilization should be of inestimable value in the development of improved strains by selection. Once a strain has been selected and established vegetatively it could be reproduced readily on a commercial scale, should it be a type which sets seed without fertilization. If this phenomenon is as common in our strains of Kentucky bluegrass as Åkerberg has found it to be in Sweden, the chances should be good that some of our vegetative selections could be propagated by asexual seed.

#### THE QUANTITY OF ROOTS UNDER BLUEGRASS

One who has handled sod knows that the surface area under grass is full of roots, but few know the tremendous quantities of roots produced by such a plant as Kentucky bluegrass. Howard J. Dittmer studied this matter in Iowa and published his results in the American Journal of Botany. He also determined the quantity of roots produced by rye and oats, but our interest lies in his results with Kentucky bluegrass. Dittmer took soil samples 3 inches square and 6 inches deep. The soil was carefully washed away. All roots, no matter how small, were counted and representative lots were measured for length and diameter. From these figures it was calculated that the 84,000 separate roots found represented a total length of 1,250 feet with a total root surface of 332 square inches.

Even the root hairs, the organs through which the plant absorbs water and nutrients, were counted. Kentucky bluegrass had in each soil sample an average of 51.5 millions of root hairs which, if extended in one line, would reach 32 miles, with a surface exposure of 16.9 square feet. Kentucky bluegrass had 12 times as many roots as rye, 6 times the root length and the roots had 5

times the surface area of those of rye. His study showed one reason why Kentucky bluegrass is so much more effective in holding soil than rye or oats.

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#### TEMPERATURE OF GERMINATION OF CRABGRASS

E. H. Toole and Vivian K. Toole, of the United States Department of Agriculture, recently presented before the Physiological Section of the Botanical Society of America a paper covering the results of their study of the relation of temperature to the germination of crabgrass seed.

Seed of the smooth crabgrass, *Digitaria ischaemum*, germinated more rapidly under alternating high temperatures of 68° to 100° F. and progressively slower at temperatures of 68° to 95° F., 68° to 86° F., and 59° to 77° F. While the common crabgrass, *Digitaria sanguinalis*, also required alternating high temperatures, the rate of germination decreased as the upper temperature limit was raised but was also lowest at 59° to 77° F.

When chilled at 38° F. seed of both species germinated more quickly. The period of chilling required was shorter when the seed was put out to germinate at the most favorable temperature than at other temperatures.

#### GERMINATION OF CANADA BLUEGRASS SEED

The testing of seed has been pretty much perfected, but there are still seeds that require special treatment to bring out the best germination. One of these seems to be Canada bluegrass (*Poa compressa*). In some studies made by Alice Anderson at the Seed Laboratory in Washington and published in the Proceedings of the International Seed Testing Association, it was found that seed kept for 17 hours at 68° F. in alternating light and darkness, and for 7 hours at 86° F. in the dark, gave a higher percentage of germination than seed kept under other conditions. It is recognized that the factors controlling the germination of this seed are not well understood.

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#### RESEARCH WORK IN VICTORIA, AUSTRALIA

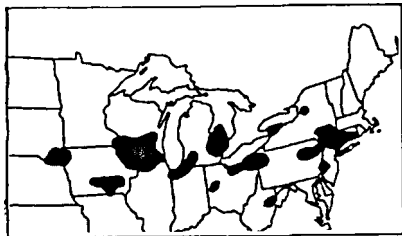
The Victoria (Australia) Golf Association is conducting research at its Riversdale Station. Their investigations in 1938 have been concerned primarily with the relative value of various manurial treatments, with trying out numerous commercial strains of velvet bent, creeping bent, Colonial bent and couch grass (Bermuda grass), and with the control of weeds in turf.

Estimates of the weed population

on the fertilizer plots were made for 1937 and again for 1938. All plots to which sulfate of ammonia and sulfate of iron had been added showed good weed control. Although it appeared that sulfate of ammonia was the best nitrogeous fertilizer, there was strong evidence of the necessity of supplying phosphate in some form.

#### WATCH FOR WHITE GRUB DAMAGE

The life habits of the white grub were described by Luginbill of the United States Department of Agriculture in Farmers' Bulletin 1798,

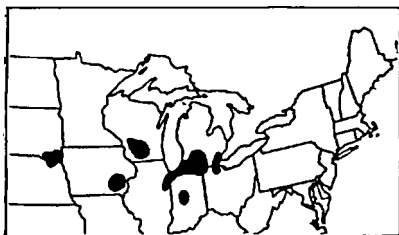


Map showing districts of greatest abundance of brood A white grubs. The extent of these districts and the amount of the damage will vary somewhat from one outbreak to another.

and the author points out that in the area roughly bounded by the Ohio River on the south, the lower Great Lakes region on the north, South Dakota on the west, and Connecticut on the east, the most abundant and

damaging form is brood A of the 3-year cycle. In this region an outbreak of more or less severity may be expected every third year, beginning in 1939.

The length of the cycle may vary with latitude, being 2 years in the southern and 4 years in the northern parts of the range of a species which has a 3-year cycle in the intermediate region.



Map showing districts of greatest abundance of Brood C of white grubs

Recently Louis A. Spain, research entomologist at the Iowa State College, as reported in the *Seed World* has called attention to the probability that damage to pastures in Iowa may be greater in 1939 than in 1938. Since the May beetle lays eggs on turf as well as on pasture it will be wise to watch for damage and to apply remedies.

The maps from Farmers' Bulletin 1798 show where brood A and brood C may be expected to be bad in 1939.

## STANDARDIZED LAWN GRASS SEED MIXTURES

The state of Connecticut has issued regulations for standardizing grades of mixed lawn grass seed. Adherence to these grades is voluntary but the grade names may not be used unless the seed in the package carrying the grade designation complies with the specifications issued by the Commissioner of Agriculture. These regulations, which have been published by the Connecticut Department of Agriculture in Bulletin 52, and which became effective February 1, 1938, are based upon three classes of seed.

Group I (Permanent grasses) includes Colonial bent, creeping bent, Kentucky bluegrass, red fescue, various-leaved fescue and white clover. Group II (Nurse grasses) includes temporary grasses used to make a quick showing, as redtop and ryegrasses. *Poa trivialis* is also mentioned in this group. Group III (Permanent special purpose grasses) includes species believed to be suited to shady or damp places, those especially resistant to drought and heat, and those thought suitable for use on athletic fields and playgrounds. As such, are listed seaside bent, Canada bluegrass, fine-leaved fescue, hard fescue, sheep fescue, creeping red fescue, *Poa trivialis* and annual bluegrass.

A fourth group "filler grasses," consisting of crested dogtail, wood meadow grass, orchard grass and meadow fescue, is mentioned only to be condemned and the use of these grasses in standardized mixtures is prohibited.

The species recommended are said to be suitable for Connecticut conditions. The table giving the grasses in each group also gives information on the minimum germination requirements, time required to produce turf, soil adaptations and remarks on each grass.

Three grades are established, Gold Seal Grade (highest quality), Blue Seal Grade (high quality), and Red Seal Grade (good quality). For each grade the minimum quantities of pure seed of species in Group I and the maximum content of seed of species in Group II are specified as well as the maximum percentages of inert matter and weed seed. The percentage of germination required for seed of each species is given under the group headings and it is provided that if such mixture is recommended for shady places a given percentage of the mixture must consist of seed of species listed under Group III.

It is surprising to find Colonial bent under three common names with different germination requirements. The inclusion of Washing-

ton and Metropolitan creeping bent seed in this list seems unnecessary since no commercial supplies of seed of these strains are available, nor are they likely to be produced.

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#### MORE UNIFORM RESULTS IN TESTING KENTUCKY BLUEGRASS SEED

Kentucky bluegrass is the standard grass used in much of the United States for lawns, fairways, and other areas in grass. Hundreds of samples are tested every year to determine the quality of the lot used. The purity of any sample depends, among other things, on the number of empty florets present and the seed analyst finds difficulty in telling whether a floret is empty or contains a good seed. This often results in lack of uniformity in the test with possible dispute between the buyer and seller.

Porter in Iowa has studied this problem. His work was published in a research bulletin by the Iowa Agricultural Experiment Station. He developed a special blower giving a uniform air blast. By means of this blower the empty florets can be removed to a uniform degree and thus the personal equation can be eliminated. Porter's paper is mostly technical and intended to be of use to seed analysts, but the fact that more uniform results in the purity and

germination tests of Kentucky bluegrass are possible is of interest to all users of this seed.

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#### THE CARPET GRASSES

It has been assumed that all the forms of carpet grass in the United States belong to the same species, but Agnes Chase in the Journal of the Washington Academy of Science has pointed out that the broadleaved form is the original or type form of *Axonopus compressus*. It is said to occur in the United States only in Florida and Louisiana. The narrow-leaved form is common in the United States from North Carolina and Florida and west to Arkansas and Texas. It is said to be undoubtedly native and more cold resistant than the broadleaved form. The broadleaved form may have been introduced but is more probably native though less widespread than the narrow-leaved form.

Mrs. Chase suggests that the narrow-leaved form be made a distinct species under the name *Axonopus affinis*. The broadleaved form is the true *Axonopus compressus*.

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The control of weeds is said to be the most important problem of the New Zealand greenkeepers.

## OUR LETTER BOX

The Green Section receives numerous inquiries concerning local turf problems and is always glad to reply to them. With the hope that some of these questions and answers may be helpful to others besides the original correspondent, a few of them will be published. While most of the answers will have a general application, it should be remembered that each recommendation is intended for the locality designated at the end of the question.

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**Green bugs on Kentucky bluegrass.**—Under separate cover I am sending a sample of Kentucky bluegrass collected late in December. I will appreciate your identifying the insects that have been depositing their eggs on the grass blades. Many of the eggs hatched within 3 days after the sample was taken. The blades bearing egg deposits eventually die. (West Virginia.)

**ANSWER.**—An examination of these specimens revealed the fact that the bluegrass was attacked by the "green bug" *Toxoptera graminum* Rond. The "eggs" to which you referred are the dried and swollen bodies of the aphids in which had developed the little winged parasite, *Aphidius testaceipes* Cress. These had hatched out into the box after the sample had been collected. This parasite is useful in controlling the green bug.

The females of the green bug are capable of reproducing at tempera-

tures as low as 45° F. or lower and it is not unusual for them to spend the winter in the crowns of plants or in bluegrass even in Washington, so that their presence at Huntington, West Virginia, is not at all remarkable. The rusty red condition of the blades of grass was caused by the feeding of the green bug. In fact, the presence of the insect is often indicated by clumps of discolored blades such as those enclosed with the specimens.

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**Fertilizer for bluegrass.**—Our turf is composed chiefly of bluegrass with a little fescue and a little clover. The soil is a clay subsoil with a clay loam surface of about 2 or 3 inches. We would appreciate your advice as to the proper fertilizer to apply. (Illinois.)

**ANSWER.**—Since your turf consists chiefly of bluegrass with not much clover and fescue, it is probable that you will obtain best results



by applying some fertilizer high in nitrogen and with perhaps half as much phosphoric acid. A mixed fertilizer such as a 10-5-2, 8-4-2 or a similar combination should give you entirely satisfactory results. It would be well to apply such a fertilizer as early in the spring as possible. If you have crabgrass do not apply fertilizer after the end of April. In case fertilizer cannot be applied in early spring, wait until early fall.

\* \* \*

Is dollarspot caused by "fuzz" from poplar trees?—During the past few years we have had in July a condition on our greens similar to dollarspot. There are poplar trees in the near vicinity of the affected greens and the greenkeeper maintains that the symptoms on the grass come from the fuzz which is blown off the poplar trees. No other greens of ours are thus affected. Have you ever heard of a similar condition? In your opinion, are the symptoms on the grass caused by the poplar "fuzz"? (Connecticut.)

ANSWER.—The symptoms which you mention were probably those of dollarspot. Dollarspot is caused by a fungus which appears on the grass as a fuzzy growth of mold in the early morning before the sun dries it out. The "fuzz" from the

cottonwood or poplar trees is sometimes confused by greenkeepers with the moldy growth that produces dollarspot. Actually, however, there is no connection whatever between the two, nor is there any evidence that this deposit from the poplar trees causes any harm to the grass. We think you will find it is just a coincidence that the dollarspot occurs in the areas near the poplar trees.

\* \* \*

Italian rye grass on Bermuda greens.—Our Bermuda greens are not doing so well this year. It occurs to me that it would be better not to sow the Italian rye on these greens but give the soil the winter rest and not have the Italian rye shading the Bermuda grass from the sun in the spring. I will appreciate your advice on the use of Italian rye grass on Bermuda greens. (Tennessee.)

ANSWER.—It is a common practice through the South to plant Bermuda grass greens to ryegrass in the fall to give a green covering for winter play. This growth of ryegrass tends to slow down the growth of Bermuda grass in the spring but after a short time it seems to grow as well as if it had not been seeded to ryegrass.

One of the common practices is to let the greens become dry in the

spring before Bermuda grass starts to grow. Drying of the greens tends to check the growth of ryegrass and much of it will die. After competition is removed in this way the Bermuda grass should be heavily fertilized to stimulate as rapid a growth as possible in order to cover up the bare spots.

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**Will turf grasses survive flooding with salt water?**—Some of our turf was under sea water for several hours and has turned completely brown. We have had the turf spiked but have not been able to water due to the fact that the sea water entered our water supply. After several tests the water is still adjudged salty. We would like to know if in your opinion the turf will be permanently damaged or if we may expect it to survive. What treatment do you recommend our using to re-establish our turf? (Massachusetts.)

**ANSWER.**—Ordinarily creeping bent is able to withstand a considerable amount of salt water. If your turf contains a good proportion of creeping bent no doubt most of it will survive. However, the colonial and velvet bents, as well as *Poa annua*, are more apt to be severely damaged than the creeping bent. If your turf is composed chiefly of

these grasses the chances are you will find much of it will not survive.

We note that your water supply is still salty and therefore you have been unable to water frequently. This is unfortunate since the best treatment no doubt would be to water frequently with fresh water so as to reduce the concentration of the salt. As soon as you can obtain fresh water it would be well to keep the turf watered thoroughly to try to leach out the salt as rapidly as possible. If it is impossible to get a supply of fresh water it would be well to topdress with a light topdressing. This would reduce the evaporation and consequently slow down the process of salt concentration on the surface of the turf.

If the grass does not recover sufficiently by spring we advise liberally seeding with colonial bent as early as possible.

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***Poa serotina* not a lawn grass.**—Is *Poa serotina* adaptable in this country for lawn or pasture purposes? (Maryland.)

**ANSWER.**—*Poa serotina* is a good pasture or hay grass for wet or swampy ground. It will not do for a lawn since it does not make a close turf.

