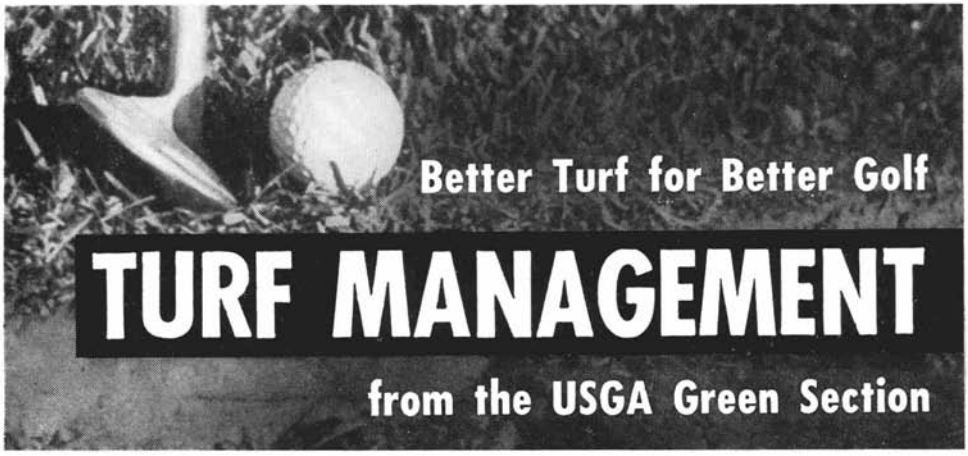


THE TURF PROGRAM AT PENN STATE

By H. B. MUSSER

A steady and growing demand for a product makes a healthy business. The turf program at the Pennsylvania State College has grown to its present proportions because of the demand for a sound body of facts that will be an adequate guide for successful turf culture.

The serious problems of growing satisfactory turf on the modern golf course have been an important factor in creating this demand. However, golf courses are not the only places where turf problems exist. The same basic principles apply wherever grass is grown for specialized uses. The same problems that confront the greenkeeping superintendent arise repeatedly on parks, estates and cemeteries, on athletic fields and other recreational areas, on airports, along highways where soil must be kept in place on cut-and-fill slopes and on the home lawn where turf contributes so much to the satisfaction of everyday living. Over 200,000 acres of special-purpose turf on such areas in Pennsylvania having a replacement value of more than $75,000,000 and costing more than $10,000,000 annually to maintain are the stimuli responsible for the interest in, and growth of, the turf program.

Activities in the special - purpose turf field at Penn State fall into two main lines of service. The first of these is the research program. It is concerned primarily with attempts to increase our knowledge of the turf grasses and the many factors that affect their production and maintenance by experimental methods. The second is placing information developed by research into the hands of those who can make use of it. It is concerned primarily with interpreting research results in terms of practical applications.

The Research Program

The turf research program has been confined to those problems which are most pressing and which we are best equipped to study from the standpoint of location and facilities. The investigations fall into three main groups:

(1) improvement of the turf grasses by breeding and selection for superior types, (2) study of soil factors affecting turf growth, such as physical condition and fertility, and (3) investigation of specialized maintenance problems, such as methods of turf renovating, weed eradication and control of disease.

Improved Grasses

Efforts to find better grasses for turf use have been concentrated on creeping bentgrass, Kentucky bluegrass and red fescue. We are growing at the present time approximately 250 individual types

Breeding Nursery for Various Types

This area contains more than 10,000 individual plants of creeping red fescue from which 250 different types have been selected at the Pennsylvania Agricultural Experiment Station

of creeping bent (these include between 70 and 80 strains obtained from the USGA Green Section). In addition, there are approximately 75 types of red fescue and 30 types of Kentucky bluegrass in turf quality test plots or in seed multiplication nurseries for producing sufficient seed to establish test plots. The individual selections of these grasses have been obtained in two ways. Some have been secured by taking plugs from greens or fairways where a particular strain has shown evidence of good performance. Others are individual plants selected out of progenies of parent plants that have shown good performance records.

Records are kept on the ability of each individual grass to produce good turf throughout the entire growing season. Promising strains are kept under observation for at least a three-year period before any attempt is made to evaluate them. This is desirable because there are marked differences in performance of many types under different temperature and other environmental conditions. The first records on the present series of quality tests were secured in 1948, and appraisals will not be made until the end of this season. Records to date show very encouraging prospects that some of the strains eventually will prove to be materially better than types available at present.

Soil Quality

Three major phases of the relationships of soil to turf production are under investigation. These include the effects of excessive water and soil compaction upon turf quality, the use of nitrogen from slowly available versus quickly available sources, and the value of potash.

The water and compaction studies probably have the most immediate and practical bearing upon turf-management problems. It is becoming more evident every day that these two physical soil factors are responsible to an important degree for the rapid deterioration of fairway turf. The experimental work is set up to determine the rate and extent of injury to good quality turf at various levels of soil moisture and compaction and to study methods of correction. These investigations were initiated by the USGA Green Section and are being prosecuted under a fellowship grant from the Association. The progressively serious effects of the treatments on turf quality are highly significant and bid fair to be of material value as a guide in water management and aerification practices.

Fertility Problems

The proved desirability of slowly available forms of nitrogen for use on turf and the relatively high cost and short supply of nitrogenous materials of this kind make this a pressing problem. New

Experimental Layout for Water and Compaction Studies

Each plot in this area receives a different quantity of water. Different compaction treatments run across the watered plots maintained by the Pennsylvania Agricultural Experiment Station

materials that have potentialities should be thoroughly investigated as rapidly as possible. The urea-formaldehyde plastics are in this class. Testing work with these products has been concentrated largely upon determining their value as compared with various natural organic carriers of slowly available nitrogen and of soluble inorganic materials. Three years' results indicate that some of them compare favorably with the organics and can be used to supplement the nitrogen from the latter sources.

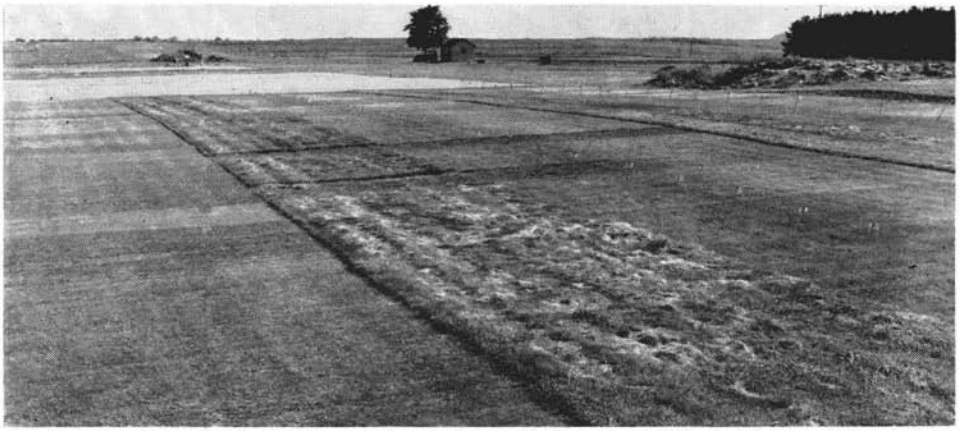
The question of the proper use of potash for turf is still an open one. A comprehensive series of field tests was established in 1948 to study the response of Kentucky bluegrass, red fescue and bentgrass to controlled potash treatments. Although no final results are available yet, there are abundant indications that there is a direct and important relationship between the potash supply and such things as the health, vigor and disease-resisting ability of the turf.

Weed and Disease Control

War needs tremendously stimulated chemical research. Many of the new materials produced have real value as herbicides, insecticides and fungicides for turf use. Unfortunately, their development has been so rapid that tests of their usefulness have not kept pace with their production. The result has been that many materials are distributed and recommended for use with only a very sketchy knowledge of their effects upon the turf which they are supposed to protect. For this reason, careful screening tests of these products have become a necessity. Funds and facilities are the limiting factors in this type of work. Tests of herbicides at the Pennsylvania Experiment Station have been confined to comparisons of the effectiveness of certain materials, such as 2,4-D, mercury compounds, cyanates and arsenites on the weeds themselves and to efforts to determine their effects on the grass. Studies of these materials applied as solution or in dry form, both to established turf or as pre-seeding treatments, have been made or are under way.

Disease-control studies have been of the same general nature as those on weed control. They have been concerned largely with determinations of the effectiveness of various fungicidal materials on the specific organisms causing the most serious turf diseases. The work in this field is more complicated than weed control tests because the disease-control tests necessitate a careful laboratory identification of the organism as well as actual field measurements of the effectiveness of control measures.

Testing Grasses under Different Cutting Heights



A part of the six-acre area of turf experiments at the Pennsylvania Agricultural Experiment Station is devoted to the testing of grasses for fairways, lawns and airfields under different cutting heights.

Grass Mixtures

Grasses have limitations in their ability to adjust themselves to climatic conditions, particularly to temperature extremes. Some grow best during the cool weather of spring and fall and are checked and often seriously injured by hot weather in the summer. The reverse is true for others. This has created a serious turf-maintenance problem wherever the climate is characterized by cold winters and hot summers. A part of the turf-research program is being devoted to the possibilities of producing an all-season, good quality playing turf by combining the cool and the warm season grasses. An important phase of this problem is to find the particular kinds of grasses that will get along best with each other. This involves tests, not only of associations of various strains of warm and cool season grasses but also to determine whether the best types of each will compete successfully with one another.

Slope Control on Highways

Grass has become an important engineering material in highway construction and maintenance. It is used extensively for holding the soil on the steep slopes of highway cut-and-fill sections and frequently on shoulders and berms. The chief problems are those of finding the grasses that will do a satisfactory job under the very severe conditions of dry and highly sterile soil common to such areas. The Pennsylvania Experiment Station in cooperation with the Pennsylvania Department of Highways has initiated a program for studying this and other problems that arise in connection with slope control. Series of field plot tests have been designed and established for securing information on grass adaptations, off-season seedings, methods of seeding and mulching and similar practical problems.

Application of Research Results

As the results of research become available, they should be interpreted in terms of their practical application to the particular conditions encountered on individual turf areas and this information should be placed in the hands of those who can make use of it. This service phase of the turf program in Pennsylvania is maintained by the Agricultural Extension Organization of the College through the County Agricultural Agents and a full-time specialist on turf matters. Other specialists also are available to assist on technical questions in particular fields, such as disease and insect control and drainage problems. During 1949 these services to turf growers in

Pennsylvania reached a total of 202 demonstrations, field meetings and tours, and more than 6,500 contacts with individuals to whom suggestions and help on their turf problems were given.

Advisory Committee

A valuable and vital part of the turf program in Pennsylvania has been the creation of a Turf Research Advisory Committee. This committee is composed of representatives appointed by the various local associations of greenkeeping superintendents in the State and other organizations interested in turf. The committee includes, also, those members of the research and extension staff of the College who are associated with turf work. The chief functions of the committee are to review and screen projects dealing with turf problems that are proposed for investigation. It also functions in determining the dates, programs and other items connected with general field meetings and annual educational conferences. Although the committee organization has been almost entirely informal, the sincere and active interest of each member in the turf program and their willingness to give time and thought to it have been a major factor in its steady development.

Turf Research Projects and Extension Service at the Pennsylvania State College

1. Production of improved strains of grasses (Musser and Wright).
   a) Creeping bent: Two hundred twenty-five selections in nursery; 50 under test for turf quality. Study of practicability of producing seed by polycrossing best parents (15 such crosses under turf quality tests in comparison with all types of commercial bent seed).
   b) Red fescue: Approximately 75 selections. Thirty-five in turf quality tests at different clipping heights at State College and Beltsville. Studies in progress to determine whether type can be held in successive seed generations of improved strains.
   c) Kentucky bluegrass: Ten selections under turf quality test. Most of our selected strains lost during war. Plan to expand these studies next season. Two thousand five hundred-plant nursery of B-27 established for foundation seed stocks.

2. Soil relationships to turf production.
   a) Potash: Nitrogen ratios. Effects on growth rates and disease incidence (Holben, Jeffries, Musser).
   b) Ureaform as source of N. Comparisons with other N carriers at State College and Philadelphia (organic and inorganic). Effects on growth rate, disease incidence and weed invasion (Musser, Stanford, Watson).
   c) Effects of excess water and soil compaction on turf survival and quality (Watson). Changes in populations, density weed invasion and disease incidence under various rates of water and compaction intensities over a three-year period. To be continued during the next two years with modifications to study methods of renovation to restore quality of turf seriously injured by the different treatments (Harper).
   d) Study of occurrence of trace elements on golf-course soils. Just getting under way. Sample plugs have been collected from untreated areas on courses throughout Pennsylvania (Pennington).

3. Special Projects.
   a) Crabgrass control. Similar projects conducted at State College and Philadelphia. Designed to determine effectiveness, rates and frequency of treatments required with various herbicides for crabgrass eradication (sodium arsenite, phenylmercury compounds, potassium cyanate) (Musser and Stanford).
   b) Associations of warm and cool season grasses. U-3 Bermuda and Z-52 *Zoysia japonica* plugged on 12-inch centers and overseeded in individual plots with B-27 Kentucky bluegrass, Penn State Chewings fescue, polycross creeping bent, colonial bent. This is small scale pilot work.

c) Association of improved strains of cool season grasses.

B - 2 7 Ky. Bl. + P.S. Chewings	Fes. + Col. Bents
+ Illahee Fescue	+ Col. Bents
Comm. Ky. Bl. + P.S. Chewings	Fes. + Col. Bents
+ Illahee Fescue	+ Col. Bents
B - 2 7 Ky. Bl. + Comm. Chewings	Fes. + Col. Bents
Comm. Ky. Bl. + Comm. Chewings	Fes. + Col. Bents
B - 2 7 Ky. Bl. + P.S. Chewings	Fes. + Red Top
B - 2 7 Ky. Bl. + Illahee Fescue	+ Red Top
Comm. Ky. Bl. + P.S. Chewings	Fes. + Red Top
Comm. Ky. Bl. + Illahee Fescue	+ Red Top

d) Pre-seeding soil treatments with herbicides for weed control in seedling turf. Ten materials at three rates followed by grass seedings at three intervals (5, 15 and 30 days after treatment). Total of 756 individual plots 5' x 10'. Only material that was effective without serious injury was cyanamid. (Musser).

e) Highway slope control (Stanford).
(1) Best adapted species. Replicated tests on 1½ to 1 slope (plots 30' x 12') of orchard, Alta fescue, red fescue, tall oats, poverty, crown vetch (separate and mulch seedings).
(2) Production of seed-mulching materials. Studies of row versus broadcast yields, harvesting time and methods.
(3) Off-season seedings and companion plantings of crown vetch with one and two grasses.

4. Disease control studies. Carried out at State College and Philadelphia. Comparisons of effectiveness of fungicidal materials (Thurston and Means).

Extension Work

Services of one full-time man on turf-problem consultation work and dissemination of information (Cooper). Special disease, insect and drainage problems handled by specialists in these fields. Total time devoted to turf problems by all these specialists, excluding Cooper, would probably amount to the full-time of one man. In 1949, there were 202 demonstrations, field meetings and tours and more than 6,500 individual contacts.

[EDITOR'S NOTE: *This is the first of a series of articles designed to inform our readers on the development and progress in the turf programs at the several cooperating experiment stations. Through these articles we will learn* what *is being done,* where *it is being done and* who *is doing it. In effect, they will be progress reports. Detailed information will follow on* results *as the data are published by the experiment stations*

Pennsylvania was chosen to lead the series because (1) it is the only State where a complete program of Research, Teaching and Extension in turf is operative, (2) this month marks the completion of the turf research fellowship (James R. Watson) sponsored by the USGA Green Section from our Education Fund and (3) Pennsylvania's turf program is largely tax-supported.]

COMING EVENTS

Mar. 6-8—Midwest Regional Turf Conference, Purdue University, West Lafayette, Ind. G. O. Mott.
Mar. 10-11—Annual Turf Conference, University of Massachusetts, Amherst, Mass. Geoffrey Cornish.
Mar. 13-15—1950 Greenkeepers' Conference, Iowa State College, Ames, Iowa, H. L. Lantz.
Mar. 15-17—Third Cornell Turf Conference, Ithaca, N. Y. John F. Cornman.

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