Golf Course Management: Past, Present, and Future

February 11, 1996, Orlando, Florida

FOR THE 15TH CONSECUTIVE YEAR the annual Green Section Education Conference was held in conjunction with the Golf Course Superintendents Association of America International Turfgrass Conference and Show. This year more than 750 people attended the Green Section's program on Sunday, February 11, at the Orange County Convention Center. Thomas W. Chisholm, Chairman of the Green Section and member of the USGA Executive Committee, welcomed the group, and James T. Snow, National Director of the USGA Green Section, served as moderator for the afternoon's program of 13 speakers who addressed this year's theme, "Golf Course Management: Past, Present, and Future."

BACK TO BASICS

A brief look through history confirms that many things have stayed the same.

by JAMES M. LATHAM

FIFTY years ago, some professional golfers threatened to boycott the United States Open Championship because the total purse was to be only $8,000, while $100,000 of the anticipated $150,000 gate receipts was earmarked for turf research. They just couldn't understand the need. The Open prizes are significantly higher this year, but so is the fund for turfgrass and environmental research — nearly $1.4 million to support 42 projects at 22 universities, and that does not include expenditures by the GCSAA and state and regional organizations.

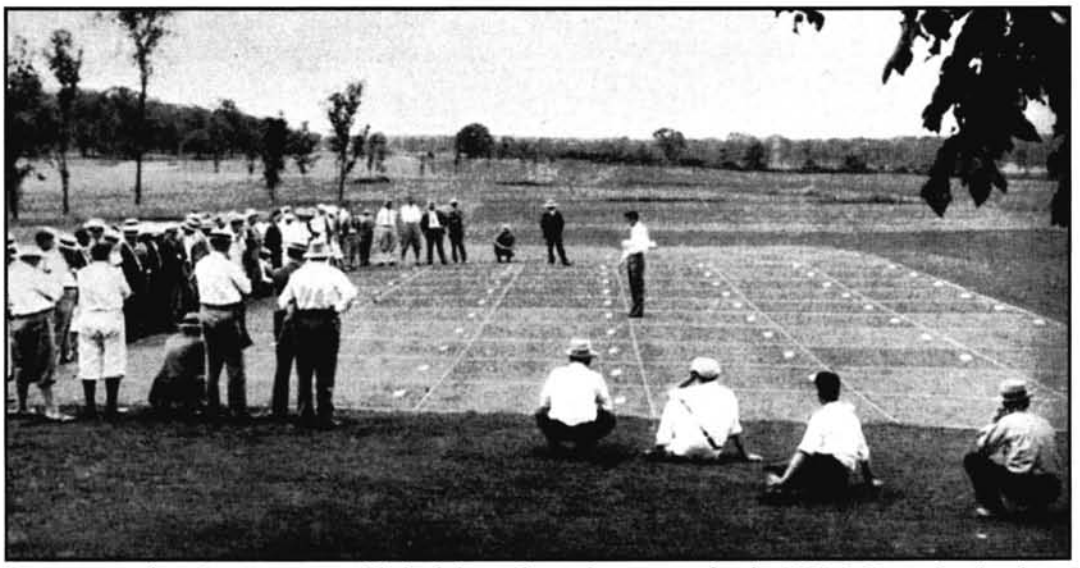
The correspondence, publications, and reports in the USGA Green Section files show that very few of our concerns today are truly new. For example, in the spring of 1921 the Brae Burn Country Club of Massachusetts sent notices to its members, asking them to "discontinue the use of the old hob-nailed golfing shoe, which injures both the greens and the clubhouse floors" and recommended "the use of rubber soles and pads." This note was contained in a newspaper article announcing the formation of a Green Section Committee of the Massachusetts Golf Association, following the lead of the USGA.

James M. Latham

The recent clamor about space-age technology in golf equipment is not exactly a new concern, either. A book published in England by M.H.F. Sutton in about 1912 deplored the development of the rubber golf ball, because its increased distance might make golf courses of the day obsolete. By 1919, someone suggested that golf balls be submitted to the U.S. Bureau of Standards for testing, but that's about as far as that idea went.

The Olcott turf garden in Connecticut, established about 1885, was the first collection of high-quality fescues and bentgrasses in the U.S. The garden was moved to Philadelphia by Fred Taylor in the early teens. Many other overlooked turfgrass investigations were underway in the South at about the same time. Correspondence between Leonard Tufts of Pinehurst and Dr. C. V. Piper of the U.S. Department of Agriculture indicates that a "German experimenter" had been hired before 1900,

at the suggestion of landscape architect Frederick Law Olmstead, to study grasses and plants suited to the Pinehurst area. He stayed "a good number of years," but achieved few positive results as far as turfgrasses were concerned. He found that bermudagrass and Texas bluegrass were the only species that would survive the summers, provided that they were watered and fertilized. Survival did not equate to golf turf quality, though, for Mr. Tufts commented, "Well-known golfers said that it would be better to keep the fairways clear of grass and just keep the sand smooth by use of a roller." Some observations on turf-type grasses were made at USDA stations in Biloxi, Mississippi, and New London, Ohio, about 1910, through the efforts of Drs. C. V. Piper and R. A. Oakley. The Ohio test included limed and unlimed plots.



Some 40 "turf gardens" were established throughout the country by the USGA Green Section in the 1920s to test grasses and fertilizers in every climatic zone. They provided excellent learning experiences for local greenkeepers and course officials. This is a summer meeting of green committeemen and greenkeepers at the Midwest setup on the Lasker estate, north of Chicago, in 1931.

At least 10 years before the birth of the Green Section in 1920, Drs. Piper and Oakley were engaged in trying to help produce satisfactory golf course turf. They responded to inquiries on turf-type grasses and soils even though their primary duties involved forage crops. There was considerable communication in 1911 between Piper and Hugh I. Wilson during the construction of the golf courses at the Merion Cricket Club. Construction costs, incidentally, were $30,000 for the West Course and $45,000 for the East Course. Loss of turf on several greens in 1913 was originally blamed on poor drainage, but in later years Piper thought the real cause was brown patch, aggravated by poor drainage.

Most of the bentgrass greens of that era were planted with seed imported from Germany. While only about 2½% of the seed produced creeping types, they became predominant in a few years, crowding out the less vigorous or poorly adapted colonial and velvet bentgrass plants. Piper and Oakley began selecting attractive plants that showed some resistance to large brown patch (*Rhizoctonia solani*), a devastating plague during prime playing weather in the summer. From more than 100 selections, four showed resistance — not immunity — and were named Washington, Virginia, Metropolitan, and Revere.

Resistance was narrow, however, since small brown patch (now known as dollar spot), which had been identified as *Colletotrichum cereale*, in 1917 attacked the so-called resistant selections and continued to wreak havoc. This confirmed the need for cultural and/or chemical disease control procedures.

The only chemical treatment at the time was Bordeaux mixture, a blend of copper sulfate and lime. The lime helped to reduce the toxicity of copper, but the high frequency of application required for disease suppression eventually created problems. During brown patch weather, Bordeaux had to be applied after every rain or irrigation — daily, if necessary. It suppressed *Rhizoctonia* but had little effect on *Colletotrichum*.

Copper toxicity was aggravated by weed control procedures of that era. Soils having a pH level between 4.0 and 5.0 were essentially free of crabgrass, goosegrass, and some other weeds, but it also increased copper solubility. It was not until after heavy disease pressure during the hot, wet summer of 1928 that the Green Section recanted the acid soil theory of weed control.

Cultural suppression of brown patch included good surface and subsurface drainage, dew removal, and early morning irrigation. Topdressing with high-quality compost was a recommended practice, but it could not be linked with disease activity.

In 1924, the DuPont Corporation introduced Semesan, a chlorophenol mercury compound, which gave good control of both brown patch fungi but was quite expensive. Dr. John Monteith, a USDA plant pathologist working at the University of Wisconsin, began testing other forms of mercury and found that almost any formulation had fungicidal properties. From his work came an inexpensive combination of mercurous and mercuric chlorides that became the standard in turfgrass disease control that we came to know as Mallinckrodt's CaloClor or Woodbridge Mixture.

Strangely, mercuric chloride had been a useful tool on golf courses since 1921 or before, as an earthworm eradicant. In one test, Piper applied it at 4 oz. mixed with 25 lbs. of sand per 1,000 ft.^{2} and watered it in. He got 200 earthworms out of an 8 ft.^{2} plot. The fungicidal properties of mercuric chloride were not recognized until a few years later in research work by Monteith.

Grubs were another prime problem because of their root-feeding habit as well as the mounds of castings they produced. Until the discovery of lead arsenate's effectiveness by Leach in the late 1920s, the only controls dealt with treating individual holes with a kerosene emulsion, carbon disulfide, sodium cyanide, and even poking the hole with a steel rod. Often, grub control amounted to plowing the soil and picking the grubs by hand. Light traps, using one kerosene lantern per acre, was suggested, but tending some 150 or 200 of them every day was unthinkable.

Mole crickets were serious pests on southern golf courses and were so noted in Volume I of *The Bulletin of the USGA Green Section* in 1921. One control was to spread burlap bags on the grass in the afternoon and then pick up the crickets the next morning. Light traps were ineffective. Chemical control consisted of a bait composed of a 3% Paris green-wheat flour mixture.

Weed control efforts were equally difficult. Hand picking was common. The chemical method to get rid of dandelions and plantain was to dip a sharp stick into sulfuric acid and stab the weed right in the heart. Fred Grau's first employment with the USGA came in the late 1920s and early 1930s when he put out weed control plots while a graduate student at the University of Maryland. Unfortunately, his work and much other research were curtailed by lack of funds during the Depression. The research showed the value of sodium arsenate, sodium chlorate, and other chemicals as post-emergence herbicides. They were non-selective, but the desired species usually recovered. The grub killer, lead arsenate, became the first effective pre-emergence control for crabgrass, goosegrass, and *Poa annua*.

Much of the Green Section's basic research was conducted at the USDA's Arlington, Virginia, farm until 1939, when it was displaced by the Pentagon building. After that, the research work was done at Beltsville, Maryland. It was not until after 1950 that the Green Section phased out conducting research and began its broad program of funding research at state experiment stations.

The Green Section philosophy from the outset, however, has been to encourage research in every climatic zone in the U.S., and to a limited extent, in Canada. Soon after the USGA and USDA formalized their cooperation in 1923, a grant of $300 from the USGA was made to the University of Florida at Gainesville to study grass species adaptable to southern lawns and golf courses. This work was extended to closely cut turf about 1926, when a greens mower was sent to the university. The grant was increased to $900 and a graduate student was hired to tend the plots. The test involved three different soils, four water and fertilizer treatments, and six grasses. The student, A. S. Laird, wrote his master's thesis on the rooting depth of grasses under these treatments and became, perhaps, the first recorded student to receive an advanced degree under a USGA grant.

Other grants went to the University of Minnesota in 1924, Nebraska and Kansas in 1925, two grants to New Jersey in 1926, and Massachusetts and Stanford in 1928. Also in 1928, $1,000 was appropriated to establish a major project at the Lasker Estate near Chicago, with additional funding from the Chicago District Golf Association and the Chicago Green Section Committee. The Chicago plots had to be abandoned during the Depression despite the efforts of the Associations and Herb Graffis, editor of *Golfdom* magazine.

The predominant putting green grass in the South was called Atlanta bermudagrass. It was a fairly fine-leafed selection from common bermudagrass, propagated vegetatively. Information on its origin has not been found, but it was in use by 1923. Its true quality is questionable, though, since Bobby Jones once recommended that a golfer should never concede a 6-inch putt on bermudagrass greens.

Little thought was given (at least in writing) to fairway turf, except that fescues predominated in the Northeast, probably because little fertilizer or irrigation was used. Apparently, Kentucky bluegrass was used in the Midwest, and bermudagrass, carpetgrass, bahiagrass, and some centipedegrass was planted farther south.

Winter overseeding of greens in the South prompted tests at the University of Florida in 1927. The grasses used were redtop, Kentucky bluegrass, bulbous bluegrass, and English, Italian, and Westerworth's ryegrasses.

Bentgrass and bermudagrass were not the only species used on greens, either. Redtop was a component of most seed mixtures. Bluegrass was not uncommon, and at least one course in Wisconsin had greens planted to clover by a couple of Scots who built a private course for a lumber baron named Stout in 1920.

Experimentation in composting, soil mixtures, and fertility became more widespread in the 1920s. Each of the 40 experimental greens set out on golf courses and experiment stations by the Green Section compared nine grasses with an overlay of ten fertilizers across the different grass selections.

Technically, much of the early work was in the nature of observation and demonstration. Replicated field plot systems are not mentioned in early reports, but some greenhouse projects were replicated. Whether or not they were statistically analyzed is unknown.

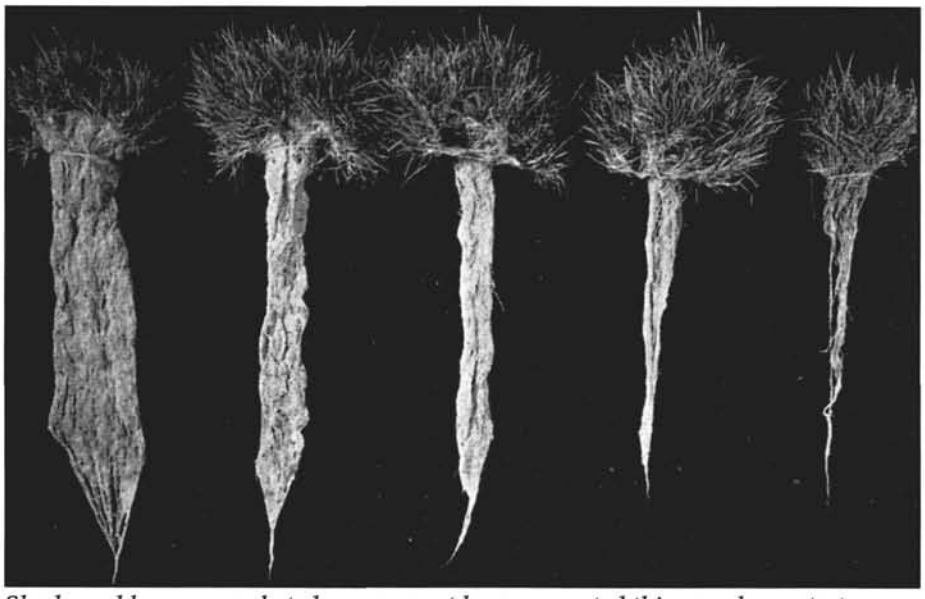
Perhaps the most far-reaching single piece of Green Section research was done in the early 1940s while plant pathologist Dr. Fannie Fern Davis was investigating the effect of plant growth hormones on turfgrasses. From her work came 2,4-D, which opened the door to a new chemistry in herbicide research. The popular press at the time hailed 2,4-D as a means of reducing hay fever distress caused by ragweed.

Emphasis on the environment is not new, either. The November 1921 *Bulletin* contains an article on attracting birds to golf courses by W. L. McAtee of the U.S. Biological Survey and Washington Golf and Country Club. In the October 1925 issue is an article entitled "Native Trees, Shrubs, and Flowers for Golf Courses," plus a list of publications on attracting birds to the golf course. McAtee also wrote a series of articles on individual bird species for *The Bulletin* in 1926, 1927, and 1928. The entire May 1930 issue was devoted to birds on golf courses, and included an excellent article by Arthur A. Allen of the National Audubon Society, who recommended reading their 64-page book entitled *Golf Clubs as Bird Sanctuaries*. He also announced that the Golf Club Bird-Sanctuary Committee of the National Audubon Societies had inaugurated its project that year in New York State.

There have been several side effects of turfgrass research. John Monteith's work on disease control went well beyond the use of mercurials, to include malachite green dye. It was used to produce green turf at Philadelphia Stadium for the Army-Navy football game in 1939. Everyone was pleasantly surprised that the player's uniforms retained their original color throughout the game.

There are other current practices and products that are not new or original. An article on the effect of rolling greens, written by Dr. W. S. Harban, appeared in *The Bulletin* in 1922. He determined that rolling to smooth putting surfaces applied less compactive force than a man's heel.

The localized dry spots we blame on sandy soil mixes and other factors were first publicized by Monteith on California greens in 1933. He believed localized dry spots were caused by a



Shade problems on pocketed greens must have prompted this greenhouse test on uncut velvet bentgrass in 1933. From left to right: Exposure to sunlight all day, sunlight in morning only, sunlight in afternoon only, speckled sunlight all day, and shade all day.

soil-inhabiting fungus that did not grow in a ring form.

Zoysiagrasses were often included in turf tests in the 1920s. One article in 1931 suggested that the Korean lawn grass, or *Zoysia matrella*, be called camel grass due to its humpy growth pattern.

Biological control efforts are not new. The bacterial control of Japanese beetle grub was marketed in 1939. At the same time, some research involved the use of nematodes as another means of controlling insects.

Post-World War II developments came rapidly. Fine-textured bermudagrasses were found in old evaluation plots at the Bayshore Country Club in Miami, Florida, which had not been maintained for several years, and were thought to be natural hybrids between *Cynodon transvaalensis* and *C. dactylon*. The Everglades, Bayshore, and Gene Tift selections were used on southern greens for many years. The Tifton hybrids came along by the mid-1950s, shortly before the official release of Penncross bentgrass by Penn State University. Meyer zoysiagrass became available during this period, as did Merion Kentucky bluegrass. These developments gave the Green Section staff the impetus to study blending the new cool- and warm-season grasses to produce year-round green turf in the mid-latitudes.

Decentralization of research was difficult to achieve. Golf course personnel were extremely interested, but could not be adequately controlled. They went beyond the bounds of specified procedure in an effort to keep *all* the plots looking good. Experiment station staff were just the opposite. Most of them worked in forage crops and simply were not interested in maintaining golf course or even lawn quality turf in the plots. Dr. Fred Grau became Director of the Green Section in 1945, and continued the effort to decentralize research. He followed the pattern of his predecessors, but his goal was to use the funds for scholarships to train scientists in turfgrass management. As a result, the first doctorate degree in turfgrass management was earned by Dr. Jim Watson at Penn State.

The resistance to turfgrass work at experiment stations was gradually eliminated beginning in 1946 by a two-man team of missionaries — Fred Grau of the Green Section and O. J. Noer, who was agronomist for Milorganite and a dedicated member of the Green Section Committee. Grau had the prestige of the USGA and state golf associations behind him, and Noer knew most of the leading superintendents all over the country, as well as the businessmen in the turf supply business, from the manufacturing level to the local distributor. This united front brought the turf industry's concerns to the directors of experiment stations as well as the scientists who would do the work. The key was to inform the administrations that any golf turf investigation would benefit anyone interested in better turf for lawns, athletic fields, highway roadsides, and airport runways, and anywhere sod-forming, erosion-resistant ground cover was needed.

This point was best said by sports editor George White in the January 26, 1947, issue of the *Dallas Morning News*: "One of these days, the plain citizen, your neighbor and mine here and all over the country who takes pride in the quality and beauty of his lawn, is going to owe a debt of gratitude to sport, particularly golf. The reason is that the gradually expanding program of . . . the United States Golf Association, is going to make turf better everywhere . . . you look whether in a small park, a school campus, football field, cemetery, or your own home lawn." He was reporting on the first Texas Turf Conference held in December 1946.

Putting Greens

Interest in the physical characteristics of putting green soil dates back as far as records go, but little scientific effort was put into it. Combinations of good topsoil, high-quality compost, and sand produced good, well-drained greens. The elevated height of cut used at that time permitted greater surface slope, so most of the drainage went off the surface, not through the profile.

It was not until the late 1940s that intensive research began on putting green soils. Preliminary work began with Gorman at Oklahoma A&M and Davis at Ohio State, who identified, among other things, the mechanical and physical differences in the soils of *good* and *bad* greens. The subsequent work at Texas A&M provided the necessary information on how to produce compaction-resistant growing media for greens.

Improvements in growing media have evolved over time, the same as in every phase of turfgrass maintenance — the fertilizers, the chemicals used for plant protection and the control of undesirable plants, the turf care equipment, the irrigation systems, *and* the knowledge of the people who manage all turfed areas today. While there are actually few new "discoveries," evolution in the industry will continue even though we are unlikely to achieve the perfection desired by those who use the product.

JIM LATHAM *retired in 1994 after ten years as director of the Great Lakes Region of the USGA Green Section.*