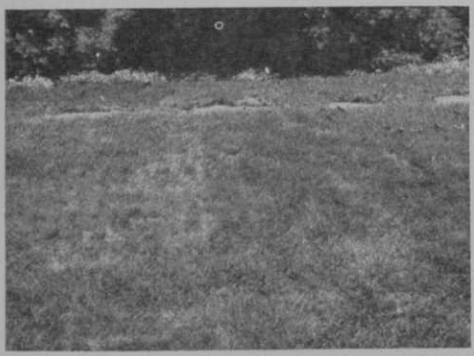
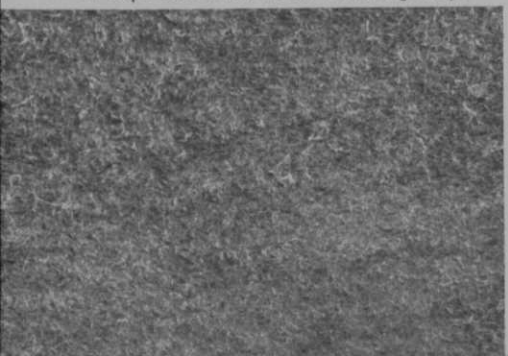
Good bent grass approach at Milwaukee photographed Labor Day weekend during unprecedented heat wave.



Mower damage on wilted bluegrass lawn. Cut with rotary mower Sept. 4 in 95-deg. weather. No rain, not watered afterwards. Photographed Sept. 24.

2,4-D damaged bent grass fairway. Sprayed twice in Sept.-Oct. Photo taken following May.



1959 Turf

By O. J. NOER

Assess Management Methods Before Condemning Turf

GOLF COURSE turf fared badly during 1959 in regions where cool season grasses are used. In our experience, dating back to 1922, it has been the worst ever in some places, and elsewhere it ranks with the very bad years of 1928 and 1938.

Most of the troubles in 1928 were with greens. For all practical purposes, many courses lost all the grass on every green. There were bad greens this year but the loss was nothing like 1928. That year, the acid era of turfgrass, management died with the grass. Lime was restored to favor and sole use of ammonium sulphate was replaced by more sensible fertilizer programs.

This year there was extensive winterkill on greens except in the Montreal area. Unseasonably cool weather until mid-June delayed recovery. Summertime troubles started during the last half of July in the East but not until early Aug. in the Midwest. There was a brief, cool weather respite in late Aug. Then bad weather returned for the Labor Day weekend and lasted until Sept. 10th. A few were caught over Labor Day. One Westchester County (N.Y.) supt. made a trite remark about wilt and syringing. He said wilt is worse when there is a drop in humidity and a moderate-to-heavy wind. According to him, it is time to start syringing when an exposed wet rag dries in 15 to 20 minutes.

Heavy Rains Hurt

The worst trouble occurred in regions where drenching rains accompanied the hot, humid weather. Rains were localized in some places. As a result some courses

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Close-up of Bermuda turf in Philadelphia Municipal Stadium is shown at left.

Noer photos

got too much water while nearby ones escaped.

Summertime loss of fairway turf was bad in 1959 for the first time on a wholesale scale. Poa annua succumbed generally and other grasses suffered. Brownpatch attacked some fairways. On others, where turf was heavily matted, algae appeared after extensive loss of grass from disease or from the ills associated with overwetness accompanied by heat.

The natural reaction in a year like this is to condemn the grass and turn to something else. This may be the best answer for some but not necessarily for everybody. An assessment of grass performance and careful scrutiny of management practices is justified. The examples of fairway turf survival in every part of the afflicted areas may furnish the clue to the answer. Just to mention a few examples, there is good bent fairway turf at Milwaukee CC, at Calumet in Chicago, Scioto in Ohio, Baltusrol in New Jersey, and Woodmere on Long Island. Bob O'Link (Chicago) fairways of bent and poa annua survived exceptionally well. Their management may be a helpful guide to others with that kind of grass herbage.

Bob O'Link Program

Briefly, the Bob O'Link summer program included aerification twice — on June 25 and on July 27. Chlordane was used at 1 gal. per acre on July 20. Activated sewage sludge fertilizer was applied three times at approximately 200 lbs. per acre each time on July 3, Aug. 5, and Sept. 4. A phenyl mercury acetate fungicide was used six times — at ⅝ quarts per acre on July 20, Aug. 5, and Aug. 20; and then at just under a qt. per acre on August 17, 25, and 28. Ferrous sulphate was used along with the fungicide on Aug. 5 and Aug. 20 at 1½ lbs. per acre, and on Aug. 17, 25, and 28 at 3 lbs. per acre. The response from its use was marked during the heavy, rainy weather. Fairway turf, including most of the poa, came through the bad weather exceptionally well. Players were happy and the cost was less than renovation and seeding in all probability.

Comments about winterkill in 1958-1959 were made in early spring. Now it is possible to assess them and remark briefly about prospects for lessening the chances of recurrence in the future.

The cold winter got the blame. But inclement spring weather was the real culprit in most places.

There was snow mold on some fairways but not sufficient to cause permanent damage. Recovery took place rapidly when weather became satisfactory. Otherwise fairway turf was not hurt by the cold. Fungicide use on fairways is not necessary excepting on some approaches, where conditions are especially favorable for severe attacks, and on the aprons around the green.

Leo Previti shows group the common Bermuda turf at Philadelphia Municipal Stadium. Seeded in June, 80 lbs. per acre. Photo taken Sept. 23.

Tricky Fungicide Treatment

Snow mold was bad on some greens which did not get adequate fungicide protection. Rates were light or the fungicide was not sufficiently potent. Failure to treat again in spring after snow melted brought a snow mold attack in some localities.

Corrosive sublimate alone, or the mixture of two parts calomel and 1 part corrosive have been the preferred treatment for snow mold prevention for many years. Customary rates have been in the range of 3 to 4 ozs. per 1,000 sq. ft. in late fall, and half that amount in spring. Presently mercury is high priced. Some of the newer fungicides have given good control, especially in years when attacks have been mild. They should be evaluated in comparison with the standard calomel-corrosive mixture over several years by research workers in regions where snow mold is bad. That is the only way to find a lower priced equally effective fungicide for snow mold prevention.

Suggests Arsenical Investigation

Actually, much of the winter injury on greens occurred in late winter or early spring and was not due to the unseasonably cold winter. Greens in the Midwest looked good in early Mar. Three to four

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O. J. Noer's Turf Roundup

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inches of snow, accompanied by sleet, fell in late Mar. Weather turned unseasonably warm the week after with temperatures up to 90 degs. Then came several heavy rains followed by cold or cool weather which persisted into June. This delayed recovery. Growth was started by the warm weather and was stopped by the cold snap with a high grass mortality. Poa annua got hit worst but some of the bent grasses, especially on heavily thatched or matted greens, fared badly. Some of the late fall arsenical treatments aggravated injury. Experience this spring justifies further investigations of their uses, especially lead versus calcium arsenate. The latter is more drastic and lead is safer.

Thatched turf is generally shallow rooted. It fares badly whenever weather is severe, winter or summer. The peat-like thatch stays overly wet and creates ideal conditions for snow mold and for every kind of summertime fungal disease. A more detailed discussion of it is planned for the January issue of GOLFDOM.

Poa annua has become a curse and a blessing on watered fairways in the North. On many of them it is the only or predominating grass. In times of bad weather poa is the first to die. By the same token, it stages a quick recovery the moment weather moderates and conditions become favorable for germination of poa seed always present in the soil.

Poa Seems to Survive

That is one of the reasons why reseeding with other grasses is disappointing. It is a matter of competition and seedling poa annua seems to win the battle for survival.

Watered approaches are especially bad with respect to poa infestation. Repeated turning of tractor and fairway mowers in these confined areas is one of the ways good grass is lost and then the same thing happens to the poa. At some clubs self propelled triplex mowers are being used to mow approaches, instead of tractor drawn gang mowers. The switch has helped preserve grass on these areas.

Some clubs have given up reseeding of approaches as hopeless, yet there has been progress. The problem is deserving of wider experimentation to develop an economical, sure way of eliminating the poa and substituting a good grass. A few clubs have resorted to sodding. At one club several bad approaches are being sodded with Merion Kentucky bluegrass. It is proposed to cut these areas with a triplex power

mower. Creeping bent predominates elsewhere on the fairways and will be cut at about one-half inch, which is a bit too close for Merion.

Herbicide Knowhow Needed

The insidious damage to fairway bent grasses by the indiscriminate use of 2,4,-D, 2,4,5-T and other chemicals is not realized by most people. Both of these herbicides have helped the spread of poa by weakening the bent. It is time to re-evaluate their effects and find the conditions under which they can be used with impunity because they are useful tools. There is some evidence that even Bermuda in the South is suffering by overdoing 2,4-D in conjunction with arsenicals for the control of goosegrass and hard-to-kill hairy crabgrass.

A return to Kentucky blue and fescue might seem like the right answer to the fairway turf grass problem. The use of Merion Kentucky bluegrass has been proposed.

Originally, fairway turf was mostly Kentucky blue and fescue. Then came fairway watering. Close cutting and lots of water doomed both of them. Bents took their place if present in the old turf. Otherwise, it was poa annua, clover, and knotweed. Bents seemed like the answer on watered courses, and may still be best in many places. To stop fairway watering is like trying to ban the electric car.

The damage to Kentucky blue grass by the foot rot stage of leafspot has been forgotten or overlooked by those who think it the best answer now. We need to learn how to avoid or prevent leafspot.

Temperate Zone Grasses

In the more temperate parts of the North, bluegrasses alone, or in conjunction with fescue, continue to be the most likely grasses for fairway use, with bents still the most likely answer on watered courses.

Use of Merion Kentucky bluegrass has been proposed because of its great immunity to leaf spot. Merion seems to thatch as badly as bent turf, so control of it will be necessary, if true. Merion has been used on a few new fairway seedings. Its performance is said to be satisfactory so far. Time will tell the story. Up to now reseeding of Merion Kentucky into existing turf areas has been disappointing.

A 50-50 mixture of Kentucky and Merion Kentucky blue has done well in Miche Stadium at West Point Military Academy. Further testing would seem justified.

Despite some loss during the past winter, Bermudagrass and zoysia performance

has been promising in the fringe belt from Washington and Philadelphia across to Kansas City. Pine Valley is expanding its program with these grasses despite a slight setback in some spots. The original U-3 Bermuda fairway at Bala in Philadelphia has been outstandingly good. U-3 has done well in St. Louis and Kansas City.

At Municipal Stadium in Philadelphia a good, dense Bermudagrass turf was obtained from seed in 5 to 6 weeks in 1958 and again in 1959. Seeding was in early June and the turf cover was good by mid-July. Seeded Bermuda might be a good temporary cover for summertime use.

There is some resistance to Bermuda fairways by golfers unaccustomed to it. This will subside in time if turf performance continues good.

To be concluded in January.

Fred V. Grau's Turf Roundup

(*Continued from page* 54)

is there always enough money to rebuild a poor green but not enough to build it right the first time?"

Research data on excesses of water are lacking. Data on excesses of nutritive elements also are difficult to find in print but there is being accumulated evidence that high levels of phosphorus are detrimental and may contribute to "wilting" and similar symptoms.

Work in Rhode Island has led to the formulation of a 20-6-4 formula for general turf use. Plots that have received a 10-0-4 ratio for 30 years are in good condition with roots 20 inches deep mining phosphorus from lower levels. Indiana work has led to the development of a 10-3-7, 12-4-6 and similar formulas. The 20-4-6 formula may not be far distant. It is well known that some of the yellowing of grass can be corrected, temporarily at least, with a light application or iron, either sulfate or in the chelate form. Also it is known that yellowing is associated with high phosphorus.

Research shows that iron is precipitated by phosphorus, creating insoluble compounds in which neither element is available to the plant. When the reaction takes place within the plant we find the insoluble precipitate blocking the channels in which water and nutrients move about. The result may be "wilt" which, if not corrected quickly, could bring about death of the grass.

Nitrogen and Water

The similarity in appearance between nitrogen-hungry grass and turf suffering

Roundup

By FRED V. GRAU

Research and Horse Sense Were Put to the Test

Here is a sample of a perfect lie on a firm, well managed bent fairway at Weirton.

MANY supts. say that 1959 was one of the worst seasons for course maintenance that anyone remembers. A wicked summer of excesses, following a long ice-covered winter and a cold wet spring, caused havoc in many turfgrass areas. Turf "rotted" before our eyes. Diseases appeared to be at an all-time high. Much of what happened simply was not supposed to be in the books. When the chips were down it took all the research results of past years, together with huge doses of old-fashioned horse sense and practical knowledge, to figure out what to do next. The "next step" was not always the right one but something had to be done. The overall loss of turf was not large but there were "hot spots" where losses were critical. Significantly, some courses in the "hot" areas came through without losses.

Research Tested

Research on improved grasses was put to the test this year as never before. The ability of a grass such as Penncross to withstand excesses gave practical evidence of the soundness of the test results which helped to launch it in the golf course field. Other improved bents that turned in great performances included Cohansey, Old Orchard and Toronto. The Arlington-Congressional (C-1, C-19) combination seemed to run into trouble this year, separating to a degree never seen before. The C-19 partner appeared to be the weak sister which couldn't take it all the way. What happened to poa annua and to the Colonial bents is too sad to relate. Seaside did not turn in the kind of performance that would win applause. As supplies of the improved grasses increase, the inferior ones gradually will bow out.

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Clippings removed from fairways helped minimize trouble at Weirton (W. Va.) CC.

Fungicide on Weirton's bent fairways saved the turf in 1959.

Grau photos

GCSA Draws Up Schedule for Houston Conference

The schedule and program for the GCSA's 31st conference, to be held in the Shamrock Hilton Hotel, Houston, Tex., next Jan 27-Feb. 6, generally have been drawn up with details yet to be filled in.

The conference will be preceded by the GCSA annual golf tournament on Jan. 28-29. The executive committee will meet the following day. Sunday, the 31st, and Monday will be set aside for registration and setting up of exhibits with the educational conference also getting underway on Monday. The educational sessions will continue through Thursday, Feb. 4th. Various committee meetings will be held between Monday and Thursday. The Get-Acquainted hour will be held on Monday evening and the annual banquet is scheduled for Thursday evening. Friday, Feb. 5th, has been set aside for a tour of Houston area golf courses and the following day, the newly elected executive committee will meet.

Exhibit space information can be obtained by writing Conference, GCSA, PO Box 1385, Jacksonville Beach, Fla.

A feature of Penncross, not covered by any known research, came to light on a trip that ended just in time to prepare this copy. Two complaints of "puffiness" were discussed in meetings. Both cases were investigated. There was a fear that the vigorous parent, Pennlu, was giving this undesirable trait to Penncross. Upon thorough investigation and sharp questioning (a form of research), it was discovered that an excessively high rate of seeding had caused the condition. There was not room for all the seedlings to grow and expand so, the only thing they could do was to try to grow upward. This caused the "puffiness".

The exact rate of seeding could not be determined with finality but it could safely be assumed to be in excess of 5 lbs. per 1,000 sq. ft. This is in distinct contrast to research and demonstration results where ½ to 1 lb. per 1,000 sq. ft. gave best turf in shortest time. Heavy rates of seeding greatly delay the time when the turf can be made ready for play. Also, they deny others the opportuniity to use this grass since there is not enough seed to go around. Anything more than one lb. is sheer waste and a detriment to good turf.

The severe winter, plus the extremes of temperatures during the pollination period, caused the shortest seed crop of Penncross and other improved grasses ever experienced. Users are asked to have patience for another year or two. Meanwhile, those who have some seed are asked to use as little as possible (as low as ½ lb. rate) and to share it with others. By establishing nurseries, limited stocks can be stretched greatly.

Use of Water

Water use research has yielded limited data but, when combined with practical experience, it added up to a significant factor in producing high-quality turf this past season. In every case where the supt. was successful in holding turf against heavy odds, it was intelligent water management that helped turn the trick. True, in some cases, heavy constant rain cancelled out careful water use. Even in this event, good water management showed in quicker recovery of damaged turf. Those who combined sprinkler irrigation with judicious hand watering came thru in much better shape. The worst of all were those who allowed set sprinklers to run for hours at a time every night, whether water was needed or not.

Hand in hand with watering is the factor of drainage. Where drainage was lacking turf was destroyed even under careful watering practices. Drainage and turf quality have not been identified thru data obtained in research projects but every supt. knows the necessity for excellent drainage. Well-drained soil is a well-aerated soil. Beneficial organisms flourish in soils that are able to breathe. Many of the poisons applied to correct the effects of poor construction accumulate in poorly-drained soils and actually help kill turfgrasses. In open, porous soils these same poisons are rendered harmless after they have done their work.

Build Them Right

It is regrettable that data is not at hand whereby a golf club, contemplating building a new course, could present figures to the architect and say, "Here is evidence to support our desire to have the best possible drainage built into our greens and other areas so that our course in the future will be easy to maintain even under the most severe extremes of weather conditions." Then the architect would be under bond to build trouble-free greens. It is all too evident that drainage systems appear to be by-passed in order to save some money. It has raised the question: "Why

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has been promising in the fringe belt from Washington and Philadelphia across to Kansas City. Pine Valley is expanding its program with these grasses despite a slight setback in some spots. The original U-3 Bermuda fairway at Bala in Philadelphia has been outstandingly good. U-3 has done well in St. Louis and Kansas City.

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Nitrogen and Water

The similarity in appearance between nitrogen-hungry grass and turf suffering

from drought has been documented in thousands of plots at dozens of experiment stations. Observations on courses confirm this close relationship. It has been interesting to note that when turf is furnished with adequate N (always in balance) water use is reduced. The condition that lead to the excess use of water having been corrected, there is an encouraging trend toward minimum water use.

Proper balance of nutrients has been shown in research at Penn State. When nutrients are out of balance, diseases actually may increase in severity. Some forms of nitrogen, which depend upon bacteria for ideal release, may fail to function properly because of a serious imbalance in relation to other elements. Poor drainage, or an excess of water combined with heat and humidity, may result in far greater damage when an imbalance exists. Soil and tissue testing have been of great help in detecting an unbalanced nutrient condition. Studies have been made of trouble areas where, in an effort to "do something", the material used added to the difficulty. No effort had been made to learn the existing level of nutrients. When questioned, the answer was, "I just thought the grass needed it."

Management by Analysis

Most of the data that are accumulating on soil and tissue tests are not available in usable form. A careful analysis of the test results would have great value in guiding future feeding patterns. It is safe to say that we are at the beginning of a great change in procedures wherein more and more of the management practices will be based on a careful technical analysis of the existing condition before action is taken.

Among the management procedures that have developed on the sound basis of research perhaps none is so universally accepted and used as that of aeration. The application of the principle of aeration has been responsible for tremendous saving of turf. In the midst of heat, humidity, saturation and confusion, many supts. saved their weak and ailing turf by aerating. Machines that embody this principle constantly are being improved thru factory research and tests on turf. Player resentment of aerating during the height of the playing season has diminished. Improved machines leave a smooth unruffled putting surface. Better aeration enhances the effectiveness of plant nutrients, especially those that have a close relationship with soil organisms. Without adequate oxygen, beneficial soil

organisms can not operate to the advantage of the system. Without ample oxygen, plant roots can't absorb water or needed nutrients. Aeration helps to restore balance in the soil-plant relationships.

What Tests Have Shown

It is impossible to measure the tremendous value of the research that has been accomplished over the past 20 years in the discovery and development of improved methods of feeding plants. Turf has been the recipient of much of this research; first, in the USDA, then in industry, and later in experiment stations. The net result is higher quality turf and more foolproof results with less labor. Research at various stations has shown that a properly-formulated fertilizer can release nitrogen steadily to turf over an entire growing season from a single application. Practical experience dictates that, on heavily-watered greens, for example, two applications provide steadier feeding than a single application. In year 'round climates, four applications are preferred by most supts. for the greens, two on tees, fairways and lawns.

In the balancing of nutrients for turf, tests are showing the value of trace elements in helping to achieve the most desirable release patterns for all nutrients. There are strong indications that some of the effects are catalytic wherein only minute quantities are required at relatively long intervals to trigger reactions. The term "controlled release" also may be applied to the trace elements wherein micronutrients are melted into a glass which is then ground to the proper degree of fineness to provide the desired release rate. This is different from the chemical union of urea and formaldehyde in which the process develops molecules of varying sizes which are attacked by bacteria in direct relation to the size of the molecule, not according to the particle size.

Morning Watering Important

The "dew" on grass early in the morning largely may be water of guttation. During the night, when humidity is high and evaporation is almost nil, roots continue to pump water out of the soil into the plant. In order to avoid an explosion, Nature provided little openings called hydathodes to relieve the pressure inside the plant. The water that is squeezed out of the leaf is charged with nutrients absorbed in solution from the soil. When the so-called dew (some of it is, of course) dries on the leaf, the close observer can detect tiny white crystals of nutrient compounds. When the concentration of nutrients is high enough and the conditions are just right, the grass blades may be "burned." A general browning of the turf may show for a few days. Most supts. syringe the excess water off the grass to wash the plant food back into the soil and to help the turf to dry more quickly for earlier maintenance and play. This early morning watering was found, thru research, to significantly reduce summer diseases on greens. Some of the troubles this season can be traced to a neglect of the early morning watering principle.

Research in establishing turf in the past has limited the level of nitrogen in the seedbed to about 1 lb. of N to 1,000 sq. ft. More recent work at Rhode Island has established the most desirable level of N

(in balance, of course) in the seedbed at the time of seeding at 8 lbs. of actual N. Earlier work was limited by the source of the N which was either inorganic (soluble) or derived from natural sources. Current research is based upon self-regulating synthetic-organic ureaform sources of N which continue to exhibit an effect on turf two years later. The practical application of this rather daring concept is found in new golf courses and other turfgrass areas where virtually a season's supply of nutrients are incorporated into the seedbed at the time of seeding.

Research has shown the way to more perfect balance of nutrients by the use of single elements applied exactly according to the needs of the plant. Similarly, research is tending toward the use of single, improved grasses in establishing turf so that the area may be managed to suit the particular grass which provides most nearly the quality of turf desired. Many supts. apply this proved principle by planting a nursery of straight Merion, for example, with which to resod teeing grounds. Putting green nurseries are planted to a single improved bent. In the past it was considered proper to include 5 to 10 per cent of bent in a lawn mix. Work at several stations and practical observations have resulted in outlawing of bent in mixtures. Under proper conditions, 5 per cent of bent results in complete domination by bent. Then, when conditions are unfavorable to bent, the end result is a mess.

One of the important developments has been refinement of thatch-removing machines. Just as with every item used in turf management, the intelligent use of the product is an integral part of success. Research results in development and testing can overcome errors of judgement when the item is used. A study of trouble spots has revealed that some difficulties have resulted from removing a little too much thatch (too deep) just prior to a spell of heat and humidity. When fertilizer was applied just after thatch removal and severe damage followed the spell of weather, there was a regrettable tendency to lay the blame for the loss of grass on the last thing that was applied.

(To be continued in January)