James B. Beard

NORTHERN MICHIGAN TURF MANAGERS ASSOCIATION

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THOS. J. REED, SECRETARY-TREAS.
3733 APOLLO DRIVE
TRAVERSE CITY, MI. 49684
PHONE: 616/943-8433

BEARD COLLECTION

TUESDAY, AUGUST 28th, 1984
GAYLORD COUNTRY CLUB
GAYLORD, MICHIGAN

The next meeting of this Association will be held at the date and location indicated above. The country club is located west of Gaylord on M-32. This is just north of where C-42 from Alba, joins M-32.

This is a fine 18 hole golf course built in 1972 and a real golf challenge. Damiam Kurkowski, is the host superintendent, Dan Webster is the golf professional and the President of the club is Wm. Deneen. These gentlemen invite you to play the course however you must have starting times, the number 616/546-3377.

Lunch is available at the club and this will be where refreshments plus dinner will be served. The cost of dinner will be in the $8.00 category plus a surprise in that steak will be served. You will be the chef and cook your own steak so if it is not cooked to your liking, guess whose fault?

Since everyone will be cooking, we would like to start our dinner as early as possible or about 6:00 P.M. We suggest therefore that you arrange your time both of starting golf and/or arrival, to be available to receive your steak. As usual, a business meeting will follow and we will have as our speaker, Mr. Terry Specht, President of Specialty Products Division of United Agricultural Products, Greenly, Colorado. This should prove a very interesting talk of interest to we in the green industry.

As usual, we must inform Gaylord Country Club of the number that will be there so----- please return your postcard in the return mail. By so doing, you can win a prize and you are making the job of our people, your associates so much easier. Your cooperation is greatly appreciated.

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The next date that you should remember is September 6th, Field Day at The Robert Hancock Turfgrass Research Center on campus at Michigan State. This year, it will be quite different as in addition to viewing turfgrass plots, there will also be a big equipment display. This should give everyone a chance to compare if you have any interest in purchasing equipment now or include in your budget for the future. Registration is 9:00 A.M. If you have any further questions, we suggest that you contact Dr. Paul E. Rieke or Dr. Bruce Branham at M.S.U.

The next date and a letter will follow shortly, will be September 12th, which is the date of our Association meeting at Lakewood Shores, Oscoda. Details will be forthcoming on the event.

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Overseeding Bentgrass Greens – Is It Worth It?

by BRIAN SILVA
Agronomist, Northeastern Region, USGA Green Section

"I TRIED THAT a couple of years ago and didn't see any results." Unfortunately, that's often the response to a suggestion for annually overseeding bentgrass to bentgrass greens. But remember, "one summer a seeding does not make." On closer examination, the long-term possibilities for green improvement and eventual success should not be even slightly overlooked.

There are many advantages to overseeding greens. Improved color, putting speed, shot-holding capability, as well as rapid recovery from injury are among the leading ones. Add to these the factors of increased uniformity and consistency of putting surfaces and a formidable, favorable argument begins to take shape.

Putting greens that have become a patchwork quilt of different bentgrasses and *Poa annua* varieties pose an unusual problem for the golf course superintendent. The various grasses and types respond differently to basic management practices, such as fertilization, topdressing, vertical mowing, and even pesticide applications. A variable response to environmental factors such as temperature is also noted. An annual overseeding program would encourage the development of greater uniformity with regard to the grass species and variety which predominates on a putting surface.

We often ask the impossible of greens originally planted to bentgrass. In many instances, these greens receive no additional desirable seed after they become established. This is the case even though annual bluegrass consistently produces vast quantities of new seed each season. Expecting the existing bentgrasses to compete solely on a vegetative basis with annual bluegrass may be expecting far too much. A vigorous annual bentgrass overseeding program can play an integral role in a maintenance scheme designed to favor the growth and development of bent and at the expense of *Poa annua* encroachment.

While many superintendents appreciate the advantages associated with annual overseeding, many of them hesitate to introduce still another variety into their putting greens. This is especially true on greens originally planted to velvet bentgrass or vegetative creeping bentgrasses such as Arlington and Congressional. However, close examination of greens originally planted to these specific grasses often reveals a less-than-claimed degree of purity. For example, many velvet bent greens often contain as much creeping bentgrass and annual bluegrass as they do velvet bent. Additionally, many greens planted vegetatively to two or more strains of creeping bentgrass have suffered separation and take on the patchwork appearance mentioned earlier. An overseeding program would provide a blending of grasses and greater uniformity of putting surfaces. Just as importantly, proper maintenance practices will yield more consistent and predictable results.

By now you are probably ready to jump on the bandwagon and wave the banner for annual bentgrass overseeding. Right? Wait a minute! Certain questions and techniques first merit your attention.

ONE OF THE keys to good germination from any seeding program is the development of proper seed to soil contact. On a new green, or on a project where complete renovation is in order, the development of excellent seed-to-soil contact is achieved with relative ease. However, when overseeding is carried out on an area of actively growing turf, the seed-to-soil contact becomes more difficult.

Any one of a number of techniques, or a combination of them, will work. If you are dead serious about a bentgrass overseeding program, consider first the use of a small, power-driven slicer-seeding machine that places the seed slightly below the putting surface. Special thin colters are available that barely disturb the surface. Very successful results have been obtained with this technique.

Soil cultivation, i.e., aerification, is another frequently used practice in gaining seed/soil contact. The soil cores should be removed and a drop seeder used for the sowing. Follow this with a moderate topdressing of desirable quality and then slowly mat or drag the material into the open aeration holes. *Slow* dragging is far preferable to the racetrack technique, and it doesn't disturb the original putting surface as much.

Depending on the time you have available and the prevailing weather conditions, you may wish to carry out a moderate vertical mowing program immediately after removing the soil cores as mentioned above. The vertical mowing should be carried out to a depth which will bring a small amount of previously applied topdressing or soil material to the surface of the greens. After removal of the thatch debris and/or soil material brought to the surface, the holes resulting from aerification and the slight grooves caused by vertical mowing will allow an infinite number of seeds to make good soil contact.

Spiking or slicing greens with mechanical disk spikes will also produce a good seedbed for overseeding. It will require at least three or four passes over the putting green — more if possible — before actual seeding is accomplished.

Remember, overseeding is taking place on actively growing turf. This allows less than optimal conditions for germination and the growth and development of new seedlings. An intensive soil cultivation program, combining aerification, vertical mowing, and spiking will prepare a better seedbed and reduce the level of competition imposed by actively growing turf. The relatively moderate topdressing which follows overseeding will permit acceptable putting conditions. Once the seed is in the ground, very light syringings for two or three weeks throughout each day will aid in higher germination percentages.

continued on page 3...

AS TO THE seed itself, one of the improved creeping bentgrass varieties is recommended. Penneagle or Penncross would represent a good choice, because they have an aggressive growth rate, which allows them to germinate and develop under less than ideal seedbed conditions. Once established, their aggressive nature will offer an increased level of competition against the ever-present annual bluegrass.

Much has been made of the tendency for such aggressively growing grasses to thatch and become puffy under putting green conditions. However, contemporary putting green maintenance practices, including light and frequent topdressing, light vertical mowing, and judicious use of nitrogen, will keep thatch accumulation in check.

Obviously, seedling mortality will be high. While the chances of overseeding success increase with the intensity of seedbed preparation, relatively high seeding rates should be used. Additionally, if you wish to shorten the time for higher bentgrass populations, overseed twice annually. Minimum seeding rates of two pounds per 1,000 square feet for the grasses suggested above are recommended. On a golf course with average-size greens, this seeding rate means an expenditure in excess of $1,000 per seeding per year. Just for a minute, though, consider the expense involved in maintaining greens through the summer stress period that are comprised mainly of annual bluegrass. The extra syringing and fungicide treatments add up quickly, and substantially. Better yet, imagine the cost in actual dollars and inconvenience associated with a set of greens that come through a winter in poor shape after annual bluegrass has exhibited its all too famous susceptibility to winter injury.

The timing of overseeding is critically important. While spring and fall might be the accepted times for propagating turf on a new site by seeding, they are not the best times for overseeding existing turf. Cool soil temperatures in the spring and fall, plus extreme competition on the part of annual bluegrass, render these periods inappropriate for overseeding. Carried out in the summertime, however, before the prime germination period for *Poa annua*, overseeding can give bentgrass seedlings an increased level of competitive ability. Soil temperatures at this time will also allow excellent germination, while diligent irrigation and fungicide treatments can improve seedling survival.

THE IDEAS behind overseeding sound great. Conditions of surface uniformity and consistency on greens can be improved. Greater competition on behalf of the desirable grasses can be gained against the encroachment of annual bluegrass. However, these results will never be realized by a one-shot effort.

A sound overseeding program must be carried out on a continuing and annual basis. Frequently we are asked how long the program should last. Is three years enough? Is five years too long? The best answer seems to be to initiate and continue an annual overseeding program as long as it is necessary to keep bentgrass in the dominant role. This may well take many, many years, but then in agriculture, only crop *failure* comes about overnight.

And you can count on one more fact. The results gained from overseeding will not be immediate. Three or four years may be required before you even see a hint of progress. However, if you persevere, you will improve bentgrass populations and uniformity throughout your putting surfaces. Without annual overseeding, your present putting surfaces will, at best, remain static. The more desirable grasses will be competing on a vegetative basis and, generally speaking, this is a losing proposition. Expect annual bluegrass encroachment.

In many cases, the initiation of overseeding will challenge a distorted equilibrium that has developed over the years and favors annual bluegrass populations. It will take time to shift this equilibrium, but a shift will surely take place through overseeding and altered maintenance practices.

If you are attracted by greens dominated by creeping bentgrasses, an annual overseeding program deserves your further investigation.

A manager develops people. Through the way he manages he makes it easy or difficult for them to develop themselves. He directs people or misdirects them. He brings out what is in them or he stifles them. He strengthens their integrity or he corrupts them. He trains them to stand upright and strong, or he deforms them, whether he knows it or not.
PETER DRUCKER

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6 ANSWERS TO QUESTIONS WE NEVER THOUGHT YOU'D ASK

(But decided to answer anyway)

1 Yes, GCSAA can help you become a better superintendent. One way it does this is through educational seminars and conference sessions it sponsors each year to help you become better informed about turfgrass diseases, pesticides, landscaping and management practices.

2 Yes, GCSAA is helping to further the advancement of the turfgrass industry. Through the GCSAA Scholarship & Research Fund, Inc., GCSAA provided more than $13,500 last year in research grants to leading turfgrass programs. GCSAA also provides educational opportunities to turfgrass students through annual turfgrass scholarships.

3 Yes, GCSAA provides a meeting ground for superintendents. Each year, GCSAA sponsors an annual conference and show for its members. Last year more than 6,500 educators, industry representatives and members from all over the world attended. GCSAA's executive committee decided at its last board meeting that the conference experience is so valuable that first-year members should be encouraged to attend by being given free admission.

4 Yes, GCSAA offers recognition for superintendents. Through its public relations efforts, its magazine, and its award programs, GCSAA helps promote the image and the professionalism of the superintendent. GCSAA also provides information to superintendents about how they can use public relations to promote their own image to their course, their community and their association.

5 Yes, GCSAA provides each member with a life insurance program. Supplemental insurance, disability and pension programs also are available.

6 No, GCSAA can't help you with your golf handicap. You'll have to work on that yourself.

GCSAA

The association that offers you more than just a name.

1617 ST. ANDREWS DRIVE
LAWRENCE, KANSAS 66044
913/841-2240

Turf Management

Fungicides: The Good, The Band and The Ugly

Peter H. Dernoeden, Extension Turfgrass Specialist

Arriving at the decision of whether to apply a fungicide to any turf area is difficult and generally based on economic considerations. For over 50 years, and prior to the popularization of the IPM concept, turfgrass managers have been fighting diseases through cultural practices. With the advent of modern fungicides, extremely reliable control has been achieved for many turf diseases. Effective chemical control, however, hinges upon a rapid and accurate disease diagnosis. As a group, golf course superintendents are the most experienced turf managers in the area of disease recognition and control. Homeowners, however, often are unable to diagnose turf diseases, or they recognize a disease problem only after substantial injury has occurred. As a general rule, use of fungicides is discouraged in most homelawn situations because (a) proper diagnosis and proper fungicide selection is difficult, (b) it is generally too late to achieve the economic and aesthetic benefits of a fungicide once extensive injury has occurred, (c) homeowners capable of only dry or granular applications do not have the proper spray equipment or they cannot obtain small amounts of the desired fungicide(s) for the disease situation, and (d) it may be less expensive, and better in the long-run to overseed a damaged turf area with disease resistant cultivars.

Where extremely high quality turf is required (e.g. golf course putting greens and other professional sports turfs) fungicides will be needed in most years, particularly in the transition zone. The indiscriminate use of fungicides or employment or numerous, preventative applications of fungicides for many diseases should be discouraged. Other than economic restraints, reasons why repeated fungicide applications may not be desirable include:

1. Fungicide may reduce the population of beneficial microorganisms in the soil.
2. Fungicides may disturb a delicate balance among microorganisms that compete with and antagonize disease causing fungi. This may explain why some diseases recur more rapidly and cause more injury in turfs previously treated with fungicides.
3. Continous usage of a single fungicide may lead to the development of fungal strains that are fungicide resistant.
4. A fungicide may control one disease, but encourage other diseases.
5. Possible phytotoxic or undesirable hormonal effects.

When used repeatedly, certain fungicides have been shown to enhance thatch accumulation. Benzimidazole fungicides (e.g. Tersan 1991, Bromasan and Duosan) and sulfur containing fungicides such as mancozeb (Dithane M-45), maneb (Tersan LSR), and thiram (Tersan 75 and Spotrete), cause thatch to accumulate by acidifying soil. The effect of these fungicides is indirect, that is they inhibit the thatch decomposition capacity of beneficial microorganisms by lowering pH. Cadmium fungicides and iprodione (Chipco 26019) also enhance thatch accumulation. In the case of these latter two compounds, thatch build-up is attributed to direct toxicity of microorganisms that degrade thatch. Fungicides may also contribute to thatch build-up by being toxic to earthworms. Earthworms help reduce thatch by mixing soil with organic matter. Benomyl, mancozeb, anilazine (Dyrene) and chlorothalonil (Daconil) have been shown to be toxic to earthworms.

Turf managers have observed that some disease may recur in turfs previously treated with fungicides, but not in adjacent untreated areas. Dollar spot is probably the most common disease to exhibit this phenomenon. Data, recently recorded in a test conducted by the University of Maryland, have shown that red thread was more severe in the spring of 1983 in Manhattan perennial ryegrass plots last treated with benomyl in July, 1982. These phenomena are attributed to non-target effects of fungicides, i.e., the fungicide(s) were toxic to microorganisms which antagonize and help keep disease causing fungi in abeyance.

The development of fungal strains resistant to fungicides has been well documented. Resistant strains of the dollar spot fungus first developed as a result of repeated usage of cadmium based fungicides and benomyl. Thiophanates (e.g. CL3336, Fungo and Duosan), anilazine and iprodione resistant strains of the dollar spot fungus have also been reported. Benomyl resistant strains of fungi causing Fusarium blight and powdery mildew, and iprodione resistant strains of the pink snow mold organism have also been reported. The development of resistant strains of fungi likely occurs in response to a selection process that eventually enables a small, but naturally occurring population of resistant biotypes to predominate in the fungicide-treated turfgrass microenvironment.

Fungicides applied to control one disease, may encourage other diseases. Tests conducted in Maryland have shown that benomyl and maneb can encourage red thread. Benomyl has also been shown to enhance Helminthosporium leaf spot, Pythium blight and superficial fairy rings. Thiophanate-methyl may increase crown rust in perennial ryegrass, iprodione can increase yellow turf, and maneb may enhance dollar spot. In 1983, in University of Maryland tests, two common-type Kentucky bluegrass cultivars treated on monthly intervals with chlorothalonil were injured more severely by Fusarium blight and heat and drought stress than untreated turf. Encouragement of disease in these situations may again be attributed to offsetting the delicate balance between antagonistic and pathogenic microorganisms in the ecosystem. It is also conceivable that some fungicides may physiologically alter the capacity of a plant to resist a particular pathogen or withstand environmental stress.

The phytotoxicity that accompanies usage of some fungicides is generally not severe. Most phytotoxicity problems occur when fungicides are applied to bentgrasses, particularly during periods of high temperature stress. Fungicides that can cause yellowing of bentgrass include benomyl, cycloheximide (Acti-dione), PCNB (Terraclor and Acti-dione RZ) and the mercurials (e.g. Calo Clor and PMAS). Benomyl has been reported to inhibit growth and stolon production in bentgrass, and may cause a tip dieback in Merion Kentucky bluegrass. Etaconazole (Banner and Vanguard), fenarimol (Rubigan), triadimefon (Bayleton) and PMAS treated bentgrass may develop an objectionable blue-green color if used repeatedly or when applied at high rates. PCNB also may elicit a purplish color when applied to Turcote bermudagrass in the autumn.

these potential problems. The importance of rapid and accurate disease diagnosis, and the judicious use of fungicides are integral in management problems were fungicides are commonly employed.

Credit — The Agronomist
University of Maryland, November, 1983

SAFETY EQUIPMENT

SAFETY EYE PROTECTION

Safety glasses, goggles, side shields, face shields, welding shields. Eye protection is needed where there is airborne dust; the danger of flying metal, wood or stone chips; welding; and splashing chemicals. Employees should chose and use the protective safety eyewear best suited for their jobs.

SAFETY FOOTWEAR

Safety shoes offer soles with puncture protection, instep protection, ankle snugs to ward off sparks, metatarsel guards, non-slip soles and steel caps that protect the toes from falling objects. Today safety shoes are very comfortable, fashionable and effective.

HAND PROTECTION

Approved cloth work gloves, leather hand pads, metal mesh gloves, insulated gloves, neoprene and plastic gloves, and rubber gloves provide protection when handling sharp, rough, greasy and hot materials, and during operations where the hands are directly involved with lifting or moving objects. Other special-purpose hand protection includes leather wrist and arm sleves, hand mitts and finger pads.

HEARING PROTECTION

When noise is above acceptable levels and it is impossible to reduce noise output, personal hearing protectors, such as ear plugs, ear muffs, sound bands, and molded ear plugs, must be used. This equipment must be worn properly and kept in good condition to be effective.

SAFETY HEAD GEAR

For protection from falling or flying objects, moving machinery, sharp corners, heat and fire, electric shock, dripping chemicals and unseen dangers, hard hats should be worn. Hard hats must have sturdy brims, and rigid inner suspension to cushion shocks and blows; the may have chin straps and removeable face shields. Hard hats can be made of plastic, fiberglass or metal. Other head protection includes bump caps, hair nets and chemical-resistant hoods.

RESPIRATORS

Respirators should be worn if inhalation hazards are present in the workplace. Respirators are used where there is dust, paint spray, fumes, smoke and mists. In hazardous working conditions, self-contained breathing apparatuses are required. Instructors should demonstrate to employees the proper methods of fitting, maintaining and cleaning respirators; practice time should be included.

OTHER PERSONAL PROTECTIVE EQUIPMENT

- Life vest when working over or near water.
- High visibility clothing for traffic work.
- Life lines and safety belts for iron and utility line workers.
- Rubber, plastic and leather aprons to protect from acid and chemical splashes.
- Insulation suits for protection from fire and heat.
- Leaded clothing for protection against X-rays.
- Leggings and sleeves for added protection against splashes and flying particles.
- Disposable paper, cloth or plastic clothing for protection against germs or harmful chemicals.

Personal protective clothing and equipment have their place in sports, manufacturing plants, foundries, construction and many other areas of industry. It is our responsibility to be safety-conscious. We must recognize the importance of personal protective clothing and equipment and take advantage of their benefits by wearing them.

SUIT UP FOR SAFETY— use and wear personal protective clothing and equipment.

10 CAUSES OF UNSAFE ACTIONS

Here are ten principal factors which can cause unsafe work practices or unsafe acts.

1. Did not know hazard existed— This may be from a lack of experience, inability to recognize a hazardous condition, a temporary hazard created by a fellow employee, a chain of circumstances or a lack of job training.

2. Indifference— The individual may know the safe method but may not care. This can be a temporary or continuing attitude. Supervisors must insist that certain standards be met by their employees.

3. Daring— This type of behavior blinds an individual to hazards that exist. Such an individual also might be classified as a clown. There are enough problems on a job without clowns.

4. Poor Work Habits— From doing the same job day after day, poor work habits are often formed. Some habits may be formed early in the job and others may be developed later. This can be seen when an individual works many years and suddenly becomes an accident victim. He may have had poor work habits all along and the law of averages finally caught up with him.

5. Poor Example Set— A new employee may follow the example of an older employer who has unsafe work practices or habits.

6. Laziness— Everyone is lazy; its the degree that becomes critical.

7. Haste— The desire to get something done fast can cause an injury or an unrealistic speed up on the job.

8. Temper— Impatience or lack of emotional control can lead to an unsafe act.

9. Physical Failure or Fatigue— The individual may have physical limitations; he may be on a job he can not handle properly. This may be because of poor eyesight or hearing or general poor health.

10. Lack of Training On the Job.— This can be the most glaring cause. A supervisor should be certain that each employee knows his job; if an employee does not, the supervisor is failing in his job. Lack of job training is a handicap. A supervisor has a reponsibility to the company in carrying out necessary job training.

Credit: "Divots", Vol. 33, No. 5, July, 1983

A nominating committee has been appointed by the Board of Directors. This committee is chaired by Dave Longfield with Leon Powell, John LaBoskey, Harold Birtles and Joe Burda, as the other members. If any of you would like to become active in our Association and to help guide its future direction, now is the time to contact this committee. Every Association needs input and by being a member of the Board, you will be able to offer your recommendations where it will be heard.

Three Board members will be elected from Class A and Class B members to serve for a term of three years. The three members whose terms are expiring are Tom Courtemanche, Robert McElheny and Tuck Tate. A Class G member must also be elected to the Board for a term of two years. Nothing prevents these people from serving another term except in the case of Tuck Tate, who must go off the Board. Our By-Laws states that no one may serve more than two terms without a break of one year and Tuck has been on the Board since inception in 1971. Tom Reed is the Class G member whose term is expiring and he too may be reelected to another term.

Election of Board members will take place at our annual meeting in September at Lakewood Shores. Nominations may also be made from the floor at that time, prior to election or balloting. It will be a secret ballot.

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Western Michigan Golf Day, 4 man best ball, full handicap, entry fee $240.00 per team, includes shotgun start 8:30 A.M. or 1:30 P.M., Buffet lunch between shotguns, golf carts, hors d'oeuvres - cocktail hour, dinner at 7:30 P.M. Anyone interested, send check payable to Chris Fochtman, 88 King Blvd., Sparta, Mi. 49345

SEPTEMBER 10, 1984 CASCADE HILLS COUNTRY CLUB

Benefit Mich. State U. Turfgrass Research

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For Sale: New, Red Rider, Electric Start, 8 H.P. Kohler Engine, $2000.00

Tuck Tate 352-4101

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Golf Tips

Close Lie — Play back slightly. Weight on left leg. Hit down and thru. Do not try to scoop ball. Let loft of clubface do lifting.

Sidehill Lie — Ball lower than feet. Aim to left of target. Grip at end of shaft and stand closer to ball to accommodate a more upright swing.

Sidehill Lie — Ball above feet. Aim further right to allow for difference. Grip farther down shaft for flatter, baseball like swing plane.

Flip Shot — Wide open Clubface. Maximum wrist action. Open stance. Hands counter clockwise. Never try off hard ground.

Uphill Lie — Stance closed. Play ball towards center of stance. Aim ball to right to allow for hook. Use at least one club longer than normal lie.

Sand Trap — Imbed feet deeply. Open stance. Open face club. Weight forward on left foot. Break wrists.

Against Wind For Distance — Play ball further back. Shut face slightly. Shorter, stiff wrist action. More weight on left foot. Hit down and through.

Sand Trap Buried Ball — Closed club face. Ball played back. Hit through with smooth unhurried stroke.

Crosswind — Use one less lofted club than usual. Tee ball on side from which wind is blowing and play that side of fairway.

Chip Shot — Shot swing. Play ball towards center of stance. Hands close to body. Knees bent. Use shoulders and fingertips. Avoid flipping the wrists.

Uphill Slope — Wide open club face. Open stance and swing far outside-in. The ball must be played to clear the top of the mound.

Downhill Lie — Open Stance. Ball back from left foot. Aim to left to allow for slice. Use at least one club longer than normal lie.

Wet Grounds — Be certain to hit ball first, just below center. Club must hit ground after the ball is in flight.

High Grass — Firm up your grip. Very upright swing. Strike ball as vertical as possible. Open clubface wide so that it becomes square on impact. Hit ball before ground.

Putting — Putts will run faster with grain, slower against. Crossgrain putts will break with the grain just as on a sidehill slope. Never move head or body during stroke.

With Wind For Distance — Play ball forward. Open face slightly. Hands over clubhead. Hit ball a low point of swing. Increase wrist action. More weight on right foot.

Courtesy of Johns-Manville Pipe Systems