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USGA GREEN SECTION RECORD

A Publication on Turf Management
by the United States Golf Association

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Potassium, Calcium, Magnesium— How They Relate to Plant Growth

by **CARL SCHWARTZKOPF,** Mid-Continent Agronomist, USGA Green Section

Potassium, calcium and magnesium play an important role in soil-plant relationships. These elements are not only essential to the complex biochemistry of plant growth, but their presence in the soil in adequate amounts and in suitable proportions to one another and to the other exchangeable cations, such as aluminum, hydrogen and NH_4+, is necessary if the soil is to be a suitable medium for plant-root development. Should one element be in excess, it may "tie-up" or make it unavailable to the plant.

POTASSIUM

Potassium is absorbed by plants in larger amounts than any other mineral element except nitrogen and possibly calcium. This element plays an important part in many of the vital physiological processes in the plant; the exact mechanism by which potassium functions is not known. It is needed for the plant cell's metabolic processes and apparently has a role in influencing the uptake of certain other mineral elements, in regulating the rate of respiration, affecting the rate of transpiration and in influencing the action of enzymes, as well as in aiding the synthesis and translocation of carbohydrates. Potassium also has a counterbalancing effect on the results of a nitrogen excess. It enhances the synthesis and translocation of carbohydrates, thereby encouraging the cell walls to thicken and help the plant to remain upright.

Potassium plays a vital role in the winter survival of turfgrass, disease resistance, and in increasing the overall hardiness of the grass plant. Deficiency symptoms of potassium on turfgrass are yellow-streaked leaves, followed by browning and dying at tips and margins.

SOURCES OF POTASSIUM

Hardwood ashes supplied much of the potassium in the United States through the first part of the 19th Century. A decline in the potash industry resulted after the hardwood forests along the Atlantic Coast were depleted. The first factory that processed KCL (murate of potash) was in Germany, and the Germans monopolized the potassium market until World War I. The embargo placed on potassium exports forced development of the resources of the United States and of other countries as well. Most potassium today comes from New Mexico, California, and Utah.

CALCIUM

Calcium, as potassium, is absorbed by the turfgrass plant in the ionic form. The calcium in the soil other than what was added as lime or in fertilizer material originated in the rocks and minerals from which the soil was formed. Calcium is a part of many minerals, such as

Injury to turf from the misapplication of plant nutrients.

dolomite, calcite and calcium feldspars. Upon their disintegration and decomposition, calcium is released.

Calcium is an extremely important mineral in plant nutrition. Many soils, particularly in humid regions, contain this element in amounts so small that plant growth is limited. Turfgrasses as a group are able to tolerate low levels of calcium; however, abnormal growth has been observed with extremely low levels. One of the primary roles assigned to calcium in the plant is the key role it plays in the cell walls. Calcium is also important in root development, since short roots are observed on calcium deficient plants.

The first sign of calcium deficiency in older plants is the appearance of a reddish-brown discoloration in the tissue between the veins, along the margin of the blade. The most obvious method of correcting this deficiency is by the application of calcitic or dolomitic lime. Should calcium be required without changing the pH that would result from the use of lime, gypsum may be used.

Liming is the addition to the soil of any calcium-containing compound that is capable of reducing acidity. The correct use of lime refers only to calcium oxide (CaO), but the term almost universally includes such materials as calcium hydroxide, calcium carbonate, calcium-magnesium carbonate and calcium silicate slags.

A description of various liming materials describing their availability and manufacture follows:

Calcium Oxide — Calcium oxide (CaO), also known as unslaked lime, burned lime, or quicklime, is a white powder that is quite disagreeable to handle. It is manufactured by heating calcite limestone in an oven or furnace. The carbon dioxide is driven off, with calcium oxide remaining. This product is most frequently handled in paper bags because of its powdery and caustic nature. This material reacts quickly when added to the soil. When unusually rapid results are desired, either calcium oxide or calcium hydroxide should be used.

Calcium Hydroxide — Calcium hydroxide ($Ca(OH)_2$) is commonly referred to as slaked lime, hydrated lime or builder's lime. It is similar to calcium oxide in that it is a white powdery substance, difficult and unpleasant to handle. Slaked lime is prepared by the hydration of calcium oxide. A large amount of heat is generated; upon completion of the reaction, the material is dried and packaged.

Calcium and Mixed Calcium-Magnesium Carbonates — The carbonates of calcium and magnesium occur widely in nature and in many different forms. Crystalline calcium carbonates are referred to as calcite or calcitic limestone. Crystalline calcium-magnesium is known commonly as dolomite.

MAGNESIUM

Magnesium is also absorbed by plants in the ionic forms. This absorption takes place from the soil solution or possibly by contact exchange.

Magnesium plays a vital role in photosynthesis, as it is the central atom in the chlorophyll molecule. It is involved in many enzyme reactions. It reacts with phosphorus in uptake and transport. Magnesium is also quite mobile in the plant, and yellow deficiency symptoms first appear on the older leaves, as it moves to the younger plants.

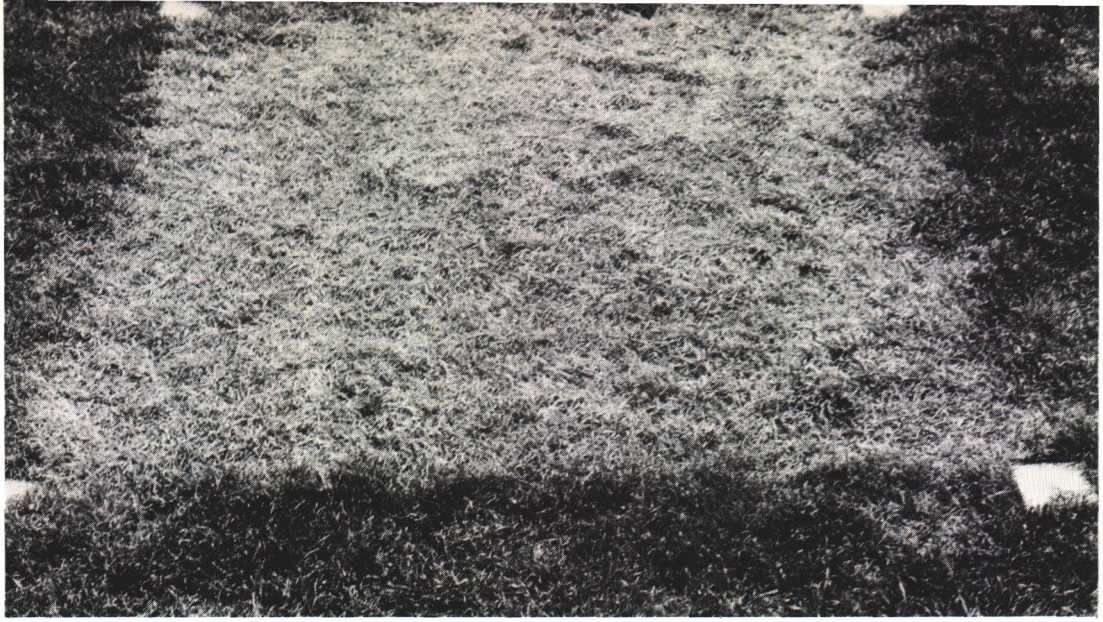
SOURCE OF MAGNESIUM

Magnesium in the soil originates in the decomposition of rocks containing minerals such as brotite, dolomite and olivine. Upon decomposition, these minerals set magnesium into the surrounding soil solution. Once in the soil solution, magnesium may be 1) leached, 2) absorbed by living organisms, and 3) adsorbed by surrounding particles.

MAGNESIUM IN THE SOIL

The coarse-textured soils of the humid region are those in which a magnesium deficiency is generally manifested. These soil types usually contain small amounts of exchangeable magnesium. This condition is aggravated by the addition of large quantities of fertilizer salts which contain little or no magnesium. The magnesium in the soil is released by ion exchange when these fertilizers are added; the larger quantities of chlorides and sulphates speeds its removal by leaching. Magnesium can be supplied in dolomitic limestone, or as magnesium sulphate, if soil pH is to remain the same. A deficiency of magnesium is less of a problem on finer-textured soils and on soils found in the arid regions. In some semi-arid locations, magnesium compounds may actually be precipitated in the soil profile.

When the appearance of a plant and environmental factors indicate a nutritional disorder, steps should be taken to verify the problem before attempting to correct it haphazardly with nutrients that are not needed. Since nutrient deficiencies on turfgrasses are difficult to visually diagnose, a suspected deficiency should be verified with soil or tissue tests before trying to correct the problem. A most important criterion for a soil test is that it should measure the nutrient in the soil that is available to the plant. Many times nutrients in the soil are held tightly and are unavailable.



Complete kill of the leaves, crowns, and rhizomes of a Kentucky bluegrass turf resulting from a 160-pound man shuffling uniformly over the wet, slushy area just prior to a severe freeze to below 20°F.

Ten Years of Research on Winter Injury on Golf Courses: Causes and Prevention

by **DR. JAMES B. BEARD,** Michigan State University

Winter injury of turf is difficult to understand because it results from the interaction of a number of environmental, soil, and cultural factors. Before a golf course superintendent can initiate the appropriate cultural program to prevent winter injury, he must determine the particular type or types of winter injury that occur most frequently at various locations on the golf course. This involves a study of the particular symptoms, including time of occurrence, soil type, topography, drainage characteristics, traffic patterns, and the probability of environmental stress. Such information is assembled over a period of years, and a specific program is established on the golf course in order to minimize the probability of winter injury.

CAUSES OF WINTER INJURY

The four major types of turfgrass winter injury that most commonly occur are presented in Table 1, along with the symptoms and causes of injury. This information has been assembled over a 10-year period of extensive research at Michigan State University. The major types of winter injury are:

Desiccation
Direct low temperature kill
Low temperature diseases
Traffic effects.

Note that ice sheet damage caused by oxygen suffocation or toxic gas accumulations underneath an ice cover are not listed. Detailed investigations at Michigan State University indicate that this type of winter injury rarely occurs. This is in contrast to the many articles by individuals indicating that this is a serious problem. Unfortunately, these earlier writers had essentially no information on which to base their comments other than data from research with alfalfa. The winter injury most commonly associated with extended periods of ice coverage occurs during freezing or thawing periods when standing water increases the crown tissue hydration and subsequent injury of the turfgrass plants when temperatures drop rapidly below 20°F.

Table 1. Types, symptoms, and causes of winter injury that most commonly occur on golf course turf

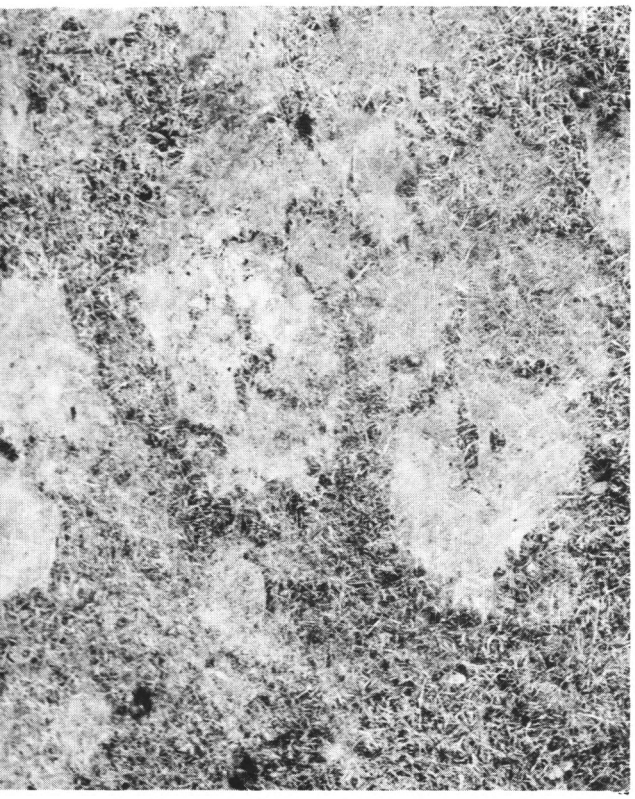
Type of winter injury	Symptoms	Cause of injury	
		External forces	Internal plant effects
A. **Desiccation:**			
(1) Atmospheric	Leaves turn distinctly white but remain erect; occurs most commonly on higher locations that are more exposed to drying winds; can range from small irregular patches to extensive kill of large areas.	A drying atmospheric environment including high winds and low relative humidity; in addition, soil water absorption is reduced at low temperatures or may be inoperative because the soil is frozen.	Desiccation of the plant causes shrinkage and collapse of the protoplasm that results in mechanical damage and death.
(2) Soil	Leaves turn distinctly white and are semi-erect; the tissues including the crown are very dry; commonly occurs in a more extensive pattern over the turf than does atmospheric desiccation.	Extended periods of soil drought due to a drying atmospheric environment and lack of precipitation or irrigation.	(Same as above)
B. **Direct low temperature kill**	Leaves initially appear water-soaked, turning whitish-brown and progressing to a dark brown; the leaves are limp and tend to lay as a mat over the soil; a distinct, putrid odor is frequently evident; occurs most commonly in poorly drained areas such as soil depressions; frequently appear as large, irregular patches.	A rapid decrease in temperature, particularly the adjacent soil temperature; kill most commonly occurs at soil temperatures below 20°F during the late winter—early spring freezing and thawing periods; may be associated with thawing of an ice cover that occurs from underneath.	Large ice crystals form within the plant tissues causing mechanical destruction of the frozen, brittle protoplasm; the higher the water content of the tissue, the larger the ice crystals and the more severe the kill.
C. **Low temperature diseases:**			
(1) *Fusarium* patch (pink snow mold)	Pink mycelium on leaves; 1 to 2 inch, tan, circular patches; or white mycelial mass on leaves, white to pink circular patches up to 2 feet in diameter.	*Fusarium nivale;* favored by turfgrass temperatures of 32 to 40°F and moist conditions.	Parasitic action.

(2) Spring dead spot	Appears in the spring as irregular, circular dead spots of up to 3 feet in diameter; shoots, rhizomes, stolons, and roots within the spot will be killed; affected spots commonly re-occur in the same location each year and may gradually enlarge.	Causal organism has not been identified; favored by turfgrass temperatures below 50°F and wet conditions.	Unknown
(3) *Typhula* blight (gray snow mold)	Light gray mycelium on leaves, especially at the margins of the advancing ring; whitish-gray, slimy, circular patches of up to 2 feet in diameter; brown sclerotia are embedded in the leaves and crowns, ranging up to 1/8 inch in diameter.	*Typhula itoana, T. idahoenis,* or *T. ishikariensis;* favored by turfgrass temperatures of 32 to 40°F, especially under an ice cover or during its thaw.	Parasitic action.
(4) Winter crown rot	Light gray, matted mycelial growth may be evident on the leaves; irregular shaped patches initially appear yellow and gradually deteriorate to a straw color; individual patches up to 1 foot in diameter may coalesce causing damage over a large area.	Unidentified low temperature *Basidiomycte;* favored by turfgrass temperatures of 28 to 32°F., especially under a snow cover.	Injury results from hydrogen cyanide gas produced by the saprophytic fungus; subsequently the fungus invades the host plant.
D. **Traffic:**			
(1) On frozen turfgrass leaves	Erect, white to light-tan dead leaves appearing in the shape of the footprints or wheels where they have been impressed onto the turf.	Pressure of the traffic (shoes or wheels) on the rigid, frozen tissues; the problem most commonly occurs during the early morning hours.	Disruption of the frozen, brittle protoplasm that has ice crystals surrounding and extending into it.
(2) On wet, slush covered turfs	Leaves initially appear water-soaked turning whitish-brown and progressing to a dark brown; the leaves are limp and tend to lay as a mat over the soil; appears in irregular shapes associated with previous patterns of concentrated traffic; soil rutting may also be evident.	Snow cover thaws to a slushy condition causing increased hydration of the turfgrass crowns; traffic, including snowmobiles, force the wet slush into intimate contact with the turfgrass crowns; kill most commonly occurs if this event is followed by a decrease in temperature to below 20°F.	Not completely understood, but is related to the direct low temperature kill mechanism.

Table 2. Practices available to minimize winter injury on golf course turf

Type of winter injury	Practices that minimize injury: Turfgrass cultural	Practices that minimize injury: Soil management	Specific protectants	Turfgrass species most commonly affected
A. **Desiccation:**				
(1) Atmosphere	Moderate nitrogen nutritional levels. Elimination of any thatch problem.	Do not core in late fall and leave the holes open.	Conwed Winter Protection Blanket Polyethylene (4-6 mil) Saran Shade Cloth (94%) Topdressing (0.4 yd^3/ 1,000 sq. ft.) Windbreaks such as snow fence, brush, or ornamental tree and shrub plantings. Natural organic mulches.	Annual bluegrass
(2) Soil	Moderate nitrogen nutritional levels. Irrigation or hauling of water to critical turfgrass areas.	(Same as above)	(Same as above)	Annual bluegrass
B. **Direct low temperature kill**	Moderate nitrogen nutritional levels. High potassium nutritional levels. Higher cutting heights. Elimination of any thatch problem. Avoidance of excessive irrigation.	Rapid surface drainage by proper contours, open catch basins, and ditches. Adequate subsurface drainage by drain tile, soil modification with coarse textured materials, slit trenches, and dry wells. Cultivation, especially coring and slicing, when compaction is a problem.	Conwed Winter Protection Cover Soil Retention Mat Enhancing a snow cover with snow fence or brush. Natural organic mulches such as straw. Soil warming by electricity.	Bermudagrass Annual bluegrass Red fescue

C. Low temperature diseases:				
(1) *Fusarium* patch	Moderate nitrogen nutritional levels. High potassium and iron nutritional levels. Moderate to low cutting heights. Elimination of any thatch problem.	Avoiding neutral to alkaline soil pH's	Cadmiums Benomyl Daconil Mercuries	Annual bluegrass Bentgrass
(2) Spring dead spot	Avoid excessive winter irrigation. Elimination of any thatch problem.	Provide good surface and subsurface drainage. Cultivate when compaction is a problem.	Nabam, time the applications to be present when soil temperatures are below 50°F and the soil is water saturated.	Bermudagrass
(3) *Typhula* blight	Moderate nitrogen nutritional levels. Moderate to low cutting heights. Elimination of any thatch problem.	Provide good surface and subsurface drainage. Cultivate when compaction is a problem.	Cadmiums Chloroneb Mercuries	Annual bluegrass Bentgrass
(4) Winter crown rot	Elimination of any thatch problem.		Mercuric chloride (2 applications)	Annual bluegrass Bentgrass
D. Traffic:				
(1) On frozen turfgrass leaves	Apply a light application of water in early morning; this is most effective when the soil is not frozen and the air temperatures are above freezing.		Withhold or divert traffic from turfgrass areas during periods when the leaf and stem tissues are frozen.	
(2) On wet, slush covered turf			Withhold traffic on turfgrass areas during wet, slushy conditions, especially if a drastic freeze is anticipated.	Annual bluegrass



White mycelium of the Typhula *species occurring in numerous irregular circular patches on an annual bluegrass fairway.*

PREVENTING WINTER INJURY

Cultural steps can be taken to minimize the potential for injury in the future once the cause or causes of winter injury on specific turfgrass areas on the golf course have been established. The first prerequisite in minimizing all types of winter injury is a healthy turf with adequate carbohydrate reserves and recuperative potential. This phase of winter injury prevention is accomplished during the normal growing season, particularly in the late summer—early fall period. Practices to prevent or at least minimize the potential for turfgrass winter injury can be divided into cultural practices, soil management, and specific winter protectants.

The specific practices utilized in each of these categories are summarized in Table 2. It should be noted that a number of them apply to more than one type of winter injury. In some cases, the practice that is effective in preventing one type of winter injury will actually increase the probability of damage from another type. For example, snow covers or winter protection covers used to prevent winter desiccation will also maintain temperatures near 32°F which will enhance the probability of snow mold disease activity. This means that when such a practice is in use, steps should also be taken to apply a preventive snow mold fungicide application to the turfgrass area prior to installing the winter protection cover.

From a cultural standpoint, the proper control of plant and soil water relations is the most critical factor affecting all phases of turfgrass winter injury. Techniques to adjust the soil-water status must be achieved during the summer period.

Finally, it is quite obvious that selection and planting of the appropriate turfgrass species and cultivar can be critical in minimizing the degree of turfgrass injury that may occur. Annual bluegrass is very prone to all types of winter injury. The bentgrasses are considerably less susceptible to injury, and also have a greater recuperative potential from existing vegetative plant parts.

IN SUMMARY: This article gives a brief summary of a great deal of research conducted at Michigan State University over the past 10 years. Portions of it were supported by the U.S.G.A. Green Section Research and Education Fund.

THE AUTHOR

Dr. James B. Beard is a Professor of Turfgrass Science in the department of crop and soil sciences at Michigan State University, East Lansing, Mich. 48823. He has conducted pioneering research in all phases of turfgrass winter injury. In 1971 he was the youngest recipient ever selected to receive the highest honor of Fellow in the American Society of Agronomy. He has authored a new textbook entitled "Turfgrass: Science and Culture" published by Prentice-Hall of Englewood Cliffs, N.J.

There has not been very much aerification in the past; however, the purchase of a new punch machine by the Argentine Golf Association will change this trend.

Turfgrass Management in the Argentine

by **JAMES B. MONCRIEF,** Director, Southern Region, USGA Green Section, Athens, Georgia

No fumar, abroche el cinturon, por favor. Fasten your seat belts, we are approaching Buenos Aires! This was good news, because we had been on Aerolineas Argentinas for 12 hours and we were eager to have our feet on the ground again. We had left Miami about 2 a.m. one day last fall and made intermediate stops in Lima, Peru, and Santiago, Chile, before flying over the tall and rough Andes to Buenos Aires.

The flight was very smooth, but the cabin crew was different from what we are accustomed to in the United States. The stewardesses were much older than their American counterparts and a steward was in charge of the cabin.

The immigration facilities were very efficient and we were given the VIP treatment. No doubt this was because I was invited to Argentina by the Associacion Argentina de Golf to visit member clubs during a 2-week stay and to take special note of the site of the World Amateur Team Championship at Olivos Country Club near Buenos Aires. My wife accompanied me and we thoroughly enjoyed the two weeks. We learned a great many things about a beautiful country we had never seen before.

The climate in Buenos Aires is very similar to the southern part of our country along the 34th parallel. The population of Buenos Aires is about 4½ million; the population of the entire metropolitan area is about 8½ million. The language is Spanish and much of the early Spanish influence can still be seen in the interior of the country, such as at Cordoba and Rosario. Since we did not speak Spanish, we had an interpreter at every golf course visit. In this manner, we conversed with the golf course representatives and answered their many questions. We visited 17 golf courses in all with many other side trips.

The design of Argentine golf courses is very striking, and they are quite similar to our own. Most were built 50 to 70 years ago when Argentina was a European resort area. Many of

Design and strategy of play equal to most courses even though many were built 50 to 70 years ago.

the courses were built near railroads, since the people would leave town to spend the weekend at the Country Club. Many members still have a home in town and another in the country.

Just prior to our arrival, revolutionists had tried to destroy two of the country clubs in the belief that they were a symbol of capitalism. They were successful in blowing the top out of one clubhouse, and a large hole in another. Earlier they had completely demolished another club. Many of the clubhouses are built in an English style of architecture, while others have attractive Spanish design, with adobe walls and tile roofs.

We observed bunkers where railroad ties or some sort of piling created a very abrupt wall. One bunker at Mar del Plata had been built 70 years ago and still exists, with the wall six to eight feet high. Of all the clubs we visited, the Jockey Club was the largest with 36 holes. It was designed about 65 to 70 years ago. It is very similar to the golf courses built here 40 to 50 years ago.

Monetary inflation exists in Argentina, and it seems to be more critical than our own. The Argentinians have not been able to use chemicals to maintain their courses on the same level as ours, but interest is building and no doubt chemicals will be used to control grassy weeds, such as crabgrass and dallisgrass. Their golfers enjoy the game as much as any we have and good turf is important to them.

Olivos Country Club, the site of the World Team Championship, is about 20 to 30 miles from Buenos Aires. The basic grass on the greens is bent, consisting of Coos or Penncross. Other clubs have common bermuda on their greens, or Tifgreen, or a bermuda selection from Brazil. The fairway grass is usually common bermudagrass, but Tifgreen is being increased rapidly, and no doubt some fairways will soon be Tifgreen. We observed Tifdwarf being increased in a nursery, and only time will tell if it will be satisfactory. Tifway is not in Argentina as yet, but I am sure it will be eventually.

During our visit to the Olivos Country Club, the greens were being aerified by an American-made machine which the Argentina Golf Association had purchased for its members. In our country, this aerifier costs about $2,000, but in Argentina its price is close to $6,000. Since the Association purchased the machine, member clubs will be able to use it for thorough putting green aerification, which is badly needed. They have not been able to aerify or cultivate in the past except with solid

punch aerators.

Equipment from the United States is so expensive that most of their turf maintenance machinery is purchased from Europe. At present, no equipment for golf courses is being manufactured in Argentina, and there is maximum use of all equipment since replacement is so difficult.

We saw two greens being constructed according to USGA Green Section Specifications, and no doubt others will be in the future. In the past, the soil media for the greens was usually of very high clay content, but a sandy soil mixture will be used in the future where water is plentiful.

We saw new mower blades being placed in reels by mechanics and then ground and sharpened by the maintenance men. This indicates know-how and ingenuity is available, and, it allows them to cope with equipment supply difficulties. How would our clubs fare under such restrictions? I'm sure we could do it if we had to! I did not see any hydraulic-operated fairway units; however, I did see 11 fairway units being operated at one time, but this was limited to a flat, open golf course.

Buenos Aires is on the 34th latitude South of the equator and our 34th latitude is just North of Atlanta, Georgia. I observed many species of grasses very similar or the same as seen on golf courses in this area. If you check a map, you will find that Argentina extends over 3,000 miles north and south from almost the tropics to the tundra.

Two weeds observed throughout the trip were white clover and *Poa annua.* I did not see goosegrass or crowfoot, however *Poa annua* was on practically every course. Other weeds were white clover, dallisgrass, carpetweed, and various sedge-like plants. One I recall was a pest called "hog's hair"; it belonged to the Juncus. It was a very aggressive sort, and in some instances greens were renovated to get rid of it. However, herbicides should eliminate it in bermudagrass greens.

Fertilization of fairways is minimal, with some receiving no more than one pound of nitrogen per 1,000 square feet per year consisting of a complete fertilizer or nitrogen alone. The soils near Buenos Aires are naturally fertile, and therefore they do not follow fertilization practices similar to ours. Some of the best fairways were on a municipal course near downtown Buenos Aires where play was the heaviest of any course we visited.

We saw some bermudagrass greens in the Rosario area that had small, round, dead areas in undecomposed organic material. On examining them with a soil prober, layers of organic material and dead, black rhizomes and underground parts of bermudagrass were prevalent. In the upper South, we would consider this a typical Spring Deadspot area. Weeds had grown back into these typical areas. A thorough aerification would be quite helpful since these greens have not been aerified. We observed some hand spiking equipment, but it is used only in problem areas where the ground becomes extremely hard and the grass is thinned out or dies.

Interest in golf seems to be increasing in Argentina, and no doubt the World Amateur Team Championships has been an influence. The people we met were very friendly and helpful at all times. It was unfortunate that we could not speak their language; however, we always found someone who could understand some English. We felt very uneducated to be confined to only one language. Would I go again? Indeed I would! I have always wanted to visit South America, but never dreamed that golf would make it a reality. We met many very interesting people and enjoyed the excellent hospitality of the Argentine.

Bunkers with walls made from piling or other material are not new as this 6 to 8 foot wall was built about 70 years ago.

A Golf Superintendent should be A Golf Superintendent should be A Golf Superintendent should be A Golf Superintendent

by **PAUL N. VOYKIN**, Golf Superintendent, Briarwood C.C., Illinois

A trend in our golf course profession is perturbing me; this month I would like to expound on it. I may be mistaken, but I think I see our golf course superintendent's profession turning from its true direction. I am speaking of the recent trend of green superintendents slowly encroaching on the field of managership and away from our true profession of greenkeeping. This situation, I believe, has developed from the managers becoming general managers and taking charge of the whole clubhouse-and-grounds operation. As a result of their yet unproven venture, we have become panicky and think that by acquiring new titles and certificates, by attending bookkeeping and finance seminars, and urgently seeking further clubhouse property responsibilities, the situation will change.

I don't think so. A Golf Course Superintendent is a Golf Course Superintendent, and a Manager is a Manager, and the only way this fact will change is if you wish to change your profession completely. If that's what you want, go ahead, but do it full turn, please. Do not play games—you're only fooling yourself.

In my case there is no conflict. I know what I want to be—a good greenkeeper and nothing else. I'll be happy with that title, because, you see, I know something else—call it a basic managerial premise, if you wish. That is, unless the golf course superintendent is in complete charge of all and total bookkeeping, and unless all money passes through his office, he can never be top dog or in full control at the club: at least not in the eyes of the board members. This fact is as sure and true as the fact that the golf professional will always be the glamour man at the country club no matter how many double knits you own or how well you groom the grass.

Clouding up our true identity by seeking out extra jobs and taking more responsibility for a little more money has nothing to do with our real profession and skill of growing and manicuring grass. This is futile hypocrisy. General managership is not our business. The managers who have taken over completely and are now total general managers have sold down the river their true responsibility to the club. They have taken on too many responsibilities and have gone into fields that they know nothing about. Let's not play their ambitious game. As in the past top clubs will learn that it's not going to work, and there really is no money saved.

Let me be absolutely blunt. Become a manager or stay a golf course superintendent, but whatever, be true to yourself—you can't be superb at both jobs. Declare your hand. Don't get into a mixed-up ball game unless you want to change jobs every few years as some general managers are doing. The wise ones (and we have a few outstanding ones in the Chicago area) work with us, cooperate with us, communicate and coordinate with us, and they are smart enough to keep out of our areas of responsibility—something they know nothing about. That's the way it should be.

I would like to say something else. I am not, nor is anybody else, impressed by greenkeepers calling themselves property managers, golf engineers, turf managers and other nonsensical names. Golf or green superintendents—yes, greenkeepers—lovely, "grass growers" or "grass farmers" is fine with me. I know what I am and I make good money at it. I don't need to seek extra "janitorial" jobs around the clubhouse to tarnish my true professional image. My direct responsibility is the golf course and that load is heavy enough for me. And please don't give me that old business about shrinking my duty as a breadwinner, or not being able to take on extra responsibility, or not trying to uplift our profession. I take on more responsibility and I am more involved with exciting things than I know what to do with—for my family and for the image of my profession. And I know many of you are the same. Long ago I could have become manager, but that's not my forte. I am a GREEN-

KEEPER, and in this field of endeavor I strive for perfection.

There is something else I must tell you that is in me (and unless you have a touch of the same, you might as well become a manager or go into something else). I would miss the soft warm rains that fall on the turf that I grow. I would miss the white snow that covers the golf course in late fall for the first time, melts, and then softly comes again. I would truly miss all the challenges of nature that go with my profession. The hot sun of summer heat and the salty sweat of humidity on my brow. I would miss the pleasure of admiring turf manicured and maintained under both good and adverse conditions and knowing that I had a hand in keeping the verdant picture that way. But of course there would be other things, also, soothing the frustrations of working with nature. I would miss her many gifts to us greenkeepers, the trees changing in the seasons and the flowering shrubs in spring. I would miss the daisies and other wild flowers hiding from our mowers next to the majestic elms, and I would miss the pheasants calling to their mates in early morning. I know I would miss the honest faces of commercial friends calling on me and old greenkeepers advising me. But most of all I would miss getting up each early morning and playing the endless chess game of man against nature, or perhaps more truthfully, trying to work with her and relishing the achievement and, oh, the satisfaction and the pleasure that comes once in a while each season when just for a short time I have won the battle.

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A TURF TIP FROM *DAVE*

Dave Miller, Superintendent at Saucon Valley Country Club, Bethlehem, Pa., has devised this ingenious idea for directing golf cars to rough areas on inclement days. The sign is made of plastic, it's attractive, it's easily attached and removed with one turn of the allen wrench. On days when not attached to the golf car, members know they can use the fairways. This is far more effective than a rule or regulation sign permanently attached to the golf car—no one pays any attention to it after the first reading.

TURF TWISTERS

TIME TO SHOOT

Question: When is the best time to aerate greens without encouraging *Poa annua* invasion? (Ohio)

Answer: Green aerification should take place only when your bentgrass is actively growing and will compete against any *Poa annua* invasion. Late spring and summer is preferred to early spring or fall.

THE FOWL COOT

Statement: Your readers may be interested in knowing of our success in ridding our golf course of coots. Over the years, we have tried everything imaginable—including a "coot drive cage" at the end of a fairway—it didn't work. Recently, a falconer hobbiest brought his trained hawk and one falcon. It wasn't long after his predators were released that the coots got the message. The entire flock left the area and we've seen only a few stragglers since. (California)

Comment: It's a fowl story, but some hobbies pay!

WITH THE STORED LOOT

Question: What is the average shelf life of the various types of chemical pesticides? Are there any tests I can perform to check their condition? (Rhode Island)

Answer: With proper storage, pesticides can generally last one to two years. They should be stored dry and warm, not frozen. Here are some tests you can perform to determine if the chemicals have deteriorated.

A) Emulsifiable Concentrates — When milky coloration does not occur by adding water, when sludge is present, and when any of the components separate, the product has deteriorated.

B) Oil Sprays — When milky coloration does not occur by adding water.

C) Wettable Powders — When excessive lumping occurs and the product will not suspend in water.

D) Dusts — Excessive lumping.

E) Granulars — Excessive lumping.

F) Aerosols — These are generally effective until the dispenser no longer sprays.