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WINTER INJURY TO TURF

JUST as there are many different causes of injury to turf in the summer, likewise there are many causes of injury during the winter. Too frequently turf injury that occurs during late fall, winter and early spring is simply called "winter injury" or "winterkill" without any attempt to determine the specific cause. Suppose that a snowmold preventive treatment was made in late fall and that when the putting greens began to show color in the spring some injured turf was found. Should the practice of applying the snowmold preventive be given up or should one run back through the happenings of the winter in the hope of explaining the injury on some basis other than a fungus disease? The answer is rather obvious although many times the turf grower is unsatisfied because the snowmold treatment applied in the fall did not prevent all injury to the turf during the winter season.

Practically all winter injuries to turf are preventable. In order that these precautions may be used to advantage it is advisable to gain a knowledge of the grasses composing the turf; the prevalence, severity and control of cool weather fungus diseases; the drainage conditions, both at the surface and in the soil; and the ordinary weather conditions to be expected. With this information plus the opportunity to inspect the turf at frequent intervals during the dormant period the greenkeeper should be able to explain the injuries which may occur and take steps to prevent their repetition if sufficient funds are made available for the necessary work involved.

Injury by Low Temperature: Bermuda and other common southern grasses are confined in the South because of periodic injury from low temperatures farther north. Along the northern border of the area in which Bermuda grass is used for turf the greens may show winter injury while the fairways are free from it. Under the system of dual greens those for summer use are sometimes covered with pine needles, etc., in order to protect them during the winter. In other sections, simply withholding fertilizer after late summer has prevented this injury. Close clipping also may tend to lower the resistance of these grasses to low temperature.

Practically all of the cultivated bents, bluegrasses and fescues are tolerant of intense cold when they are in a dormant state. Conditions which induce active growth usually lower resistance to cold. It is the sudden drop in temperature following a period when the grasses are more or less in active growth that causes cold injury, and where winters are severe it is well to allow the greens to become dormant early. Late fertilizing tends to induce active growth of the grasses depending on the weather during the winter and early spring, and many times snow or ice coverings have a similar effect. If a turf is too heavily matted the plants are more apt to be injured by low temperatures. Grasses which tend to become green early in the spring are probably more susceptible to this type of winter injury than those which are rather late in becoming green.

Snowmold and Other Diseases: Snowmold may appear as a thick cottony growth of mycelium covering the turf or in later stages as irregular patches of grayish dead turf somewhat resembling brownpatch. In any case a rather definite patch is apparent. Snow is important for the growth of the snowmold fungi only to the extent that it provides a favorable temperature and moisture, because in the Pacific Northwest and occasionally elsewhere the disease is active during the winter season when there is an abundance of mist or rain but with little or no snow.

Red fescue, *Poa annua* and some of the strains of creeping bent appear to be particularly susceptible to snowmold. Of the common bents in use on putting greens, seaside creeping bent appears to be the most susceptible. The Columbia, Inverness and some similar strains are also in this class.

Covering greens with manure, straw and the like has proved unwise where snowmold has been found to be a serious pest. The use of any covering which keeps the grass wet after the snow has melted and the grass has commenced growth should be avoided. Fertilizing late in the growing season also has been shown to favor the disease. A layer of snow on unfrozen ground is particularly favorable for snowmold disease.

If the particular conditions are considered favorable for snowmold it is good insurance to apply a preventive treatment now. Even should the greens be covered with snow it is still practicable to apply corrosive sublimate or a mixture of calomel and corrosive sublimate at the rate of 2 to 3 ounces to 1,000 square feet, mixed with sand. Under the extreme western conditions where the winters are open, more nearly perfect control is obtained by repeating treatments with mercury compounds in the fall, winter and spring and applying less material each time. It is also a good practice to treat badly diseased patches as soon as they are evident in early spring even though a fall treatment was applied. Every means to bring about quick killing of the fungus should be used whether or not the mercury material is applied.

Another more or less common disease of late fall and early spring is ringspot, which does not yield as readily to the ordinary mercury fungicides at the rate applied for the prevention of snowmold. For more details on this and other diseases, including winter injuries, refer to the Bulletin of the United States Golf Association Green Section, Vol. 12, pp. 86-186.

There is a less known disease of cool weather occurring in New England caused by the fungus *Corticium fuciforme* which forms patches somewhat intermediate between snowmold and dollarspot.

There is always a question as to the advisability of removing snow in order to lessen the injury to greens. The snow may interfere with the flow of water so that drainage channels are needed through the drifts. However, there should be no need for wholesale shoveling of snow provided the mercury treatment for the snowmold disease has been put on and provided proper precautions as to fall fertilizing and resistant grasses have been taken.

Poor Drainage: Inadequate drainage is probably the greatest of all causes of wintry injury. There are a number of factors which are involved in this problem particularly during the winter. Although drainage may be good during the summer, the snow, ice and frozen soil all combine to prevent the water from running off or penetrating the soil in winter. Too frequently the turf is weakened by poor drainage conditions during the summer as well as winter.

An important cause of injury, particularly to seedling turf, is the alternate freezing and thawing (heaving) which is aggravated by poor drainage both on the surface and in the soil. As a rule heaving is worse in heavy soils than in light soils.

A covering of snow is usually desirable provided the soil is frozen under the snow and that natural drainage ways are opened through drifts as the snow is melting. Under heavy drifts there may be a tendency for the grass to initiate growth somewhat earlier than in more exposed locations.

An ordinary covering of ice such as a sleet storm has not been found harmful to turf. However, when the drain-

age is poor and ice forms in the pools there is a decided tendency for the turf to begin to grow, since the ice and water act in the same way as a window pane. Such ice should be removed or drainage ways opened through the ice as soon as possible, particularly from the greens, as the grass is rendered more tender and may be severely injured by a sharp cold wave. The theory that ice acts as a lens to concentrate the sunlight and burn the turf has not been proved and it seems hardly a plausible explanation of the damage which may result in such cases. Skating rinks located on turf have caused little noticeable injury provided drainage conditions were good.

It may be feasible to open trenches in late fall to drain pockets in the green or fairway. By next winter these pockets should either be filled or a worth-while channel should be cut out and the sod replaced. Seepage from shelves of rock or hard pan may water-log a large portion of a fairway or green for a month or more in the spring and so provide ideal conditions for fungus growth as well as prevent the roots from penetrating deeply. It must be remembered that water excludes the air from the soil which is needed by the root as well as the top of the grass plant. Drainage of such areas by means of tile lines which intercept the seepage above the wet area is a good remedy.

Drying of Turf: The drying action of cold winds has been found to injure exposed greens or parts of them where the snow blows off or where the fall of snow is light. Under these conditions it is a good practice to hold the snow or even shovel damp snow on them since these greens are usually free from snowmold disease. Injury of this type is particularly common in the western States. Where this type of surface drying occurs, the greens should be watered late in the season and occasionally during the winter if it is practical. Snow fences and light covering with brush may be useful to prevent the snow from being blown off and exposing the turf to excessive drying.

Winter Play: In a survey of the causes of winter injury on the golf course, the player also must receive some attention. Ordinary winter play will cause no serious damage to turf wherever the topsoil is not too heavy. There are, however, critical periods during the winter when the grass is apt to be injured and at such times players should not be permitted to use the regular putting greens. On some courses with sandy soil it may not be necessary to take play off the regular greens at any time. On most courses it should be necessary to close the greens only for a few days at most, and this is usually at times when weather conditions are such that there is little play. In placing the cups for winter use it is well to choose places near the front of the green and, wherever feasible, toward the side nearest the next tee. Such positions will tend to reduce the trampling across most of the putting green area.

WINTER SPORTS FOR THE GOLF CLUB

THE golf club located in the belt in which winters are mild to severe, particularly if located close to a city, should find several advantages in encouraging winter sports. The popularity of winter sports seems to be decidedly on the increase among both the younger and the older groups. If the club is readily accessible to the members much can be done to interest them in a program of winter sports. Even though the days for winter sports may be limited in the milder regions, the members could be advised by notices whenever conditions for winter sports are favorable. Much has been said about more time for recreation, and golf courses can be made to provide the proper facilities at moderate expense. Even if a sports program does nothing more than stimulate some off-season interest in the club it will have been worth while.

Accommodations for winter sports can readily be provided by the greenkeeper and his staff. In addition to extending the use of the course to members for a larger period it provides worth-while work for the greenkeeping staff so that the most desirable workmen may be occupied throughout the season. This provision often saves the greenkeeper from the unpleasant job of "breaking in" an entirely new personnel in the spring when the busy season opens.

Coasting and skating are welcomed by the entire family. It is not as simple to find the proper place either to coast or skate as it was some years ago. On many golf courses there are places that can easily be used for skating rinks or for coasting.

Skating is usually the leading winter sport. Ordinarily the tennis courts located near the clubhouse can be flooded to form a rink. The flat surface and the accessibility of water at the courts make these areas particularly desirable for conversion to skating rinks. Any flat area on lawns, fairway or rough where water is readily available may be flooded for skating. The turf will not suffer from the ice covering provided the ground is frozen well when it is flooded and if provisions are made to allow the water to escape quickly during thaws. If there is snow on the ground it should be removed before flooding. The best skating ice is made by repeated light spraying rather than heavy flooding. The latter tends to produce "shell ice," which is an abomination to skaters. Boards 8 to 10 inches wide are high enough around the outside of a rink to build the ice against. A small hockey rink with stake and board sides 3 to 3½ feet high should be provided for the children and possibly a larger one for the grown-ups.

Ponds and lakes on the course may be used as skating rinks. Bad cracks may be sealed with snow and hot water. Occasional planing, brushing and spraying of the ice will keep it in good condition at little cost.

To provide maximum enjoyment of the sport the skating rink should be provided with a heated house which need not be large but which should include toilet facilities. Light and music amplified from a phonograph will add much to the popularity of the rink, as will contests of various sorts. It may prove advisable to have a skating instructor available.

Coasting downhill on sleds or toboggans is a popular sport and there need not be any expense involved — only a hill well covered with snow. Many fairways with long hills may be used to advantage for such slides and the turf will not suffer provided no bare spots are used. Occasionally during the middle of the day small areas on the run which had a thin covering of snow may become nearly bare. Such areas may not be important enough to stop the use of the slide but they may result in some injury to the turf. By shoveling a thin layer of snow over such areas the grass can be protected and the slide greatly improved.

The skier can often be provided with a hill steep enough for an exciting ride at no expense. A ski trail or run cut through timber or smaller growth on a steep hillside will be even more appreciated. Small jumps properly placed can be provided with small cost and will give the skiing members some good fun and exercise. A long hill sloping towards the north or northeast is ideal.

GREENKEEPERS' CONVENTION

THE eleventh annual convention of the National Association of Greenkeepers of America will be held in Washington, D. C., February 2 to 5, 1937. The plans include a three-day educational program and an extensive exhibition of equipment and materials used in golf course upkeep. John Anderson, President, has arranged a new and varied educational program which should be of much interest and value to those who attend.

As has been the case in previous conventions, the Green Section is glad to cooperate with the Greenkeepers' Association in this program. Since the 1937 convention is to be held in Washington, the Green Section will welcome the opportunity to have attending greenkeepers visit the Green Section office or its turf experimental work at Arlington, Va., just across the Potomac River. If weather conditions permit, visitors will be shown the turf experiments at the garden and the greenhouse, laboratory and office activities of the Green Section.

SEASONAL REMINDERS

TOO many golf club officials assume that as soon as the golfing season is over work on the golf course should cease. This short-sighted policy accounts for many cases of hurried and makeshift work during the rush season. It usually means waste and inefficiency as well as being unnecessarily unfair to the greenkeeper and his best workmen.

In the normal operations of most golf courses it should be possible to keep the greenkeeper well occupied during the winter months even on courses where there is no play for several weeks. On most of the better courses the greenkeeper during the winter months can also use to good advantage the services of at least one helper. Many serious interruptions and inconveniences next summer may be avoided by a little judicious use of labor during the winter months.

Overhauling Equipment: Winter offers an exellent opportunity to thoroughly overhaul machinery and equipment. Any good piece of machinery will last longer and give more effective service if it is occasionally overhauled, greased and painted. Old and worn equipment can often give additional good service with proper overhauling and replacement of worn or broken parts.

Work Shops: Any consideration of the repair of equipment and some of the other jobs naturally raises the question of proper housing for these operations. Altogether too many first-class golf courses are still maintained without an adequate workshop and sheds for housing equipment and materials used on the course. This particular season is a good time to make an appraisal of adequate building facilities in order that new construction or repair work may be started at once to provide these facilities in time to be used to advantage during the remainder of the winter.

Burning and Clearing Rough: Burning over the rough and clearing out some objectionable thickets are good jobs for late fall and winter whenever the weather will permit. If this type of work can be done early, it will keep it off the long list of jobs that must be done during the rush period in spring and it will serve also to provide better playing conditions during the winter.

Raking Leaves: This is probably the major job in fall and early winter on courses with plenty of trees. The removal of leaves and other litter from golf turf is usually a costly procedure. A few machines have been developed in recent years designed to speed up this type of work and reduce the labor cost, but on most courses the leaves are still removed by the use of the hand rake. Until machines which can do this work efficiently are in general use, the rake is all important. It may be worth while to consider the type of rake that is adapted to the purpose. A wide rake has much to recommend it for clearing leaves from greens, tees and fairways — at least double the width of those commonly in use. An example of such a rake is described and illustrated in The Bulletin of the United States Golf Association Green Section, Vol. 11, p. 224. Men who have used these rakes have found them no more difficult to handle than the ordinary size and with them one can cover a much larger area of turf in a given time.

Using Leaves for Compost: The leaves removed from various parts of the golf course may be used to good advantage for supplying organic matter in compost. Leaf mold is well recognized by plant growers as a desirable form of humus material. The cost of hauling the leaves is practically the only expense involved as the leaves are usually raked and piled, whether or not they are utilized for the compost pile. The unsightly areas in the rough or out of bounds made by burning the leaves in piles would be avoided, likewise the disadvantage of the weedy growth which often develops in these burned areas. The addition of chemical or organic fertilizer materials as the leaf humus pile is made has been found to hasten the decomposition materially.

One of the formulae for hastening decomposition in straw or leaf stacks consists of approximately 70 pounds of sulphate of ammonia, 25 pounds of superphosphate, and 55 pounds of finely ground limestone to each ton of material. The leaves should be spread in layers of about 6 inches. Each layer should be treated with the preceding fertilizers and watered individually as the pile progresses.

This work will require some labor but it will be found to be well worth while when the pile is ready for use on putting greens. Leaves may also be spread on a soil bed and worked into the soil by thorough discing. Fertilizers spread on the leaves will hasten their decomposition on the soil bed as in the case of the pile.

Screening Compost: The best time to screen compost is when it is relatively dry and friable. This condition is usually reached in the late summer, when it cannot be screened due to the rush of other work. Too many times the greenkeeping force is diverted from important work during the growing season to screen some compost. This is particularly annoying to the greenkeeper in early spring when compost may be wet and soggy and when he is pushed with other jobs. Some provision for shelter for an adequate supply of dry and screened compost ought to be made. It is a wise policy to screen enough soil for next year's use during the fall and winter.

Fill Surplus Traps: For many years the Green Section has advocated the leveling and sodding of the large number of useless and expensive traps and hazards that clutter up the fairways of many courses. Winter offers many opportunities to do much of the hauling of materials needed for such changes.

Remove Rocks and Stumps: A few winter days spent in removing outcropping rocks from fairways may save money or mower repairs next summer, in addition to making playing conditions more pleasant. Large rocks and stumps in the rough may also be removed to advantage. Dynamite will greatly facilitate the work and can be used to advantage when there is little or no play to interfere with blasting operations.

Clean Drainage Ways: Another important item of work that can as well be attended to during the late fall and winter season is the matter of drainage ditches and tile lines. Choked ditches and stopped lines of tile are unable to aid in the early opening of the golf course in the spring and may result in more than an ordinary amount of winter injury. The outlets of all tile lines should be inspected and all catch basins cleaned to allow capacity flow.

Install Tile Drains: A great many places on the golf course remain wet long enough to interfere with spring play. Many of these locations would require a relatively small amount of tile and labor. Diseases frequently appear in such poorly drained parts and the turf often suffers from the water-logged conditions. Seepage areas, for example, may interfere with an entire fairway and are usually of the sort that can be rather cheaply remedied by tiling on the uphill side. Pockets can sometimes be improved by installing French drains (pits filled with sand or gravel). This work may well occupy a number of men for several weeks during the months of little play.

Cutting and Trimming Trees: The best time to cut down trees or trim off branches is during periods of good weather during the winter months. In doing work of this kind it is well to keep in mind the opening of passage ways which will admit freer circulation of air on some of the greens and tees that are in bad air pockets. The pruning of shrubbery during the winter months will often add materially to the general appearance of the clubhouse grounds. It should be remembered, however, that many of the flowering shrubs, particularly those that bloom early in the season, should not be trimmed during the winter. In such cases the pruning is best delayed until after the shrubs have bloomed next spring.

Moving Trees: Fall and winter are good times to transplant trees. This work can be handled by any greenkeeping crew if it is done at the right time. Some detailed information on this subject appears in the Bulletin of the United States Golf Association Green Section, Vol. 10, p. 136. The tree is prepared for transplanting if time permits by pruning the roots during one or two seasons, gradually cutting around the ball and watering and fertilizing to induce growth of new roots close to the trunk. Medium to large-sized trees are conveniently moved with the ball of earth

frozen. Approximately 12 inches of root ball should be secured for each inch of the trunk diameter. If trenching is begun now the frost will penetrate deeply, and if desirable to wait until the soil freezes the place for the trench may be covered with straw or manure to save labor in digging. In the same way the hole for the tree on the new site can be dug now or covered to prevent deep freezing of the soil. The hole should be dug larger than the ball in order to allow room to fill in with good soil. Piles of such soil may also be mulched against freezing.

Fertilizing in the South: In the southern States where the summer grasses are turned brown during cold periods, it has been found that applications of fertilizer will encourage sufficient growth of grass during the intervening warmer periods to improve the playing conditions greatly. Sulphate of ammonia is the most effective fertilizer for this purpose. It should be applied during the cold period so that it may be available for the use of the grass as soon as the cold wave has passed. This method during mid-winter is effective only in the most southern portion of the Bermuda grass range.

Making and Repairing Bridges and Shelters: During slack time at this season there may be an opportunity to utilize labor to good advantage in the repair of the old bridges and shelters and possibly to install new structures wherever needed. Plans for shelters have appeared in the Bulletin of the United States Golf Association Green Section and reference may be made to the volumes and pages as follows: Vol. 3, p. 136; Vol. 13, p. 52.

Inside Painting Jobs: When weather is unseasonable for outside work there may be some inside painting of the implements, out-of-bounds and other markers, barn, and the clubhouse itself. Probably nothing has the effect of promoting a well-kept appearance as much as a new coat of paint. Winter is one of the best times for such work.

Reading: The winter months offer many opportunities for the greenkeeper to do some reading which will provide him with information which may prove of considerable value to him next season. This is a good time of the year to get together a small greenkeeper's library as part of the regular course equipment. If used with even a small degree of intelligence a greenkeeper's library will no doubt return bigger dividends to the club than any equipment on the course regardless of the cost of the equipment with which the small library cost is compared.