MANAGING TURFGRASS TRANSITION IN BOTH SPRING AND FALL

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The term "transition" in turf parlance refers to the periods of time in which turfgrasses pass from one season to another and is usually reserved to describe warm-season grass management in those seasons south of the Mason-Dixon line.

Bermudagrasses, and other warm-season grasses, become dormant in the cold season. Dormancy implies life, not death. Dormancy is initiated by cool fall temperatures and is accelerated by frost. The degree of dormancy is dependent on the latitude of the region and the severity of the cold season. Such grasses growing in the latitude covering Virginia, Kentucky and westward become completely dormant in the winter. Those growing in southern Florida may not go dormant at all.

In between these extremes, the degree of dormancy fluctuates depending on temperatures obtained. During the wintering of 1976-1977 and 1977-1978 temperatures reached 0° F in many areas and grasses became completely dormant as far south as Macon, Ga. and Dallas, Tex. A completely dormant grass is one whose stems, stolons and leaves have been killed back but whose roots, rhizomes and crowns are alive. The length of the dormant season may be long (October-March) in the northern areas and short (December-February) in more southern areas.

Warm-season grasses pass through two transitions: fall, from growth to dormancy; and spring, from dormancy to growth. Grasses must be managed differently during each. In the fall transition, grasses must be managed to enter dormancy in a healthy condition. In the spring transition, they must be brought out of dormancy as quickly as feasible for their particular use.

Healthy root system reduces the vulnerability of bermudagrass to winter-kill.

Man and nature impose many conditions which may adversely affect the grasses while in dormancy, causing winter injury and preventing satisfactory re-appearance in the spring. Man usually has the greater impact. Some of the practices of man which adversely affect dormant turf are:

non-relief of traffic-induced compaction
permitting excessive thatch development
unbalanced or excessive rates of fertilizer elements
use of non-adapted cultivars
non-correction of poor water drainage
use of improper mowing heights
over-irrigation
allowing shade on critical turf areas
misuse of pesticides

Nature capriciously adds to the effect with:
dessication by high velocity, drying winds
low temperatures of varying lengths of time
snow and/or ice cover
disease

These factors, and combinations of them, are capable of killing bermudagrasses during the dormant period. The resulting condition is commonly called winter-kill and can occur on swards in golf greens, tees, roughs and fairways, as well as in other important turf areas.

Fall Transition

Management for fall transition should begin (if it has a point of origin) in the summertime. The grass should be maintained in a healthy condition and at a reasonable rate of growth. Cultivation procedures, such as aerification, should be performed early enough to allow the grass to recuperate before the onset of conditions which will start retarding the grass. Excessive plant nutrients that are conducive to lush growth should be avoided. Nutrients should be applied only as indicated by soil tests. In order to pass through dormancy safely, grasses should have a healthy, deep root system.

Carbohydrates provide the elements for initiation of new growth from crown adventitious tissue in the spring. Because roots are the primary storage organ for carbohydrates, late summer nutrition should include adequate amounts of those nutrients which encourage good root development. Expecially important is potash and in those areas where they are lacking, phosphorus and sulfur.

Since carbohydrate reserves (and root populations) decrease when grasses are mowed, height of cut as temperature drops becomes important, needing to be raised or mowing frequencies altered. Removing too much top growth at one time results in root system reduction.

Managing turf for entrance into dormancy is complicated in many instances when warm-season swards are overseeded with cool-season grasses.

Two very different grasses must be simultaneously managed.

There are two major reasons for overseeding. Use of grass swards in the southern region is year-round, especially on golf courses. Putting is possible on a dormant bermudagrass green but color and uniformity of putting quality is a demand of southern golfers.

The second reason is because overseeded grasses do more than just provide color and putting quality. They provide active root growth which keeps the soil in a more friable condition than that provided by a dormant sod. Overseeded bermudagrass greens thus are able to take a good bit more punishment from traffic.

The growth of the overseeded grass must continue without being of detriment to the underlying bermudagrass. In some instances, the bermudagrass, in the early phases of dormancy, is inhibited by the application of a growth retardant. Generally, the culture of the sward is maintained in such a way as to protect the bermudagrass until it becomes sufficiently dormant and then management favors the overseeded grass.

Spring Transition

Bermudagrasses begin serious growth between 60-70° F (33-38° C). Once spring temperatures stabilize above 70, they grow rapidly. This occurs quite late in the spring. Growth can, and does, occur at lower temperatues but at a much slower rate. Unwanted stimulation, brought about by temperatures which initiate some response from the grass, can occur early in spring. The grass is thus subjected to alternating periods of growth and quiescence. If these are in sharp contrast to one another, winter injury may occur. It is essential not to unnecessarily stimulate the now awakening bermudagrass with nutrients. These should be applied when the alternating periods smooth out.

Growth of dormant grass is initiated by its crown cells developing both stem and root initials. The food which nurtures these initials comes, at first, from the old roots. As new stems and roots develop into mature organs, reserves in the old roots are depleted. They no longer function, except as solute conduits for a time, and eventually slough off to become part of the soil organic matter.

If nature and man have not disrupted normal biological processes, the changeover from old roots to new ones is smooth and transition is successful. Rarely, however, is an ideal transition obtained because of the aforementioned adverse conditions. It is best to discuss these as separate entities.

Compaction

It has been shown that the most important single factor contributing to death of grass in winter is compaction resulting from foot and vehicular traffic. Compaction kills grass because it prevents normal, necessary gaseous exchanges from occurring in the soil. (This is also true for grasses growing in heavy, fine-textured soils.) The necessary pore space for holding atmospheric oxygen is lacking and chemical reactions within the roots are impaired.

In late summer, the grass enters into dormancy damaged and is thus at a disadvantage and unable to withstand other adverse conditions. Carbohydrates are not stored in amounts needed for regeneration. The same conditions prevail in spring, when grass begins to emerge from dormancy.

Winter-kill indicates failure of bermudagrass to survive the dormant period of transition.

The process by which the grass plant uses oxygen to react with carbohydrates is called respiration. In an uncompacted soil, aerobic (with soil oxygen) respiration takes place. Energy, water and carbon dioxide gas are produced. In a compacted soil, respiration becomes anaerobic with less energy and greater amounts of carbon dioxide are produced. This quite toxic gas is trapped in compacted soil with resulting injury to the grass plant. In the anaerobic process, oxygen comes from stored carbohydrates and other substances within the roots. These are abnormal reactions and can only result in unhealthy or dead grass.

Cultural practices against compaction should be preventive. Traffic, both foot and vehicular, should be routed onto more tolerant areas and re-routed frequently. On high-use areas such as golf greens, cups must be moved frequently to protect the area around the hole.

In many places in the South temporary greens are established in the fairway near the permanent ones and no traffic is allowed on the latter. In some mid-South areas, mulches have been used on golf greens but the verdict on their success has not yet been rendered. In some few instances alternate greens or alternate areas on greens have been tried. Space restrictions and expense involved in erecting such greens limit their feasibility. Greens have been dyed with colorants for play but the disadvantage is that compaction is enhanced because there are no white roots, as with overseeding, to naturally relieve the effects of foot traffic. Certainly, turf areas shouldn't be used while they are exceedingly wet.

Coring, spooning, and other forms of aerification are effective cultural tools for relieving compaction. However, any such practice can be used only at the time it does the least damage to roots. As far as bermudagrass is concerned, aerification should be practiced early enough in summer for the root system to recuperate sufficiently and es-

tablish an underground system which will carry it safely through the dormant period.

Conversely, in the spring, aerification should not occur until the new grass has established itself sufficiently to withstand the loss of some roots. Any tool which harms the grass, even temporarily, should never be used when it is doubtful that the grass will recover in time to enter a stress period. Any factor which allows or promotes compaction will encourage loss during dormancy.

Thatch

Thatch is an important component in turf swards but only when excessive. A certain amount is needed to maintain balance in the microbiological community in the soil. Excessive nutrition is one cause of excessive thatch.

Soil under heavy thatch is deficient in roots or rhizomes and is more easily compacted because those plant parts are predominantly situated higher up in the thatch layer. When dry, heavy bermudagrass thatch sheds water and the soil under it becomes dry; but if wet, the thatch loses water rapidly because of evaporation.

It can readily be seen that roots and rhizomes situated in thatch are much more easily killed by low temperatures than those growing in mineral soil. Thatch, an organic medium, is also the site for pathogens which affect grasses. Since the microfloras of thatch and soil are not the same, these pathogens are not kept in balance and, given the right conditions, may parasitize plants. This relationship is discussed further under diseases.

One of the keys to thatch control is timely and judicious use of fertilizers. Excessive nitrogen results in lush growth. Bermudagrass will do well on no more than one pound of nitrogen per 1000 sq. ft. during the growing season.

Verticutting is essential, especially under higher fertilization.

Verticutting is essential, especially under higher fertilization. However, it should never be severe or deep. It should be frequent enough throughout the year to keep undesirable grass parts combed out. The use of the brush with the triplex riding mower has, unfortunately, been reduced. Brushing greens in advance of the mower will keep thatch at a minimum, reduce the need for frequent verticutting, and be less harmful to the grass.

Where thatch is very heavy, its complete removal at one time would be very detrimental. Such turf must be brought back slowly over a long period of time. Aerification is perhaps the best practice to employ in this case. This opens the thatch to air and water and allows regrowth around the aerifier holes. Topdressing should be coupled with aerification to ensure a more reliable comeback. Timing in the application of these procedures is of prime importance.

The emphasis here is that excessive thatch, among other things, leads to pathogenic problems. It, together with other factors considered in this treatise, is a prime contributor to many transition failures. Thatch control is essential to the subsequent control of turf diseases and to the production of satisfactory turf.

Turf Nutrition

It has been alluded to many times that unbalanced rates of fertilizer elements result in damage to grass. The damage comes from predisposition of the grass to the effects of adverse conditions. The most prevalent type of damage comes from lushness promoted by excess nitrogen, but there are others.

Minor elements need to be considered, chief of which may be sulfur.

Deficiencies are equally as important. Low potassium will not allow hardening of grass tissues so that they may withstand rigorous conditions. Minor elements need to be considered as well, chief of which may be sulfur.

How does one know what he does or doesn't need? The use of a soil test! Turf managers should submit soils for testing, ideally, once a year. The timely use of all fertilizer elements at the correct rates is essential for grass which withstands adversity.

The standard soil test provides a reading of soil pH. Fertilizers frequently change the soil pH over a period of time. It is essential that pH be maintained at the proper level for the grass being grown.

Calcium and magnesium are necessary minor elements in turf culture and must be maintained in the correct relationship to one another. These elements are supplied, and pH is corrected, by dolomitic limestone. This substance does not immediately alter pH but takes considerable time to be broken down. One must, therefore, be aware of the entire soil situation well enough ahead of time for correction so that bermudagrass will not be at a disadvantage as it enters dormancy.

Cultivars

Bermudagrass varieties, hybrids, and cultivars of many different kinds are used throughout the region in which we are considering transition. They do not react similarly to conditions and each requires its own form of management. The importance of this can be seen in the change in use of grasses which has come about in recent years. Zoysiagrass has replaced certain bermudagrasses on fairways and tees in the Kentucky-Missouri-Kansas region. Throughout the upper South bermudagrass greens have been replaced in many places with those of creeping bentgrass because of the former's susceptibility to spring dead spot of bermudagrass (SDS).

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Much has yet to be done in breeding better bermudagrasses in spite of the excellent work that is going on, especially in regard to winter hardiness. Present ones perform well in most years, if managed properly. Any bermudagrass should not, however, be grown at the outer edge of its range of adaptation. New grasses should be tested on location instead of arbitrarily deciding to use them.

For a number of years now, golf course superintendents in the Tennessee and north Georgia area have been critically examining Midiron (P-16) for its ability to overcome winter effects on their regular cultivars. Most seem to be pleased. Still they want more time to evaluate it. Some work at universities in the region shows this grass to perform well.

All bermudagrasses may suffer winter injury to some degree.

The same work indicates that all bermudagrasses may suffer winter injury to some degree. The best ones appear to be Tifway (419) and U-3 with Tifgreen (328). Tifdwarf and Tufcote are seemingly susceptible. Common bermudagrasses may suffer damage at times but, because of genetic diversity, performance in any one year is unpredictable. Commons selected within a region appear to tolerate winter injury a little better than other commons.

Choice of cultivars is especially important in the establishment of a turf. Spriggings and seedings that are able to withstand a severe first winter will have little difficulty in subsequent winters.

Drainage

Soils which retain water too long, especially in localized low spots, provide conditions which lead to loss of grass. The foremost condition is prevention of gaseous exchange of both oxygen and carbon dioxide, reducing transpiration and bringing about death of roots. Areas of little or no drainage are subject to prolonged freezing which brings about the same results. Too, these areas are prone to be compacted more easily by traffic. Providing drains for excess water to move out is essential to turfgrass survival in these areas.

Mowing

Turfgrasses are prevented from establishing as deep a root system as their counterparts used in forage and pasture by the kind of management applied. When a plant is fed it grows and produces leaves, stems and roots. Almost immediately, in turf management, the new top growth is removed by mowing which reduces the photosynthetic area needed for regrowth. When growth occurs again, it is primarily top growth. And again we cut it off!

Eventually, there is not much of a root system because its priority is below that of the leaves. With such a deficient root system the grass is in trouble in the winter. Raising the height of cut and reducing mowing frequency will do much to regenerate root growth. Generally, the higher the cutting height, the better the root system. The objective of mowing is not just to cut grass but to manage it in such a way as to strike a balance between roots and leaves and at the same time provide a suitable surface for a particular use.

Irrigation

Irrigation is both a boon and a detriment. When misused, it makes the work of the turf manager very difficult. Any system, that applies enough water to consistently run off the surface or to pass through the soil medium into drains, is applying too much water and courting trouble. Fertilizer is probably being leached and made unavailable to the turf. Secondly, roots are not stimulated to reach down into the soil and are usually situated within the top inch. Under these circumstances, loss of irrigation water would be catastrophic to the turf.

Thirdly, water-saturated soil is the same type of soil medium that compacted soil is. Such soil is also much more easily compacted. Atmospheric oxygen becomes unavailable and carbon dioxide becomes toxic. Lastly, this condition provides an excellent growing medium for water-loving fungi like the Pythiums which can further debilitate a root system.

Throughout the year, all factors considered, it is best to apply water only when it is needed by the plant almost to field capacity and then wait until the amount is depleted. Only then is the soil recharged. This type of application may be impractical to program into a system but shouldn't be any harder than syringing cycles.

Shade

Bermudagrasses react adversely to the slightest bit of shade. The deeper the shade, the poorer the bermudagrass with potential natural replacement by shade-tolerant grasses. Winter shade becomes of importance in turf survival because of the long shadows cast by trees, especially tall pine species. Turf shaded in this way may remain frozen much too long.

Many golf fairways situated along streams are shaded in this manner and have to be renovated each spring. It is not uncommon in the South for this condition to last from late November to late February. The result is no bermudagrass emerging in the spring. Death of the grass is due to lack of aeration and frozen tissue. To prevent this type of damage, it is necessary to remove the tall trees well in from the tree line.

Herbicides

The use of herbicides is commonplace on most golf courses for a number of purposes. Rate and timing of application is important to prevent damage to desired grasses. In regards to transition, perhaps the most critical time is in late winter or very early spring when paraquat and glyphosate are used to eliminate broadleaves, *Poa annua*, and other green species from fairways and tees and other turfs. If bermudagrass has been aroused and is growing in the slightest degree, the application of these non-selective herbicides will retard it and prevent a normal transition. The bermudagrass

Winter-kill can lose a good customer if the phenomena is not carefully explained.

must remain completely dormant in this instance. The application of herbicides to turf that is making some growth is flirting with a replanting job. In spring renovation due to winter kill, it has been found that application of herbicides may delay the establishment of a satisfactory turf. This may predispose the turf to damage in the next winter.

The use of preemergence herbicides on golf greens is a similar situation. Post-emergents should never be used at higher rates in early spring as the bermudagrass is emerging from dormancy. Know the state and condition of your summer grass and apply herbicides only when it is safe to do so and the time and dose is right!

NATURAL PHENOMENA

There is nothing that man can do about what Mother Nature does. He can however, anticipate and prepare for what she does.

Dessication

At times, under low humidity, high velocity winds may occur during the dormant season. Dessication of this nature is more serious on green grasses, but there is an effect on dormant grass as well, even though indirect. Excessive transpiration depletes the soil of water and it must be replaced, especially on overseeded greens. Dry spots are damaging to dormant turf if allowed to remain.

Temperature

The effect of temperature on dormant grasses lies in the sharp contrasts that occasionally occur between these. A sharp drop to very low temperatures after a period of warmth which has stimulated dormant grass will result in retardation, at best. The earlier in the fall and later in the spring these contrasts occur, the more damaging to the grass. The damage is first invisible but becomes manifest in the spring because damaged cells cannot function.

Play or traffic on frozen turf must not be allowed! Frosts, and temperatures which fall below 32° F (0° C), cause ice crystals to form within the cells of all grass tisssues. When pressure by any form of traffic is applied to these cells, they are injured and will die. Where the soil water is frozen in a turf it must be allowed to thaw **completely** before traffic is permitted on it. Otherwise, devastating damage to roots by shearing occurs at the interface between frozen and unfrozen soil.

Snow/Ice

Winter precipitation which lingers too long as a cover is rare in the bermudagrass region. Its effect, if it persists, is the prevention of gaseous exchange in the soil and the enhancement of disease (snow molds) with resultant loss of both dormant and green grasses. The condition, if and when it occurs and persists, must be alleviated.

Diseases

Generally, diseases are not problems on dormant bermudagrass. They do, however, affect this grass prior to and after dormancy.

The Helminthosporiums, which affect leaves, crowns and roots and are perpetual inhabitants of soil and thatch, are especially active in late summer and fall and have a direct effect on entrance of grass into dormancy. Their control should be by a year-round preventive fungicidal-cultural program.

The snow molds are rarely a problem in bermudagrass even though the causal agents (especially of pink snow mold) are omnipresent in our soils and thatch and are seen growing saprophytically on dormant turf. There is not a snow cover of enough duration.

Perhaps the most important disease of dormant bermudagrass if the root rot named spring dead spot of bermudagrass(SDS). The disease is so named because straw-colored spots ranging from a few inches to a foot in diameter remain as the grass becomes green in the spring. These spots remain dead throughout the growing season and become green only because of encroachment by stolons from the periphery of the spot. The disease usually appears the third year after establishment on turf that has been fertilized heavily and which has heavy thatch. It affects all cultivars to some degree and has been investigated since 1954. To date no causal agent has been identified.

Good evidence indicates that this is a "management disease" which can be controlled by sensible turf management. Enough is not yet known to recommend fungicides for control; these have been tested but their general use would be overly expensive at the present time.

There is a mistaken notion that this disease is a form of winter-kill. Evidence shows that this is not so; it predominantly favors pathogenic action.

In summary, providing a suitable bermudagrass turf on all areas from one summer to the next lies in the best turf management procedures it is possible to apply, and requires knowlege and use of the basic principles of turfgrass science. **WTT**