TURF CULTIVATION - PROS AND CONS

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In turf maintenance we strive for turf which is both beautiful and functional. But we also recognize the need for turf which can withstand stress conditions as well. If properly managed, a healthy turf will be growing actively enough to compete with weeds and will survive modest attacks by diseases, insects and other pests, as well as moisture stress and traffic. Of course, when any of these stresses are severe, corrective practices are necessary. As site conditions become poorer (such as shade, traffic, compaction) the susceptibility to stresses will increase the intensity of management needed to survive those stresses. Two conditions which contribute significantly to stress problems are compacted soil conditions and thatch. If these conditions exist maintenance practices will be needed which will require a number of years for improvement.

Compacted Soils

On many turf sites the soils have been highly compacted by grading or preparing the site while the soil was wet. Contributing further to the problem is the fact that many sites have not been established on good topsoil, but on compacted subsoil which is high in clay content. These soils are especially susceptible to the compactive forces of equipment and people traffic when wet. Turfgrasses do not have very strong, aggressive or deep roots. On compacted soils this results in shallow root systems and many management problems. This presents unique difficulties for lawn care companies which are expected to provide a quality turf when most of the management practices are not under their control and when sufficient monies are not expended by the homeowner to correct the problems.

Soils are compacted by pressing the soil particles closely together resulting in a loss of pore space, especially the large pores needed for drainage. This causes several problems: 1) poor aeration for roots and desirable soil organisms; 2) slow infiltration of water leading to runoff and inefficient water use; 3) poor drainage with areas where water ponds, limiting use of the area when wet and making those areas susceptible to more compaction or rutting and footprinting; 4) a very dense soil mass that makes rooting difficult and may prevent the activity of soil animals like earthworms which could help relieve some of the compacted condition; 5) a soil which has very little resilience and can result in more injuries to children and others playing on such surfaces; 6) greater susceptibility to stresses, such as moisture stress, insects, diseases, weeds and other pests; 7) the turf will have poor traffic tolerance; 8) there may be an increased tendency to form thatch and 9) a poor quality turf will result.

Some soils are more susceptible to compaction than others. As silt and especially clay content increase, the soil can be compacted more easily than

those higher in sand. As the soil moisture increases the amount of compaction will increase. Of course, heavy equipment which exerts a high pounds per square inch pressure on the turf will result in more compaction than if low psi equipment is used. Obviously, as the site is subjected to more traffic, more compaction will occur. A good example is the edges of sidewalks or other traffic areas where the soil is highly compacted and knotweed or annual bluegrass predominate. How the turf maintenance equipment is operated can play a role in greater compaction. And a football field on which 200 pound athletes are playing ball will be subject to greater compaction than where children are playing. Vegetative cover, particularly where there is a dense turf with some thatch can absorb some of the pressure applied, reducing the amount of compaction of soil.

Thatchy Turfs

Thatch is that light brown layer which exists between the green, growing portion of the turf and the soil beneath. Some thatch (1/2 inch or less) is considered desirable for good resilience and wear tolerance, but more than 1/2 inch can result in problems. Thatchy turfs often are shallow rooted as the roots find it easier to grow in the thatch layer than in soil. This makes the turf more susceptible to stresses, particularly moisture stress and related problems as mentioned for compacted soils. Insect activity may be greater in thatchy turfs. And some herbicides and insecticides are less dependable in thatchy turfs.

Core Cultivation of Turfs

Core cultivation removes a core of soil from the turf, usually to a depth of 2 to 3 inches. Hollow tines or various spoons are used on a variety of equipment to remove these soil cores. The cores are deposited on top of the turf but may be removed with certain types of equipment.

Advantages suggested for core cultivation include: 1) improved rooting; 2) better moisture stress tolerance; 3) improved water infiltration and less runoff; 4) aids significantly in thatch control; 5) may improve resilience; 6) contributes to deeper penetration of fertilizer and lime or sulfur; 7) provides improved aeration for roots and microorganisms; 8) can break up soil layers near the surface which may limit rooting; 9) can stimulate turf growth to some degree in old turfs; and 10) can be used effectively in overseeding or renovation if the thatch layer is not too thick.

There are other points to consider in using core cultivation. There are many different types of core cultivation tools available on the market and more are coming. Some of these tools work very effectively, others are essentially ineffective. Consider the depth of penetration of the tines. If a coring unit does not penetrate to a depth of at least 2 inches (preferably deeper), very little soil is removed. This does little good for the turf, especially if the thatch is quite deep. Further, the tine size and spacing are important. The figures in Table 1 are very revealing regarding the percentage of the surface of the turf area which is affected by different tine sizes and spacings. For example, a 3/4 inch tine size (inside diameter) with a 4 inch by 6 inch tine spacing only removes soil from 1.8% of the turf

surface. In order to have any significant impact on the turf it may be necessary to make 2 or 3 passes with such a piece of equipment. The intensity of core cultivation (number of passes) will not only depend on the equipment to be used but also on the degree of soil compaction and thickness of the thatch layer that exists. The more soil that is brought to the surface and deposited on the thatch, the greater the effect on the thatch layer. And the more holes and the deeper the holes left in a compacted soil, the greater the improvement in rooting and other benefits.

Table 1. Effect of tine size and spacing on percent of soil surface exposed by core cultivation.

Tine diameter	Area of tine	Percent of surface exposed			
inch	square inch	2"x2"*	2"x4"	4"x4"	4"x6"
.25	.05	1.2%	0.6%	0.3%	0.2
.5	.20	5.0	2.5	1.3	0.8
.75	.44	11.0	5.5	2.8	1.8
1.0	.79	19.6	9.8	4.9	3.3

* Spacing between tines is 2 inches by 2 inches, etc.

As the cores are deposited on the turf they can be unsightly. On most turfs, the cores will break apart with normal use and maintenance. On more highly groomed sites, it may be wise to remove the cores or the thatch can be separated from the soil with a verticutter or similar tool and or dragging, then removing the thatch component.

Coring should be done at the proper soil moisture content to make sure the equipment is operating properly. If the soil is too dry some coring equipment will not penetrate deeply enough to be of any value, especially in the compacted areas which are in greatest need of the benefits of coring. If the soil is too wet, on the other hand, the coring equipment may do more harm than good, particularly if the wheels leave ruts in the soil.

The practice of coring does: disrupt the turf surface to some degree; may interfere with its normal use; cause some physical injury to the turf; may leave it more exposed to stresses; can provide a place for weed seeds to germinate or cutworms to get into the soil; and may disrupt a preemerge annual grass herbicide layer.

Timing of Cultivation

It is best to use core cultivation when the grass is growing actively enough to recover from an injury and grow back over the coring holes quickly and when soil moisture is adequate enough for the equipment to operate effectively. This normally means spring and fall, but it can be done in

warmer parts of the year if the turf is irrigated or sufficient rainfall occurs for recovery and growth. Summer cultivation would coincide with reduced maintenance needs for lawn care and maintenance firms, but soils may be too dry for good tine penetration. A further advantage of coring in the summer is the lower probability that weeds will germinate compared to spring and fall treatments. However, spring and fall are periods when root growth into the coring holes will be much more active, hopefully giving a stronger plant going into the summer stress time.

Considering all these factors it seems late spring and/or late fall are appropriate times to core cultivate general turfs without irrigation. These are normally times of limited stress, lower potential for weed germination, and growth is still active enough to cover the coring holes quickly. If sufficient irrigation is available, coring during lower stress periods in the summer is an alternative.

Of course, no type of cultivation should be done when the turf is in a condition of wilting or near wilting or when a given turf is likely to become stressed by disease. An example could be a leafspot susceptible Kentucky bluegrass which might be weakened by coring if cultivated during prime leafspot weather. One cultivation per year should be adequate on most general turfs unless a very severe condition exists.

Timing of cultivation should also be based on the use of the turf. Football fields can be core cultivated after the season is over in the fall and in the spring and summer, but should be avoided just previous to and during the season since there will be extensive wear on the field and it would be unwise to subject it to further injury. And other athletic fields should be cored during the off season to allow recovery before the season begins. Up to two or three coring treatments could be used on intensively used fields depending on the degree of compaction and wear present.

In renovation and overseeding procedures it will be necessary to make many passes over the area in order to bring enough soil to the surface to provide a reasonable seedbed. The number of passes needed will depend on the type of equipment used and how much soil is needed in the renovation project. This may require as high as 10 to 15 times over the area.

CONCLUSIONS

Core cultivation is a very important management practice that should be used on more turfs although it is not needed on all turfs. Specific site conditions will determine the need for coring. It should be considered as an annual practice at a frequency during the year as needed. The benefits will be seen over a period of years and will seldom show turf improvement in one year. The problems of compaction and thatch can be dealt with effectively with core cultivation only over a period of years. Remember that the real benefits of core cultivation are beneath the turf. This practice must be sold on the basis of its contribution to producing a beautiful, functional and stress tolerant turf when utilized along with other management practices.