Clay Switzer made Honourary Life Member of Sports Turf Association

[On the occasion of the Annual Field day held at London on June 17, 1992, our President, Peter Kleschnitzki had the pleasure of presenting Dr. C.M. (Clay) Switzer with an Honourary Life Membership in the Sports Turf Association. For those who were not present the following is the citation read in making the award].

CLAY SWITZER was raised on a farm near Strathroy, Ont. where he attended high school prior to entering the O.A.C. in 1949. After receiving his BSc. degree in Agriculture and his MSc in Botany, he proceeded to Iowa State to gain his Doctorate in Plant Physiology with emphasis on weed science in 1955. Clay returned to the O.A.C. to become Professor of Botany and to continue his work in weed science, but with emphasis on turf management.

Following a term as Chairman of the Botany Dept., he became Associate Dean of the O.A.C. in 1971 and Dean in 1972. After 11 years as Dean he moved to Deputy Minister of Agriculture in 1984, a position he held until 1989. Since then he has acted as a consultant to the Federal government and as Special Assistant to the President of the University of Guelph.

As Special Assistant he was primarily responsible for the fund raising programme that resulted in the construction, which is now under way, of the headquarters of the Guelph Turfgrass Institute. During his term as Deputy Minister he supported the development of the Institute and the acquisition of land at Guelph on which to develop a new research facility and to construct the headquarters building. Early in his term as Deputy Minister he supported the appointment of Annette Anderson as the turf specialist in the Extension Branch of O.M.A.F.

While Dean of the O.A.C. he also was President of the International Turfgrass Society for four years during which time the Fourth Conference was hosted at Guelph in 1981. This Conference served to elevate Guelph to world recognition as a centre for turf research and to lay the ground work for the formation of the Guelph Turfgrass Institute.

During his active research career the emphasis of his work was in the area of weed control in turf and in the chemical control of growth of turf species. Furthermore, he served the weed control industry by acting as Chairman of the Ontario Weed Committee from 1962 to 1983.

Clay has been the recipient of many awards that have recognized his leadership in agriculture and weed science. They include Honourary Degree, Doctor of Laws, Dalhousie University - Alumnus of Honour, University of Guelph - Fellow of the Agricultural Institute of Canada and Fellow of Weed Science Society of America.

It is an honour for the Sports Turf Association to recognize this distinguished career by naming C.M. (Clay) Switzer a Honourary Life Member of the Association. It is our sincere wish that Clay will have many more years to serve the industry which is his *raison d'être*.

THE EUROPEAN CHAFER

Pam Charbonneau
O.M.A.F. Turf Specialist

European chafer (Rhizotrogus majalis) is in a family of insects called the Scarab beetles. Other turf pests in this family include the Japanese beetle, June beetle and Black Turfgrass Ataenius. The larvae of these insects are called grubs and are the stage most destructive to turfgrasses. Because of the extensive damage experienced last season the focus here will be on the European chafer.

Description:

Mature adult European chafers are a medium sized, fawn coloured beetle. They are slightly smaller than the June beetle and they can be distinguished from the adult June beetle by the absence of a distinct tooth on their tarsal (foot) claw.

The grubs of European chafers have a brown hardened head capsule with three pair of true legs and the body is bent in a characteristic C-shape. They can be distinguished from the other Scarab beetles by looking at the spines on the raster (hind end) (Fig. 1).The spines on the raster of the European chafer are parallel, diverging to a V-shape toward the far end.

Damage:

Adults of European chafers are short-lived and do not feed to any great extent. Grubs of European chafers feed on the roots of all common species of turfgrass. Patches of grass turn brown and die as a result of grub feeding. The dead grass can be easily pulled out by the crowns because of the absence of roots. On a non-irrigated turf 5 - 10 grubs per sq. ft. can be tolerated and as many as 20 per sq. ft. on irrigated turf. Secondary damage caused by skunks, birds and other small mammals digging for the grubs is often more extensive than the feeding damage caused by the grubs.

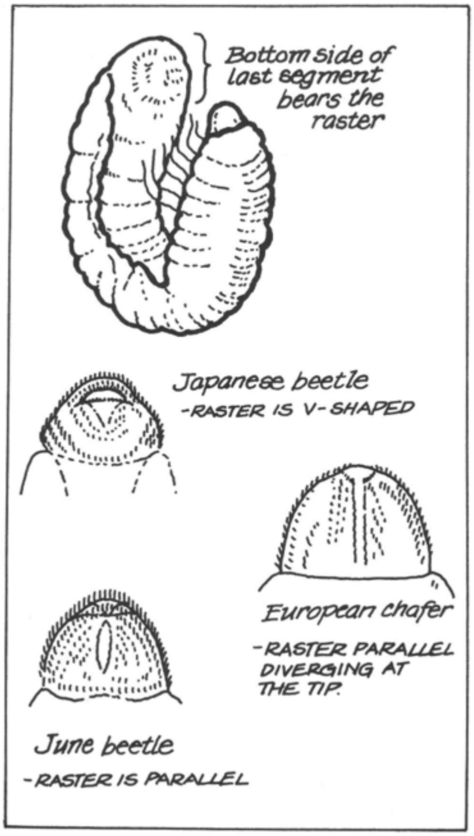

Fig. 1

Life Cycle:

The European chafer has a single generation per year. Mature grubs (3rd instar) overwinter in the soil down below the frost line. During the larval stage, grubs pass through three molts. The stage between molting is referred to as an instar. In April to mid-May they move up to the soil/thatch interface and feed until they pupate in mid-May. In mid to late June the adults emerge with peak flight activity in late June. Females congregate at night in large numbers on broad leaf trees to mate. After mating females lay eggs in the soil, usually on the south-west side of large trees, with each female being able to lay 25 - 50 eggs. Small larvae (1st instar) hatch in roughly two weeks and feed continuously until late fall when they migrate below the soil frost line to overwinter.

Control:

A few points should be kept in mind when planning your control strategy. The first step is to monitor for the grubs. Once you have established that you have grubs, you must correctly identify them. Knowing their life cycle will allow you to determine the time for control based on their vulnerable stage.

Monitoring for the presence of European chafer grubs should take place 1 -2 weeks after observation of swarms of adult beetles on trees surrounding the turf areas. Control of early larval stages with an insecticide should begin in late July and may continue throughout the fall. A spring treatment after monitoring for the presence of the grubs at the soil\thatch interface may be warranted in early April to mid-May, however, late summer to fall treatment is preferred. First instar grubs move up and down in the soil seeking moisture. During a drought, they will be down several inches and insecticide treatments will not reach them. Consult *O.M.A.F. Publication 384, Recommendations for Turfgrass Management* for current insecticide recommendations.

When insecticidal control is warranted, it is preferable to apply it to turf that has been watered and it is very important to water the insecticide in after treatment to a depth of 2 - 4 cm., depending on the amount of thatch.

The best defence against grubs is to maintain healthy turf with a good root system. Insuring adequate aeration, proper mowing, fertilization and irrigation will greatly enhance the turfs ability to withstand grub feeding.

Understanding Turf Management

The fifth in a series by
R.W. Sheard, PhD., P.Ag.

MOVEMENT OF WATER IN SOIL

In the last article of this series an explanation was given of the physical principles by which water is held in the soil. Water, however, does not remain stationary in the soil, but is continually moving. Water always moves from places where there is a high amount to places where there is a lesser amount. Primarily the water is moving downward due to the pull or forces of gravity. This type of water movement is called gravitational flow. Nevertheless, at the same time water may be migrating sideways, or even upward due to the capillary forces generated by the occurrence of the small **micro** pores in the soil.

Capillary Flow

While it is easy to understand that water will move down due to gravity the concept of capillary flow is less obvious. As the flow by capillary forces is through the micro pore it is often referred to as unsaturated flow. Capillary flow is the movement of water at moisture contents of field capacity or less.

A simple illustration of capillary movement is to fill a glass to the brim with water and place a dry sponge over one half of the glass. The water in contact with the sponge will be immediately move **upward** into the sponge. If water is slowly added to the glass to maintain contact between the sponge and the water, it will soon be noticed that the sponge is being wetted **sideways** from the edge of the glass as well as **upward**. The water is moving from an area of high concentration (in the glass) to an area of low concentration (in the dry sponge, both above and beyond the edge of the glass). Of course the capillary movement of water also acts in a downward direction to increase the rate of flow due to gravity.

Capillary movement of water is of great importance in supplying grass roots with water because it allows water to be replenished at the surface of a root as the zone within a millimetre or two of the root dries out due to the absorption of water by the grass.

The amount of water that will move to the root by this process and the speed at which it moves is dependent on the size, number and continuity of the micro pores. Large numbers of relatively small micro pores are to be found in clay soils, therefore, capillary movement is of greatest significance in fine textured soils.

The smaller the micro pores, the further the water can move by capillary forces. On the other hand, the slower it will move. In a sand-based rooting zone with relatively large micro pores, water can move relatively rapidly over a short distance to a root surface. In the sand the distance over which the water will travel, however, will be measured in centimetres regardless of the time allowed. In a clay soil the water may move several feet, however, it will take weeks for this to occur.

The principle of capillary flow is employed in the design of sand-based sports fields. In this design a rooting zone of 30 cm. of sand overlies gravel which creates a temporary, 'perched water table' or zone of saturation of a few centimetres depth at the base of the sand. Water may move upward from this saturated zone to replenish the water surrounding the roots near the surface at a sufficient rate and quantity to be of importance in the growth of the turf.

Under normal soil conditions the movement of water from a water table by capillary flow at a rate to be significant in growing grass is limited to less than two feet. Furthermore, because of the relationship between soil air and water, it is preferable in sports fields constructed on natural soil materials to not have a water table within two feet of the surface. Tile drainage is recommended to prevent the water table from coming closer to the surface.

Gravitational Flow

Flow of water by gravity is important in the rapid removal of excess water and the return of air to the system. Gravitational flow, often referred to as saturated flow, occurs in the macro pores of the soil and only occurs when the moisture content of the soil rises above field capacity.

When gravitational flow is restricted it is necessary to install artificial drainage systems. Removal of gravitational water, however, does not remove any water of value in the production of grass.

Infiltration Rate

An important measurement of soil water movement is the rate at which water enters the soil surface - the infiltration rate. The value is an indication of the potential for erosion or water runoff, an event which seldom occurs with a turf covered surface. Under sports field conditions localized ponding may occur after heavy rains if the infiltration rate is low. It must be

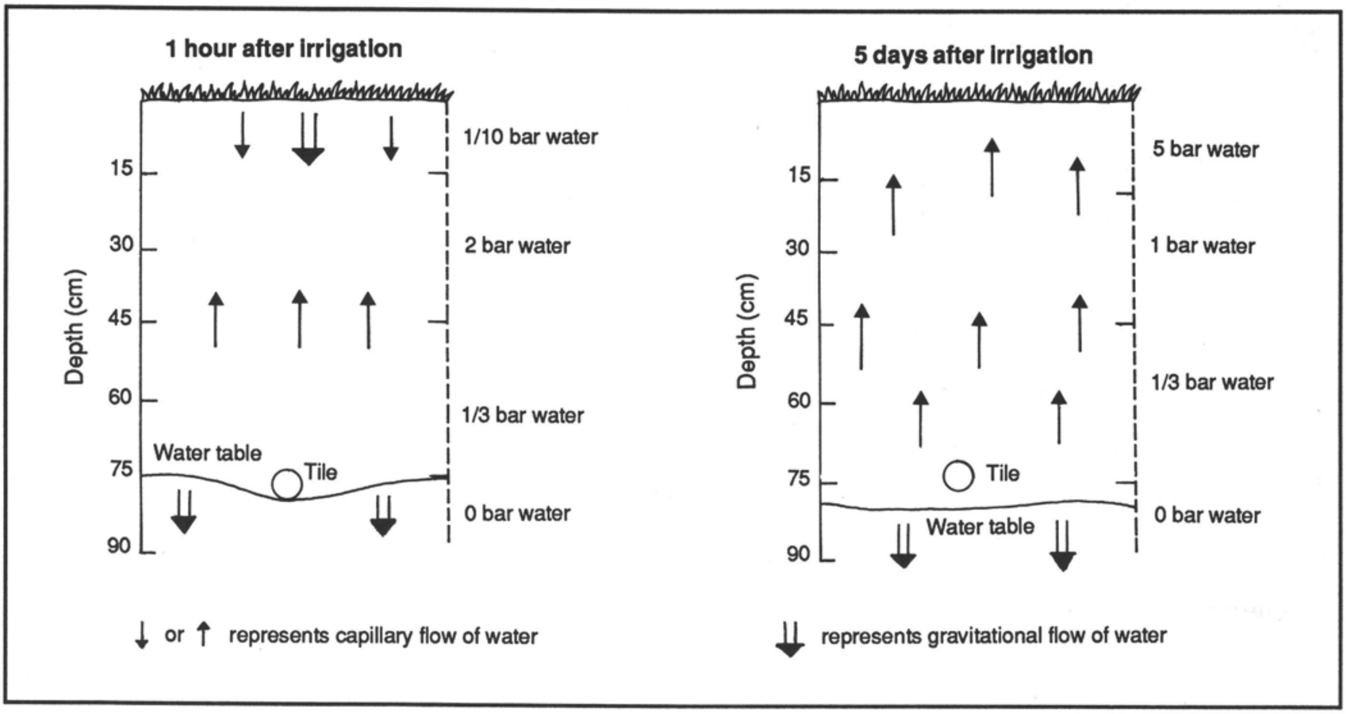

Fig. 1: The direction and type of movement of water in a soil profile under turf one hour and five days after irrigation or rain. The approximate tensions on the water at different depths are given on the right side of each diagram.

remembered that where the infiltration rate is low the rate at which irrigation water may be applied must be restricted.

Generally the infiltration rate in soils growing turf is related to the clay content, the degree of compaction and the occurrence of thatch. Soils high in clay have a lower infiltration rate than sands due to the lower percentage of macro pores. Similarly compaction, which tends to reduce macro porosity, restricts the infiltration rate. Dry spots occur where there is thatch build up, particularly if the thatch is allowed to become air dry. Due to the resistance to rewetting, the water tends to run to areas where the thatch is thinner or has not dried to the same degree, causing uneven wetting of the soil.

Generally an infiltration rate slightly greater than the expected intensity of storm rains is desired. Under Ontario conditions the intensity is seldom greater than 7.5 cm. per hour. Sand-based systems which have properly selected sands will have an infiltration rate meeting this standard.

Textural Barrier

Playing field construction using an imported material of significantly different texture from the underlying material, creating a 'textural discontinuity' or 'textural barrier', may result in a 'perched water table'. A 'perched water table' is a temporary zone of saturation because gravitational flow of water is restricted.

Textural barriers occur in sports fields under two widely different conditions. The first condition is where a coarse material, such as sand, is placed over clay. The percolation rate in the clay may be 1000 times or more slower than in the sand, resulting in a temporary saturated zone of a few centimetres at the surface of the clay layer. Eventually as the soil dries the sand will, in reality, dry faster due to the increased suction placed on the sand layer from the fine micro pores in the underlying clay.

The second condition is found where a fine sand material is placed over small stone. Again, due to the marked difference in pore size, water will not move from the sand into the stone layer until a zone of saturation builds up at the base of the finer material. The water must be at zero tension before it will 'drip' into the stone layer.

This second condition of a 'textural barrier' is an advantage in sand-based sports field construction because it provides a reservoir of water which may move upward to the active root growth area by capillary flow. By using the 'perched water table' principle greater water use efficiency is achieved and the frequency of irrigation is reduced.

It is interesting to note that at the surface of a drain tile a similar phenomenon occurs. Gravitational water does not enter the tile line until the tension on the water reaches zero. Therefore there will be a thin 'perched water table' at the surface of the tile until the soil moisture content drops to near field capacity. Placing stone around the tile only moves the 'perched water table' back to the interface between the stone and the soil material and does not speed up the flow of water into the tile.

Closing the loop of recycling:

Using Waste Derived Composts on Athletic Fields

Ron Alexander
E & A Environmental Consultants, Inc.,
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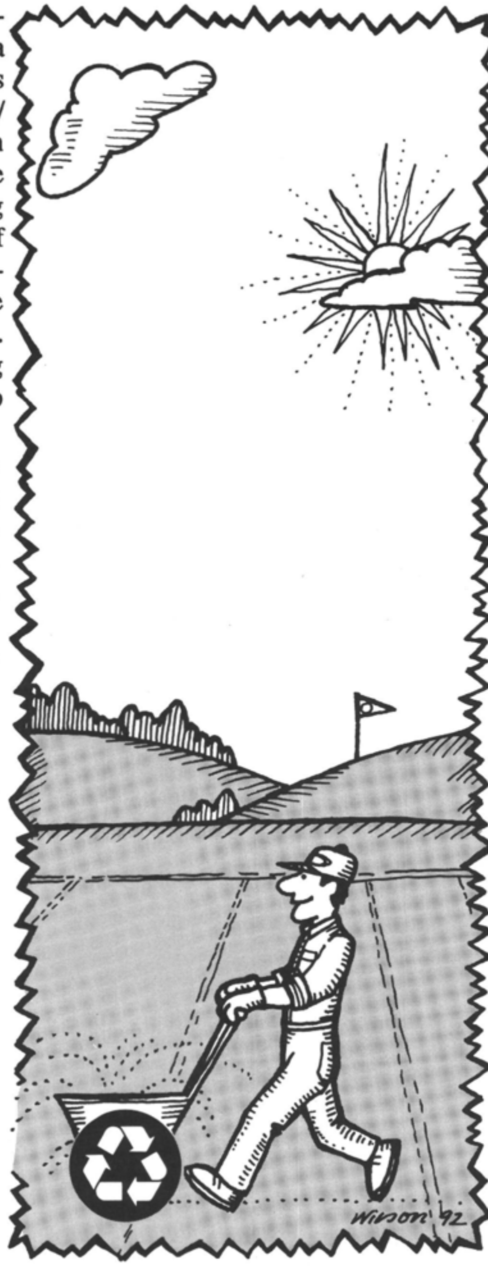
Large cities have the seemingly impossible task of maintaining a thousand or more athletic fields throughout their school and parks/recreation facilities at any given time. In any given city or municipality there are many athletic fields which are not being adequately maintained. In a time of decreasing budgets, it is time to consider the cost effective use of waste derived composts on our athletic fields. Not only will municipalities be aiding the cause of recycling, but they will also be making their fields safer to play on!

Today, athletic field safety and the issue of liability on poorly maintained athletic fields is getting more and more media coverage. The national exposure given professional athletes which have received artificial turf injuries has even accentuated the issue. Over the past several years, studies compiled at Pennsylvania State University (PSU) have shown quantitatively that properly maintained athletic fields are in fact safer to play on than fields which are not adequately maintained. They are also finding that the more use a field gets, the more care a field needs. Indeed, many natural turf athletic fields have been shown to be harder than artificial turf fields.

Researchers at PSU believe that better fields possess smoother surfaces, lower bulk densities (less compacted soil), more vegetative cover and a denser turf cover. Waste derived composts, produced from leaf and yard waste, municipal solid waste and sludge, can be utilized to enhance all of these conditions. PSU also points out that the soil's properties, as well as field maintenance practices, greatly influence the quality of the turf stand and therefore influence athletic field safety. In one study, PSU found that one out of five (20 %) athletic field injuries were "definitely or possibly field related". Consequently, if a player gets hurt and it is proven that the athletic field was not properly maintained, someone may be held liable.



At the same time, our supply of organic matter has been on the increase. The supply is being influenced by many municipalities and cities which have found an environmentally sound method of turning sewage sludge, leaf and yard waste, municipal solid waste (MSW), and other organic waste into high quality compost products. Through composting, these organic waste materials are now being manufactured into a safe, high quality, inexpensive, nutrient rich source of organic matter.

So what does all this mean? 1) The use of waste derived composts on the maintenance, renovation, and construction of athletic fields has tremendous potential, and 2) this end use could allow quantities of compost to improve the quality of turf areas currently being ignored.

This brings us to an often asked question, "Are waste derived composts (specifically municipal solid waste and sludge based composts) safe to use on athletic fields? Of course they are. Waste derived composts which meet provincial standards are without doubt safe to use on athletic fields. However, you will find this to be a commonly asked question by members of the general public. Their common fears will be related to heavy metal content and bacteria (virus, fungi, etc.) levels in the compost. When discussing these safety related issues, it is important to know that: 1) only compost produced from "clean" or low metal organic wastes can be marketed to the general public, and 2) current composting methods were designed to create temperature high enough to destroy potentially harmful organisms. So we, as green industry professionals, must have enough technical knowledge to address their concerns. We must understand the benefits and actual dangers of using waste derived materials if we are to convey that information to the general public.

Back in February of 1987, rumour had it that Milorganite, a fertilizer derived from sewage sludge, was linked to Amyothropic Lateral Sclerosis (ALS), commonly known as Lou Gehrig's Disease. Circumstantial evidence was gathered and the press was judge and jury. It was assumed that because Milorganite was used on the San Francisco 49er's football fields and that three members of the 49ers were afflicted with ALS (two had died from it), that Milorganite was the cause of ALS. This situation got national exposure through the news media, but after a short period of time, Milorganite was cleared by a distinguished panel of federal and state health officials. Stating that "there is no evidence to indicate an increase incidence of ALS" in areas where Milorganite was used or manufactured and that "associating the disease with Milorganite was premature and speculative" Milorganite's good reputation was upheld.

Unfortunately, these types of unsubstantiated attacks are common place in the recycling or "waste to resources" industry. That is just the nature of the beast. We are often easy targets for many sceptics in the world. Unfortunately, only time and continued public education will change the negative image toward recycled products.

Though extremely versatile, waste derived composts are primarily used by sports turf professionals in three ways: 1) as a top dressing to help maintain the quality of the turf surface, 2) as a soil amendment, used in the renovation of athletic fields and 3) as a component to athletic field mixes used in the construction of new fields.

Topdressing

Topdressing has long been a reliable turf maintenance practice in the golf course industry. The practice entails applying a thin uniform layer of "topdressing" material over an established and usually declining turf area. Topdressing is performed for many reasons including: promoting seed germination, increasing the organic matter content of soil and levelling the surface of turf areas. Topdressing is usually done in conjunction with aerification and reseeding. Aerification is a practice where hollow and/or spoon like tines are projected into the soil. As they are removed, small plugs of soil are removed and deposited on the soil surface. The topdressing material would then be applied and through dragging the holes would be refilled with the topdressing material. When topdressing is performed along with aerification, many other benefits are obtained. These benefits include: improved soil drainage, increasing the water holding capacity of soil and reducing soil compaction. Commonly used topdressings are topsoil, compost, sand and sand based mixes.

Topdressing is often used as a maintenance practice on turf ares which are over used or on the decline. When topdressing is applied in conjunction with seeding, seed germination will improve. Because the topdressing improves the environment of seed germination, both the speed and percentage of seeds germinating will be improved.

When using compost as topdressing, the finer the compost is, the better. Most professionals prefer a topdressing material which is screened through a one quarter inch screener. The best equipment to use to apply topdressing are units which apply compost directly onto the soil surface and not up in the air (like manure spreaders do). By applying the compost directly onto the soil surface you will achieve better uniformity, while creating less odour and mess.

Topdressing Athletic Fields with Waste Derived Composts - Step by Step

1. Heavily core, aerifying the entire field, concentrating on most heavily trafficked areas.
2. Apply approximately a half inch layer of compost or 50/50 sand/compost mixture. The most uniform and efficient way to apply the compost is with a topdressing unit or a manure spreader.
3. Smooth the turf surface using a raking device or using a weighted drag mat. The raking/dragging will break up the soil plugs. mix them with the compost and backfill the holes.
4. Seed and water the topdressing area. It is important not to leave the grass seed on the soil surface. It should be mixed into the soil/compost layer.

Renovating

When athletic fields are over used and large portions of the vegetative cover have been destroyed, it will be necessary to renovate them. Renovating the fields entails destroying the surviving turf stand in favour of establishing a new, healthier one.

The quality of an athletic field's turf cover is greatly influenced by the amount of usage the field receives and its areas of highest wear. Each type of athletic field has its own "wear pattern" (areas of concentrated use). On football fields, most of the wear is in the centre of the field "between the hash marks". On soccer and field hockey fields, the goal area is the most heavily worn.

These areas are sparsely covered with turf and the soil beneath them is extremely compacted. The renovation process will loosen the soil allowing the grass roots to grow deeply.

The addition of compost will improve the characteristics of specific soils in different ways. In heavier, clay based soils, the compost will lighten the soil, improving drainage and slowing compaction. In the lighter, sandier soils, the compost will improve the soil's water holding capacity and nutrient utilization ability.

This new compost enriched soil will provide an excellent medium for turf growth. It will also allow the turf stand to survive through more stressful environmental conditions such as drought.

Renovating Athletic Fields with Waste Derived Compost Step by Step

1. Mechanically till the entire field, turning the soil and destroying the remaining vegetation. A rototiller or farm disk are the best pieces of equipment to use. Killing the existing turf cover with a non-selective herbicide may be worthwhile if weed infestation is significant.
2. Apply two or three inches of compost over the entire field. More product can be used in ares on the filed which have received the most wear (e.g., centre of football fields). Incorporate the compost into the filed soil to a depth of six to ten inches. Normally, the deeper you can incorporate the product the better. Work the soil until it is thoroughly mixed and clump free.
3. Shape and smooth the field using a raking device. Firm the field using a light roller. Establish a crown on the field if desired.
4. Seed and water the field. Make sure the seed is incorporated into the top one quarter inch of modified soil.

Construction

The use of waste derived composts in the construction of new athletic fields will continue to increase as the popularity of soilless sand based athletic field mixes increases. Because athletic fields are receiving so much usage, field mixes are now being designed which do not readily compact. Recommended mixes for these fields consist mainly of uniform sand, with a small amount of organic matter or topsoil added for good measure. Less and less topsoil is being used because it is difficult to find large uniform and weed free sources of it. A common mix will consist of nine parts sand to one part organic material (usually peat moss) or eight parts sand to one part top soil to one part organic material. Waste derived composts can be used to fulfil the organic matter requirement of this mix. They can also be used to replace topsoil in the mix entirely. waste derived composts will prove to be much more uniform than commercially available topsoil and less expensive than the commercially available bulk organic matter sources.

Compost screened through a three-eighths of an inch screen will work quite well in athletic field construction projects. This slightly coarser compost will improve field drainage and slow compaction.

Within a few months a new, densely vegetated , wear tolerant field will be ready for use. The field will have excellent drainage and will not readily compact.

It is becoming increasingly important for our society to reduce the amounts of waste it has to dispose of.

Constructing Athletic Fields With Waste Derived Composts - Step by Step

1. Using front end loaders or other bulk blending machinery, manufacture your field mix. To ensure uniformity, manufacture the mix in small controllable batches. mixing should be done off the construction site.
2. Spread the athletic field construction mix using a grading blade over the entire field, starting from the centre of the field and working out. For optimum results, the mix should be spread to a depth of 12 inches.
3. Shape and smooth the field using a raking device. Firm the field using a light roller. Establish a crown on the field if desired.
4. Seed and water the field. To improve seed germination, incorporate the grass into the top one quarter inch of the construction mix.

Technology has allowed us to manufacture high quality products out of many waste materials, while research has developed sound agronomic and horticultural end uses for these products. Only through usage of these newly created products can we close the loop of recycling.

The use of these products by the general public, by our business community and by government institutions is vital. Creativity will allow us to utilize these products for the betterment of all. A good example of this is the usage of waste derived compost for the improvement of athletic fields on which our children play. It aids the environment, enhances athletic field safety and gives us peace of mind. That is what I call closing the loop of recycling.

Ed. Note: This article is reproduced with permission from Landscape Trades, Jan. 1992.

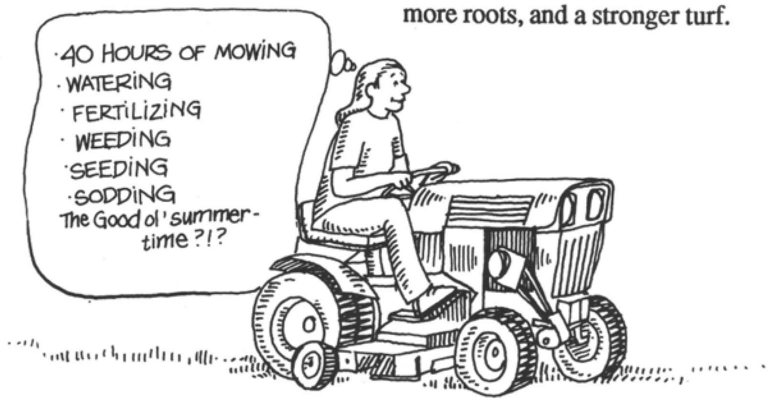
Compost Research at GTI

A two year (1990-1991) field study was conducted on established Kentucky bluegrass at the Cambridge Research Station. Composts prepared from leaves (LC), irradiated sewage sludge (ISSC) and animal manure (AMC) were applied at 0, 10, 20, 30, and 40 tonnes compost per hectare per year. Treatments received recommended amounts of N, P and K by supplementing the compost with chemical fertilizers. The 0 rate, a control, received chemical fertilizer only. The effects of the composts were evaluated by determination of clipping weights, visual ratings, depth of thatch and plant and soil macronutrients. Except for depth of thatch, which increased but requires further investigation, compost addition enhanced visual ratings of the bluegrass and supplied a portion of the plant N, P and K requirements.

Plant nitrate concentrations were highest in the ISSC treatments in 1990, but not in 1991, whereas plant phosphorus concentrations were consistently highest with AMC in 1990 and 1991. Plant and soil K concentrations were consistently highest with AMC which contained high K concentrations. The high K may have interfered with Ca and Mg uptake as the plant concentrations of these two elements were lower with AMC. There were few differences in clipping weights in compost treatments compared to the control. Irradiation of sewage sludge prior to composting did not result in a compost that behaved differently from composts from unirradiated sources. Compost application can benefit established Kentucky bluegrass by enhancing visual quality and supplying a portion of N, P and K.

[Reproduced from P. van der Werf, T.E. Bates and R.P. Voroney, Evaluation of Compost on Established Kentucky Bluegrass. Annual Report, Dept. of Land Resource Science U. of G. 1991]

Thoughts on Mowing



If the height of cut is raised only 1/8 inch there will be an average increase in leaf surface of 300 sq. ft./1000 sq. ft. of lawn. This will allow more photosynthesis, more transpirational cooling, more roots, and a stronger turf.

Good mowing practice calls for the removal of leaf tips when growth is about one third more than the cutting height. Therefore a lawn cut with a mower set at 1 1/2 inches should be mowed soon after the growth has reached two inches.

It is estimated that the average lawn requires 40 hours of mowing a year.

Every individual Kentucky bluegrass plant produces some three feet of leaf growth in an average season. This amounts to about five tons of clippings per acre each year. When clippings are left to decay in place, they are worth the equivalent of three applications of lawn fertilizer.

now available

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- **Cultural Practices**
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by
The University of Guelph
and
The Sports Turf Association

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Learn how a grass plant grows. Study the attributes of the principal grasses - Kentucky bluegrass, perennial ryegrass, tall-fescue, and creeping bentgrass to consider in selecting the correct species for a sports field.
(Running time - 8 min. 50 sec.)

Tape 2

Cultural Practices

Study the principles related to mowing, fertilization and irrigation and the cultivation methods for controlling thatch and compaction in sports turf.
Learn the processes of overseeding or sodding of damaged play areas.
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Tape 3

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(Running time - 10 min. 30 sec.)

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Pacific Turfgrass Research Program

In a joint effort between the Western Canada Turfgrass Association and U.B.C.'s Department of Plant Science, and under the interim direction of Dr. Brian Holl, much progress has been made towards establishing a permanent program of turf trials and evaluations at the U.B.C.

The research site is located at the southwest corner of the U.B.C. campus, adjacent to newly enlarged field offices and equipment buildings. The site contains 1600 sq. m. of irrigated, sand-based experimental space in addition to conventional soil conditions. The National Turfgrass Evaluation Trials on fine fescue and perennial ryegrass are located at this U.B.C. site.

The long term goals of the program are:

1. Explore all aspects of Integrated Pest Management for non-chemical dependence.
2. Develop ongoing two-way communication between turfgrass research and turfgrass industry members.
3. Develop a data base concerning the evaluation of ground waters.
4. Support the development of a turfgrass science curriculum and research program at U.B.C.
5. Develop research projects at specific sites to address particular needs.

DID YOU KNOW?

There are 1,300,000 Kentucky bluegrass seeds per pound: 500,000 fine fescue seeds per pound: 300,000 perennial ryegrass seeds per pound; and 230,000 tall fescue seeds per pound.
These values must be taken into account in designing a turf mixture for seeding if you wish to have the same number of plants of each species in the final stand.