Categor Blast Service

Use this new Category Blast Service to get FREE information on the products or service categories listed below which you are planning to purchase within the coming nine months. You will receive information, and possibly other follow up contact, from appropriate companies advertised not just in this issue, but throughout the year in ***sportsTURF.*** Just circle the number(s) on the reader service card (opposite) corresponding to the product or service categories below and drop the card in the mail!

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9007 ......Infield mixes

9008..............Irrigation supplies

9009................Mowers

9010 ....Seed

9011 ....Site amenities

9012 ....Sod

9013 ..Turf equipment

Green Waste Composting

A small-scale version of this commercial compost operation can benefit your entire program. Courtesy: Golden Bear Arborists

by Michael DePew and Gilbert Pulley

Composting not only reduces the volume of green waste going to landfills, it produces stable organic byproduct that is useful as a soil conditioner or mulch. Composting is a natural biological process, but under controlled conditions, the time it takes to get a stable end product may be greatly reduced. The composting process is dependent on many biological and environmental factors, including microorganism population size and species composition, temperature, oxygen concentration, moisture, pH, nutrient levels, and carbon to nitrogen ratio (C:N) of the substrate material.

Two broad types of biological composting processes are possible, depending on the composting environment. These two processes are referred to as aerobic and anaerobic microbial oxidation.

Aerobic processes occur in the presence of free oxygen, while anaerobic processes occur in environments devoid of free oxygen. To produce the most beneficial compost end product in the shortest period of time and with the least odor, it is imperative to ensure that you maintain an aerobic composting environment.

Bacteria and fungi are the major players in the decomposition cycle. These microorganisms naturally colonize in the soil and in airborne dusts that will inoculate leaves and other green waste. When green waste is placed in the proper environment, these microorganisms will begin the composting process by using the green waste as an organic food source.

Under optimum conditions the microorganism population will increase rapidly, thereby increasing the rate of decomposition and degrading the raw green waste into beneficial organic material. During this composting process, water vapor, carbon dioxide, and heat are also produced, which decreases the bulk volume of the composting material.

Temperature

In aerobic composting, there are two categories of microbes that can be active. Mesophilic organisms (moderate temperature loving) become active at temperatures just above freezing. Thermophilic organisms (high temperature loving) become active at temperatures in excess of 110 degrees F. When the temperature reaches 150 to 180 degrees F, the organisms normally die or assume dormant forms.

The heat generated in a compost pile is a balance between metabolism and insulation. Heat loss occurs through pore spaces between the material, and by surface

cooling. In winter, making piles larger can protect them against excess heat loss.

During the composting process, microbe metabolism gives off heat and increases the temperature of the composting material. As the composting process continues, the temperatures will continue to rise.

In a green waste composting program that places waste in piles or rows, temperatures may stretch beyond the optimum range for microbial activity. Excessive temperatures may then slow the composting process and increase the retention time required to convert green waste into stable organic compost. The optimum temperature range for many of the more desirable composting microorganisms is between 100 to 140 degrees F.

To reduce the potential for pathogenic organisms and undesirable weed seeds, pasteurization is required. Compost pile temperatures must be held at around 140 to 150 degrees F for three or more days. This period of elevated temperatures also helps break down the larger, more resistant organic molecules.

Following this process, the pile should be turned. This will release some heat and allow the temperature to go down. Microbial activity will then increase again as the optimum temperature range is restored. The breakdown process proceeds fastest because a larger number of organisms live in this range.

Oxygen

Oxygen is one of the key elements in a desirable composting process. The atmosphere is approximately 21 percent free oxygen, but a composting pile only needs five percent to maintain aerobic microbial oxidation.

If the level of free oxygen falls below five percent, the pile quickly turns anaerobic. Anaerobic organisms digest green waste slowly, and they create smelly compounds during the process, such as ammonia, hydrogen sulfide, and many nitrogen-based compounds. Conditions that may lead to an anaerobic state include packing piles too tightly, too large, too wet, or with wastes having fine particle size. In short, an anaerobic environment is promoted by conditions in which the oxygen diffusion rate into the compost pile is diminished.

In all of these cases, the pore spaces or voids within the pile are not adequate to provide the necessary oxygen to the system. These conditions can be alleviated by turning, decreasing pile size, and/or increasing particle size in the pile. Oxygen can also be introduced by forcing air into the system with pumps or fans.

Moisture

Bacteria and fungi need moist environments to grow and reproduce. However, water dissolves the soluble nutrients that are used by the microbes. Moisture levels below 40 percent limit microbes' nutrient availability and growth. Moisture content greater than 60 percent limits oxygen flow and produces anaerobic conditions.

Incoming green waste material should be monitored so moisture can be added if the material is too dry, or dry material can be added if it is too wet. Thorough mixing of the green waste within a pile is important to ensure that moisture levels and other conditions are homogeneous. Homogeneity is important so that similar environmental conditions persist within the pile to speed the composting process and produce a uniform end product.

Many factors affect the moisture content of a compost pile. Moisture control can be enhanced by covering or indoor composting in high-rainfall areas. In drier climates, additional water may need to be added.

Sprinkler systems and rows/piles with slight depressions at the top to catch water can enhance internal moisture content. Turning the compost in the rain or snow may also help incorporate moisture in the pile. Excessive moisture can be released from a pile by frequent turning, or turning during periods of high temperature and sun.

The size of the compost pile also affects moisture. Small piles with a large surface area to volume ratio tend to dry more quickly. Capping the pile with fine material (decreasing the rate of water vapor diffusion from the pile) can decrease water loss due to evaporation.

C:N

A basic understanding of the C:N ratio is needed to manage composting operations. Carbon and nitrogen are the basic building blocks of life, and are used by the microorganisms to sustain population growth.

The availability of these elements becomes a limiting factor in compost processing. Optimum C:N ratios range from 20:1 to 40:1. When the ratio is greater than 40:1 nitrogen represents a limiting factor and reaction rate slows. With a C:N ratio below 15:1, excess nitrogen is volatilized as ammonia, lowering the fertilizer value of

the end product and generating odors.

pH

The acidity and alkalinity of material is expressed in terms of pH, which is simply a measure of the hydrogen ion concentration. The microbes involved in the composting process grow best at pH values of 6.0 to 8.0. However, the pH of the composting material is hard to predict and control.

Compost pH values below 4.2 indicated anaerobic conditions. However, other indicators of anaerobic conditions are also normally present and are more easily monitored. These include depressed temperatures and odor production.

Aerobic composting tends to be acidic at first, but as degradation progresses the pH will move toward a neutral 7.0. The fluctuations should be expected, but anaerobic composting can range from 4.5 to 5.0 pH, and can fall as low as 4.2. This is due to the production of excessive organic acids. However, organic acids are not stable, and over time they degrade to other products. The pH then tends to move toward neutral.

Steps for successful composting

A basic compost operation consists of six steps:

- Material collection
- Preprocessing
- Pile formation
- Turning/aeration
- Curing
- Shredding/screening

The most important element to a successful operation is the people you have monitoring, turning, stacking, hauling, and using the compost. It is their senses that determine how the material is handled. Look, feel, and smell all mean something to operators. They need to look for signs such as the smell of ammonia, water running out from under the pile, and the amount of fine material that sticks to your hand when you put it into the pile. If these people simply go by a schedule to turn, load, or mix the material, the operation will not be successful. Too many variables are at work to go by some "run-key" operation.

• Collection

In the collection phase of the process, the key element is to minimize the "junk." Things such as batteries, large pieces of metal, plastic, rocks, soil, wire, and twine can cause damage to equipment and pollute the end product. Taking some time to ensure that incoming loads are clean and junk-free will pay big dividends along the way. Care should also be given to ensure that the green waste remains uncontaminated by such things as oil, salt, fuel, pesticides, paints, and solvents.

• Preprocessing

The preprocessing phase involves removing undesirable or foreign objects and manipulating the size of particles included in the compost batch. Grinding can reduce particle size. The material can then be mixed with coarser bulking agents. Bulking agents are coarse ground or chipped wood products that are added to the compost to ensure good porosity and pore continuity. This porosity creates good oxygen diffusion characteristics in the pile.

Just make sure that your bulking agents are not ground too small. Smaller particles tend to pack and reduce air space. This may predispose the compost pile to anaerobic conditions. Eight-inch by two-inch wood chips may seem large, but they will allow you to turn the pile less frequently. If your compost pile is composed strictly of grass clippings, the pile may have to be turned several times each week.

If bulking agents in the compost pile are too large, it is true that the compost will have to be screened on the other end, but you can put large undecomposed material right back in the preprocessing end of another batch of compost. These coarse particles also carry the composting organisms and will serve as an inoculant to speed the onset of decomposition in the next composting batch.

Another preprocessing hint is to premix all materials as thoroughly and homogeneously as possible (and don't forget to monitor water content). This will help minimize trouble spots in the pile, like cold or hot spots. Pathogens and weed seeds will be killed, and decomposition will occur more uniformly and efficiently.

• Pile formation

Correct choice of pile size depends on many factors. Conditions that might warrant small pile size include: small particle size of the composting material, high moisture of the material or high precipitation area, high-nitrogen materials, and warm climates. Conditions that may warrant larger pile sizes include: large particle size or high proportions of bulking agents, low precipitation or low moisture, cold climate, high-wind areas, and limited space.

• Turning/aeration

Turning/aeration is one of the most important management tools.

Turning will help maintain a temperature within the 100- to 140-degree F range. If the material becomes too wet, turning will facilitate the release and evaporation of excess moisture. If too dry, turning accompanied with sprinkling will moisten the pile. Turning will also fluff the material, releasing noxious gases and reintroducing oxygen into the pore system.

• **Curing**

At this stage, we can say the compost is done. Such things as the look, feel, and smell of the compost will tell you if it is ready to be cured. When mature, the compost should be temperature stable, have no discernible foul odors, and have no distinguishable plant parts other than decomposition-resistant bulking agents or wood fibers.

Temperature stability depends on several factors. The temperature at which compost stabilizes depends on the ambient temperature, the moisture content, and the amount of wood products in the compost pile. As a general rule of thumb, temperature stability is achieved when turning/aerating the pile does not produce significant temperature fluctuations. Depending on the ambient air temperatures, stable compost can range from ambient temperature to as high as 120 degrees F.

• **Shredding/screening**

Screening is used to remove large bulking materials or large undecomposed materials from finished compost. These materials can be added to the next compost batch. Screening will also remove any rocks and debris that survived the collection and preprocessing phases. The screening process can precede curing and final decomposition.

Shredding is least critical to the process, and is optional. It is often used to make a uniform and consistent final product. Shredding size and the decision to remove bulking agents prior to shredding will depend on the intended use of the final product.

Many variables must be considered in the composting process; it may look simple, but appearances can be deceiving. It takes dedicated people to manage a composting program. They must use all available tools to get a good stable product — managing by the calendar doesn't cut it.

A good composting program can provide positive benefits to your entire program. It can divert tons of waste from landfills, provide a beneficial organic byproduct, provide good public relations opportunities, and create an environmentally friendly landscape at your facilities.

Gilbert Pulley is the Landscape Manager at Brigham Young University in Provo, UT.

Michael DePew is a sports turf agronomist with ProTurf Environmental and Sports Turf Services, L.C. Mr. DePew consults on a variety of issues in the green industry. He may be reached via e-mail at proturf@itsnet.com.

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Seed vs. Sod

Have questions? Send them to Dave at: ISU, Hort. Dept., Ames, IA 50011.

by Dr. Dave Minner

We are in the process of renovating a number of our soccer fields that are in poor condition due to over use. The park supervisor has been renovating the fields by seeding, which takes the field out of use for at least an entire season. As we are already short of soccer fields, this is not the ideal remedy.

Based on a quote of $2 per square yard for sod, I think we would be better off sodding the middle of the field and overseeding the edges. We have a watering system for the sod.

- Dave Zinnen
Woodstock Recreation Director
Woodstock, IL

Soccer field renovation can range from scattering some seed in hopes of a greener pasture, to a complete overhaul, where soil is removed and new grass is established. When you spend more money, you certainly expect to have a better field.

Please review the *Q&A* section from May 1999, "How Long Should I Wait," and the one from January 1999, "How much is too much... Round II."

I expect that there will be many more questions on how to deal with over-used fields. Your suggestion to sod the center of the field and overseed the edges is a good approach. It concentrates your resources where they are needed most.

Soccer fields usually have diamond-shaped wear patterns that are wide in the center and tapered at either goal. An average-size soccer field is approximately 82,500 square feet. The diamond-shaped traffic area will cover about 40,000 square feet. The most intense traffic areas, around the goals and at the center of the field, will cover approximately 20,000 square feet.

It makes perfectly good sense to develop separate plans for different areas of a field that have separate traffic intensities. Over-used fields should budget for annual sodding of chronic-problem areas that never seem to catch up after overseeding alone.

In some cases, the area that needs to be resodded each year may be as little as 5,000 square feet, and it's usually confined to the goal areas.

You should expect sodded areas to be ready in half the time it takes seeded areas to mature. Sodded areas also last approximately twice as long as seeded areas given the same amount of traffic.

Whatever your situation, you should expect sodded areas to be ready in half the time it takes seeded areas to mature. Sodded areas also last approximately twice as long as seeded areas given the same amount of traffic.

If we sod, how deep would you suggest we core underneath (the subsoil is in poor condition), and what would you suggest for a sub base?

I assume that when you refer to "coring underneath" you are asking how to prepare your soil before laying sod. Areas where sod will be installed should first be cut out with a sod cutter, so that the resulting field surface will have a smooth transition between the newly laid sod and the remaining sections of the field.

Hollow coring, deep-tine Vertidrain, and Floyd McKay drill-and-fill are all options for putting some nice holes in the field before laying sod. The holes can be left open or filled with sand or other amendments.

Tilling the area before resodding will require substantially more work to get the surface smooth and firm. Tilling sand into the surface of a compacted field is often suggested. Review the March 1999 *Q&A* before you try this. Remember that you usually need approximately 80-percent sand in the final mixture to begin to get some benefit in terms of less compaction and better water movement.

Hollow coring and heavy topdressing may provide a more effective and economical approach to dealing with compaction than tilling sand into the surface. With 3/4-inch hollow tines on four-inch centers, you can remove 50 percent of a field in 18 passes. So crank up those coring and topdressing practices if you want to use sand to reduce compaction.

David D. Minner, Ph.D., is an associate professor with the Department of Horticulture at Iowa State University. He serves on STMA's Certification Committee. Send your questions to Dave at: ISU, Hort. Dept., Ames, IA 50011; or call: (515) 294-2751, fax: (515) 294-0730, or e-mail: dminner@iastate.edu.

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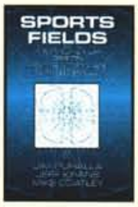

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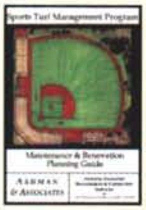
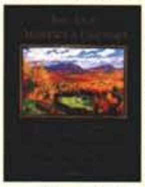
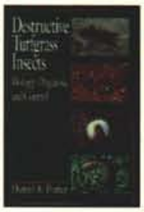
Sports Fields: A Manual for Design, Construction and Maintenance, ***by Jim Puhalla, Jeff Krans, and Mike Goatley,***
This book covers every important aspect of planning, design, construction and turfgrass maintenance with hundreds of illustrations and step-by-step procedures to help you get the job done right. No other book provides such intricate detail, combined with easy-to understand guidance. Sports Fields is unparalleled in quality, practicality, and scope. In Part 1, you will learn the basics of turfgrass science and culture. Part 2 provides complete instruction on facility design, construction and renovation - for football, soccer, field hockey, lacrosse, and more. Part 3 covers other facilities such as playground surfaces, and volleyball courts. Procedures for equipment use, quality assurance, and safety are covered in Part 4. In Part 5, you will learn about stadium management, sand fields, turf paints, and many more useful topics. 600 pgs.
4084 $74.95



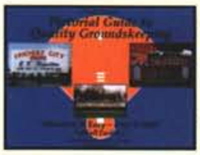
Sports Turf Management Program-Maintenance & Renovation Planning Guide, ***by Ashman & Associates***
This manual was developed to provide a coherent plan for the management of the baseball field playing surface and provides operational guidelines for the grounds crew to use as part of the maintenance plan. Enhances the "playing conditions" of the field by elevating the maintenance standards to the highest level possible. Complete descriptions of the maintenance protocol and identification of key issues to be discussed before starting objective maintenance procedures. This book provides a plan of action outlining the tasks to be completed and benchmarks to measure the progress of the program. 160 pgs. ***4024 $105.00***



NEW! **Fine Art of America's Fairways,** ***by Mike Ventola, Jr.,***
This coffee table book, featuring 48 of America's finest golf courses, showcases golf course architecture and legends of the game. Featuring 138 pieces of artwork, this book guides the reader on a unique golf journey from the majestic mountains and stark deserts of Arizona and California to the vast wetlands along the coasts of Georgia and the Carolinas. The book examines the work of celebrated golf course architects, such as Trent Jones, Tom Fazio and Jack Nicklaus. 256 pgs.
4209 $59.95



Destructive Turfgrass Insects: Biology, Diagnosis, and Control, ***by Daniel A. Potter,***
This book has the answers you need to control white grubs, mole crickets, fire ants, and other pests. Stinging and biting insects such as yellow jackets and ticks are included, as well as nuisance wildlife such as moles raccoons, and more. Covers the biology, diagnosis, and control of virtually all of the insects and mites that attack warm and cool season turfgrasses. Over 250 full color photographs. 400 pgs. ***4150 $65.00***



Maintain It Easy(Keep It Safe), ***by Grounds Maintenance Services***
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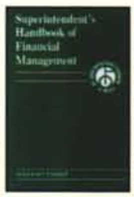
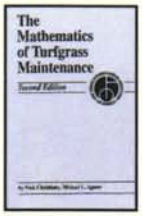


Superintendent's Handbook of Financial Management, ***by Raymond Schmidgall,***
Written specifically for golf course superintendents, managers and owners. Official certification textbook of the Golf Course Superintendents Association of America. The book presents useful methods and techniques for understanding and using income statements, balance sheets, accounting procedures, financial statements, operating budgets, capital budgets, record keeping and much more. 150 pages.
4006 $34.95



The Mathematics of Turfgrass Maintenance, 2nd edition, ***by Nick Christians and Michael L. Agnew,***
This book provides you with basic mathematical principles of budgeting, fertilizer and pesticide application, the ordering of top-dressing, irrigation, and many other parts of golf course operations. 149 pgs.
4149 $34.95

Shop Service Manuals Set, ***by Intertec Publishing Corporation,***
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