Between the Lines
Keystone Athletic Field Managers Organization

Inside:
SELECTING YOUR INFIELD SKIN SURFACE

Also:
Fall maintenance programs
The benefits of turfgrass
TIPS: Training, Ideas, Professionalism, Solutions
...and more!

SportsTurf
Make the most of your turf!
Put your best performer on the field -

Diamond-Tex
Safety • Playability • Less Maintenance
-A Martin Limestone Product

Diamond-Tex is always a good call because it provides a championship level infield surface that drains and recovers quickly after a rain, compacts to a firm surface that plays true, and requires less daily maintenance than other materials. Diamond-Tex is ideal for new field construction or as an immediate upgrade to existing fields. And with three grades of Diamond-Tex, there's one sure to provide you with the ideal surface for your specific needs.

Also available -
Diamond Gro Turf
Topdressing Products
100% Organic Compost, Compost/Topsoil Blends & 100% Screened Topsoil

For more information or to request a sample, call
800.823.7866
or visit
www.diamondtex.com

#1 Conditioner
On America’s Most Playable Fields

For Product and Distributor Info: 800-207-6457 Or visit www.turface.com
The KAFMO Cup Open golf tournament is the main fundraiser for the Waddington/Harper Scholarship Fund. Since 2001, thanks to the generosity of the sponsors and golfers, the tournament has raised more than $12,000 for educational grants. This year the scramble format tournament will be held October 10 at Dauphin Highlands Golf Course. Last year's winning team was James Wian III, Tom Kinzer, Kevin Bevenour, and Sean Cooper.

KAFMO’s Waddington/Harper Scholarship is named in honor of Dr. Donald Waddington and in memory of Dr. John Harper, two legends of the Penn State turf program. The scholarships are awarded to identify and recognize outstanding students who plan careers in sports turf management and to advance the student’s educational potential in the science of turfgrass management. Qualified applicants must be enrolled at an accredited college or university in an approved turfgrass program; must have completed a substantial portion of the requirements needed for graduation; must demonstrate an interest in sports turf management; and be willing to accept the scholarship in person at the KAFMO’s annual Athletic Field Conference.

Requirements for entry include completing the scholarship brochure, which is available as a pdf file on KAFMO’s website (www.kafmo.org/scholarship), college transcript, letter of recommendation from faculty, and a statement detailing your interest in the field of sports turf management. All application materials must be submitted by December 5, 2011.

The Keystone Athletic Field Managers Organization was formed in 1994 by a small group of individuals who were concerned about the quality of the athletic fields in Pennsylvania. In 1997, KAFMO became incorporated as a chapter of the Sports Turf Managers Association. Today, KAFMO is over 300 members strong and each individual is committed to enhancing the professionalism of athletic field managers in the Keystone State.

Our goals are to improve the safety, playability and appearance of all athletic fields in Pennsylvania. As an organization we strive to accomplish our goals through seminars, field days, publications and networking with other professionals in the sports turf industry.

Any individual, institution, organization, vendor or supplier who has sincere interest in athletic field maintenance is welcome to become a member. Our members represent a wide range of professionals in the sports turf industry. From high school, collegiate and professional athletic facilities, to parks and recreation departments, municipalities, educators, youth leagues, contractors, and commercial vendors, our membership base is made up of a broad range of individuals who pool their knowledge together for the good of our craft.

Annual Events include:

- Summer - Field Day(s)
- October - KAFMO Cup Open golf tournament – proceeds benefit the Awards Fund
- January - Eastern Pennsylvania Turf Conference
- January - Northeastern Pennsylvania Turf Conference
- February - Annual KAFMO conference featuring seminars, exhibits and the annual awards program
- February/March - Western Pennsylvania Turf Conference
- March - Northwestern Pennsylvania Turf Conference

Educational Grants and Research

KAFMO has donated over $47,000 for educational grants and sports turf research since 2001. KAFMO provides scholarships for sports turf education and sponsors collegiate teams in the Sports Turf Managers Association’s Collegiate Challenge at their annual national conference. Research beneficiaries include: Sports Turf Managers Association’s Foundation for Safer Athletic Field Environments (SAFE), Pennsylvania Turfgrass Council’s fund for sports turf research at Penn State University and the Pennsylvania Turfgrass Research Fund, Inc.
Fall athletic field maintenance for cool-season turfgrasses:

*September – November*

This information courtesy of the Sports Turf Managers Association.

**Mowing**

*Frequency:* mow as often as needed. Fields may need to be mowed 2-3 times per week during September and early October. Ideal temperatures make this an active growth period. As cooler temperatures become more frequent, generally at the end of October and into November, fields may not need to be mowed as often and may only require once a week. Maintaining a low height will increase the density of the turf and improve the wear tolerance of the field for fall sports.

In the event of excessive rain, mowing should be avoided to prevent rutting and compaction. Also, avoid mowing in the middle of the day if temperatures exceed 90 degrees F as this may cause damage to the turf. High daytime temperatures rarely continue into October and November. Avoid mowing (and turf use in general) when there is early morning frost. Traffic on frosted turf ruptures leaf blades and the damage will likely be visible into the following spring.

**1/3 Rule:** A general rule when mowing any stand of turfgrass is to remove no more than 1/3 of the total leaf surface at one time. Effects of removing more than 1/3 of leaf surface include:

- Negatively affect photosynthetic production of food
- Deplete carbohydrate reserves in the plant roots
- Graying or browning of leaf tips
- Root growth restriction
- Weed encroachment
- Increased susceptibility to damage from pests, environmental extremes and traffic
- Excess clippings
  - Clippings comprised of leaf blades break down rapidly and do not contribute to thatch when removing no more than 1/3 of the leaf blade and clippings do not clump.
- Negative effects of excessive clippings:
  - Smother grass
  - Provide ideal environment for disease and insects

**Equipment.** No matter what type of equipment is used to cut the turf, maintaining a sharp blade is the most important element to have a healthy, well groomed, aesthetically pleasing turf.

- Reel mowers provide the best cut for turf mown less than 2 inches; they cut grass with a scissor or shearing action where there actually is slight metal to metal contact so blade and bedknife sharpness is important. Reel mowing can cause longer grass to lay over so they require careful maintenance to keep adjusted and sharp.
- Rotary mowers provide the best cut for turf mown more than 2 inches and cut grass using impact; speed of blade rotation combined with blade sharpness cuts the turf. If blade is not sharp, fraying may occur.
- Flail mowers are typically used on utility turf mown more than 2 inches but improved models can be used on athletic fields. They cut grass by series of spinning, levered blades in a self-contained deck. Since blades are free-spinning, they ‘give’ if they strike a solid object and chances of blade breaking and being discharged are negligible. Flail mowers are ideal to use in park-like settings where sticks and other debris might exist as bystander safety is enhanced by the blade and deck design.

**Mowing direction.** Change direction each time the field is mowed. This promotes upright growth and can reduce wear from equipment continually following the same pattern. Mowing the same direction creates ‘grain’ and the wavelike ridges affect the speed and direction of ball roll.

**Clipping collection.** Clippings typically will not need to be collected if the turf is being mowed regularly using the 1/3 Rule. However, variables such as weather conditions, season of the year, soil fertility, moisture conditions, growth rate of the turfgrass, and the surface playing characteristics of the sport sometimes require clipping collection. Collect clippings if they are so long and excessive that they negatively impact turf playability and/or turf health (i.e. blocking sunlight, increasing disease activity under the piles, etc.). Research at Penn State shows that over a 3-year period, Kentucky bluegrass
clippings returned 46-59% nitrogen to the plant. Clippings contain nutrients that act as a fertilizer for the turf. Microbes in the soil hydrolyze the clippings into a solution that plants are capable of using.

**Irrigation**

Irrigation should occur as needed. One or two irrigations per week are usually sufficient to maintain fields. The proper amount of water to apply at any one time is dependent on water holding capacity of the soil, grass species, soil texture, climatic condition (rainfall, humidity, temperature, and wind movement), exposure, intensity of use, drainage and amount of moisture present when irrigation is started.

Most turfgrasses require between 1.5-1.75 inches of water per week during their active growing period to remain healthy and resilient. When natural precipitation is not present, irrigation is essential to maintain the health of turf and if appropriately managed, a soil surface that still provides desirable footing characteristics with reduced surface hardness. Irrigating supports active growth and helps maintain turf’s green color. It is necessary for photosynthesis, plant and environmental cooling, and plant rigidity. Properly irrigated turf also helps decrease weed encroachment and tolerates insect and disease pressure.

*Always water at the first sign of wilt.* Wilt is characterized by folded or curled leaves, blue-green color, and visible footprints left after the walking on the surface. Wilted turf recovers quickly if it is taken care of immediately. Traffic should not be allowed on wilted areas or recently recovered wilted areas.

**Timing. Early morning is the best time to water your turf.** Between 4:00 am and 9:00 am is the best time to water because it reduces water loss to evaporation due to lower temperatures, less sunlight, and lower wind velocity. It also reduces disease potential by minimizing the duration of leaf wetness. Also, in some cases municipal water demand is lower.

Midday watering can be effective if the goal is to temporarily cool plant temperatures and reduce heat stress. Syringing is a very light application of water applied to the turf leaf surface that cools the turf so it can get through the hottest part of the day. Irrigating during evening or night should be avoided because excessively wet plants in the evening can remain wet throughout the night and make a favorable environment for fungal diseases.

**Drought. If athletic fields do not have access to irrigation or you are facing a water ban or restrictions, allow fields to go dormant.** Dormant fields should be watered once every four weeks during a drought. Fields will recover from dormancy as long as traffic is very limited.

**Fertilization**

Fall is the best time to apply nitrogen fertilizer to cool season grasses because there is enhanced root growth and carbohydrate storage potential during this season. Make sure to check with your local and state agencies for any restrictions on applying nutrients. For areas with restrictions on inputs or other management program constraints or objectives, there are organic and microbial products available in the marketplace. Talk with vendors and practitioners for recommendations to fit your specific needs.

An application in late August or early September allows for nitrogen release and enhanced growth during fall sports when fields are heavily trafficked. Another application can be made in late October or anytime in November after fall sports are over and top growth has slowed. Avoid applying fertilizer to frozen soils as this can negatively impact water quality due to fertilizer runoff.

However, nutrients applied at appropriate times late in the growing season will encourage root growth, food storage, and density of turf. A slow release water insoluble fertilizer application can be beneficial as its controlled nitrogen release characteristics and low-leaching potential sustain turf growth for the fall and promote spring green up the following year. A quick release water soluble fertilizer can also be applied to prepare your fields for spring green up.

**Soil and tissue testing.** Soil tests should be conducted routinely, at least every year for sand-based fields and every 3 native soils fields are recommended. A soil test will analyze nutrient requirements, pH, phosphorus and potassium levels, and will provide the best guide to fertilization to maintain or achieve a healthy field.

Tissue tests are a great diagnostic tool in that they provide a snapshot of nutrients present in the plant at the time the sample was taken. However, their real value is realized if conducted simultaneously with a soil test since only the soil report can provide clues as to why a nutrient deficiency or toxicity is occurring.

**Nutrients.** The macronutrients required for turfgrass growth include nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), and sulfur (S).

Nitrogen influences color, shoot growth, shoot density, root growth, rhizome and stolon growth, carbohydrate reserves, high temperature stress, cold tolerance, drought resistance, wear tolerance, thatch accumulation, disease susceptibility and recuperative potential.

Phosphorus is involved in transfer and storage of energy for metabolic processes in turf and it affects seedling development, maturation, root growth and seed production. It is necessary during establishment. Phosphorus has been eliminated in many fertilizers due to potential environmental concerns. Also, soil that already has adequate phosphorus does not need any additional from a fertilizer application. This is one reason why soil tests are necessary.

Potassium is involved in photosynthesis and is important in regulating stomates and internal water management. It also maintains turgor pressure in plants, and affects root growth, heat, cold and drought tolerance, wear tolerance, disease susceptibility, and environmental stress resistance.

Calcium aids in cell wall structure and new cell formation and stimulates root and leaf development.

Magnesium is involved in formation of proteins, improves P uptake from soil and aids in plant respiration.

Sulfur is involved with formation of proteins, helps with turf growth, green color, shoot growth and density, root growth, carbohydrate reserves, and disease susceptibility.

The micronutrients required for turfgrass growth include iron (Fe), manganese (Mn), zinc (Zn), copper (Cu), boron (B), molybdenum (Mb), chlorine (Cl), nickel (Ni). Adequate amounts of micronutrients are usually present in the soil as long as pH is appropriate. Excess amounts of these nutrients are more commonly seen than deficiencies. Deficiencies are much more likely in sand-based soils than heavier textured native soils.

Lime should only be applied in accordance with what is recommended on soil test results. If recommended amounts exceed 50 pounds per 1000 square feet, apply in split applications. Proper liming is as important as fertilization. Properly managed soil pH regulates nutrient availability and creates a soil environment not only desirable for turf, but also for healthy soil microorganisms.

**Products.** Quick release products are water soluble and cause a turf response in a week or less. These products are generally inexpensive, but have increased leaching and leaf burn potential if used improperly. Application should always either be planned before a rain event or followed with irrigation to prevent turf burn.

Slow release products are water insoluble and provide a gradual, sustained turf response over a period of 3-10 weeks or more. These products are generally more expensive, but rarely burn leaf blades.

**Equipment.** Rotary spreaders:

- The most rapid way to apply product as fertilizer is distributed in a wide pattern.
- Holes in the bottom of the hopper drop granules on to a rotating impeller that slings granules in a pattern wider than the spreader.
- Distribution is not uniform and is more concentrated in the middle of the pass.
- To achieve uniformity, on each pass, granules should reach the wheel path of the previous pass.
- Splitting the application in half and applying material in two directions can help eliminate striping.
- Drop spreaders:
  - A very precise way to apply product as fertilizer is distributed by only the width of the hopper.
  - A row of holes across the full width of the bottom of the hopper releases granules.
  - Distribution is uniform across the width of the spreader.
  - To achieve uniformity across the entire area, run the tire just inside the track from the previous pass.
- Splitting the application in half and applying material in two directions can help eliminate striping.

(Continued on page 6)
Fall maintenance...
(From page 5)

Cultivation
Timing. Soil cultivation should be done once a month when plants are actively growing. However, if playing schedules make that difficult, aerify at least once in the fall, before the season begins, after the last game or both. More frequent coring may be necessary in heavily trafficked and compacted areas. Do not aerate if the turf is under severe stress.

The benefits of soil cultivation include: physical penetration of the soil to improve air, water and nutrient movement within the rootzone; correcting or alleviating soil compaction (this is especially important for high traffic areas such as goal mouths. It may be necessary to cultivate these areas 6-8 times per year); improving water infiltration; improving gaseous exchange between the soil and atmosphere; and thatch reduction.

Equipment. Hollow tine:
• Aerator pulls soil core (3/8 – ¾ inches in diameter) from a 2-6 inch depth.
• Helps minimize thatch and improves water penetration
• This method should be done at least twice a year with high traffic areas receiving 4-6 times per year. This is an effective practice when done with renovation and reseeding.
• Soil cores can be removed or reincorporated into the rootzone using a drag mat.

Solid tine
• Solid tines penetrate through the rootzone with minimal surface disturbance
• Increases initial water infiltration rate
• Effective way to plant seed with minimal disturbance to grass and soil stability
• An ideal tool to utilize during periods of intensive field use, but it does not substitute for overall benefits of core aeration.

Shatter coring. Solid tines aggressively penetrate the soil and fracture background compaction zones at a depth up to 6 inches. Shatter coring promotes deep rooting, assists in removal of standing water, and increases initial water infiltration rate. It is effective for planting seed and improving soil properties with minimal disturbance to the surface and soil stability

Water jet coring. Streams of pressurized water penetrate thatch and loosen soil to promote root growth, an effective way to cultivate stressed turf in unfavorable weather conditions. It also promotes deep rooting, increases water infiltration rate with minimal disturbance to the surface; it does not substitute for overall benefits of core aeration.

Slicing. V-shaped knives mounted on disks attached to a slowly rotating steel shaft cut into the turf while the blades sever stems of creeping grasses and promote additional lateral growth. Also promotes deep rooting, helps remove standing water and is an effective alternative to aggressive cultivation during extreme temperatures but use does not substitute for overall benefits of core aeration.

Vertical moving. Knives that cut into the turf are attached to a rapidly spinning horizontal shaft. Depending on height adjustment, can be used to relieve grain, delath or cultivate.

Spiking. Similar to a vertical mower, only blades are pointed rather than broad and flat. Blades are attached to a slowly turning horizontal shaft. Spiking stimulates shoot and root growth.

Deep tine. Tines penetrate the soil to a depth of 6-18 inches. If using hollow tines, holes can be back filled with a soil amendment to improve drainage. Solid tines are beneficial when cultivating heavily compacted clay or gravelly soil because there is minimal disturbance to the surface with use of solid tines; core aeration results in significant surface disruption and a concentrated effort to manage the cores and/or topdress with new soil material. Deep tines promote deep rooting, help remove standing water, aggressively fracture below-ground compaction zones at 6-12 inch depths, increase initial water infiltration rate, create deep aeration channels, and improve air, water, and nutrient movement through layered, poorly drain soils.

Deep drill/drill and fill. Drills penetrate the soil to a depth of 6-18 inches and those deep channels loosen soil.

Seeding
Soil of Kentucky bluegrass, perennial and annual ryegrass, or tall fescue can be installed at any time as long as the soil is not frozen, but consider that sodding during warmer parts of the fall will better ensure root development and a stable playing surface.

Timing. It is important to seed throughout the year to maintain turf density. Early fall is the best time to seed. This time period is ideal for grass establishment because late summer temperatures are warm enough to encourage quick germination and the cool, moist conditions that are necessary for successful seedling establishment.
autumn weather will promote dense growth. If fall sports conflict with the seeding schedule, managers will seed often and at higher than normal rates to keep a healthy and dense stand actively growing. University research has also shown that athlete’s cleats assist in incorporating the seed into the soil.

Species and mixtures. Always use certified seed when overseeding athletic fields. Certification ensures that the cultivar listed on the label is what is contained in the bag. The label also lists a test date. Seed should not be sold if the test date is more than 15 months past.

The species used for overseeding depends on the current species on the field and the amount of play the field will be receiving within 6 weeks of seeding.

Pest control
Healthy, dense stands of turf are the best way to prevent disease, weed or insect infestations. Following proper cultural practices throughout the year, including fertilization, irrigation, mowing, seeding, and soil cultivation, can minimize and sometimes eliminate pest problems. The goal of turf management is to produce healthy turf while limiting reliance on pesticides. Many managers follow Integrated Pest Management (IPM) practices. This program does not completely eliminate pests, but maintains the population at a tolerable level.

Pesticides are often a part of IPM programs, but they are selected and applied responsibly to avoid health risks to other living organisms than those targeted. It is important to routinely scout the fields and identify the pest problem in the early stages so a decision can be made whether its effects need to be controlled culturally or chemically. University research and efforts by turf managers and communities continue to evolve and support the trend towards sustainable turf management.

Make sure to check with your local and state agencies for any restrictions on applying pesticides. For areas with restrictions on inputs or other management program constraints or objectives, there are organic and microbial products available in the marketplace. KAFMO encourages you to talk with vendors and practitioners for recommendations to fit your specific needs.

Between the Lines
Hits YOUR Target Market!
To Advertise
Call (609) 655-2000 or visit:
www.BrainerdCommunications.com

Fisher & Son
COMPANY, INC.
The “Green Industry” Supplier

Mike Fisher 800-262-2127
Dave Hunley 215-262-3912

Brandon Maunz 717-449-1233
Bob Seltzer 610-704-4756

Superior Products for the Turf & Horticultural Professional!
110 Summit Drive * Exton, Pennsylvania 19341 * 800-262-2127 * fax 610-363-0563
www.fisherandson.com

Fertilizer
Herbicides
Field Striping
Fungicides
Moisture Management
Plant Protectants
Soil Amendments
Turf Blankets
Soil Testing

Earth Works * Dupont * Lebanon * Tricure * Surface

KAFMO.Summer 11.indd 7
7/11/11 3:10 PM
Skin surface selection and management for infields

By Bradley S. Park, and Dr. James A. Murphy

This article provides information on infield mix (soil) selection for use as baseball and softball skin surfaces, as well as maintenance guidelines to provide uniform playing conditions.

Soil used to construct a skin surface is referred to as infield mix. Thus, soil selection and management of skin surfaces will affect playability. A high quality skin surface is smooth, uniform, and provides consistent footing and ball response; whereas a poor skin surface can result in errors by players fielding ground balls, player injury, and chronic puddling in rainy weather.

A high quality skin surface is often described as one that is moist and cork-like, as opposed to hard and dry; the surface should allow players’ cleats to penetrate the surface and leave an imprint with very little soil disturbance or displacement. The skin surface should not give way (break loose) when players plant their feet to throw, field a ball, or run. These characteristics are strongly controlled by the physical properties of the infield mix and its maintenance.

Physical properties of an infield mix are strongly affected by its sand and fines (silt and clay) content. Maintenance of a skin surface involves managing water (irrigation and tarping), dragging and grooming, and the use of conditioners. Dragging and grooming loosens, levels and smoothes the skin surface to maintain safety and playability. Conditioners are typically granular, clay-based materials used to maintain playability over a range of weather (water) conditions.

Selecting an infield mix

ASTM (2007) suggests that infield mixes consist of 60 to 81% sand with the remainder being comprised of silt, clay, and gravel (preferably none) according to the particle size specifications. A 4- to 6-inch layer of mix is placed above the subsoil and finished to final grade. In cases where the infield mix contains greater than 85% sand and exhibits high internal permeability after heavy compaction, the mix should be placed above a gravel drainage blanket to improve water retention and stability of the skin surface.

Mixes with less than 19% silt and clay are better suited for rainy climates due to better internal drainage; however, these mixes will require more irrigation in dry periods to minimize dust and provide a firm stable playing surface. In contrast, mixes with greater than 19% silt and clay will drain more slowly and retain more water; hence, the need to irrigate (frequency) will be less. Mixes with > 19% silt and clay will also be more prone to compact and be difficult to loosen, especially when dry.

Some field managers prefer skin surfaces that contain a greater percentage of fines (silt and clay) compared to the ASTM recommendation for infield mixes. An infield mix should contain between 50 and 75% sand because mixes with > 75% sand can become too loose and are readily moved (displaced) during play or dragging leading to high and low spots, as well as the formation of lips at the skin-turf boundary. Infield mixes should not exceed 40 to 50% silt and clay because these materials can become compacted, reducing the ability of the surface to accept water, and thereby limiting the grounds manager’s ability to “soften” a hard skin surface with irrigation. We recommend infield mixes be comprised of approximately 60% sand, 20% silt, and 20% clay.

Skin surfaces should be constructed with a finish grade that provides adequate surface drainage (water runoff) away from and off the skin due to the limited permeability of most infield mixes. Baseball and softball skin surfaces should be designed with a finish grade of 0.5 to 1.5% slope away from the center of the infield.

Baseball and softball fields designed into multi-sport fields should surface drain water away from the infield and skin surfaces. Field designs that position skin surfaces of infields at the lowest elevation can render the baseball/softball field unplayable for several days after rain.

The following design parameters will provide reasonable skin surfaces for the majority of municipal and board of education baseball and softball infields.

1) Excavate 4 to 6 inches of native soil from the site.

2) Match the subgrade to the finish grade contours (ideally 1.0% slope away from the middle of the infield) using laser-guided equipment.

3) Firm, if necessary, but do not overly compact the subgrade [i.e. roll with a small (< 1 ton) pavement roller disengaging any vibratory function]; any internal drainage that can be achieved through the subgrade will be beneficial.

4) Replace the excavated layer with 4 to 6 inches of infield mix containing no more than 70 to 80% sand (remainder silt and clay). Ideally, there should not be any gravel in the mix.

5) Use laser-guided equipment to final grade the skin surface to mimic the contour of the subgrade. This will ensure the correct contouring required for proper surface drainage.

6) A calcined clay conditioner product can be applied as a topdressing (0.25-inch or less) to the surface to create more consistent ball bounce and desirable sliding conditions.

Skin surface management

Skin surface management is typically as much art as science and practices have often been handed down from one field manager to the next. The skills of the grounds manager are often a greater contributing factor to the playing quality of skin surfaces than the infield mix itself.

Grounds managers must use practices that are appropriate for the specific field or modify the field conditions to match a given maintenance program. While skin surface management techniques may differ from one grounds manager to the next, there are specific tasks that need to be performed to produce safe playing conditions on skin surfaces. These tasks include but are not limited to watering, scarifying and dragging, leveling, lip removal and conditioning.

The frequency and intensity of these tasks is strongly influenced by the particle size distribution (sand, silt and gravel content) of the infield mix.

Water management

Water availability is probably the most important factor affecting the overall performance of skin surfaces. The water content of a skin surface affects both ball and player reaction. Water is needed to soften fine-textured infield mixes (high silt and clay content) and firm coarse-textured mixes (high sand content).

Field design should include water supply to the skin surface. A quick coupler (hose connection) should be located approximately 6 feet behind the mound on a baseball field; the safest and most logical place for the coupler. More involved irrigation designs include automatic pop-up irrigation sprinklers to lightly water (syringe) skin surfaces.

Differences in the approach to watering skin surfaces are attributable to water accessibility, budget, labor, climate, particle size distribution of the

KAFMO.Summer 11.indd 8

7/11/11 3:10 PM
infield mix, and coach and player preferences. Irrigation water for skin surfaces and turfgrass is often unavailable in the case of municipal fields. Conversely, managers of professional fields often “flood” skin surfaces before a homestand, immediately after a game, before lunch on game day, and conclude with a final light watering in between batting practice and pre-game activities.

Water held within a skin surface produces the “corky” feel that players desire; water is often provided through irrigation after games in addition to supplemental game day irrigation dictated by weather. We recommend skin surfaces be deeply irrigated at a rate that allows water to infiltrate slowly into the surface and be retained for a considerable amount of time. Care must be taken to avoid overwatering areas surrounding skin surfaces.

Infield dragging and grooming

Periodic scarification, leveling, and smoothing of skin surfaces is required; this can be accomplished with commercially purchased grooming machines or constructed drags which can be hand-pulled or towed by a small tractor or utility vehicle. Scarification and leveling methods should produce a thin (0.25-inch) loose layer or “cap” on the skin surface. This cap provides more uniform ball bounce and roll and a good surface for sliding. Scarification of this layer should not exceed 0.5-inch (too deep) otherwise traction (footing) will decrease and ground balls can skid rather than bounce. Scarification often involves dragging the skin surface with a nail-drag (or similar) to loosen the surface 0.25- to 0.5-inch.

This loosened material is used to level-out high and fill low spots, which decreases the time to dry the surface after rain (puddles are reduced in size after leveling). After scarification and leveling, a steel drag or cocoa mat is often used to groom (smooth) the surface before play.

Proper infield dragging, leveling, and grooming techniques maintain/improve surface drainage, safety and playability of skin surfaces. Improper techniques that physically move infield mix into turf will encourage the development of a lip. A “lip” is a mound or ridge at the boundary between a skin surface and turf. Lips impede surface water drainage off the skin surface as well as present unsafe playing conditions. Therefore, it is imperative that infield dragging and leveling along the perimeter 12 inches or more of a skin surface be performed by hand in a direction that

(Continued on page 10)
Skin surface selection...

(From page 9)

moves soil away from or along the skin-turf boundary, not toward the turf. Wind and water erosion can also move infield mix into border turf areas resulting in a lip.

Invariably, movement of infield mix into the bordering turf does occur and routine corrective practices should be used to reduce lip development. Stiff-bristled brooms are often used to brush 6 to 8 inches of the bordering turf towards the skin surface. Blowers, irrigation hose spray and power washers have also been used successfully.

If allowed to develop, large lips require costly and time consuming methods to correct. A sod cutter will be needed to remove the grass and buildup of infield mix from the lip along the skin surface-turfgrass border. Repair of large lips may also require substantial re-grading to re-establish an acceptable grade along the skin surface and turf boundary area. Typically, the turf-skin boundary is re-established with sod.

Adding infield mix to “eliminate” a lip is a common mistake because this action elevates the skin surface relative to surrounding turf, decreases playability and safety, and often stops surface drainage. Repeated addition of infield mix eventually results in major renovation work to fix these compounded infield problems. Renovation involves the “extra” infield mix being removed and re-grading to reset the proper infield contours. The turf-skin boundary can then be re-established with sod.

Use of infield conditioners

Conditioners are materials designed to be spread on top of skin surfaces to improve playability over a range of weather conditions. Calcined clay is one of the most commonly used conditioners. Typically montmorillonite clay is fired at approximately 1200°F to form granules of calcined clay that remain hard even when wet.

Conditioners are often used to soak-up excess water after rain; finer-textured conditioners work best for this purpose. Conditioners used for this purpose should be swept-up (removed) from the skin surface after play, stored and allowed to dry for re-use.

A 0.25-inch layer of conditioner can be spread (topdressed) evenly across the skin surface to produce the loose cap described previously. Using a granular conditioner as the cap material rather than infield mix generally makes it easier to remove migrated material from the turf boundary back onto the skin surface and prevent the development of a lip.

Skin surface water retention is a function of the amount of silt and clay in the infield mix, not the amount of calcined clay on the surface. Calcined clay applied to the skin surface will often dry before the underlying infield mix resulting in some grounds managers applying unneeded irrigation water. Fine-textured infield mixes can be modified to react more like coarser-textured mixes by incorporating calcined clay. In contrast, coarser textured infield mixes would be less affected by adding calcined clay because of the similar particle sizes between the infield mix and the conditioner. Thus, a particle size analysis of the existing infield mix is necessary when deciding whether to incorporate a conditioner; the addition of calcined clay to a coarse-textured infield mix often will not improve playability.

Mounds and batter’s boxes

Clayey soil or “bricks” (clay >35%) are used to construct a stable, wear resistant surface for the “table” (the area behind and to the sides of the pitching rubber), landing area of the pitcher’s mound, and the batter’s and catcher’s boxes around home plate. The installation of a clayey soil often minimizes the damage caused by a pitcher digging in front of the rubber. Clayey soil should be placed and compacted (hand tamper) about 0.5-inch below the surface of the mound; infield mix is used to bring the area to final grade.

Particle size guidelines for an infield mix to be used in the construction of a skin surface range from 50 to 81% sand and 20 to 50% silt and clay. Infield mixes that contain greater than 75% sand will require substantial irrigation to provide a firm and stable playing surface during dry weather. Conversely, infield mixes with less than 60% sand will be very firm when dry and irrigation will be needed to “soften” the skin surface for play.

Regardless of infield mix selection, skin surfaces must be graded to provide surface drainage away from the infield (0.5 to 1.5% slope). It is also important to provide a water source to irrigate the skin surface. If irrigation is not available, playability of a skin surface will be less than optimum during drought. Grooming methods are needed to produce a uniform 0.25- to 0.5-inch cap over the skin surface and preventative maintenance is necessary to minimize lip development. Lips along skin surface perimeters present a hazardous condition and require costly, time consuming renovation work.

Conditioners can be applied (topdressed) to skin surfaces to act as the cap; finer-textured conditioners can improve playability during rainy conditions. Additionally, conditioners can be incorporated into finer-textured infield mixes to improve surface hardness and increase permeability. A particle size analysis should be performed on the conditioner and infield mix to determine compatibility before incorporating conditioner into the infield mix.

Pitcher’s mounds and the batter’s and catcher’s boxes should be constructed with clayey soil or “bricks” containing >35% clay to provide the stability, traction and durability needed in these high traffic areas.

Bradley S. Park is sports turf research and education coordinator at Rutgers University; Dr. James A. Murphy is extension specialist in turfgrass management at Rutgers.
The benefits of turfgrass
By Pamela Sherratt

Turfgrass defined is a ground cover composed of close cut, thickly growing, intertwining stems and leaves of grass plants. The distinguishing characteristic of turfgrasses is the ability to withstand close mowing and still provide a functional, dense and healthy ground cover and that is what sets it apart from other plants. The turfgrass industry in the USA is valued somewhere between $40-$60 billion, with more than 50 million acres of turf.

Carbon storage (sequestration)
Turfgrasses, like all plants, capture atmospheric carbon dioxide and use it via photosynthesis to create usable energy in the form of sugars and carbohydrates. With increasing levels of atmospheric CO2 associated with the greenhouse effect (global warming), turfgrasses serve as a source of carbon storage, or sequestration.

Most of the turf volume, or biomass is below ground. Given the perennial nature of turf, the storage of carbon in root mass and organic matter development in the soil, turf is a significant carbon sink. An average-sized healthy lawn is a carbon sequestering system that can capture as much as 300lbs carbon per year and a golf course fairway can capture 1,500 lbs. carbon per year.

Research has also concluded that carbon storage in turf is comparable to the rate of carbon storage in land situated in the Conservation Reserve Program. A practical example of carbon sequestration is that one soccer field to the rate of carbon storage in land situated in the Conservation Reserve Program.

Soil, water & nutrient stabilization
Turfgrasses also play an important role in soil erosion, dust control and water runoff by holding the soil in place. The fibrous root systems of turfgrasses form excellent soil “netting” that reduces dust and stabilizes soil on both flat and sloping areas. Healthy turf has the ability to absorb and conserve water, filter water and prevent run-off, which is why turf is often used on slopes, roadsides, and around parking lots. Since turf is a perennial and stable ground cover that is not cultivated, it slows storm water runoff reducing erosion potential and also improves the likelihood of the water infiltrating down through the soil.

Runoff and erosion of soil is considered to be one of the primary causes of nutrient contamination in our water systems. Reducing storm water runoff from impervious surfaces is a relatively new concept in landscape design, with rain gardens being developed in some residential neighborhoods. Some researchers are also recommending designing turf areas to serve as catchments and filtration zones for polluted runoff water.

Turf systems are not only efficient at catching and filtering water, but are also very efficient at holding on to nutrients. Nutrients like phosphorus are fixed onto soil particles or taken up by the plant and they do not leach out readily.

The bottom line is that fertilizers applied to a healthy lawn are held in the soil and used by the turf plants.

The cooling effect
As communities grow from a village to a town to a city an increase in temperature occurs. In major cities the term urban heat island is used to characterize the temperature increase. On warm summer days, the temperature can be 10°F greater in an urban area compared to the surrounding area. A 5,000-square foot Kentucky bluegrass lawn contains 9 million shoots, while an average creeping bentgrass putting green contains 72 million individual shoots. Each of these plant shoots carries a cooling process called transpiration. Transpiration helps reduce temperatures in the urban environment by dissipating high levels of radiation. To that end, turf is considerably cooler than other common surfaces. Research at Brigham Young University has recorded temperatures on turf 20 degrees cooler than bare soils and 40 degrees cooler than synthetic turf.

Transpirational cooling is dependent on an adequate supply of water. In turf areas, water is provided by rainfall and sometimes supplemented by irrigation, depending on length of the growing season, temperature, evapotranspiration rates, soil type, turf species and management practices. It is estimated that turf, including residential and commercial lawns, golf courses, etc is the largest single irrigated crop in the US.

While residential landscapes are typically watered with municipal sources, golf course irrigation water comes primarily from on-site ponds and lakes, wells and streams. Only 9.5% of golf courses use public water exclusively.

Regardless of location though, if supplemental irrigation is needed, there are many university bulletins and fact sheets that can be used as a guide. There are standard guidelines on irrigation timing, amount and frequency, to make sure that water is used sparingly.

Sport & recreation
In addition to environmental benefits, turf is used extensively for recreation and sport. Lawns and other recreational areas are places where adults, kids and pets can spend time outside of the home. Turf is used for play, for places to relax and for entertaining friends.

This all contributes to the quality of one’s life.

Per the census, there are 267 million people in the United States at seven years of age and older. Of those 267 million people, around 80 million people (30 % of the population) play sports on turfgrasses. In the top five sports played on turf, it is estimated that golf courses have the most activity at 25.6 million and baseball and soccer have around 15 million regular participants.

The importance of encouraging people to play sports and offering them places to play those sports cannot be down-played, particularly when the Center for Disease Control estimates that 17% of American children and adolescents are obese. Also, and just as important, it is an outlet for children and adults to spend their leisure time in a positive and safe environment.

Turf in the urban landscape
The last role that turf plays in society is in value to the landscape and urban environment. Turfgrasses help provide a pleasing urban environment through noise abatement, glare reduction, fire protection, and pest reduction. Turf areas like golf courses and parks also protect and foster wildlife. The natural state of these landscapes, coupled with the addition of trees, ponds, lakes and wetlands support a diverse population of birds, animals and plants. Studies looking at landscaping & house values have found that there is a positive relationship between a home’s value and the existence of trees, up to a certain threshold. A more recent study suggests that the existence of a lawn also has a positive effect on the value of a home, with a lawn 1/4-1/3 of an acre in size associated with the greatest effect on selling price.

Turfgrasses are plants that are used extensively as a stable and perennial ground cover. Turf is a positive carbon sink and it offers many benefits, not just to the environment but also to urban living. Most importantly, turf gives up a place to enjoy our families and spend some hard-earned leisure time, which ultimately improves our quality of life.

Pamela Sherratt is the sports turf extension specialist at Ohio State.
**TIPS: Training, Ideas, Professionalism, Solutions**

**Football practice techniques that help minimize field wear**

Wear and field overuse are two conditions that can cause the most hazardous and unsafe playing conditions on your football field. Following are some basic techniques to help move player activity around the field for more even wear and some techniques on improving playing conditions.

**Practice tips**
- Change daily the location of practices on the field.
- Use a portable goal and move it around the field, thus limiting wear in the area of the mounted goal posts.
- Have players do their individual warm-ups off of the field.
- Execute team drills outside of the painted numbers.
- Move off of the 20 yard line and start practice plays on the 25- or 30-yard line.
- Create two practice fields perpendicular to each other, outlining each in brightly colored field paint.

To produce safe, playable conditions throughout the football season, a customized field maintenance program must be implemented all year long. Following are a few strategies to help keep conditions playable as the season progresses:

- Spread seed in wear areas before games and practices.
- As the season goes on, let the grass grow longer. The longer grass will help protect the crowns of the plants from the player’s cleats and allow for more grass mass for the players’ safety.
- If you only have funds to fertilize your field once or twice, then fertilize the field in July/August and September/October. It is wise to fertilize the fields leading up to and in the first month of the playing season to help promote new growth during the activity period.
- When making plant protectant applications of any type, be sure to explicitly follow the label instructions on the application rates, timing, efficacy period, etc.

**Prioritize your spending**

No person knows more about fields than the field manager that manages them, so you are the perfect person to prioritize practices and purchases needed to keep the field safe and useable.

If your fields were properly designed and constructed, received good maintenance in the past, and had controlled use during the season, you should be in good shape. Remember the ultimate goal of a good sports field is a safe field. Keep this in mind as you make management decisions, and keep reminding your supervisors that this is your priority when you are considering management and purchasing decisions.

Most field managers only have several variable expenses under their control. These generally include: labor, equipment purchases, equipment maintenance, fertilizer products, pesticides, paint, topdressing sand, and sod/seed expenses. Energy (fuel, electricity, etc.) expenses are often not as easily controlled.

I believe the number one item that must stay in a management program in terms of field impact is nitrogen fertilization. Use your soil test to modify your non-nitrogen nutrient needs (e.g., phosphorus, potassium, calcium, etc.) so you do not buy something you do not need. Your field will need nitrogen fertilizer. It will maximize turf density and a denser field is a safer field. Plus it will recover from damage faster and density discourages weeds encroachment. The rule of thumb is one pound of nitrogen per 1,000 square feet per growing month.

Price out your fertilizer products per pound of nutrient rather than per pound of product. And if you have available labor, you can often get better results by splitting the fertilizer applications and going out more frequently (e.g., half pound rates twice a month).

After fertilizer, keep a good mowing program. Regular mowing also discourages broadleaf weeds from getting a foothold. And if you do have some weeds, the mowing makes them less noticeable.

The next most important item on the list should be weed control. You want to hear complaints about your field condition, have a weedy field. With the loss of MSMA herbicides, our inexpensive post-emergence grassy weed control options are now more limited. I think this swings the pendulum toward more emphasis on pre-emergence programs. Using a good pre-emergence program combined with a post-emergence broadleaf herbicide as needed, will maximize your maintenance dollars and will help ensure you have an attractive, safe field.

Do not forget aerification. A playable field is not rock-hard. An aerification can also reduce some weeds, discourage spring dead spot, reduce thatch, increase water infiltration, and improve plant stress tolerance. So, use whatever you have available for core aerification and do it as often as possible. I do not believe you can core aerify too often.

I think all the other management practices and products are secondary after these three. So be sure the resources are available and then schedule the above practices as priorities.

Of course all these practices require labor. If your labor force is reduced, there are a few management other practices you may want to consider. One idea is to use a plant growth regulator such as trihexiconazole (e.g., Primo Maxxx, Governor, T-Nex) to suppress turf growth so less frequent mowing is needed. There is a product cost, but it is offset with reduced mowing and reduced equipment wear. It also will provide you with a denser, more wear tolerant turf. Along those same lines, there is a label rate for putting Primo Maxxx in turf paint. This can dramatically reduce the need for re-painting your athletic field lines resulting in more labor savings.

Always be looking for inexpensive ways to save money. For instance, with soccer fields, move the sidelines and goals in or out to redistribute wear areas. Have open communication with the field user groups so they understand how they can improve the fields by moving their drills around the field. Look at leasing equipment. This can reduce downtime and allow you to use newer equipment with less capital outlay.
My last piece of advice is to go to meetings and learn how others are dealing with reduced budgets. Local, state, and national STMA meetings may be your greatest resource in solving your problems. I believe attending them is time and money well spent. Dr. Grady Miller, North Carolina State

Get ready for dry conditions

Even though we experienced a lot of rainfall this spring in most regions of Pennsylvania and are not close to drought conditions, here is a quick review of how to manage turf under dry conditions. One of the mistakes that many ground managers make is over-watering. Irrigating too frequently will allow the turf to remain green, but does not allow the turf root system to grow deeper in the soil. The deeper the root system the better the turf will survive in hot dry conditions. The best advice is to water infrequently and deeply. Irrigating athletic fields so that the entire field receives an inch of water every 2 weeks is more than enough to maintain and sustain your athletic fields throughout the summer. This will ensure green and safe fields for when fall sports begin in August. For any other questions regarding irrigation or summer field maintenance, please visit our website at www.kafmo.org.
Penn State’s Center for Sports Surface Research is offering a few lucky facilities the opportunity to have a sample of their new field tested for upright fiber wear resistance. The data will be compiled in an online database and be available to the public.

If you are installing a new field at your facility and would like to be considered for our testing, all you have to do is fill out a form online (http://cropsoil.psu.edu/ssrc/fibertest/fiber-test-request). You will also be required to collect a sample at your facility and mail it to us. Unfortunately, we don’t have the resources to test all fields being installed but plan to test several of each and every monofilament product being installed in today’s market place. We plan to test several samples from each available product each year.

Currently, we will only be accepting monofilament products. Email us at fibertesting@psu.edu for more details or go to ssrc.psu.edu/fibertest for more detailed information. Required sample size (carpet only – no infill): 60” x 30” (smaller sizes may be acceptable, please email us if you cannot meet the size requirement).

**Testing procedure**

Our wear simulator was designed to match similar wear testers commonly used for FIFA testing. Our machine consists of two studded (cleated) rollers. As the rollers move across the surface of the turf, they produce a similar wear pattern to that of cleated shoes worn by field users. Additionally, the rollers move at slightly different speeds, allowing for a sliding movement of one of the rollers. Our model also includes a sample table that moves side-to-side, providing a more even distribution of wear. One complete cycle (down and back) is roughly equivalent to one hour of field use. Our testing is considered a modified version of the European (EN 15306) and FIFA test method as our machine includes plastic cleats with a metal tips instead of 100% plastic cleats. In our testing protocol, we remove random fiber samples prior to wear and at every 10,000 cycle interval up to 30,000 cycles. The extracted fibers are then placed into the categories of ‘good’, ‘hair-splitting’, ‘fractured’ or ‘complete splitting’. We also take photographs of the fibers. Results from this testing are only applicable to mechanical wear of fibers and do not take into account ultra-violet light degradation, weathering, or any other form of degradation.

Dr. Andy McNitt, Penn State turfgrass professor & director of the Center for Sports Surface Research.

---

**A great surface for a great game.**

**Martin Infield Mix** is ideal whether you are building a new field or refurbishing an existing field.

For more information contact Bruce Hoffman:

bruce@martininfieldmix.com

610-367-2011

---

To Advertise in

Between the Lines

Call (609) 655-2000

or visit:

www.BrainerdCommunications.com
## Turfgrass Management Calendar

<table>
<thead>
<tr>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aeration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broadleaf Weed Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fertilization</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grub Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liming</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overseeding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil Test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summer Annual Weed Control (Pre emergence)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summer Annual Weed Control (Post emergence)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topdressing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Can perform management practice or control at this time. **Optimum time to perform management practice or control procedures.**

Technical information provided by Dr. Andrew McNitt, Penn State University
Make your sideline look as good as the end zone.

FieldSaver® Sideline Tarps from CoverSports USA™!

UNMATCHED SIDELINE TURF PROTECTION

FieldSaver® Features:
• Durable—stands up to cleated football shoes
• Breathable—allows water and air passage
• Grommets at 3’ intervals on all sides for stake down

Special offers ONLY at www.CoverSports.com/KAFMO
For price quotes, colors, sizes and fabric specs, visit www.CoverSports.com/KAFMO
sales@coversports.com • 800-445-6680

We make covers for all athletic surfaces: Rain Covers, Growth Covers, EnviroSafe™ Stadium Padding

Moving Ahead To Serve You Better

YOUR FRIENDS AT...

TURF EQUIPMENT AND SUPPLY COMPANY

888-384-8676 • www.turf-equipment.com