Turf managers at increased risk of skin cancer

Editor's note: Thanks to STMA Board member Jeff Fowler, Penn State extension office, and the Pennsylvania Cancer Control Consortium (PAC³) for supplying this article.

S THE GROWING SEA-SON APPROACHES, sports turf managers will be hard at work outdoors. Turf managers face many potential hazards in their line of work from machinery injuries to chemical exposures from fertilizers and pesticides. One danger that may not be as visible comes from the sun's ultraviolet rays. While turf managers rely on the sun for grass and plants to flourish, they often don't realize too many of these invisible rays may damage their skin, leading to skin cancer, premature aging of the skin, and suppression of the immune system.



MELANOMA NEEDS EARLY DETECTION

This year more than 1 million new cases of skin cancer will be diagnosed in the United States. Recent studies prove a link between sunburn and increased risk for melanoma, the deadliest form of skin cancer. One person every hour dies from melanoma in the United States. The good news is that melanoma is highly curable if detected on the skin at an early stage. The risk of melanoma can be reduced by protecting the skin from the sun and its harmful ultraviolet rays.

Sunlight consists of two types of harmful rays: ultraviolet A (UVA) rays and ultraviolet B (UVB) rays. UVA rays (which pass through window glass) penetrate deeper into the dermis, the thickest layer of the skin. UVA rays can cause suppression of the immune system, which interferes with the immune system's ability to protect you against the development and spread of skin cancer. UVA exposure also is known to lead to signs of premature aging of the skin, such as wrinkling and age spots. The UVB rays are the sun's burning rays (which are blocked by window glass) and are the primary cause of sunburn. A good way to remember it is that UVA rays are the aging rays and UVB rays are the burning rays. Excessive exposure to both forms of UV rays can lead to the development of skin cancer.

The U.S. Department of Health & Human Services has declared ultraviolet (UV) radiation from the sun and artificial sources, such as tanning beds and sun lamps, as a known carcinogen (cancer-causing substance).

MEN MORE AT RISK

Men are more likely to die from melanoma most likely due to late detection. Common locations where melanoma can develop include the back, arms, neck and shoulders. Women get more melanomas on their legs. Turf managers with years of outdoor sun exposure are more likely to develop a form of melanoma that occurs more commonly on the head and neck region. This type of melanoma can resemble a large, dark freckle with irregular borders. The Melanoma International Foundation urges everyone to examine their skin regularly, and your loved ones, too. This means looking over your entire body including your back, your scalp, the soles of your feet, between your toes and the palms of your hands. If there are any changes in the size, color, shape or texture of a mole, the development of a new mole, or any other unusual changes in the skin, see your primary care physician or a dermatologist as soon as possible.

WEAR LIGHT-COLORED CLOTHING

Since turf managers spend a great deal of time working outdoors, it's important for them to understand the many ways to protect their skin so that they can reduce their chances of developing skin cancer. Clothing protection is most important in protecting the skin.

Hats can protect the most vulnerable head and neck areas from the sun's rays. While baseball-type caps will protect the top of the head, they don't protect other important areas including the ears, nose and neck. Turf managers should wear wide-brimmed hats. The recommendation is to wear a hat that has at least a 4inch brim. Long-sleeved shirts and long pants will help protect the arms and legs. Wearing tightly woven lightweight and light-colored fabric can actually keep the body cooler in the sun and will protect against cancer-causing rays. There are many companies that manufacture high quality, sun-protective clothing. And there is a sun-protective solution by Rit Dye that you can wash into everyday clothing to make it protective.

CHOOSE WATERPROOF SUNSCREEN EVEN ON CLOUDY DAYS

You should apply sunscreen every day to exposed skin—and not just if you are going to be in the sun. While UVB rays cannot penetrate glass windows, UVA rays can, leaving you prone to these damaging effects if unprotected. For days when you are going to be indoors, apply sunscreen on the areas not covered by clothing, such as the face and hands. Sunscreens can be applied under makeup, or alternatively, there are many cosmetic products available that contain sunscreens for daily use.

Don't reserve the use of sunscreen only for sunny days. Even on a cloudy day, up to 80% of the sun's ultraviolet rays can pass through the clouds. Sunscreen should be applied to dry skin 15-30 minutes BEFORE going outdoors. When using sunscreen, be sure to apply it to all exposed areas, and pay particular attention to the face, ears, hands and arms. Coat the skin liberally and rub it in thoroughly; most people apply only 25-50 percent of the recommended amount of sunscreen. One ounce, enough to fill the palm of your hand, is considered the amount needed to cover the exposed areas of the body properly. Don't forget that lips get sunburned, too. Apply a lip balm that contains sunscreen with an SPF of 15 or higher. Be sure to toss outdated sunscreen, as it will have lost its effectiveness. Reapply sunscreen frequently during the day.

There are so many types of sunscreen that selecting the right one can be confusing. Sunscreens are available in many forms, including ointments, creams, gels, lotions, sprays and wax sticks. The type of sunscreen you choose is a matter of personal choice. Creams are best for individuals with dry skin, but gels are preferable in hairy areas, such as the scalp or male chest. Sticks are good around the eyes. Creams typically yield a thicker application than lotions and are best for the face.

Ideally, sunscreens should be water-resistant,

so they cannot be easily removed by sweating or swimming, and should have an SPF of 15 or higher that provides broad-spectrum coverage against both UVA and UVB light. Ingredients to look for on the sunscreen label to ensure broad-spectrum UV coverage include: oxybenzone, octyl methoxycinnamate, cinoxate, sulisobenzone, octyl salicylate, menthyl anthranilate, titanium dioxide, zinc oxide, avobenzone (Parsol 1789), ecamsule (Mexoryl SX)

Although working outdoors when the sun is less intense, before 10 a.m. or after 4 p.m., may not be feasible, sometimes rescheduling chores where exposure is lessened can be achieved. Seeking shade may have obstacles, but creating shade where you work with an umbrella or an awning is a great idea. You certainly now see more mowers, carts and utility vehicles with a canopy to protect the operator from exposure to the elements.

If you notice a mole on your skin, you should follow the simple ABCDE rule, which outlines the warning signs of melanoma:

• Asymmetry-One half does not match the other half.

• **B**order irregularity-The edges are ragged, notched or blurred.

• Color-The pigmentation is not uniform. Different shades of tan, brown or black are often present. Dashes of red, white and blue can add to the mottled appearance.

• Diameter-While melanomas are usually greater than 6 mm in diameter when diagnosed, they can be smaller. If you notice a mole that is different than others, or if you notice a mole that changes, itches or bleeds, even if it is smaller than 6 mm, you should see a dermatologist.

• Evolving-You should always be suspicious of a new or changing mole on your skin.

It's never too late to protect yourself from the sun and minimize your future risk of skin cancer. Understanding how to best protect your skin from the sun can help prevent melanoma, the deadliest form of skin cancer.

FOR MORE INFORMATION

Melanoma International Foundation, www.melanomaintl.org

American Academy of Dermatology, www.aad.org





Hosting a successful STMA local chapter event

e all know that the local chapters are the lifeblood of the Sports Turf Managers Association and that each individual chapter is unique. One thing that most chapters have in common is that we host events to help educate members on a local level that may not get the opportunity to attend the STMA National Conference. With that said, one of the common questions that I kept hearing in Austin from members from all over the country is," How do we get more members involved in our local chapter events?"

With this question in mind I wanted to share some ideas that have worked for our chapter on the local level. The Gateway Chapter had worked hard to provide educational events that were beneficial to our members, but we were still getting mixed results regarding attendance. As a board we collectively sat down and brainstormed on ways to improve our events. We wanted to make sure we were giving the membership what they wanted. We came up with a number of things that we were doing right and wrong.

SOMETIMES LESS IS MORE

A couple of ideas that came from our brainstorming were implemented and we had one of our best years to date. We found out that sometimes less is more. The chapter focused on fewer events but with more quality. The membership had mentioned that it was hard to make it to monthly meeting or outings. We scaled back to quarterly meetings and attendance went up.

"With the busy schedule that I have, it is hard to make it to all of the monthly events. Going to a quarterly system enabled me to attend more events this year than in years past," said Keith Labitska, grounds supervisor for Saint Louis University.

One of the other ideas was to get our Commercial Members involved with the educational events. The commercial people in the chapter have a wealth of knowledge and are willing to share; they are one of our best resources. Many of them once worked on the other side and can relate to many of the issues that face sports turf managers.

The commercial vendors can also promote the chapter and its events to a large audience. Many of our vendors will carry flyers about upcoming events in their trucks to hand out or leave them on the counter in their shop. Many of our commercial members also will sponsor an event in some way or another, or they will provide the meals or help defray the cost of bringing in a speaker from outside the area.

As a result of the commitment we get from our commercial members, one of the things we do as a chapter for them is to host a Vendor Day at one of our sites which is free to all dues-paying commercial members. This is a great way for our vendors to get out and show off their products, and it also provides the members a "one stop shop" experience to try out any equipment or to get a look at a number of products all in one place.

Glenn Kraemer from GR Robinson Seeds & Service said, "The best thing that happened for me and my small company was meeting prospective customers. I actually sold some product at the event, but better yet, gained a very valuable customer because of the show. The show only cost me some time, but the value was beyond what I thought possible. It's

Forming a chapter

IF YOU ARE INTERESTED in exploring the possibilities of forming a local STMA Chapter, there are many resources available, including the key "Chapter Compliance and Procedures Manual."The STMA Chapter Relations committee developed it with input from many of the leaders of STMA's current affiliated Chapters. This manual will help guide you step by step through the process of starting and maintaining a local STMA Chapter.

Begin the process by calling your fellow sports turf managers, those that share the same enthusiasm and who want to be involved in the foundation of a new STMA local Chapter. STMA Headquarters can provide you with a list of STMA members in your area to add to the list of your own networking contacts. Building a strong foundation of these enthusiastic, committed individuals will give you the nucleus to support a vibrant, active local STMA Chapter.

There are several other key individuals ready, willing and able to help you as you get started: the Chapter Relations Chairperson and Board Contact. Don't hesitate to contact them at any time with your questions or concerns. They'll share their expertise, giving you input on their successes and some of those "not so successful" steps they've made as well. Currently the Chapter Relations Committee Co-chairs are **Amy Fouty, CSFM, 517-355-0323, fouty@ath. msu.edu,** and **David Pinsonneault, CSFM, CPRP, 781-274-8355, dpin son@ci.lexington.ma.us**

Starting a new chapter takes time. New chapters generally take between 6 months to one year to become affiliated. Be patient, be persistent and have fun! It will come together. If you think you are ready to begin forming an STMA Chapter, or if you would like to discuss the possibilities of doing so, please call **Kim Heck, the Chapter contact at STMA HQ (1-800-323-3875)** for the basic background information to start you in the right direction.

Kim Heck, Chapter contact at STMA **1-800-323-3875** the old saying, 'You never know' that will keep me coming back."

When asked about our chapter's Vendor Day, Drew Williams with Redexim Turf Products said, "It is unique because it is like a local trade show that is free to commercial members and we get the opportunity to demo our equipment and show off products to a large audience of sports field managers."

Another way we are attempting to reach a larger contingent of our membership is by improved communication about upcoming events. For 2010, we lined up our events early in the year and were able to get that information out so people could mark it on their calendars. We use a three-prong approach as far as communicating with our members: One, we send a mailer out early in the year with our membership applications to let them know when the events are and to also let them know what they are getting for their membership dues. Second, we email a reminder a couple of weeks before each event just to confirm how many attendees to expect, and third, we put all of our events and sponsors on our chapter website. Keeping our website up to

date on chapter events is very important. If a member goes to the site and the information is outdated and there isn't any new content, they won't be back to the site.

Getting together with other green industry organizations has also been a benefit for our chapter. One of our most successful events over the past 2 years has been a collaboration project with the Missouri Turf and Ornamental Council and the Gateway Irrigation Association to put on the Missouri Green Industry Conference. This year's conference included 1 full day of educational classes with a vendor trade show/expo. On the following day we have our ornamental and turf (Category 3) pesticide applicator recertification program.

But probably the most effective way to have a successful local event is to ask the members what they want. Email them, send out surveys, make phone calls but however you need to do it, make sure you are getting feedback and in turn giving the membership information on topics that they want to learn about. Our members told us that while they like the classroom setting and the information they were getting, many wanted to have some "hands on" events too. This past year we were fortunate enough to have a Field Day that combined the two. We teamed up with experts from Beacon Athletics, Toro, and Diamond Pro to create a comprehensive learning session that combined hands-on and classroom on field maintenance knowledge.

Each chapter is going to be different as to what is pertinent to their membership, but the key is to get chapter members involved. Share the information you gained by attending the National STMA. Use local universities, extension agents, and vendors to help educate. Use emails, phone calls, mailers, Facebook, Twitter or whatever means you can to communicate the information to your members. Network and use your membership to its potential. We all deal with the same issues, so why not use a great resource like your local STMA chapter to help solve those issues.

Brian Winka, CSFM is parks maintenance supervisor for Chesterfield, MO and president of the Gateway Chapter of STMA, www.gate waystma.org.



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Want to be an environmental steward? *Here's how*



>> A RAIN GARDEN designed to handle run-off from tennis courts, instead of directly into the river. An example of an Albion College's projects initiated and built to demonstrate future parking lot designs.

T SOME POINT, you may make the choice to become an environmental steward. It is a personal decision greater than trying to achieve "sustainability." Sustainability, in my opinion, is a media buzzword and is an overused dust pan in which to sweep up every process and then declare victory. It is an appropriate buzzword for your communications department and doesn't put any dirt under your fingernails.

We have a job to do and that is to provide safe athletic fields. Environmental stewardship is more in line with our jobs as sports turf managers as "keepers of the earth." It takes a high level of self-organizing to embrace the mystery of the earth and understanding that Mother Nature is the victor. Self-organizing is like cleaning up the desk in your brain. The challenge is, "How to do it?"

Let's assume you are a leader on your campus and have accepted the seriousness of taking Environmental Stewardship from your institute's agenda. Be prepared because once you begin to inquire about environmental issues it will be magnified and you have to be able to wrap your mind around this worthy topic.

"What we focus on becomes our reality." Begin with gathering all the loose papers in your brain that document what your campus has accomplished successfully on environmental stewardship. Communicate with everyone involved with past practices, across the campus, that you have identified their accomplishments, how they were done, and that more of the same accomplishments are in the future of our campus.

In every society, organization, or group, something works. "This step will do two things for self-organizing. One is that it will put success stories on the tip of your tongue when you need motivation and two, you will realize that you're not alone. A team will start to form if you focus on how successful individual projects contributed to the campus's Environmental Stewardship. How you function as a team is up to you. It is my experience that face-to-face meetings are best with the goal being an agreed upon collaborative document.

Now that you're not alone and a team is built, start to create questions that can explore environmental stewardship. Here are some sample questions to ask the team: Describe a time when you feel the campus performed really well with environmental issues? What were the circumstances during that time? Describe a time when you were proud

Here are some sample questions to ask the team:

Describe a time when you feel the campus performed really well with environmental issues?

What were the circumstances during that time?

Describe a time when you were proud to be a member of the organization's environmental movement. Why were you proud?

What do you value most about being a member of this team? Why?

to be a member of the organization's environmental movement. Why were you proud? What do you value most about being a member of this team? Why?

Take these exploratory questions to your team and facilitate interviews and/or surveys. For interviews, separate team members into pairs and have each person interview the other with these questions. *"The act of asking questions of an organization or group influences the group in some way.*" Make sure notes are taken by the interviewer because the questions will turn into conversation. Notes will be shared soon.

Regroup as a team and start asking for small tidbits of information from the interviews. As the facilitator make sure to write the nuggets of information on a white board or large paper pad. What will happen is a common thread will emerge about environmental issues that will be visible for all of the team. *"People have more confidence and comfort to journey to the future (the Unknown) when they carry forward parts of the past (The Known)."*

On our campus, for example, we discovered that we had about 80% of the Michigan Turfgrass Environmental Stewardship Program (MTESP) portfolio of modules completed, just by identifying our past success stories. We also discovered that with some administrative work with the state we qualified for participation in the Michigan Business Pollution Prevention Partnership (MBP3). It was easy to attach a process to our commitment to environmental stewardship half way into the discovery of our successes. Of course, this opened up invitations to invite authors, consultants and administrators of these statewide programs onto our team. The partners helped with the next step of "How to do it."

Combining the campus team and state partners emphasizes the focus on the positive. With the positive in mind, ask the team to start dreaming. Much like facilitating the information from the interviews, with a white board, asks the group, "What if we could do more of what works and what could we accomplish?" "If we carry parts of the past forward, they should be what are best about the past." On our campus, we decided to finish the other 20% of the MTESP modules with the help of the students and enroll in the MBP3 partnership. We had another success story to build upon.

The team believed that we made strides in environmental stewardship fairly early in the process. The dream became a daily reality in other best management practices outside of the athletic fields. Purchasing started to consider Michigan-based companies and evaluated the company's environmental awareness and visions. Technology Services engaged Consumers Energy to take advantage of re-lamping rebates to re-lamp buildings with energy efficient fluorescent bulbs. Students started to gain momentum reducing the solid waste landfill stream with student organizations willing to run a recycling contest. When extraordinary developments grow on campus as a result of just asking questions, as the leader, it is time to capitalize and display that everyone on the team made all this happen and there is still work to celebrate. "It is important to value differences."

On our campus, we continue to see environmental stewardship action and innovation from faculty, staff, and students. We completed the MTESP and organized a multi-media press conference, bringing attention to the success of adopting an Environmental Stewardship Program. In the process, I explored some poetic explanation to my motivation:

A river is to the earth, as a vein is to the heart. The Kalamazoo cradles our acres of athletic fields, in the fold of a southern curve of least resistance.

On a quiet day the river can be heard in the distance. If something spills on campus, its fate is the river, the vein to the earth. A quiet campus is the result from the awareness of this relationship.

(Our campus is a postage stamp of property in the Kalamazoo Watershed. The Kalamazoo River Watershed encompasses approximately 2,020 square miles and includes parts of eight counties in the southwest area of the Lower Peninsula in Michigan. The watershed stretches 162 miles and varies 11 to 29 miles in width.)

In summary, to start an environmental steward process and complete a successful program, start with self-organization and focus on what works. Success is found only if you're looking for it and once it is found create the future around it. In this case, I choose to focus on Environmental Stewardship and in general much of this language can be applied daily. "The language we use creates our reality."



Mark Frever, CSFM, is director of grounds for Albion College, Albion, MI.



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Photo 1

Photo 3

Photo 4

AN CONST

Photo 4 Photo 5

Top Photo courtesy of Clinton Bailey, Engineer–City of San Angelo. Photo 1: Irrigation problems—could have been avoided. Photo 2: Know and analyze your existing soils. Photo 3: Sample and analyze soils. Photo 4: Verify your grades. Photo 5: Specify weed control throughout construction period.

Factors to consider before building a new sports field complex

AVE YOU EVER gazed upon a sports field, either your own or someone else's, and wondered why there are so many problematic conditions on that site? It could be issues dealing with soils, drainage, compaction, salinity, or any number of other problems. Who is responsible for these issues? How could they have been avoided? Could something have been done differently during its construction that would have made a difference? Ultimately, the design and construction of a sports field/ complex plays a major role in determining the maximum level of overall performance from your turfgrass for that site.

Anyone who has ever been a part of building a new sports complex knows that it can be one of the most satisfying experiences in their career. Walking onto a new sports field where you and your staff played some role in its completion can be a very proud moment. But, as most turfgrass managers know, the path to this proud moment isn't easy. It takes a tremendous amount of time, hard work, and determination.

Throughout the entire process, you will likely work with many fantastic people within the turfgrass industry and some outside of our industry. You will have days where everything goes your way. Then, unfortunately, you will face some days that are not pleasurable. Trials and tribulations with your project can be expected, but you CAN minimize the varying degree of these problems.

There are many factors to consider when building a new sports field complex that will assist in maximizing the performance of your site and minimizing the unnecessary problems. As a turfgrass manager, you should create your own list and outline the issues that you feel are important. Here are a few helpful tips:

PLANNING AND DESIGN

• Choose an architect who knows and understands the complexity of sports field construction (i.e. turfgrass management, soils, irrigation, drainage, fencing, buildings, electrical, plumbing, etc.).

• Always check the references of the architect for performance of past projects.

• Work directly with the architect on the design and specifications of the contract.

• Make sure the architect understands his or her role before, during, and at the completion of the project.

CONTRACT SPECIFICATIONS

• Review and make the necessary changes in the contract before going out for bid.

• Use resources you know and trust for advice (i.e., turfgrass specialists, soil lab personnel, other turf managers, books, articles, etc.).

• Make sure the owner is well informed and accepts the contents/specifications of the contract.

• Add more specifications to cover ALL aspects of the project. Do not assume that the contractor will know and understand the complexities of sports field construction (i.e., over-compaction, drainage, soil types and depths, soil quality, weed management, irrigation installation procedures, laser grading, fencing, buildings/structures, etc.). • Remember, you can always negotiate what you have in the specifications of the contract, but you cannot add to the specifications once you have hired the contractor and started the project—unless you want to pay extra!

• Know and understand your construction plans as well as the contract specifications. You will use these extensively throughout the project.

CONTRACTOR SELECTION

• Contractor shall list all sports field construction (or related) projects currently in progress: name, contact person, schedule or percent completion, and value/amount of project.

• Contractor shall provide list and credentials of all sub-contractors for approval before the awarding of the bid.

• Contractor shall list all projects that were awarded to them but failed to complete within the past 7 years.

• Contractor shall list all defaults of bids and/or performance bonds.

• Contractor shall list all judgments, claims, arbitration, proceedings, or lawsuits pending or outstanding either against them or from them for the past 7 years.

• Contractor shall provide the name, credentials, and job responsibility of the **turfgrass superintendent** the contractor intends to use during the sports field construction before bid.

• Contractor shall provide information or a list of past completed jobs relating to sports field complex construction as a reference.

• Specify that the bid will go to the lowest, **qualified** bidder for the project and then define "qualified."

CONTRACTOR/OWNER ISSUES

• Have the contractor develop a timeline for the start date and completion date of all aspects of the project in the appropriate order.

• Contractor should meet with his/her architect, sub-contractors, and owner representatives at least once per week. Communication is the key!

• Contractor should make periodic changes on the timeline and approved by the owner.

• Liquidated damages should be applied to the contractor if he/she fails to meet the timeline. Make sure the amount is appropriate (i.e., \$100 per day for being late will likely not get the attention of a contractor on a \$10 million project).

• Change orders need to be made in a timely manner with approval by the owner and the contractor.

• Documentation is critical for change orders and specifications of the contract.

• Payments to the contractor should be made if he/she adheres to the contract and shows adequate and acceptable progress.

• Payments should be withheld if the contractor fails to adhere to the specifications or does not show adequate and acceptable progress.

SOIL SELECTION

• Use a reputable soil testing lab for



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analysis and advice before and during the project.

• Sample, analyze, and understand your existing soils at the site.

• Know and understand the drainage issues, sub-grade, topsoil, and infield mix that you plan to use.

• Keep the ranges of the specifications tight for all types of soils used in the project.

• Specify the type of analysis (i.e. texture, EC, pH, fertility, plasticity, organic content, etc.)

• Specify the soil sampling technique.

• Specify what, when, and how many samples will be taken (i.e., before delivery and at delivery for verification before installation, for example, every 2,000 tons, every quadrant, etc.).

• Remember, you can always negotiate a wider range if you choose to do so later, but you cannot make the specification tighter after hiring the contractor unless you want to pay extra!

• Take soil samples of blends, existing

soil, etc. to verify your specifications.

• If you specify a certain depth of topsoil over the sub-grade, spend the time verifying that you have it.

• Specify that the sub-grade and topsoil over the entire site be free of rock, debris, glass, etc.

• Specify that two different soils cannot be used on the same field, area, etc.

• Verify compaction issues in the subgrade and topsoil. If appropriate, specify scarification to eliminate/minimize compaction issues.

• For proper turfgrass growth, proctor densities should range from 83% to 88%. Anything greater may lead to management issues due to over-compaction.

• Define the expectations for weed control during construction throughout the entire project site.

INFIELD MIXES AND CONDITIONERS

• Make sure the contractor understands the specifications for the texture, color,

plasticity, organic content, etc. of the infield clay and conditioners (i.e. 60% sand, 20% clay, and 20% silt for the infield clay with +/- 5% tolerance).

• Define the depth of the infield clay and conditioners, mound installation process, etc.

• Keep the ranges of the specifications tight for the infield clay and conditioners used in the project.

• Specify what, when, and how many infield clay samples will be taken (i.e., before delivery and at delivery for verification before installation, for example, every 1,000 tons, every field, etc.).

• Specify that the infield clay will be free of rocks, glass, debris, etc.

• Understand the differences in sand particle size.

LASER GRADING

• Specify laser grading with tight but appropriate tolerance levels (i.e. +/- 0.5 inch).

• Specify the appropriate type and size of equipment that can be used.



• Verify sub-grade and final topsoil grade elevations to confirm slope, topsoil depth, proper drainage, etc. by having the contractor use a 3rd party, licensed surveyor with an appropriate grid pattern.

• Fine grade the topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of sub-grade.

• Finish grade shall be a smooth, clodfree, non-compacted seedbed ready for planting.

• Throughout the project, it is the contractor's responsibility to maintain the topsoil in place at specified grades. Topsoil losses due to erosion will be replaced by the contractor until acceptance is achieved from the owner.

• Protect existing plant growth and features remaining as final landscaping.

IRRIGATION

• Check the architect's irrigation system design for flaws, equipment type and compatibility, layout design, manufacturer specifications, application rates, distribution uniformity (head to head coverage), etc.

• Make sure you have enough irrigation water from the source to meet the demands.

• Specify the method of installing the irrigation system (i.e., ditch and pipe into sub-grade, add topsoil, and then place heads to avoid topsoil contamination issues.

• Specify irrigation audits on all zones for approval by owner.

• Strategically place isolation valves throughout the project site.

TURFGRASS SELECTION

• Specify exactly what you want—variety/type, sod vs. sprigs vs. seed, planting rate, appropriate dates of planting, preplant and grow-in fertilizer, herbicide applications, tillage, rolling, irrigation, etc.

• Have a backup plan if the contractor cannot meet the dates for planting.

• Specify a finished product free of weeds (i.e., common bermudagrass as a weed in a hybrid bermudagrass site).

• Specify that the owner must approve the turfgrass before installation. Travel to

the sod farms for sod/sprig approval.

• Specify the guarantee maintenance period after planting for the contractor.

FINAL THOUGHTS

• Be observant and verify the work of the contractor.

• Don't expect to always be the most liked person at the site.

• Take digital photos and document everything.

• Stay focused, sustain professional mannerisms, but maintain resolve!

Roger D. Havlak is a private turfgrass consultant who also serves as the Parks Superintendent for the San Angelo, Texas community. The City of San Angelo completed the construction of a sports field complex in 2009 that included 15 baseball/softball/flag football fields, concession and restroom facilities, playground site, four sand volleyball courts, and 55 acres of Tifway 419 bermudagrass turf. He can be reached at rdh@zipnet.us.



Assignments and grounds crew work plan for the Seattle Mariners

AS PART OF THE SPORTS TURF MANAGERS ASSOCIATION'S REGIONAL CONFERENCE last July in Seattle, the group toured Safeco Field, home of the Mariners and groundskeeper Bob Christofferson, the 2005 Harry C. Gill Memorial Award winner. During the tour Bob shared that day's grounds crew assignment and game plan schedules. We reprint them here with his permission.

GROUNDSCREW						
TO .	GAME PLAN					
Date:	Wednesday July 21					
Game Time	Game Time 7:10pm					
	ASSIGNMENTS					
Show up:	9am-Tim Leo Billy Jackson 11am - Dave Kevin Sean					
Water Flowers:	10am - Billy Jackson					
Blow Track:	9am - Billy Jackson					
Daint Lineau						
Paint Lines:	NO					
Bullnens:	11am - Dave Billy Jackson Sean					
Dunponor	Thin bave bing backeon bean					
Homeplate:	12pm - Dave Billy Sean					
Main Mound:	1:30pm - Billy Tim Sean					
Mow Infield:	11:15am - Tim					
Mow Sides:	11:15am - Kevin					
Many Outfields						
wow Outfield:	11:45am - Leo BC					
Mow Bullnen:	12nm - Jackson					
mon bunpen.	12pm - Jackson					
Mow Sod Farm:	aftewr bullpens					
Water Rhodys:	YES - Jackson with a hose					
Water Sod Farm:	NO					
Track Prep:	1pm - Billy					
14-1						
Water Infield:	12:30pm - BC TIM Leo Sean					
NOTES	0.45 Objects infield work, means that a basis					
NOTES:	M's DED 9:15nm - 3:50nm					
	ווואס דרד ט. זטאוווי ט. טטאווו					

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SEATTLE MARINERS

GAME DATE: Wednesday July 21, 2010					
G	GAME START TIME: 7:10pm				
AMERICAN LEAGUE	OPPONENT: Chicago				
Gue	Guest Groundskeeper Dan Donaldson John Rylaarsdam				
				MAJOR LEAGUE BASEBALL	
		Court product of			
EARLY WORK					
MEET GUEST O	BROUNDSKEEPER 5:	OO PM	eo Liebert		
WATER 3R	D BASE SIDELINE 5:	OOPM	Kevin Dvorak Dave Mattson Jackso	on Guzzo	
F	RIGHTFIELD MESH 5:	15PM	Kevin Dvorak Dave Mattson Jackso	on Guzzo	
	WARNING TRACK 5:	35PM F	Right - BC Jackson Guzzo Lauren Chr	ristofferson Roy Young	
	WARNING TRACK 5:	35PM 0	Center - Tim Wilson Don Brisbois Mac	ckenzie Young Leo Liebert	
	WARNING TRACK 5:	35PM L	eft - Kevin Dvorak Dave Mattson To	m King Steve Larsen	
FOUL LINES w/Billy [5:50PM Tom King Steve Larsen					
MOUND BLATFORM	Ti	BPIEA	HDOWN - 6:30pm		
MOUND PLATFORM	R	m Wilson	Fielder		
DIATE MAT		Dave Mattson Kevin Dvorak Billy Brown			
HOMEPLATE CAGE		Tom King Steve Larsen			
1st BASE SCREEN		Roy Young Fielder			
2nd BASE SCREEN		Tyler Christofferson Fielder			
OUTFIELD SCREEN		Leo Liebert Fielder			
SCOREBOARD SCREEN	Ja	ackson Gu	uzzo		
SIDELINE SCREENS 1ST	La	auren Chr	istofferson Mackenzie Young		
SIDELINE SCREENS 3RD	Do	on Brisbo	is Fielder		
TRAILER SCREE	ENS Le	eo Liebert			
BP BASES	Jo	ohn Rylaa	Irsdam Dan Lonaldson	Christofferson BC	
INFIELD MESH	11	PPE-CAL	ME ASSIGNMENTS	auren Christonerson BC	
MOUND	Tir	m Wilson	- done by 6:43pm		
INFIELD	BF	ROOM - D	Oon Brisbois Mackenzie Young Roy	Young	
INFIELD	Ту	ler Christ	tofferson		
BASELINE WATER 1ST	La	auren Chr	istofferson Steve Larsen John Ryla	arsdam	
BASELINE WATER 3RD	BC	С То	m King Dan Donaldson		
1ST Base Track Water		Lauren Christofferson Steve Larsen John Rylaarsdam			
3RD Base Track Water		BC Tom King Dan Donaldson			
HOMEPLATE TRACK WATER	Da	ave Matts	on Kevin Dvorak	and the second second second second	
OUTFIELD TRACK WATER	JUTFIELD Ja	tekson Gl	on Guzzo Leo Liebert Bight-Lauren Ch	bristofferson Stave Larson	
INFIELD WATER 197	r Ti	m Wilson	Don Brishois Mackenzie Young Boy	V Young John Bylaarsdam	
INFIELD WATER 3BI	D BC	C To	m King Tyler Christofferson Dan D	Donaldson	
HOMEPLATE	Da	ave Matts	on Kevin Dvorak - done by 6:43pm		
TRAILER HO	OMEPLATE Ke	evin Dvor	ak		
BASELINE CHALKING	Bi	illy Brown	- done by 6:45pm		
TRACK D	UGOUTS 1S	ST - Dave	Don Home - Kevin 3RD - Tyl	ler Roy	
BULLPENS	To	om King -	W3		
CATWALK	Do	on Brisbo	bis - W2 Steve Larsen Mackenzie	Young	
	St	eve Larse	en	Pour Vouna	
UMPIRES TUNNEL	La	3PD 2 6	TH INNING DBAG	Hoy foung	
DRAGGING	De	on Brisbo	is Steve Larsen Mackenzie You	ng	
RAKE 1S	T & 2ND TV	ler Christ	tofferson Roy Young		
RAKE 2N	ID & 3RD BC	C La	auren Christofferson		
PULL 2ND BASE	Jo	ohn Rylaa	rsdam Dan Donaldson		
		POST GA	ME ASSIGNMENTS	日本には「日本」の「日本」	
MOUND	La	auren Chr	istofferson		
BROOM FO	UL 3RD To	om King	Wanna		
BROOM FA	IR 3RD Ma	ackenzie	Young		
BROOM EO		eve lares	an		
BROOM	IR 1ST	on Brisbo	lis		
BASELINES 1S	T Do	on Brisbo	lis		
BROOM 1S	T - 2ND St	teve Larse	en		
BROOM 2N	D-3RD To	om King			
HOMEPLATE		Tyler Christofferson Roy Young			
PICK UP BASES		John Rylaarsdam Dan Donaldson			
INFIELD		Tom King Steve Larsen Mackenzie Young Don Brisbois			
BULLPENS Tom King Don Brisbois - Water home grass by hand				and	
HOSES FROM BEHIND TARPS		Crew			

Design and material selection for newest MLB facility

HE DIAMONDBACKS AND ROCKIES are doing something never done before in Major League Baseball. The new spring training facility shared by the NL West rivals is the first professional complex built on Native American land. Salt River Fields at Talking Stick is on 140 acres of land shared by the Salt River Pima and Maricopa Indian communities near Scottsdale, AZ. Designed by HKS architects, the facility was built by Mortenson Construction and features tremendous views of Camelback Mountain, the McDowell Mountains, Four Peaks, Red Mountain, and the Superstition Mountains.

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The crown jewel of the complex is the 11,000-person capacity stadium, featuring a few other "firsts."

The video scoreboard is the largest Spring Training board in baseball, measuring 24-by-48 feet and featuring LED technology. Also, the positioning of the field and the roof structure ensures that 85% of the seating bowl will be in shade by the late innings...

Interview with Joe Traficano, West Coast Turf

SPORTSTURF: Who made the decision to install your sod on these fields, what is that turfgrass, and are all the fields employing the same variety?

TRAFICANO: Grant Trenbeath, head groundskeeper for the Arizona Diamondbacks and Mark Razum, head groundskeeper for the Colorado Rockies were the primary decision makers in going with Tifway 419 hybrid bermudagrass. This variety is used exclusively throughout the entire complex including all landscape areas.

ST: What reasons did they give for going with that particular variety?

TRAFICANO: Both Grant and Mark have grown and maintained this variety throughout their careers and were familiar with its growing characteristics; it is the most commonly used bermuda on sports fields and golf courses in Arizona.

ST: How many fields are there at the complex? Approximate total acreage?

TRAFICANO: There are 13 fields total; each team has six practice fields and the main stadium field that is shared. Along with the fields each team has pitching mounds, bunting fields, half fields, and agility fields for conditioning. West Coast Turf provided 35 acres of Tifway 419 sand base for all the playing surfaces and 15 acres of Tifway 419 native base material for all the landscape areas around the complex.

ST: How far in advance was the type of turf decided upon, and did WCT grow particular acres specifically for this project?

TRAFICANO: West Coast Turf was contacted in January 2010 to hold 1.2 million square feet of Tifway 419 Bermuda sand base for an approximate June 2010 installation date. Typically for this sized project you would contact the sod supplier at least 8 months in advance so the sod can be held until it was time for installation. We knew that the project was going to be built before our initial meeting and made a decision in Fall 2009 not to overseed any material projected for the complex so it would be in prime condition when needed.

So for this project the short window was not an issue at all due to several factors, one being that we are a large sod supplier and had the inventory to handle the quantity and time frame required for the project. Secondly, we have worked with all the parties involved in the construction and lastly, West Coast Turf currently grows our turf on land that is leased from the Salt River Pima-Maricopa Indian Community. The construction team said the [Native American Community] was pleased to be using turf that was grown on their land for this project.

ST: What challenges does Marshall Jennings, the on-site turf manager there, face in this first year, in your opinion?

TRAFICANO: The biggest challenge in my opinion would be having to overseed the turf installed in summer and then having to bring in sod that was overseeded in late November through January due to schedule of the project. It is always recommended that new turf installed in the summer not be overseeded and let it have 1 year to establish and mature, but we all know that is not always possible, especially in this situation. These fields need to be in prime condition for spring training and here in the Southwest the Tifway 419 Bermuda goes dormant.



^{ohoto} by Jon Willey

The crown jewel of the complex is the 11,000-person capacity stadium, featuring a few other "firsts." The video scoreboard is the largest Spring Training board in baseball, measuring 24-by-48 feet and featuring LED technology. Also, the positioning of the field and the roof structure ensures that 85% of the seating bowl will be in shade by the late innings. As the owners are targeting a LEED Silver rating, ASLA award-winning Ten Eyck Landscape Architects designed the landscaping surrounding the complex to reduce the amount of concrete and asphalt, using more natural materials inspired by the tribal heritage.

The teams are the last holdouts to move up from Tucson to the metro Phoenix area from Tucson. The building of this complex further solidifies the Phoenix area as the epicenter of professional baseball facilities, with more of them located in a metro area than anywhere in the world. It is estimated that the Cactus League generates \$359 million in revenue for the state. While spring training tourism dollars are critical to the Arizona economy, the pressure the Great Recession has put on an already strained tax budget, made the spectacular investment needed to build such a facility nearly impossible to come by. This perhaps is the most incredible "first," a \$100 million complex built tax-free in a down economy-thanks to the two tribes.

A TALE OF TWO GROUNDSKEEPERS

While the official groundbreaking took place in November 2009, the specific field design was not completed until March 2010. The field design process was unique in itself. Rather than simply offering input and consultation, two MLB head groundskeepers came together to essentially lead the field design process. For the Rockies' Mark Razum and Diamondbacks' Grant Trenbeath, this felt like déjà vu on a grand scale. In 1994, their groundskeeping paths originally crossed, just miles away from the new complex, when Razum designed the practice fields for the Oakland A's Spring Training site. Trenbreath, an up and coming groundskeeper, took over on the construction after Razum left to take the head position with the Rockies.

Flash forward 16 years, the two collaborated on the field design and material selection for the 12 practice fields, stadium field, and bullpen areas. Razum recounted the first time the two discussed the project. "We could have been rivals working for different clubs, but we decided to work as a team toward the same goal, and try to keep things uniform throughout the entire complex."

Razum agreed with Trenbeath when he said, "These fields were designed to be truly professional in every element." This is true for the elements that are seen, as well as the unseen. At first glance, one may think that the two were preparing for large rain events with the 12 inches of amended sand rootzone over 4-inch gravel drainage layer on top of drain lines, but another motivation is hidden just under the surface. The name Salt River Fields pays homage to the Native American community's relationship with the Salt River, which is exactly what its name suggests. The dry climate and soil composition has led to a build up of salts in the area's groundwater and waterways. The drainage system was designed to quickly evacuate these salts out of the rootzone. Installation began on this first

piece of the puzzle before material selection of the other playing surfaces. Barkshire Laser Leveling laser graded the USGA spec 95% sand composition amended with 5% peat, before West Coast Turf sodded the 45 acres of playing surface.

The infield and warning track material selection was a one-of-akind process. In keeping with the theme of "firsts," Razum and Trenbeath collaborated with Stabilizer Solutions, Inc. to engineer brand new infield and warning track mixes specifically for the complex. "We wanted something that would set us apart from the other Spring Training complexes, so the first criterion in designing the mix was an eye-catching color. We wanted something that would match the overall color scheme with the brickwork and reflect the tribes' preferences," said Razum. Outfitted with boots and hard hats, the two groundskeepers made the expedition with the Stabilizer team and lead designer Anthony Stevenson of Lloyd Civil and Sports Engineering, out into the Arizona desert to the company's quarry. "It was amazing to look around at the surrounding hills and see the various layers of natural color. Beyond the natural wonder, it was an eye opening experience to see the science and engineering that goes on behind making the mixes," said Trenbeath.

After narrowing down their top color choices, the decision making process moved into the lab. With particle size analysis in hand, different combinations of silt and clay were added to the crushed and screened raw materials. For the professional infield mix, the team agreed upon 40% of silt and clay content, with a silt-to-clay ratio (SCR) right around 1. For the warning track mix, the motivation was to make it as coarse as possible without reaching too large of gravel, and a lower clay content than the infield mix to reduce compaction from utility vehicles. The Stabilizer product was blended with both mixes to stabilize the mixes and help increase moisture management during the intense weather swings from dry to wet that the area experiences.

Next the mix moved from the lab to the playing field. Razum and Trenbeath left nothing to chance; the pair had the new mix installed at Seton Catholic High School, just minutes from the Trenbeath residence. After weeks of intense scrutiny, the pair finally approved the new mix after D'backs legend Matt Williams took grounders from Trenbeath on the field, ultimately giving it his blessing. Razum remembered Williams as "a connoisseur of infield mix during his playing days, so his opinion meant a lot."

AN EYE ON MAINTENANCE

Professional elements do not always mean increased maintenance. "We kept maintenance in mind throughout the process," said Trenbeath. Razum added, "We have a combined 50 years of experience, so every selection had the grounds crew in mind."

A major focus was to reduce maintenance and time spent on less important components. Warning track heads were installed on all of the practice fields, and Hilltopper Waterless Warning Track Mix was installed at the main stadium to eliminate manpower on watering the warning tracks under Arizona's intense sun. The warning track heads serve a dual purpose, not only to reduce watering time on the warning tracks, but to water the grass edges that are first to go under the Arizona sun. The area is susceptible to high winds, so two extra infield sprinkler zones were added to help with additional coverage

WHAT HYDRAULICS?

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on windy days. Hilltopper Mound Clay was used to reduce labor hours on the pitching slopes and homeplate areas, further reducing water consumption on the 100+ mounds across the complex. Equipment corrals were secured permanently to withstand the intense force of the monsoon storms that attack Arizona every summer. These corrals were also placed in close proximity to the fields for easy movement of batting practice screens and equipment.

Trenbeath mentioned innovations that would have reduced maintenance even further, but were not done because of budget considerations. The two wanted to incorporate an underground infield skin watering system, similar to the one in use at Yankee Stadium. They would have also incorporated a heating system under the stadium field turf to help establish ryegrass more quickly in autumn months, and ease the transition process to Bermuda in the warmer months.

To the outside observer this may seem unnecessary with Arizona's climate, but Trenbeath says to consider that the stadium is designed to shade 85% of the seating bowl by 1 PM during the spring, which leaves even fewer sunlight hours during the fall rye establishment period. Trenbeath is intimately familiar with managing lesser talked about shading issues. At Chase Field (regular season home to the D'backs), beginning in August, the grass area behind homeplate is completely shaded for the remainder of the season. To combat this Trenbeath developed a grow light system, placing large light carts on the warning track to provide artificial sunlight.

The pair made a conscious effort to keep many of the materials uniform across the complex to ensure easier maintenance, but there are certain customizations on each side that make the facility feel more like home for each team. Each side has a practice field that is built to their respective home ballpark dimensions. While the replica Coors Field may be to exact dimensions, Trenbeath shared a secret the replica Chase Field was built according to the stadium's original specifications rather than the current ones. He says that the differences are only noticeable to the keenest eye, such as the width of the trademark pathway from homeplate to the pitcher's mound.

Other customizations are located in the bullpens. The D'backs chose to go with artificial turf for the homeplate areas, with natural turf between those areas and pitching mounds. The Rockies kept clay homeplate areas with warning track mix leading up to the mounds.



Photo by Jon Willey

The D'backs have two bullpen areas, one area with an 8-mound pack and another with a 10-mound pack, each area with mounds side-byside. The Rockies have one bullpen area with a 10-pack of side-byside mounds, and one area with an 8-pack of back-to-back mounds. The D'backs also have two individual bunting fields, while the Rockies have staggered three bunting areas onto one field.

Furthermore, the Rockies have opted to combine their professional and minor league practice areas and weight rooms, while the D'backs decided to keep the two separate. This includes 10 covered cages in one area on the Rockies side, while the D'backs maintain five for each group.

A NEW CHALLENGE

Despite the consideration given by Razum and Trenbeath on the field design, the stadium design will pose a new challenge for fulltime veteran groundskeeper Marshall Jennings. The design allows for unprecedented access to players as they move between practice fields, including ramps that lead into viewing areas of bullpens and batting cages. As Diamondbacks President Derrick Hall has been quoted saying, "It is... the Disneyland of baseball and spring training." While this aids in the fan experience, potentially drawing more customers in the long run, in the short run this poses a challenge for groundskeepers learning how to deal with the new fan interaction. How exactly will this affect groundskeepers? No one can tell for certain although both Razum and Trenbeath believe that it is a legitimate concern that should be closely monitored. As teams compete for fan attention in this information age, greater fan access may become the norm. "Once a fan steps on the property they become a part of the baseball experience. I think the first year will be a feel-itout kind of thing. It may be a challenge, but I think they will be able to make the adjustments," said Razum.

FINISHING TOUCHES

At the writing of this article (mid-February), finishing touches are swiftly being made to the complex for Opening Day on February 26. With an overall timeline of 15 months from groundbreaking to Opening Day, sticking to the scorching construction schedule has been an amazing feat for all parties involved. Although this timeline has forced concessions from the design team, the complex is already receiving rave reviews from the teams, media, and the Native American community. For the two groundskeepers, they see a project of this magnitude, on this time frame, as always posing unique challenges. Through it all, Razum summed up the project best when he said, "Being involved and having the cooperation of the community really said it all. They followed our recommendations on all 13 fields without cutting corners. I am proud to say that these are professional fields in every aspect. During this process, I enjoyed working with Grant and developed an appreciation for his professionalism. Many other people were involved who all wanted to see this project through to the final result, and I think the relationships that we built getting to that point are what matters the most."

Clayton Hubbs is a former groundskeeper for the Arizona Diamondbacks and Director of Operations for Stabilizer Solutions, Inc., clay.hubbs@stabilizersolutions.com.



SHAWN MAHONSKI, sports turf technician, Towson University

Towson competes at the Division I level in men's lacrosse. They compete at home on a FieldTurf surface installed a few years ago. On synthetic surfaces, I always stress to those installing a new field that they inlay all the lines. On a grass surface though, everything should be measured from the center of the field. After the outline, we'll first paint all the lines that cross the field sideline to sideline, and then add the wing area lines and creases. It's important not to forget the face-off square at center field. We paint a 4x4-inch square in a contrasting color for this.

Our team does practice on grass in the fall. Also, we have huge lacrosse camps in June. There are not many options for keeping grass in wear areas, usually inside the crease and at face-off. We try moving the field side to side, much like many do for soccer. We'll seed with perennial ryegrass seed all through the fall to try to get something to grow. In the end, we re-sod those areas almost every year.

JESSE PRITCHARD, CSFM, sports turf manager, University of Virginia

Our men's lacrosse team plays in Klockner Stadium, a sand-based, Patriot bermudagrass field that is heavily overseeded with perennial ryegrass in the fall. Klockner is home to the University of Virginia men's and women's soccer programs in the fall and our men's and women's lacrosse teams in the spring. Men's lacrosse can bring in up to 8,000 fans per game.

Laying out a youth men's lacrosse field

is actually quite easy. With three people the field can be measured, strung and painted in less than an hour. Laying out a women's lacrosse field is a completely different matter and quite difficult without any previous experience (see June 2009 *SportsTurf* for laying out women's lacrosse fields.)

There is a reason there are only 10 Division I men's lacrosse programs that compete on natural grass fields: keeping grass growing on a lacrosse field in the Mid-Atlantic region in January, February, and March is nearly impossible. We treat three areas on a men's lacrosse field differently than that of a soccer or football field. The team bench areas and attack areas are needle-tined after every game and seeded with additional perennial ryegrass starting March 1. The area inside the crease will



break through the sod layer after three or four games. At that point we will dig out the sod and some sand and pack in mound clay. We treat this area the same as we do a baseball or softball home plate area in order to make sure all the balls have true hops. We repair the holes dug from the goalie after every game. The faceoff area in the center of the field we try to move up and down the midfield line to spread out the wear.

From what I can gather, the only grass fields in D1 lacrosse are at Virginia, Maryland, North Carolina, Duke, Rutgers, Penn State, Ohio State, Fairfield, Brown, and VMI.

MEN'S FIELD DIMENSIONS

A lacrosse field is 110 yards long and can be from 53 1/3 to 60 yards wide. The goals are 80 yards apart with a playing area of 15 yards behind each goal. The length of the field is divided in half by a center line. An 18 ft. diameter circle is drawn around each goal and is known as the crease. A rectan-



Klockner Stadium is a sand-based, Patriot bermudagrass field and home to the University of Virginia soccer and lacrosse teams. Photo by Jesse Pritchard, CSFM.

gle, 35 yards by 40 yards surrounds each goal area and is known as the goal area. An "X" is marked in the center of the field. There is a special substitution area on the sideline, next to the timers table. Access field diagrams below for a clearer picture. The goal is 2 vertical posts 6 feet apart, joined by a top crossbar which is 6 feet from the ground (a 6'x6' goal). A line is drawn on the ground between the posts in order to indicate the plane of the goal. This line becomes known as the goal line. Attached to the goal is cord netting, which is fastened to the ground 7 feet behind the center of the goal. The boundaries are determined by the natural restrictions of the field. An area of 120 yards by 70 yards is desirable.

