

## **COMMON PROBLEMS ON SAND-BASED AND NATIVE SOIL ATHLETIC FIELDS**

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Native soil fields and sand-based fields have entirely different types of rootzone materials; however, they often have similar problems because they face the same pressure from a given sport. Improved drainage and less compaction are anticipated benefits with sand-based systems, but this does not exclude them from problems related to too much water nor does it mean that they will not benefit from deep tine cultivation. Simply put, sand based-systems unto themselves, do not guarantee a certain level of playing field performance. Instead, they offer the ability to manage moisture and compaction under adverse conditions of excessive rain and intense use. Managers should recognize the strengths and weakness of both types of systems, communicate realistic field performance expectations, and develop specific strategies for each field type.

### **COMPACTION**

Compaction is most problematic on native soils where the protective mat of vegetation has been removed and the exposed soil loses structure. The smearing of wet soils and crushing of dry soils breaks apart soil aggregates. Aggregates in native soils increase macropores. This loss of soil structure on intense traffic areas of the field allows individual soil particles to pack very tightly. Aerification is a mandatory management strategy on native soil fields. A combination of hollow, solid, water-inject, deep-tine, and shatter aerifiers will improve the ability to establish and maintain grass. Sand-based fields do not rely on soil aggregates to create macropores, therefore they are less prone to compaction. However, aerification is still a very beneficial management tool on sand-based fields. It is a common practice to construct sand-based fields under wet conditions since they grade and compact better. I have experienced situations where fields built using USGA specifications have been overly compacted, especially where equipment repeatedly treads, to the point that water movement and root growth were inhibited. Although not popular with field contractors it is good idea to mechanically loosen a sand-based field after final grade and before sodding to avoid any over compaction during construction. Aerification on established sand-based fields is needed to mix the sod, topdressing, and thatch layer into a more consistent material that does not develop layering problems. Compaction on sand may not be the primary problem but deep tine aerification has certainly helped promote deeper rooting on some of my fields that seemed to only root in the upper four inches. A specific strategy for sand-based fields might be to promote deep rooting, stabilize the surface and avoid organic matter build up in the upper 2 inches of the profile. Annual aerification to meet this goal would include: hollow tine and remove cores twice per year with 3/4" tines on 3 inch centers; Vertidrain once per year; and solid tine, spike, slice or shatter as needed during the playing season to keep the surface open for air and water.

## **POROSITY**

Macropores are simply insufficient in native soils to provide any type of rapid water movement and this leads to ponded water or muddy surfaces for up to two or more days. Native soils will seldom have a percolation rate greater than one inch per hour. Saturated sand fields often move water at 6 to 24 inches per hour. Even though they drain slower, most native soils provide reasonably good growing conditions, i.e. notice that the area outside of the hash marks on most football fields provides a reasonable grass surface. The slow drainage combined with the need to use the field when its surface is too wet often results in muddy conditions and the accelerated demise of the playing surface. The rapid internal drainage of sand-based fields allows for the surface to dry faster and thus be ready for play sooner. Having said this, it is still very important to have a strategy that will not allow the surface 2 inches of the field to build up excessive organic matter that clogs the large pores in the sand and also holds too much water. Hollow tine aerification combined with core removal and topdressing is critical to preventing organic matter build-up.

## **WATER RETENTION**

Water retention is greater in a native soil field and this means that they can go for a longer period of time between watering. Native soil fields can often store 2 inches of available water per foot of soil while sand-based fields may only store 0.5 inches of available water. Under summer growing conditions native soil fields may last up to 10 days without the need for irrigation, while sand-based fields seldom last more than 3 days before irrigation is needed. Sand-based fields do not necessarily need more water, but they sure need more attention to watering. I still see poor irrigation strategies being used on sand-based fields. Because of the rapid infiltration and large pores some managers believe that any excess water will simply drain away and not be a problem. This misconception really turns bad when this ill fated rationalization goes forward as “I will put a little water on every day just to keep it growing and if I put on too much the extra will drain away”. The other comment that is a kiss of death for the field is “it’s a sand field so you can’t water it too much”. We need to stop thinking of the sand-based field as a laboratory report that says how fast water will go through the tested rootzone. The reality is that the performance of the field is highly dependent on the upper field surface that includes the grass, thatch, sod-soil, and upper one-inch of roots. This important surface inch is where most of the action is and it has very little to do with the water infiltration rate of the rest of the 11 inches of the rootzone. Organic matter accumulates more near the surface because this is where most of the vegetation and roots are located. Organic matter holds much more water than sand and consequently frequent watering results in wet conditions near the surface even if your water infiltration rate is 24 inches per hour. So don’t assume that your frequent watering simply “drains away”, it actually hangs up near the surface. Here are some simple tips to help develop a proper irrigation strategy and avoid over watering.

- Turn off the daily part of the automatic irrigation system and use the manual mode so that the irrigation interval is based on your determination of the fields’ need for water that is based on your visual observation.

- Inspect the field each day and decide if it needs water. Grass does not need to be watered until it begins to wilt! If you are watering grass that has not started to wilt, then you are watering too frequently. Determine how many days you can go without watering and then keep trying to extend the irrigation interval. Too many times I hear this comment from turf managers and it clearly indicates that your strategy is flawed; “The field looks good (with no wilt), but I will give it just a little water tonight just to make sure it keeps growing”. Extra water or unsolicited watering does not translate into better growth. Instead of using the philosophy of extra water for extra growth, you should consider using the least amount of water that will still keep the plant growing enough to require normal mowing. Sport field managers with the keenest eye will anticipate wilt, notice when first wilt starts, and then irrigate in time so that the grass quickly recovers. Mild wilting is not a severe stress on grass and in fact it provides benefits to the plant and soil system. Just before wilt a hormonal process in the plant signals growth of root hairs and root mass. There is very little root hair production when soil pores are continuously filled with water. Mild wilting insures that the soil has sufficiently dried to allow maximum infusion of air to the roots. Plant cells and leaf tissues that grow under maximum water content are thin walled with weak structure. Plants that are summer hardened by cycles of mild wilt and recovery have smaller, thicker cells resulting in more wear resistant tissue. As a general guide, mature sand-based fields should be able to last at least three complete days without watering before they show signs of wilt that signals the proper time for the next watering. Finer textured soils with more silt and clay can often stretch there watering cycle out to once every one to two weeks. Another general target for watering is approximately 1 inch of water per week from either irrigation or rain.

Here are some specific tips to help you develop a watering strategy:

- “Foot printing” is an indication of pre-wilt. Just before wilting, leaf water content decreases to a point where leaves are no longer rigid and full of water. Plants with sufficient water quickly return to their normal upright shape. When wilt is imminent, grass remains depressed and footprints are more noticeable. Waiting to see signs of “Foot printing” is therefore another visual key to indicate when to apply water.
- Wilt is the visual drooping, rolling, or folding of turfgrass leaves that results in loss of plant turgidity. The most obvious indication of wilt is the dark blue/gray or purple appearance of the leaves. Notice the areas of your field or facility that wilt first. These first-to-wilt areas can be routinely observed to help you determine when to irrigate. You may have heard the adage to water deep and infrequently. Watering just at the time of wilting will maximize the time between each watering to give the infrequent part of this general rule of thumb. When wilt occurs nearly all of the available water in the soil is gone and you need to supply enough water to completely fill the root zone again. Think of your root zone as a tank of water. Run the tank near empty and then fill it back up. Filling the tank or thoroughly watering the field is another way of expressing “deep” irrigation. Depending on the soil water holding capacity, it may take 0.5 to 1.5 inches of water to replenish the moisture between these infrequent waterings.

- Sand-based systems store less water so they need to be checked more often (daily), but not necessarily watered more often. Mild wilting on sand-based fields is a mandatory part of proper management to maximize rooting and traffic tolerance. Since water storage is minimal in sand systems, be prepared to water shortly after onset of wilt. A sand field showing mild wilt will usually need watering within 24 hours. If wilt is carried too far, then tire tracking from equipment may injure turf. Tire traffic on severely wilted turf will cause brown grass in the tire tracks a few days after driving on the wilted grass.
- Black and gray discoloration of soils often referred to as “black layer” is a clear indication of excessive and improper irrigation. A nasal inspection of the soil will easily detect a stinky odor of sulfur or methane gas from the anaerobic condition. This is a common problem on sand based and native soil fields that are sodded and then over watered in an attempt to make the sod grow-in faster.

## **SURFACE STABILITY**

Surface stability of native soil fields is seldom a problem unless they are excessively wet and slippery. Tight soils make a reasonable surface for footing as long as the cleats can bite into the surface. Even when the grass mat has been worn away the stability and footing provided by the fine textured soil does not result in large displacement of the surface. Sand fields on the other hand have very little stability provided directly from the sand particles. Most of the stability comes from the grass mat and the roots themselves. Sand based fields are more prone to surface instability problems any time that the grass is less than one year old. Most of the sand fields are sodded and in many cases played on with only 60 days of grow-in time. These fields are obviously weakest during the first year and will usually become stable by the second year provided that the sod is not replaced. Replacing the sod within three months of the playing season simply puts you back in the establishment phase again. Thick cut sod and synthetically stabilized systems have made it possible to make season repairs that can be played on within a few days of installation. Here are some other tips to help you stabilize your sand-based fields.

- Use sod that is 18 months old. Many consultants recommend that the sod contain the same sand particle size from which the field was built. Finding a sod field grown on USGA spec sand is difficult, if not impossible. Furthermore, it has been my experience that the sand content need only be about 75% by weight. I believe that the silt and clay is important to binding the surface and getting the field through the first year of play. It is important to aerify, remove cores, and topdress as soon after sodding as possible. My philosophy is to poke the sod full of holes and bury it with a 1/2-inch of sand if possible. If the grow-in time is too short or the conditions are too hot, then back off of the topdressing.
- Seeding instead of sodding. If you have one full year to grow the field in, then I strongly suggest seeding. In the long run, root growth is more substantial and there are no layering problems. I have had rather good success with seeding high school fields in very early spring and playing on the field in September or seeding in late August and starting play the following spring.

## DEVELOP YOUR OWN STRATEGY

It is important to develop your own strategies or at least copy others success and make it fit your situation. Here is one to close on. I call it “never be bare”. Basically the practice is to keep some type of vegetation, preferably turfgrass, growing at all times. This can be a real challenge given the amount of activity that some of you have on your fields. Inspect your field frequently. In the intense traffic areas of the field you will first notice divots, bare spots, or thinning turf as the season begins. The key to this tip is to start doing something right away and not wait until you have lost a substantial portion of your grass. The effects from traffic are cumulative and suddenly you will be at a point where you can’t successfully recover the grass before the next playing season. It is important to keep a protective mat of grass between the player and the soil at all times. When the protective mat of thatch, crowns, and surface roots is removed, then the soil is exposed and the system quickly deteriorates. Many times the manager will simply wait and repair worn areas of the field by seeding at the most appropriate time of the year, usually the fall. The “never be bare” program seeds as soon as there are bare spots and in some cases in anticipation of bare spots to come. In this program there is no wrong time to seed. Seed is inexpensive and you should anticipate that some of your seed will not establish, but those that do will put you well ahead and keep you with more mature plants than those that seed only once or twice a year.

- Seed before each football game and allow the players to cleat the seed into the ground.
- Pre-germinate seed three days before a game. Immediately after the game clear any plant debris and old divots. Do not replace divots, they never root anyway. Mix the pre-germinated seed with sand and surface and fill divots. Spread any left over divot mix in thin areas of the field.
- Seed with the species that is most appropriate for the situation. Early fall and early spring use Kentucky bluegrass so that it will have time to establish before winter or summer. Late fall and late spring use more ryegrass since it starts quick and bluegrass may not have time to establish. Mid summer, use seeded bermuda to cover bare areas, since bluegrass or ryegrass doesn’t establish well in the summer. Bermuda may not work for some areas but it has worked nicely into football practice fields when the field is given to the turf manager at the end of May with the request to have the field ready by mid-August. When seeded in mid- to late-June it will completely fill the bare areas and out compete most of the weeds by the beginning of football season. Overseed with bluegrass or ryegrass in mid-August. The bermudagrass dies, but it makes for an impressive start to the football season.
- Take plugs from off the field and place them in damaged areas of the field. Plugs that are 4 to 8 inches in diameter and 3 inches deep can be played on by the next game.
- Budget each year for sod in soccer goal areas and for worn areas between the hash marks on a football field. This is a small cost and you will be getting grass that is already mature since it is 18 months old from the sod field. You are buying thatch and mat and maturity, not just grass.