Soil Health Fact Sheets – Ocean County

Athletic Field Soil Quality

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The proliferation of grassed athletic areas for outdoor pursuits such as soccer, softball, baseball, lacrosse and football can lead to concerns for the impact of these areas on water quality. Because these areas must be established and maintained to hold up under heavy use, considerable planning and management must be done. This means that soil quality must be addressed, fertility is optimized, pests are controlled, and moisture for growth is adequate.

What is Soil?

Soil is a natural body comprised of solids (minerals and organic matter), liquid, and gases that occurs on the land surface. It consists of mineral particles of different sizes (sand, silt, and clay), organic matter, water, air, and numerous living organisms. Soil has biological, chemical, and physical properties. It is not an inert, lifeless medium but rather a living matrix of solid, liquid, and gas, with microorganisms, earthworms, fungi, bacteria, insects, living and decayed organic matter, water, air, and nutrients, all engaged in a biological and chemical give-and-take of energy and elements.

What is Soil Quality?

Soil quality is simply how well soil does what we want it to do. More specifically, soil quality is the capacity of a specific kind of soil to function, within natural or managed ecosystems, to sustain plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation. For people engaged in athletic field management, it may mean highly useful land, sustaining or enhancing recreational activities, or maintaining the soil resource for future generations.

What does Soil Quality Affect on Athletic Fields?

- Regulating water – Quality soil helps control where rain, snowmelt, and irrigation water goes. Water and dissolved solutes flow less over the land and more into and through the soil through infiltration.
- Sustaining plant and animal life - The diversity and productivity of living things depends on healthy soil.
- Filtering potential pollutants - The minerals and microbes in soil are responsible for filtering, buffering, degrading, immobilizing, and detoxifying organic and inorganic materials, including fertilizers, pesticides, and atmospheric deposits.
- Cycling nutrients - Carbon, nitrogen, phosphorus, and many other nutrients are stored, transformed, and cycled through quality soil.
- Providing a resilient, attractive, safe playing surface.

How are Soil Quality and Good Athletic Fields Related?

Simply put, quality soil makes for a better recreational playing surface, reduces maintenance headaches, and reduces runoff of stormwater and pollutants. Here are some specifics:

Field Construction

In many cases, athletic fields are built on relatively flat areas, so the concern for soil erosion and runoff may be reduced. However, often the land available for fields is sloping and must be graded extensively to create several regulation fields that are 'stepped down' in a terraced arrangement. The slopes between each field often are quite steep, often exceeding a 3:1 grade. These slopes are usually seriously eroded by the time the project is finished, and it can take years before the rills and gullies are stabilized sufficiently. A soil that has been eroded is severely damaged and will not provide adequate function.

Compaction: the Hidden Menace

Appropriate methods need to be used during the construction process, to avoid a compacted condition on the field. It is impossible to build a quality athletic field without using large earth moving and grading equipment. That said, there are techniques which can mitigate the impact of this machinery. First, topsoil at the site should be stripped and stockpiled. This stockpile must be stabilized temporarily to prevent erosion. The stockpile should not exceed 5 feet in height to help maintain soil life in the pile center.

Field grading operations must not be done when the soil moisture is too high. Wet soils compact easily, losing their structure and pore space. This problem can be nearly impossible to correct.

Equipment used at the site should use low p.s.i. tires. Track and balloon tire outfitted equipment have a less compacting effect than narrow wheel machines.

Proper Drainage

Athletic fields are generally crowned in the middle and subtly sloped toward the edges to facilitate rapid drainage. The grading in this final phase is critical, to ensure that the drainage crowning is properly executed. A variation of just a few inches from the engineered design can cause problem spots in the turf. Improper drainage, can result in surface ponding. Moderately poor drainage results in increased turf diseases due to the moist habitat for fungal growth. Ultimately, the quality of the playing surface can be greatly compromised.

A network of engineered subsurface drains is usually installed to collect the flow and remove it to an outlet efficiently. The surface must drain rapidly for two reasons: to make a play surface usable as many days of the year as possible; and to have a properly aerated soil environment for adequate root development of healthy turfgrass.

Subsoiling or deep tillage should be considered if the soil is susceptible to compaction or has been compacted during field construction. This involves 'ripping' slots at least 18 inches deep to fracture restrictive soil layers. It must only be done in the summer in dry soil conditions. Often, addition of compost or other organic matter can be combined with this process to feed the soil.

If the field is in a position to be receiving runoff from upslope areas, such as in a terraced field design, the runoff must be captured and diverted around the playing area with a diversion or grassed waterway. These structures must be constructed to blend in subtly to the periphery of the playing area and the ground above the field.

Feeding the Soil

Organic matter, in the form of municipal leaf compost or composted waste, should be incorporated into the subgrade once the drainage system is in place. The organic matter should be spread to a depth of about 2 inches, and then incorporated using a chisel plow, a common agricultural implement. The purpose for this is to provide the soil with a better environment to handle water and heavy use in the layer beneath the topsoil. Organic matter added to the soil creates a matrix for nutrients, water and air. It provides a source of carbon to feed the microscopic soil organisms.

If the native soil subgrade is overly acidic, final surface preparation is the time to add pulverized dolomitic limestone based on soil test recommendations, to help buffer the root zone. Then, the topsoil should be spread to the depth that was removed, taking great care to do it evenly over the field, and to use the lightest equipment available to smooth and level.

Soil Chemistry and Characteristics

Fertilization of an athletic field should be done according to Rutgers Cooperative Extension recommendations resulting from a soil test. In addition to primary nutrients, several other soil analysis parameters provide valuable information about the quality of a given soil:

pH (estimate of soil acidity) 6.0-7.2

Organic Matter: sands 2%, loams 3-4%, silts/clays 5%

Bulk Density (the measurement of soil weight per unit volume): sands <1.6, loams <1.4, silts/clays <1.1

Cation Exchange Capacity (CEC- an estimate of the soil's capacity to attract and exchange nutrients): sands 3-5 meq/100g, loams 10-20 meq/1006, silts-clays 25-40 meq/100g.

Seeding or Sodding

The final phase in athletic field construction or renovation is establishment of a thick, healthy turf. This compliments the soil beneath by preventing erosion and supporting the life in that top couple of inches of soil. The environment in the root zone is full of life forms and constant nutrient, air and water exchange. A properly established and managed turf will facilitate this as well as require fewer inputs of non-selective pesticides and inorganic fertilizers. *A healthy, balanced environment for turf means that the leachate and runoff from the site will be reduced and more water will be infiltrated into the soil profile resulting in less environmental impact.*

Turf selection should be based on the soil texture, sunlight exposure, and anticipated role the field will play. A field that will be used for youth soccer will be subject to a different stress load than one used for high school football.

Turf that is chosen and established under the right conditions, and managed in the correct way, will be better able to ward off disease, better able to utilize fertilizer applications, and need less re-establishment than a turf surface that is not. Secondly, a turfgrass mix should be chosen that will require less water and fertilizer, provide good disease resistance, and require less maintenance.

Prior to seeding or sodding, soil should be fully prepared with correct fertility and organic matter levels. Once the seeding is complete, mulching should be done with clean straw, providing at least 90% surface cover and tacked down to prevent movement by wind and water. An irrigation schedule must be set up and followed to get either the sod or seed established.

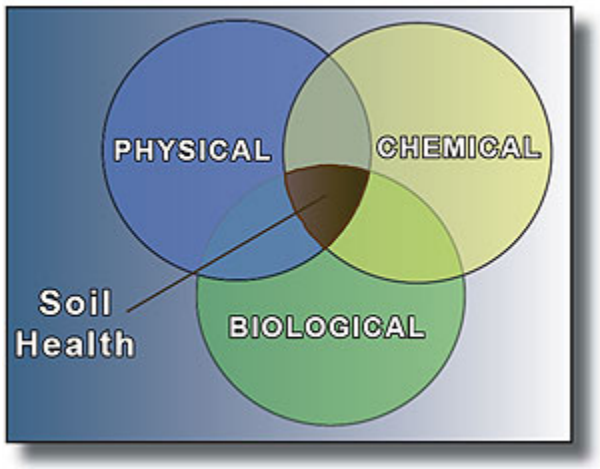
For specific research and educational information about turf management go to Rutgers Center For Turfgrass Science at: http://turf.rutgers.edu/outreach.html

Where can I get more information on Soil Health?

For additional information go to the following websites:

- www.nj.nrcs.usda.gov
- www.soils.usda.gov/sqi
- www.soilhealth.org

The full series of Soil Quality Information Sheets is available at http://soils.usda.gov/sqi



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