

Ways To Eliminate Leaching in Sand Base Sports Fields.



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Introduction

Leaching is a process of soil nutrients being washed away by large volumes of water. Fertilizers provide nutrients for the over all health and growth of the plant. There are 16 essential elements of nutrients for turf, with nitrogen, phosphorus, and potassium being the main three. Nitrogen provides color, growth, shoot density, reestablishment of turf from disease or damage areas. Phosphorus provides help with establishment of seed or sod and should be some what close to the surface to stimulate root growth. Potassium provides help with building a strong root system, drought, heat & cold hardiness, and wear tolerance. Before we start talking about fertility and irrigation rates, let's look at some construction methods and how their benefits will improve the growing environment or the root zone mix, there by helping to reduce leaching.

Subsurface Drainage and its Importance

On the subsurface 1 % slope should be shaped from the middle of the field to the outside edges. In the subsurface a 10cm (4") perforated drain line will be installed in each trench at 4.5 meters (15') intervals running the length of the field. Just outside of the playing surface a four way fitting will be attached to each drain line, with one line being brought up to the finished grade on the surface. Not only will the drain lines help with removing excess water, but also with exchanging gases. You want as much oxygen going down into the root zone and carbon dioxide coming out, this is called "venting the field". Grassplant roots gather oxygen and release carbon dioxide along with microbes (microscopic organism) that live in the root zone mix. A sports field having the capacity to replenish its oxygen supply by exchanging gases with the atmosphere will be far better off then a sports field that doesn't. If carbon dioxide is allowed to build up in the root zone, the oxygen levels will decline, creating a poor growing environment. This will bring other very stressful conditions to the grassplant. Venting the field is like "opening up windows in a basement".



What's In The Root Zone Mix

There is 80% sand in the total volume of the root zone mix and there are two main reasons for this. 1) There is far less compaction with sand than with soil. Compaction is the process of particles being compressed tightly together. Compaction that is allowed to build up will reduce oxygen levels, slow infiltration rates of large volumes of water after a heavy rainfall, also creates a “sealed off” layer on the surface, which will affect irrigation & nutrient applications in the future, and will reduce microscopic organism populations that live in the root zone. With all these stressful elements going on, the end results will be a very poor growing environment, which will speed up the decline of the turf.

2) Infiltration rate, water can move easier through sand then soil. Having a sports field that can move excess water from a heavy rain into drain lines in the subsurface is healthier for the grassplant, plus the field will be in better playing condition for the user groups.

With having such a high sand content in the root zone, you want to add some high quality peat (organic material) to the total volume of sand for the field. This is to improve the water and nutrient holding capacity. Also having a strong microbial population living in the root zone is a positive building block. Some of the micro organisms are aerobic bacteria, fungi, algae and alittle bigger earthworms. Micro organisms help to break down and unlock the minerals & nutrients that are in organic material and make it available to the roots.

Cation Exchange Capacity

CEC is the positive and negative charged sand particles in the root zone. A high CEC is typically more fertile and less likely to lose nutrients



PH is the measurement of acidity or alkalinity in soils. These concentration are measured then applied to a scale from 0 – 14. A low PH value and the soil is acidic and a high PH value and the soil is more alkaline. A PH between 6.0 – 7.0 will give a maximum benefit of available nutrients to the turf roots. You can keep track of both CEC & PH through regular soil testing.

Cultural practices that directly affect health of the playing field.

Cultural practices are mowing, aeration, and topdressing with straight sand. Having a



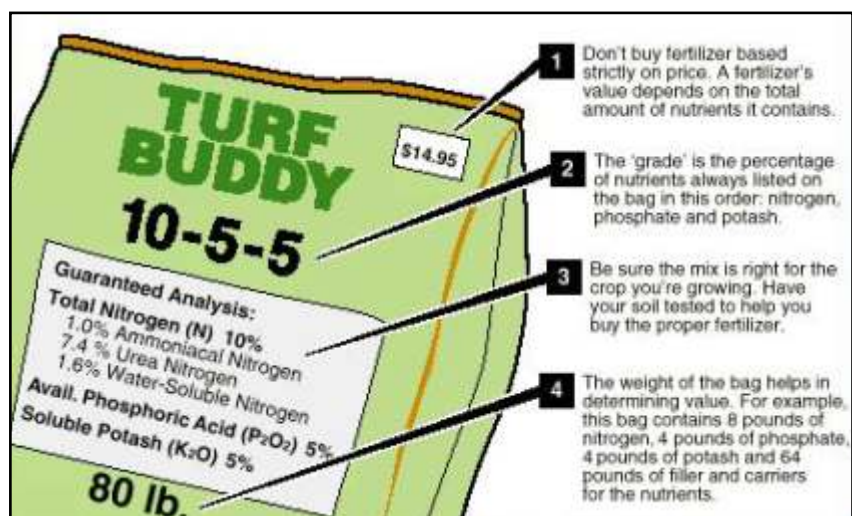
healthy root zone reduces leaching because a healthy grassplant can take up nutrients that are applied more easily and more effectively, than a grassplant that is very stressed or is in poor growing condition. Keep in mind there are four elements that are always working against a healthy root zone. Compaction, build up of organic material, low levels of oxygen, and trapped carbon dioxide. There are a number of ways to reduce and release these stresses and they are

mechanical. Hollow or solid tine aeration, and there are different size tines to choose from, spiking, slicing, and deep tining. By following these method's we are ensuring the best possible outcome for the turf.



Fertilizing

Fertilizing turf should be based on the information that is provided from a soil test, which should be done on an annual schedule. There are different types of fertilizers, slow release, controlled release, soluble synthetic, liquid and organic. Also there is different fertility rates depending on the needs of the turf such as at the establishment stage or just maintaining turfs color and vigor. A “light & frequent” program should be used. What this means is, instead of going out once a month at 1lb per/1000sq.ft, you would go out 2 – 3 times a month with a small amount. By going out more often at a smaller rate the grassplant can use up all the nutrients that are applied, reducing any chance of leaching, plus maintaining color & growth. A fertility program that is base on once a month application will have a quick flush of growth, inconstant feeding & color, plus a greater chance of leaching. The turf should have consistent growth instead of stressful peaks and valleys.



During the growing season here in Victoria (May – September) organic fertilizers can be used, then in early fall a slow release fertilizer should go out to maintain the grassplant throughout the winter. Also using a liquid fertilizer is another way of eliminating leaching all together. The liquid nutrient is sprayed onto the grass blades and absorbed throughout the plant.



Watering

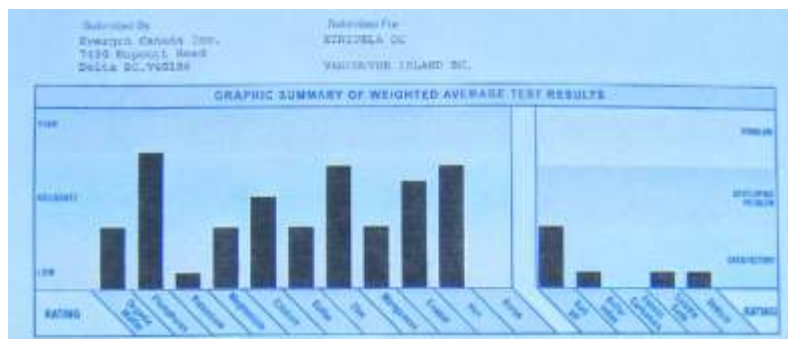
We know large volumes of water is one of the main reasons for leaching, so setting up irrigation run times and how often should be strictly controlled by the turf manager. Knowing when to water is the key, and by following local weather patterns will be very helpful, along with using a probe to view moisture levels in the root zone. When the heat of the summer comes (July – August), that's when watering will be at its highest, so we want to maximize the benefits. Watering in the early morning will provide us with reaching that goal. The turf will use up what it needs and any extra moisture will be consumed through evaporation into atmosphere. When fall and winter comes irrigation is turned off and fertility is dramatically reduced to 1/10th of a pound every 8 weeks. This is because winters here in Victoria are somewhat mild (compared to other parts of Canada) and the grassplant doesn't totally shut down. A “spoon feeding” (very small rate) application is important because it will carry the grassplant through the winter months and then be in better shape coming into early spring. Also this spoon feeding application can be timed to avoid a heavy rain that is in the forecast, this is another way of eliminating any chance of leaching.



Science & Documentation

Water from the drain lines can be collected and sent off to a lab to see how clean the water is. If adjustments need to be made, they can be implemented right away.

Using science and not assumption will guarantee a positive outcome for the field. Also water testing should be a regular event every year along with documentation, to see how well the grassplant is taking up the nutrients that are being applied from the “light & frequent” fertility program.



There is no reason why a sports field, the environment, and waterways can't coexist. Knowledge, good science, the above outline, and professionalism are keys in being successful

References.

International Sports Turf Research Center, guidebook

Master Superintendent Brian Youell Uplands GC

Superintendent Greg Kowalski

Kinipela GC website www.kinipela.ca

Turfgrass Science and Culture James B. Beard

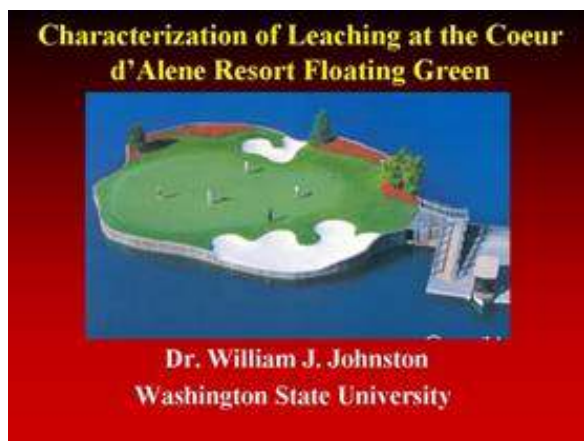


Here is an example of highly maintained turf surrounded by water. Coeur d'Alene GC wanted to build a floating green and at the same time control all elements. All drain water is collected and then through an umbilical cord drains into their main drain system on land.



Coeur d'Alene G.C. along with USGA & WCTA did a 3 year study to see if Nitrates would leach from the floating putting green.

Microlysimeter measuring nutrient levels in the putting green



In Canada the allowable limit for nitrates in the water is 19 parts per million, in the U.S. its 30 ppm. At the end of the three year study the highest reading from the green was 3 ppm. In other words the drainage water coming from the sand base green that was floating in the lake was safe enough to drink. With the will and determination of this group their ultimate goal was achieved. There is no reason why their effort can't be duplicated here in Langford. A sports field construction and maintenance program won't be as intense as a putting green, but proper construction and good science will ensure a very successful turf project.



Summary.

We know there are many elements that will help to eliminate leaching in sand base fields.

Having drain lines laid out in the subsurface the length of the field at 4.5 meters (15 ft.) spacing will help remove excess water from heavy rains, there by leaving the field in better condition for the grassplant and the user groups.

At the end of each drain line in the subsurface, a four way fitting will be attached. From that fitting a 10cm (4") pipe will be attached and brought up to the finished grade. By doing this we are allowing oxygen to flow down through the drain lines, and carbon dioxide to flow out.

Using high volumes of sand (80% of total volume) mixed in the root zone growing medium will greatly reduce compaction and help with the infiltration rate. The remaining 20% of the root zone should have high quality peat mixed in, to improve water and nutrient holding ability. Microbe organisms will flourish in this environment creating a healthy root zone for the grassplant to survive in.

The field will have four elements working against it at all times, compaction, organic material build up, low levels of oxygen, and trapped carbon dioxide. There is mechanical equipment that will help reduce and release these stresses. A regular maintenance schedule will need to be set for this. Some of the equipment and tools needed is hollow and solid tines aeration, spiking, slicing, and deep tining.

There are many different types of fertilizers to use. Depending on what the conditions call for, whether its establishment or just maintaining the turfs color and vigor.

A "light & frequent" fertility program should be used for applying small amounts of nutrients for the grassplant to use up, there by eliminating leaching.

Watering the fields during late spring and summer months is to maintain the turfs life process. The amount that should be applied is dependent on local weather and moisture levels in the root zone.

Sincerely,
Rob Crompton

