DEVELOPING & IMPLEMENTING BMPS for sports field water conservation

WATER CONSERVATION is not all about irrigation. It is primarily about the plant and doing the correct agronomic practices that allow the plant to survive periodic dry periods. Research has shown that a properly planned landscape that has been carefully installed and properly managed will be healthier, less prone to insects and diseases, and will require less irrigation.

Water is essential to human life, the health of ecosystems, and economic development. However, summer drought is common for much of the US when significant rainfall amounts may be 30 or more days apart. These periods of limited rainfall increase demand on pubic water supply systems. During the summer months, municipal water use increases between 30% and 50% generally for outdoor recreational purposes (e.g. swimming pools), utility purposes (e.g. car washing and pressure washing) and, for lawns and landscapes. No doubt, water conservation is a concept which must be adopted as water resources become more limited.

Turfgrasses are the primary vegetative covers on airports, athletic fields, cemeteries, churches, commercial buildings, golf courses, home lawns, schools, parks, and

Two quick and simple practices to improve turfgrass water use:

1. Raise the mowing height. There is an optimal height range for each turfgrass species, during periods of drought raise the mowing height to upper end of the range. This helps increase the rooting depth and ability of the grass to extract water from greater depths.

2. Decrease the nitrogen rate. Each turfgrass species has an optimal nitrogen fertility range; during periods of drought reduce the amount of nitrogen to the lower end of the range. This avoids overstimulating the grass during periods when water resources are limited.

roadsides. Healthy grass is an aesthetic asset and a growing body of scientific evidence points to positive environmental and health contributions from lawns and other turfgrass areas. While turfgrasses are typically thought of for recreation and aesthetic value, they also provide a valuable environmental service by preventing soil erosion. As a permanent vegetative cover, turfgrass can reduce runoff from rainfall, improve soil absorption and infiltration of water, and filtering contaminates from polluted water. Furthermore, recent research indicates that turfgrass systems help rid the atmosphere of greenhouse gases, like carbon dioxide (CO_2), which contribute to the global warming.

To meet the nation's demands for water resources, the focus must be on how to use water more efficiently without sacrificing environmental quality. This objective can be achieved through proper selection and installation, and integrating turfgrass management practices which accentuate a plant's natural ability to survive, despite a temporary deprivation of required resources (e.g. nutrients and water).

The Best Management Practices (BMPs) for turfgrass water conservation can be employed by all levels, from the well trained turfgrass professional to the homeowner. The BMPs are basic agronomic tools which will improve the overall health of the turfgrass plant and, in turn, will condition the grass to better withstand seasonal and prolonged drought. A few BMPs specific to turfgrass water conservation are:

BMP 1 – PROPER TURFGRASS SELECTION

Selecting the proper turfgrass is perhaps the most important factor in planning, planting, and maintaining a lawn for water conservation. A properly selected grass species or cultivar is more likely to thrive and need fewer inputs (e.g. water, fertilizer, pesticides, etc.). Turfgrass selection should be based on environmental conditions, turfgrass quality or appearance desired, and maintenance requirements. Environmental conditions to consider include temperature and moisture, shade adaptation, soil pH and fertility. It is also important to realize that all turfgrasses have good and bad features. Thus, selection should be based on which turfgrass most nearly meets the criteria considered. Using grasses which have been genetically bred for an intended purpose or geographic region further enhances the turfgrass plant's ability to survive specific stresses.

BMP 2 – SOIL AMENDMENT

Improvement in either the chemical or physical characteristics of the soil can reduce turfgrass irrigation needs by enhancing infiltration of rainfall, increasing soil moisture retention, and promoting deeper rooting to reduce water leaching beyond the rootzone. To improve water conservation, amending native soils prior to planting can be beneficial during the establishment process and for long-term sustainability of the landscape. The water and nutrient holding capacity of the sandy soils have different needs than clayey soils and, therefore, need to be modified or managed accordingly. Sandy soils have little moisture or nutrient holding capacity. While the addition of some clay can improve water and nutrient holding capacity, it makes the soil more prone to compaction under traffic and normal use. In general, changing textural (percent sand, silt, and clay in a soil) and physical characteristics are more difficult than modifying the chemical characteristics, yet, these changes can be made to improve soils for the purpose of water conservation. Furthermore, the organic matter content can have a tremendous affect on moisture and nutrient retention.

You want deeper roots with more soil volume to explore for water and nutrients. Organic amendments improve the physical and chemical properties of the soil. They not only help the soil hold water and nutrients, they also improve water movement throughout the soil.

BMP 3 – PROPER IRRIGATION

Each unique microclimate, or zone, within the landscape should be irrigated separately according to the needs of each zone. Allow plant factors to indicate a need for supplemental water. Apply only the amount of water the turfgrass needs to wet the rootzone. For many plants and crops there are growth periods when water is critical to physiological and reproductive processes. However, for most homeowners and turfgrass managers fruit set and seed-production are not important processes. Basically turfgrass needs water to maintain growth. The exception to this is during establishment where water requirements would be the greatest. Once established, turfgrass requires relatively little water for survival. In fact, research conducted in throughout the US supports the recommendations of established turfgrass requiring approximately 1-inch of water per week during the growing season.

BMP 4 – MANAGE EXTRINSIC STRESSES

To reduce water use, maintain turfgrass stand density, and promote survival during periods of drought stress, wear must be minimized. A thinned weaken turfgrass will require more water for basic maintenance of physiological processes and recovery than a turfgrass which has ample cover despite being drought stressed. Proper management of extrinsic stresses, like traffic and plant competition, aid in reducing water use by maintaining turfgrass stand density and promoting survival during periods of drought stress.

Water conservation in all areas of water use, indoor and outdoor, is becoming more critical. But through proper agronomics and judicious irrigation, landscapes can be maintained during periods of drought. Fortunately, the Southeastern US will only experience periodic drought and environmental conditions will eventually change. When rainfall returns, established turfgrasses will typically resume growth and regain color. During these good periods it is imperative that proper management practices be employed to precondition fields for the next drought.

A positive and proactive approach to water conservation is essential for the sports field industry within each state. The best approach is one used for other environmental issues, BMPs. The following elements are key to fostering the BMPs approach at the regulatory level.

• Define what is meant by BMPs for water conservation on sports fields for the understanding of the field manager and facility staff, as well as, for that of regulatory agencies, environmental groups, and the general public.

• Actively strive to gain acceptance for this approach in ordinances, regulations and public policy.

• Adopt and implement a BMPs approach on our sports fields, not just as a general concept but as a daily operating policy.

• Use moisture probes, smart controllers, and other new technologies. ■

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HOW ONE FACILITY COLLECTS WATER

▲ **The water from the collection tank** is filtered on the way out of the tank before reaching the pumping system..

Grinnell College completed phase two of an athletics building construction project in late August of 2010. The phase two construction consisted of an Olympic size swimming pool and an indoor field house with athletic offices attached. Phase one, Darby Gymnasium (home of the record-breaking Grinnell men's basketball team), was completed in 2005. A unique aspect of the phase two project included a rain water collection system from the large field house roof and surroundings, which feeds a 20,000-gallon collection tank. Condensate water is also harvested from the air handling system in the field house, which provides a large amount of clean water for the collection tank. The water collected is used for toilets

When the tank water level reaches 91 inches, the excess water is diverted to the storm sewer system that feeds the Grinnell Country Club ponds.

▲ **Down spouts** from field house roof feed the collection tank.

▲ **The field house roof** behind the football game field.

in the field house and to irrigate the game day football field.

A new main irrigation line, valves, decoder system and controller were installed after the building project was completed. This system was hooked onto our current infield piping and irrigation heads. We installed a Hunter Industries wireless Solar Sync ET sensor to help with weather monitoring, which helps conserve water on the football field.

City water is used for all of our other fields and the water quality is not good. With the city water's high pH, bicarbonates and sodium issues, the idea of using natural rain water was quite positive. With any unique projects we had our reservations but after a full calendar year of having the system in tactic it has performed well.

How the collection system works is simple; the rain water is collected from the roof, storm drains, and bleachers from the field house area and funneled by drains into the concrete 20,000-gallon holding tank under the field house. Condensate from chiller and air conditioner units also help feed the storage tank.

The collection tank was actually dug, formed and poured with concrete as the field support structure was being constructed. When the tank water level reaches 91 inches, the excess water is diverted to the storm sewer system that feeds the Grinnell Country Club ponds. Irrigation for golf course is pumped out of these ponds. When a low point level is reached at 34 inches the system switches to city water by sensors and

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electric valves, until the collection tank is recharged by rainfall. As an example, the summer of 2013 saw a state-wide drought and our system never switched over to city water because the condensate collection kept up with the watering demand. Ground water seepage and the condensate lines must be adding a lot of water to the tank to keep up with our current water demands and lack of rainfall.

The water from the collection tank is filtered on the way out of the tank before reaching the dual variable pumping system; this system is based on flow needs for the restrooms and field irrigation. The variable pump system has been a large upgrade; also the coverage of the irrigation heads has increased. The water quality has been relatively good so far; we have been sending in water samples to track the water quality to see if there is much fluctuation in the tank water through the year. One interesting sample I sent in early April 2011, at our irrigation system start up, was of water that had sitting for an extended period of time; the test came back very good even after being stagnate. Water test have fluctuated some but the tank water has been a huge upgrade in quality for our turfgrass compared to our city water.

This water collection system has been a success so far and more systems similar to this will be examined for any future building projects on our campus. Benefits we are experiencing so far include saving water, spending less money on water resources, slowing the watershed runoff speed from the building, and increasing the water quality immensely. ■

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