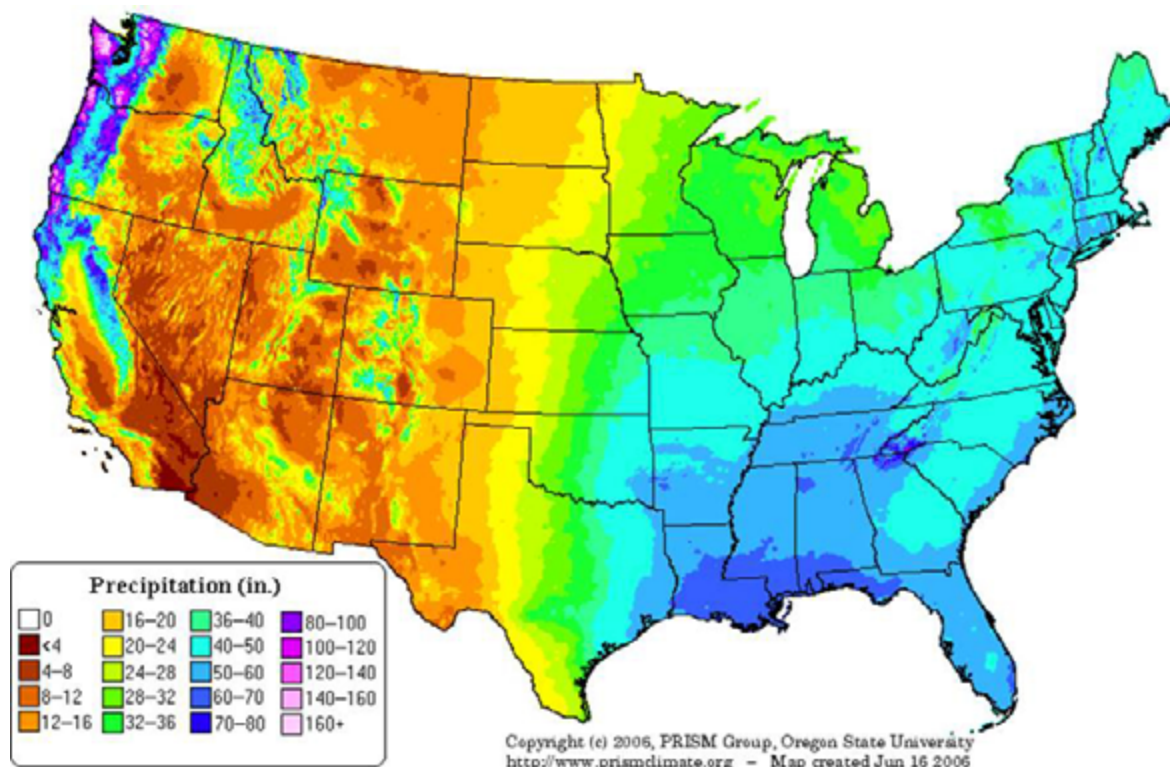


Ten Things Every Golfer Should Know About Water Use On Golf Courses

The proper use of an irrigation system is both an art and a science.

BY CHRIS HARTWIGER



Rainfall varies greatly across the United States, but the availability of water and its regulation are important topics in all parts of the country.

Did you know that a turfgrass plant is 80 to 85 percent water by weight? Did you know water is continuously being lost through its leaves and absorbed by its root system? Keeping water at the proper balance within the plant is one of the core functions of a golf course superintendent, who relies on an irrigation system and rainfall to meet the water requirements of turf. Making the decision about where, when, and how much water to apply embodies both the art and science of turfgrass management. This article sheds light on the important topic of water by explaining 10 things every golfer should know about golf's use of water.



Years of drought have left massive reservoirs far below full capacity in some parts of the U.S.



In areas with high rainfall, storage ponds are generally small and can be depleted quickly when rainfall stops or water regulations are implemented. This is why golf facilities in these parts of the country can go from plenty of water to not enough very quickly.



Although irrigation systems are highly engineered and sophisticated, their distribution of water is not perfect.



Hand watering is a valuable conservation technique because water can be applied only where it is needed without overwatering other areas that already have ample soil moisture.

1. Irrigation is applied for plant health, not necessarily optimum color.

There is no question that the appearance of a golf course is part of golf's appeal. Whether a course is green space in a city or located along an ocean, every course is unique and beautiful in its own way. Fortunately, turfgrass species have the ability to provide quality playing surfaces under a variety of soil moisture levels. However, irrigation is still required at times to support healthy turf growth and performance. This requires a proficient understanding of how and when to use an irrigation system. With limited water resources in most parts of the country, combined with golf being considered more enjoyable when played on dry, firm ground, the best use of an irrigation system is to supplement natural rainfall, not replace it. Supplemental irrigation should be applied to promote healthy turf that can tolerate stress and provide a desired playing surface. Irrigating to attain a desired color is not recommended and wastes valuable water. Furthermore, excessive irrigation can lead to problems for turf, including increased pest pressure, reduced stress tolerance, additional expenses, and poor playing conditions.

2. Turf stress can necessitate changes in irrigation practices.

Turfgrasses on golf courses are constantly subject to environmental stress, including drought, flooding, diseases, pests, and temperature extremes. Simply considering the range in temperatures many turfgrasses can endure exhibits the extraordinary ability of turf to tolerate environmental stress.

Unfortunately, turfgrass stress does not stop with the environment. Golfers may play tens of thousands of rounds on a given golf course every year, and this contributes a significant amount of traffic stress through golf cart and foot traffic. Soils often become compacted in high-traffic areas. This is common for tee and green complexes and entry or exit points from cart paths adjacent to landing areas. Furthermore, regular maintenance can add additional traffic and mechanical stress to further

exacerbate the problem in areas already suffering from soil compaction. When soils become compacted, water infiltration into the soil is compromised; therefore, additional irrigation may be needed to reach an adequate level of plant-available water in the soil.

Finally, turfgrass stress can occur in the form of pests that may compete with turfgrass roots for soil moisture or damage roots so that the plant's ability to take up water is compromised. Common examples include competition from tree roots and root-feeding pests, such as nematodes, both of which compromise the ability of turfgrass roots to absorb water. Consequently, additional irrigation water may be needed to mitigate stress caused by these factors.

3. Soil type influences watering practices.

Different soils have different water-holding capacities. A sandy soil contains individual soil particles of larger size and will hold less water than a fine-textured clay soil. Therefore, turf grown on a sandy soil requires water more frequently than turf grown on finer-textured soils. Superintendents base irrigation schedules, in part, on soil type(s) present on the golf course. Often, there are multiple soil types on a golf course, so irrigation practices must be adjusted accordingly.

4. Aeration and soil cultivation are not performed to ruin your game, but to decrease runoff and improve water infiltration into soil.

Superintendents determine when to irrigate and how much water to apply. However, even with a well-designed irrigation system, site-specific conditions, such as compacted soils, can interfere with irrigation effectiveness. When a soil is compacted, the rate at which water moves into the soil, known as the infiltration rate, is reduced. Water that is unable to enter the soil due to a reduced infiltration rate may instead be lost as surface water runoff. This creates small, isolated areas of overly dry, stressed turf because the soil contains an insufficient amount of water for turf roots. Water that is lost as surface runoff typically collects in



Soil moisture sensors provide golf course superintendents with real-time soil moisture status and are an affordable resource-conservation tool.



Aeration is an important water-conservation technique because it helps prevent the loss of surface water as runoff.



Repeated cart traffic compacts soil and wears down turf. Instead of being taken up by the soil, irrigation and rain are more likely to be lost as surface water runoff, further reducing turfgrass quality.

low-lying areas, which causes turf and soils in these areas to be too wet. Fairways with both overly wet and overly dry areas make for poor playing surfaces.

Aeration, the practice of poking holes into the soil with either solid or hollow tines, is an effective method to

overcome soil compaction, improve soil structure, and encourage water infiltration. Although aeration may create short-term disruption to the playing surface, it is a resource conservation practice that helps keep irrigation water on intended areas.

5. All water is not equal and turfgrass can be managed with lower-quality water.

It is easy to assume that all irrigation water applied to any given golf course is of the same quality and equal benefit to turf. This is not true. Sometimes irrigation water contains components such as sodium, bicarbonates, and/or soluble salts at levels that can accumulate in the soil over time. When these components accumulate to problematic levels in the soil, they become harmful to turf. Negating the harmful effects of these compounds may require the use of natural amendments, such as gypsum, and/or flushing the rootzone with water to leach compounds deeper in the soil and below the root system.

Alternatively, scientists have discovered that turfgrass and soil can be great filters of not only salts, sodium and bicarbonates, but other compounds such as heavy metals. Thus, turfgrass and soil can act to purify water before it reaches an aquifer or groundwater source. This indicates that turfgrass systems are well suited to receive treated wastewater, or effluent, from



Water that is high in salinity can damage soil and turf. The green grass pictured here is a more salt-tolerant turfgrass species called seashore paspalum.

local water treatment plants for irrigation use.

6. Water applied to a golf course is not necessarily drinking water from a municipal water supply.

There are numerous potential sources of irrigation water for golf courses. Consequently, only a small percentage of golf facilities use drinking water from municipal water sources. Below are several of the most common sources of irrigation water:

- Effluent, i.e., wastewater — Effluent water comes from a wastewater treatment plant. Effluent water receives several levels of treatment, but it does not meet the standards for drinking water.
- Runoff captured on site — In areas with high rainfall amounts, ponds or other reservoirs on golf courses can capture significant amounts of surface runoff that can be used to irrigate turf.
- Streams and ponds recharged with groundwater — Streams and ponds that are recharged naturally with groundwater are sometimes used as irrigation sources.
- Groundwater — Many golf facilities have wells that pump water into ponds or streams for irrigating the course.

7. Different grass types have different water requirements.

There are numerous cool-season and warm-season grass species used on golf courses throughout the U.S. and world. Although they can all be managed to provide quality playing surfaces, the inputs they require to remain healthy vary by species. Some turfgrass species have better internal mechanisms to tolerate or avoid drought stress than others. Therefore, whenever there are different turfgrass species on a golf course, golfers may notice the superintendent watering one part of the course more frequently than another.

8. Irrigation systems are highly sophisticated and improving.

A typical golf course irrigation system is likely to have in excess of 1,000 irrigation heads with precisely engineered nozzles to maximize the uniformity of water distribution, hundreds of miles of in-ground wiring, a vast network of underground pipes, a powerful pumping station, and a sophisticated computerized control system that enables superintendents to control when, where, and how much water is applied. Irrigation systems require regular maintenance to ensure they function as intended. A properly functioning irrigation system plays a

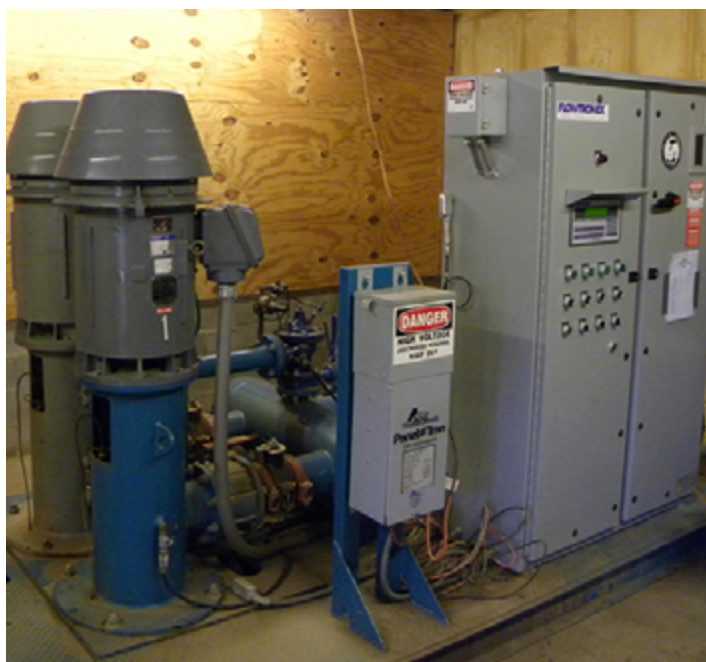
pivotal role in maintaining turf that meets golfer expectations while conserving water.

Despite incredible sophistication, no irrigation system distributes water perfectly, nor can it account for all surface undulations, playing area contours, or localized soil conditions. For this reason, hand watering is sometimes necessary to supplement areas that are inadequately irrigated. Hand watering is actually a sound resource conservation strategy. Small amounts of hand watering in areas without adequate irrigation coverage can prevent overwatering that is likely to occur if the automated irrigation system is relied upon as the sole source of irrigation.

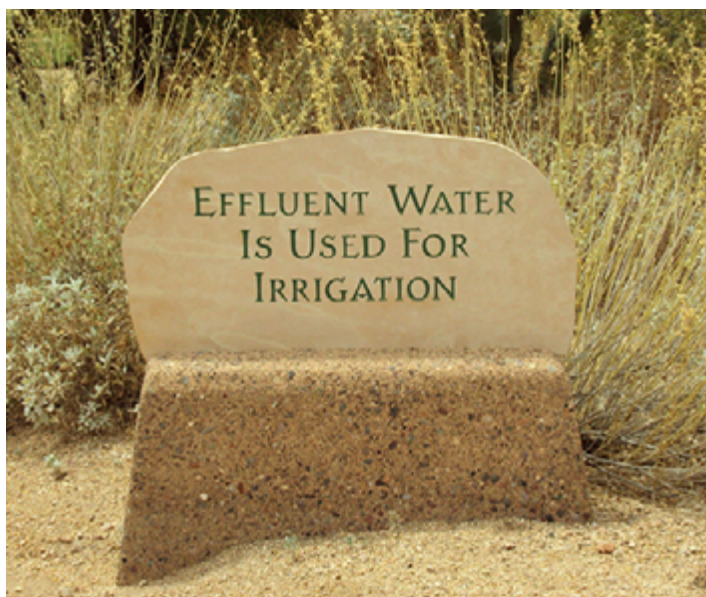
Precision turf management will further aid water conservation efforts. Precision turf management incorporates the use of soil moisture sensors that are placed strategically throughout the golf course. In-ground, wireless soil sensors provide superintendents with real-time information regarding the amount of plant-available moisture in the soil.

9. Water use is an issue in all parts of the country.

The amount of rainfall across the United States ranges from more than



Powerful pumping stations are kept behind the scenes, but they play a vital role in delivering water to golf course turf.



Golf courses are well suited to use reclaimed water. Not only is the water used for plant growth, but the turfgrass, thatch layer, and soil all serve to purify the water before it enters an aquifer or groundwater source.



Grass is 80 to 85 percent water by weight. Irrigation systems are critical to replenishing soil moisture when rainfall isn't sufficient so that turf remains healthy enough to withstand the daily stresses and rigors faced on a golf course.

60 inches per year in parts of the Southeast to only a few inches per year in the West. However, concerns about water use are not limited to areas that receive less rainfall.

Broadly speaking, regions east of the Mississippi River receive ample rainfall on average, but quite often storage capacity of water is limited. When there are a few months of little or no rainfall, stored water reserves are used rather quickly and it may become necessary to impose stricter regulations on water use. In regions southwest of the Mississippi River, rainfall levels are much lower than those observed in the East; however, water storage capacity is typically greater. States in the Southwest intensely monitor and regulate water use due to the inability of infrequent precipitation events to recharge storage reservoirs. Many golf facilities in these areas have limitations on the amount of water they are allowed to apply each year. Furthermore, golf course water use is regulated by a variety of local, state, and federal guidelines.

10. Sometimes irrigation is applied when it is raining or when there is already adequate soil moisture.

Occasionally, USGA agronomists are asked by golfers, "Why does our

golf facility sometimes irrigate after it rains? Did our superintendent forget to turn off the sprinklers?" Managing a golf course is a year-round effort that requires the application of inputs such as fertilizer to help the turfgrass grow and plant protectants to ward off harmful diseases or insects. When certain types of fertilizer are applied, they must be watered in to ensure that plant nutrients reach the soil and do not move from the intended application site. Further, light irrigation can

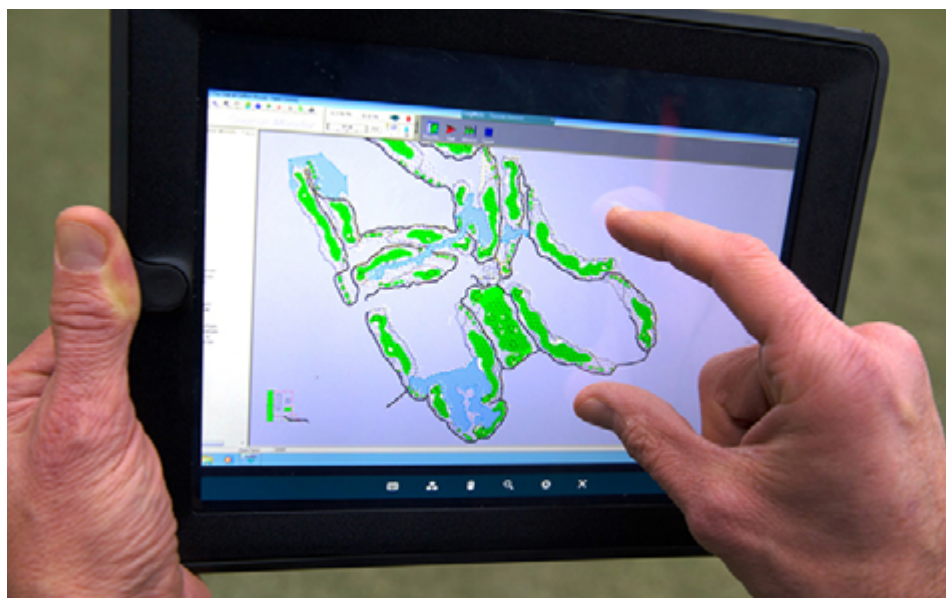
prevent volatilization, a change from a solid to a gas, of some fertilizer components.

As mentioned earlier, the presence of sodium, bicarbonates, and/or soluble salts in irrigation water may require periodic flushing of the soil to leach these compounds from the rootzone. Rainfall can aid greatly in this process, but sometimes not enough rain moves through the soil to complete the flushing process; therefore, additional water must be added by the irrigation system to complete the process.

CONCLUSION

The USGA has been and continues to be committed to promoting the conservation of important resources, such as water, through research, education, and outreach. Currently, the USGA Green Section is supporting research efforts to develop grasses that require less water while maintaining acceptable playing conditions. Water is a precious resource, and the USGA is working hard to conserve it. For more information on this very important issue, we encourage you to visit our [Golf's Use of Water Resource Center](#).

CHRIS HARTWIGER has played golf through rain, snow, and an occasional irrigation cycle while serving as the USGA Green Section's director of the Course Consulting Service.



Golf course superintendents have the ability to create an almost unlimited number of irrigation programs from one central computer.