Less Water/ Healthier Turf:

HOW TODAY'S IRRIGATION SYSTEMS PROVIDE VALUE

It may seem counterintuitive, but it is possible to save water, improve turf conditions and save money, all at the same time. It sounds too good to be true, but to see how it works, this article will dispel a few myths, and then show the math.

While most people realize that through efficient irrigation design there can be substantial water savings and improved turf quality, saving money can be a surprising addition to those benefits. To understand how this works, some simple math is required. But first, an old irrigation myth must be dispelled.

QUESTION:
If a golf course has more sprinklers, will it use more water?

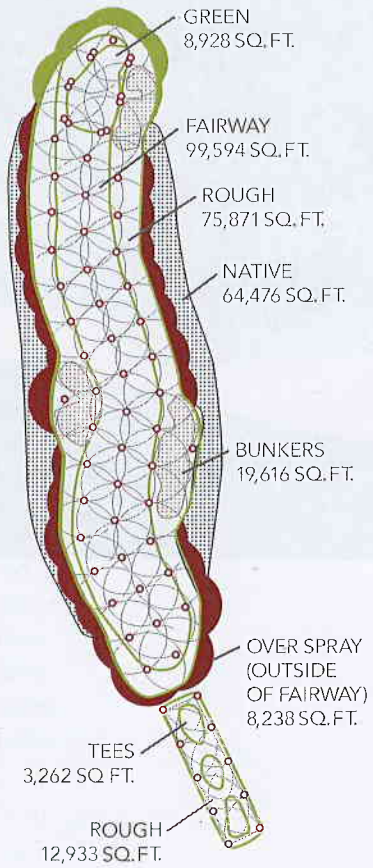
ANSWER:
Not if the design is done properly to deliver higher irrigation uniformity and improved coverage.

At right is a sample golf hole, irrigated in a seemingly simple way, with three rows of full circle sprinklers. Many people believe that having fewer sprinklers and getting the most area out of them by using full circles is the easiest, least expensive and best way to irrigate.

Actually, this "simple" design choice results in several irrigation issues that can be greatly improved upon. To achieve reasonable coverage in this layout, the full circle sprinklers must over-throw the desired grassing line by about 40%.

Doing so results in the red area or over-throw area that is beyond the desired grass line. This water is 100 percent waste, since we have no desire to irrigate those native areas.

In this sample par-4 hole (deemed to be typical), that over-throw area in red is almost 15 percent of the total sprinkler coverage area of the entire hole.



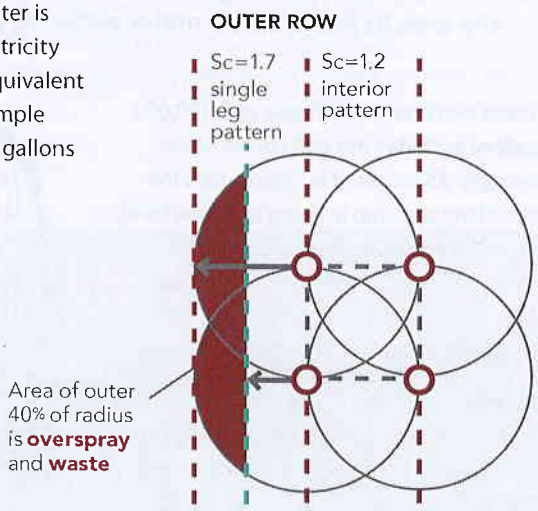
3-ROW COVERAGE PAR - 4 SAMPLE

The next issue is a loss of irrigation uniformity due to the difference in the interior sprinkler pattern vs. the exterior sprinkler pattern. You can see that the interior pattern, where you have three or four sprinklers contributing to the coverage, provides excellent uniformity, and thus a very high Scheduling Coefficient (Sc) of 1.2 is achieved.

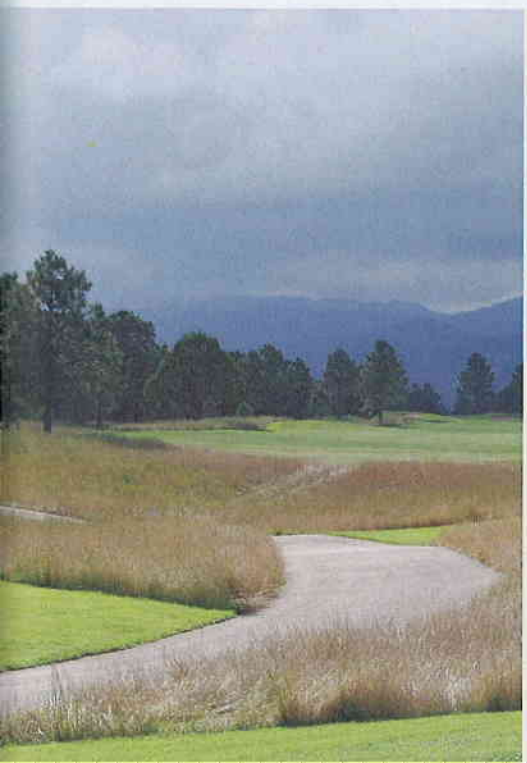
In the area on the outside of the outer rows, there are only one or two sprinklers (Single leg pattern) contributing to the coverage which results in less effective coverage, and in this case, a much lower Sc of 1.7. This difference in uniformity would require that in order to properly irrigate the turf between the outer row of sprinklers and the desired grassing line, the outer row of sprinklers must be irrigated approximately 40% more, compared to what is required to irrigate between the rows. (Sc 1.7 / Sc 1.2 = 42%)

While this change improves the irrigation of the outer grassing areas, it increases the wasted water in those over-throw areas by approximately 40%, and now is also over-watering the interior pattern areas by 40%.

The result of this is a combination of wet and dry turf across the hole between the grassing lines. In a simple example on an average par-4 hole where the required irrigation was 0.25 inches per day, almost 6000 gallons of water is wasted, as well as the electricity to pump it. (An 18-hole equivalent golf course using this example would waste over 100,000 gallons of water per day.)



OVERSPRAY AND WASTE



The Agronomic Impact

Being able to control irrigation inputs as finitely as possible offers many rewards associated with turf quality and budget savings beyond those related to water and electrical cost:

- Over-watering creates more compaction, which in turn requires more aeration and related additional labor expense.
- Disease pressures greatly increase as excess moisture is applied, resulting in additional fungicide applications (add cost of fungicide and labor to apply).
- Over-watering also creates the perfect environment for higher weed population, thus more herbicide cost and labor to apply.

The average American golfer is sometimes hooked on "wall-to-wall green," and golf course managers tend to buckle under the pressure to produce it. The gold standard for agronomic excellence is to produce uniform green color while maintaining the perfect agronomic balance for healthy turf growth, enhance the environment throughout the property, and improve playability throughout the golf course… all while managing water responsibly and staying on budget.

Here's a better design solution.

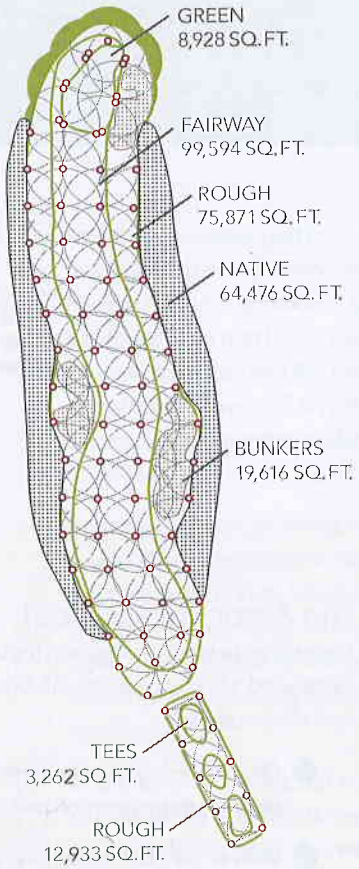
Using the same sample par-4 hole, this example shows two rows of full circles down the middle, but effectively provides for one extra row of sprinklers, which allows a row of part-circle sprinklers down each outer grassing line, throwing only inwards. (Going from three rows in total to four rows)

First, this has eliminated 100% of the over-throw area and thus all the wasted water in those areas.

Next, because the sprinkler coverage is evenly uniform across the entire width between grassing lines, the coverage efficiency is greatly improved, yielding a Sc of 1.2, and eliminating the need for over watering any area to make up for under watering another.

These two changes will save over 100,000 gallons each day this golf course needs to apply .25 inches of irrigation, plus the electricity to pump it. Using an annualizing factor for seasons, a course such as this in the central US might save more than 12 million gallons of water per year, and almost 20,000 kWh of electricity to pump it.

So what is the catch? Saving so much water and power must have a huge up-front initial cost. The actual cost in this example is the addition of 270 additional part-circle sprinklers. (The total sprinklers on the 18-hole plan would go from 1,242 to 1,512). The contractor bid includes a "per sprinkler added" total of $400 each (all-in), so the total additional cost during construction would be $108,000. However, this is immediately offset by the savings of water and electricity. Water in this example is from a city water supply at a cost of $4.85 per 1,000 gallons, and electricity cost is $0.11 per kWh.



4-ROW COVERAGE PAR - 4 SAMPLE



In 10 years, about 125 million gallons of water will have been saved.

Each year, these combined savings amount to $61,775, giving a total payback period on the extra sprinklers of only 1.75 years. In 10 years, the cumulative net savings would be over $500,000, and continue at almost $62,000 per year. The savings of resources is not trivial; in those 10 years, about 125 million gallons of water will have been saved as well as almost 200,000 kWh of electricity.



Maybe the best outcome for a club is that the uniform coverage across the entire grassing area will provide greatly-improved turf grass, both aesthetically and from a golfing playability standpoint, which are attributes which golfers will appreciate.

An experienced superintendent can explain why this will also help to better maintain the turf grass and increase plant health, thus reducing the other maintenance practices required. Every course's turf grass and budget would see a benefit from having higher uniformity irrigation coverage.

Each golf course has its own unique circumstances and situation, and while some may only see half or less of this amount of cost savings, many others could see two to three times this amount.

Owners tend to appreciate the extra savings and profitability as well, with all this coming from just a slight change in irrigation design style and technique.

The combination of technological advances, development of sophisticated and common sense approaches to design and superintendent management skills is leading many courses to realize the benefits of using less water and energy to give golfers healthy turf and great playing conditions.