SPORTS FIELD IRRIGATION AUDITS - PART II

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Editor's Note:
This article is a continuation of an article Sports Field Irrigation Audits – Part 1, which can be found on Page 6 of the July/August 2007 edition of ***SFMANJ Update***

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At this time it is necessary to gather information from outside sources. I used information gathered from the internet that was published by the Delaware Cooperative Extension Service and from the book "Sports Fields-A Manual for Design, Construction and Maintenance" by Puhalla, J; Krans, J; Goatly, M; John Wiley & Sons Inc.

Next I had to determine the **average water holding capacity of my soil**. Different soil textures have different water holding capacities depending on soil pore space. Sandy soils have large pore spaces between the soil particles, silt loams and clays have minute pore spaces. While sandy soils with their large pore spaces can absorb volumes of water quickly, the water also drains quickly. The soils such as silt loam and clays hold their water much longer. My soil type was silt loam which has an average water holding capacity of 0.17 to 0.23 inches of water stored per inch of soil; multiply by 12 to get inches of water per foot of soil (Delaware Cooperative Extension).

Following that, the next step was to find out how much water the turf needed and was using and figure out the irrigation volume and frequency. A turfgrass plant is more than 90% water and requires a different amount of water than a shade tree. Evapotranspiration, the process where available water in the soil evaporates into the atmosphere and transpiration the process where a plant gives off water vapor and oxygen as a byproduct of photosynthesis, is higher during the warmer parts of the year than other times. So, transpiration rates vary every month.

Monthly Potential Evapotranspiration (PET) values can vary slightly from year to year and PET values vary by month. The PET value for Delaware in May is 3.72 inches; for daily PET values divide the monthly PET value by 30 (Delaware Cooperative Extension). If you can measure the ET at your site, you can become very precise.

The water requirement Crop Coefficient (K_c)is a scale used as a multiplier in irrigation audit equations. The water requirement crop coefficient for cool season turfgrass is 0.6 to 0.8; the water requirement crop coefficient for warm season turfgrass is 0.5 to 0.70 (Puhalla et al., 2001).

Using the information found from my data collection as well as the information in the preceding tables, I was able to find the **irrigation frequency** using the following formula:

$$\text{Irrigation frequency} = \frac{\text{average water holding capacity x root depth x management allowable depletion}}{\text{potential evapotranspiration x crop coefficient}}$$

I found the **run time frequency** using the following formula:

$$\text{Run Time} = \frac{\text{60 x irrigation frequency x potential evapotranspiration x crop coefficient}}{\text{net precipitation rate x irrigation application efficiency}}$$

So what did I find out after all that work? Irrigation frequency is all about evapotranspiration which varies each month. Assuming average temperatures and humidity and no rain, I would only need to irrigate once every 7 days in May. Because there is less evapotranspiration in April, I would need to irrigate once in 14 days. In July there is more evapotranspiration so I would need to irrigate every 4 days.

I found that the run times would vary from about 108 minutes in April, to 113 minutes in July to 117 minutes in May. For convenience, I rounded up to 120 minutes for the audit in May. My Kifco water reels were calibrated to travel 60 feet per minute, applied ½ inch of water during the first run time. So, by pulling back out a second time immediately following the first run, I could supply the field with a full inch of water.

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As a result of conducting an irrigation audit on my site, I was able to save over $2,000.00 dollars in my irrigation budget and over 150 hours of my personal time.

Remember that the idea is to irrigate the soil, not the turf. Consider the concept of the soil as an H_2O bank account for your turf. Just like your personal checking account, try to maintain a prudent balance of moisture in the root zone so as not to become overdrawn and stress the turf.

References

Delaware Cooperative Extension

Puhalla, J., J. Krans, and M. Goatley. 1999. Sports fields: A Manual for design, construction, and maintenance. Ann Arbor Press, Chelsea, MI.

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