



Best Management Practices for New York State Golf Courses

Evapotranspiration Demand

Evapotranspiration (ET) describes the water lost through soil evaporation and plant transpiration and is influenced by the climate conditions on any given day. Hot, windy days with low relative humidity have higher rates of ET than cooler calm days with low relative humidity. At the wilting point, ET has depleted the available water and the plant begins to show stress. Irrigation scheduling needs to periodically refill the soil reservoir to avoid wilting and can be scheduled by calculating the potential evapotranspiration (PET).

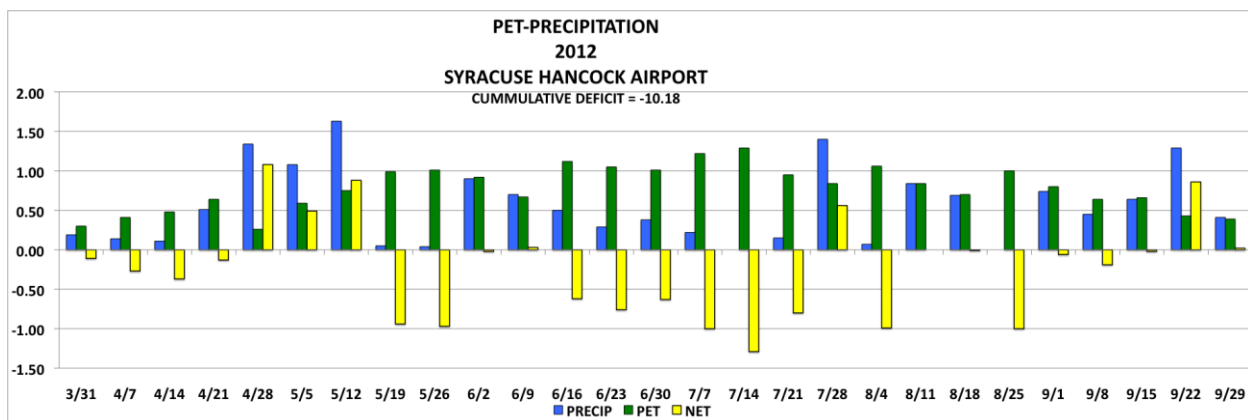
Calculating PET

The Northeast Regional Climate Center (NRCC) provides estimates of PET based on climate data from every regional airport in New York State. An ET rate of 0.20 is considered high. Conversely, an ET rate of 0.05 is considered moderate. Calculating PET requires a crop coefficient (Kc), which varies by plant species, the leaf area characteristics, and density of the canopy. The Kc typically used for turfgrass management is 0.80. PET estimates should be factored by the crop coefficient to calculate the water replacement to be scheduled.

$$PET \times Kc = \text{Adjusted PET for Turf}$$

$$\text{Precipitation} - \text{Adjusted PET for Turf} = \text{Water Deficit}$$

In 2012, New York State experienced three successive seasons that challenged turf managers with very hot and dry periods. Using NRCC data, the 2012 PET deficit for each week is shown for Syracuse Hancock Airport below. During the 2012 season, ET exceeded precipitation for 17 weeks, exposing turf to drought stress. The total deficit was 10.18 inches of water. Replacing 80% of the PET deficit would have used 11.9 million gallons of water to irrigate 54 acres, the average number of irrigated acres on an 18-hole golf course in the Northeast (Throssell et al 2009).



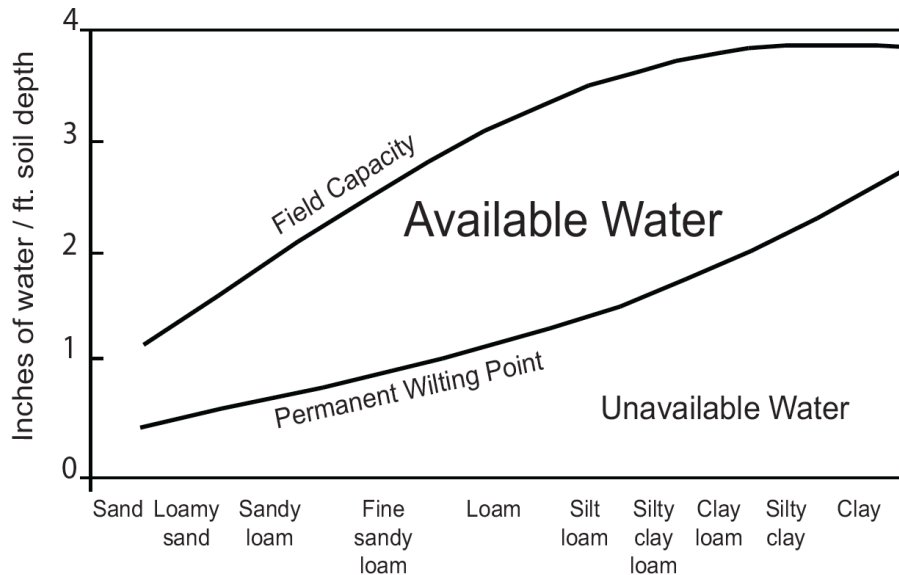
Cumulative weekly evapotranspiration deficit for Syracuse Hancock Airport, New York.

The NRCC provides historical data and ET forecasts at <http://www.nrcc.cornell.edu/grass/>.

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Using PET

Information from onsite weather stations or PET data from the NECC can be used at a golf course scale or at a smaller scale to adjust for microclimates and conditions. Meaningful ET occurs from April through October in most cases in NY, so rainfall and ET is useful for this period. A few well-monitored golf courses in NY have demonstrated the importance of factoring in the soil water holding capacity to calculate the amount of irrigation. As shown in the figure below, the soil texture determines water supply and frequency of irrigation. For example, a typical 12 inch USGA sand root-zone green will have only about 0.75 inch of plant available water stored. Any daily rain events greater than 0.75 inch need to be reduced to 0.75 inch in the PET calculation (rainfall-ET). Also, to avoid drought stress in turf, irrigation should be at 50% of the PAW, or in the case of the sand green, about 0.20 inch of PET. On very dry days, this value could mean irrigating daily or every couple of days, depending on the weather. At the smaller scale, irrigation should be adjusted in areas with lower PET, such as shady areas. If an on-site weather station is not an option, at the least a rain gauge should be used to collect rainfall due to localized summer storms.



Available water by soil type. Source: Ohio Agronomy Guide, 14th edition, Bulletin 472-05.