Turf water use influenced by more than air temperature
July 15, 2015

It's miserably hot. Factor in the humidity eastern Nebraska experienced last weekend and it's downright unbearable. Sometimes it's easy to confuse high air temperature or heat index with high turf water use. While there is definitely a relationship between air temperature and water use (evapotranspiration, ET), total solar radiation and average relative humidity are actually better predictors of potential ET (Fig. 1). For example, potential ET on June 24, 2015 was 0.25" with a high temperature of 94°F and 74% average relative humidity. On April 20 the potential ET was 0.26" but the high was only 59°F and the low was 36°F. The average relative humidity that day 47% which made all the difference (solar radiation was nearly identical).

On-site weather stations and websites like the High Plains Climate Center calculate potential ET from past weather data. Unfortunately, most weather forecasts don't predict future ET. This causes us to water heavier on mornings with hot weather in the forecast. One way to make predictions about future ET is to look at the forecast high air temperature, humidity and cloud cover. Weather.gov has great Hourly Weather Graphs that are specific to your location (Fig. 2). These graphs contain a wealth of information including percent sky cover, hourly temperature and humidity (dew point and relative humidity). This information can be used to estimate how much water the turf will use over the course of the day.

Solar intensity is highly correlated to ET; turf will need more water on sunny days than cloudy or hazy days. Make sure the soil has enough water to support the turf when clear skies are in the forecast. Temperature and humidity work together to affect ET. While relative humidity is commonly used, it can be the hardest to understand because it changes frequently during the day. It's usually highest during early morning and lowest in mid-afternoon. This is because relative humidity is related to air temperature (which can change quickly) and the dew point temperature (usually more stable). Relative humidity is high when air temperature approaches the dew point (small temperature-dew point spread) and low when air temperature is much greater than the dew point (high temperature-dew point spread). Look for dew point temperatures forecasts when trying to decide how much water the turf will need because it is more stable. For example, the dew point temperature in southeastern Nebraska ranged from 77 to 80°F last weekend; that's New Orleans type humidity. That helped keep ET lower than it could have been given the high temperatures and clear skies. Meanwhile the dew point on the Nebraska panhandle was in the 40's and 50's. Evapotranspiration there was two times greater than it was in southeastern Nebraska despite similar high temperatures, clear skies and cooler nights (Fig. 3).

Consider cloud cover, dew point, high air temperature and temperature-dew point spread when estimating how much water the turf will need for the day. These factors together will impact turf water requirements. Focusing on one can be misleading. Increasing irrigation quantity simply "because it's hot" is a good way to over-irrigate which can have disastrous effects during summer.

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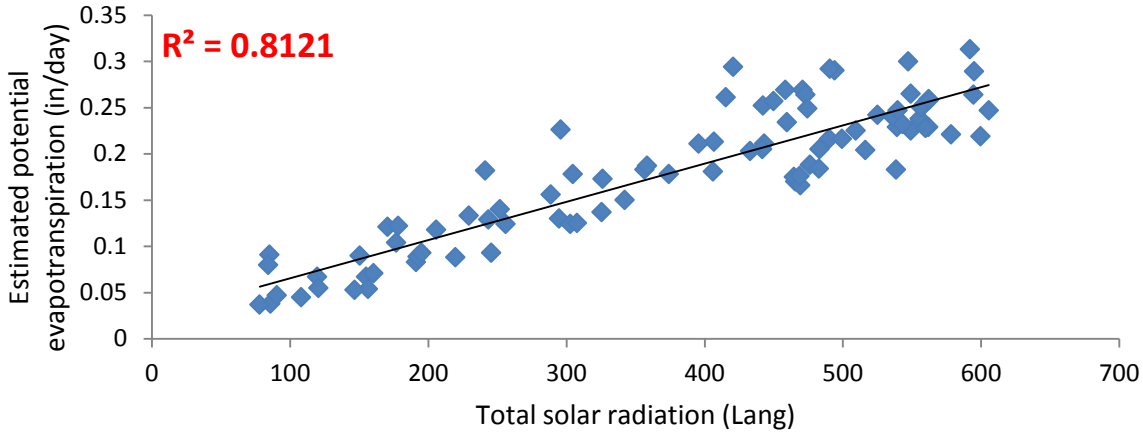

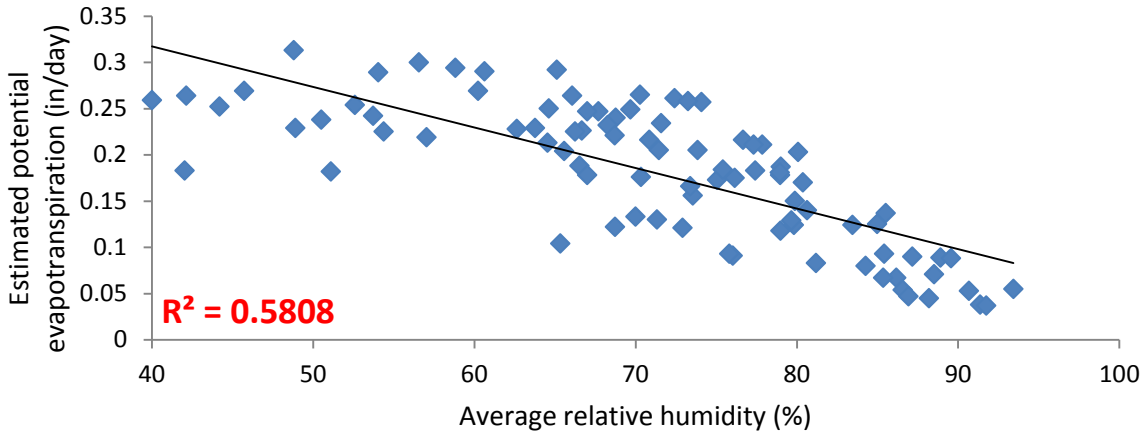

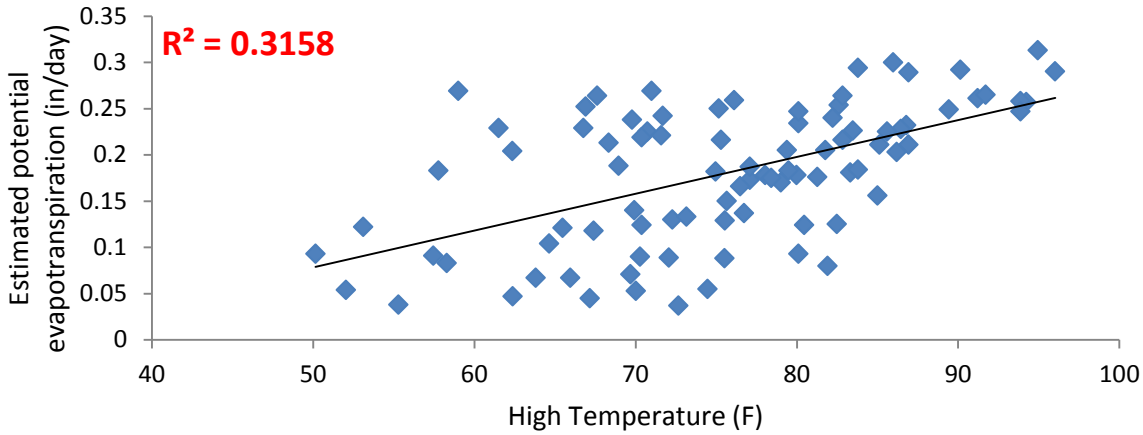

Figure 1: Evapotranspiration is affected by more than just air temperature. This is weather data from Lincoln, NE during April 15 until July 13, 2015. Total solar radiation (A) was the strongest predictor of ET, followed by average relative humidity (B) and high temperature (C). Notice warm days can have low ET and cool days can have high ET. Wind speed can also impact ET but its effect depends on other weather factors. Wind speed is more important on dry days than humid days.

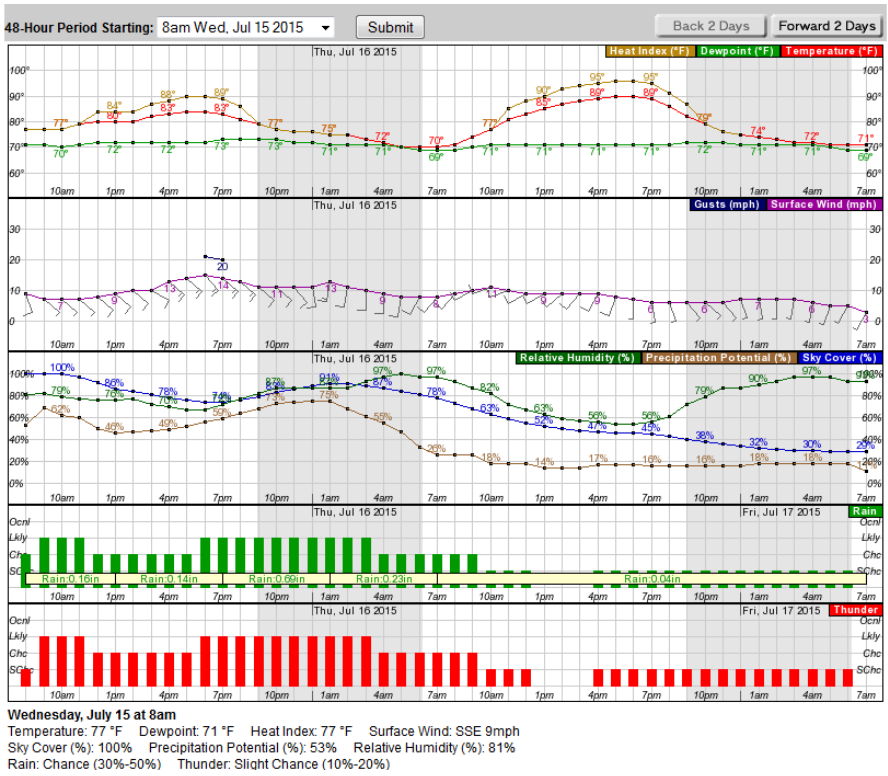

Figure 2: The Hourly Weather Graph provided by Weather.gov provides a wealth of forecast data to help predict water requirements. Low dew point, warm temps and clear skies will result in high water use by the turf.

Figure 3: Last weekend the high temperatures were in the upper 90's across all of Nebraska. The skies were clear of clouds but the dew points in eastern Nebraska exceeded 75°F and were less than 60°F in the west. This led to large differences in ET across the state. View these map for free.