



Weather 101:

fundamental meteorology for turf managers

WE LIVE UNDER AN OCEAN OF AIR SOME 60 MILES THICK. How that ocean of air behaves day to day is what we call weather. Nearly every sports turf manager will agree that weather affects most aspects of their job and is a critical component of their daily lives. In this article, we will examine some of the basic principles of weather and applications of those principles to day to day management activities.

One of the first things a sports turf manager does in the morning is check the current weather conditions. This information can be obtained from TV, radio, the internet, and newspapers. Most commonly reported are temperature, humidity, dewpoint, barometer, and wind.

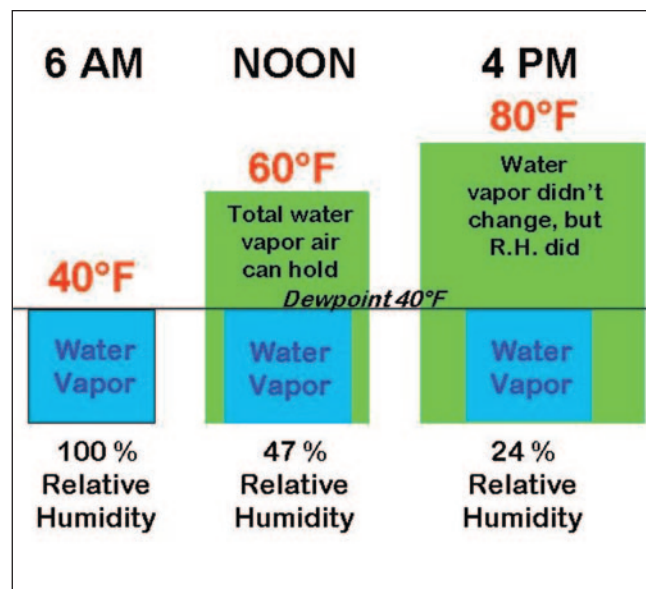
Temperature is one of the two major drivers of weather and is one of the most obvious of the weather components. It is a measure of how rapidly air molecules are moving in the atmosphere, which in turn tells us how warm or cold it feels. Normally, temperatures change gradually over a period of time. However, when major changes in temperature occur over a short period of time, it usually indicates the presence of a front. Fronts are narrow boundaries separating relatively cold and warm air and have predictable qualities.

Cold fronts are made up of relatively cool and dense air and move along the ground like a bulldozer, forcing air up along their leading edge. When air is forced up in this manner, we experience more abrupt weather with gusty winds and thunderstorms. This abrupt weather normally lasts for only a brief period, so, if you are preparing for a game or project on the field and a cold front is passing through, you may only have to plan for a delay of a couple of hours.

Warm fronts move much more slowly than cold fronts and are made up of relatively warm air that is less dense. This air cannot displace cooler air and gradually warms the space it travels through. Because of this gradual process you may experience several hours or even a day or two of light to moderate rain as a warm front passes.

Moisture is the second major driver of weather. In essence, moisture could be considered the fuel for earth's weather while temperature is the activator. In a weather report, moisture is represented by humidity and dewpoint. Humidity is expressed as a percentage, which indicates relative humidity.

Relative humidity is a measure of how much moisture is in the air compared to how much it can hold. Warmer air can hold more moisture while colder air holds less. Since relative humidity varies with air temperature, it changes as the day warms up, making it a less reliable indicator of humidity levels.



The table above illustrates the relationship between temperature and relative humidity. As air temperatures warm throughout the day, the amount of moisture it can hold also increases, resulting in lower relative humidity. All the while, the actual amount of water vapor (dewpoint) does not change

Weather icons courtesy of istockphoto.com

The higher the dewpoint, the greater amount of water vapor in the air which means muggier conditions and lower evaporation rates.

Dewpoint (or the dewpoint temperature) is a measure of the actual moisture content of a parcel of air. Dewpoint is the temperature at which air becomes saturated and water vapor condenses into dew, fog or clouds. In general, the higher the dewpoint, the greater amount of water vapor in the air which means muggier conditions and lower evaporation rates. Table 1 lists some example dew-point temperatures.

Dew-point Temperature	
< 10°F	Significant snowfall is inhibited
> 55°F	Minimum for severe thunderstorms
> 65°F	Considered humid by most people
> 70°F	Typical of the rainy tropics
> 75°F	Considered oppressive by most

Lutgens and Tarbuck, 2007

For example, dewpoint tells Dan Bergstrom at Minute Maid Park in Houston, TX, how fast the water will evaporate from his infield skinned areas. Given the warm temperatures in Texas, a dewpoint over 70 tells him he won't have to spend much time throughout the day watering the infield skin. A dewpoint under 40 tells him that he will spend most of his day watering the skin. The low dewpoint and high temperatures contribute to high evaporation rates.

It is also beneficial to include dewpoint in your recordkeeping when managing diseases. You may discover that certain diseases develop at certain dewpoint temperatures. This may help you better anticipate the onset of diseases and make better use of your fungicide expenses.

One more note regarding dewpoint; as relative humidity approaches 100%, the air has about as much moisture as it can hold and will start to form frost when temperatures are at or below freezing and form dew when the air is above freezing. Understanding how temperature and dewpoint interact may help you schedule early morning maintenance more efficiently and save downtime waiting for the frost to break or dew to dry.

The barometer reading indicates surface atmospheric pressure and is generally measured in inches of mercury (in. Hg). This is a measure of the total weight our ocean of air has as it presses against a surface. Colder air is denser and exhibits greater pressure, while warmer air is lighter and exhibits less pressure. In areas of high pressure, air tends to sink and promote clear skies while air rises in areas of low pressure and favors cloud formation.

Suppose that the barometric pressure is 30.06 inches of mercury

and that the pressure is rising. This means we can expect to experience higher pressure with fair weather and little chance of rain. Barometers will rise as cold fronts approach and fall with the approach of warm fronts. Fair weather is most commonly associated with a rising barometer and high pressure while more rainy weather is associated with a falling barometer and low pressure.

Wind is generally defined as air in motion. Air tends to blow away from areas of high pressure and toward areas of low pressure. The greater the difference between high and low pressure areas, the stronger winds blow. This is called pressure gradient force.

Because the earth rotates, it causes winds to flow in a circular motion. This circular motion is what causes cyclones, tornadoes and hurricanes to behave the way they do. Winds flow out of high and into low pressure areas in a regular pattern, so weather forecasters can develop rules of thumb of what type of weather to expect when winds shift and pressure changes.

Remember: A wind is named for the direction from which it originates. So, a northeast wind blows from the northeast.

Applying basic weather knowledge

The following are perspectives from various sports turf managers and how they incorporate weather data into their day to day activities:

“What if you have a cold front coming through the night before a home stand and you're trying to decide whether to pull the tarp. If you get ¾ inch of rain overnight, but then have 35-degree dewpoints forecast the next day with low humidity, full sun, and a good breeze, then why spend the labor to tarp when the field will dry out anyway? You just saved overtime budget money AND irrigation water money for the infield dirt the next day.

“Of course if you made the same decision to NOT tarp with a 68-degree dewpoint forecast, you likely just rained out the game and cost your administration the gate for the night. So it works both ways. A savvy field manager who is a good communicator with the front office can really save some money by watching the weather closely.”-Dan Bergstrom, Minute Maid Park, Houston Astros

“There is a direct correlation in baseball between weather and your daily maintenance activities. We all know on the turfgrass side how variable weather conditions impact turf health, disease pressure and irrigation scheduling. Knowing you have 2 days of rain coming up, you may think ahead and spray a preventative fungicide on the turf that will be under and near the tarp.

“Also to be monitored and projected is the amount of sunlight expected and how much wind is blowing on a given day. Evapotranspiration figures are a nice guide, but I like to use my skin. Am I sweating a lot or is my skin dry? Do I need to apply

extra sunscreen that day or is the UV level fairly low. This also changes based on the time of year. June is vastly different from September in terms of sun strength and the amount of daylight.”-Larry Divito, Minnesota Twins

“The first thing I do every day is to wake up and check the latest weather reports and discussions. Weather impacts all parts of our operation and planning. This goes on 24/7/365 as the grass does not know what a weekend or holiday is. I read the latest National Weather Service weather discussion and forecast every day at 6 am and 4 pm (when the updates come out). We also contract with a local weather consultant and they issue daily reports every morning. Our weather consultant also offers a lightning and severe weather notification service that we use for events at the stadium.”-Ross Kurcab, Invesco Field at Mile High, Denver Broncos

“The weather is not just confined to temperature, precipitation and wind; sun angles play a big part as well. Do we plow snow? Is the sun going to melt the snow/frost? Do we syringe the fields? Do we put on the Evergreen blankets? This is just the tip of the iceberg as there are so many other decisions based upon the weather forecast that it makes it a necessity to be on top of the weather not only on daily but also a week ahead of time. It is also useful to know what the climatic averages are for your particular area.”-Troy Smith, Denver Broncos Practice Facility

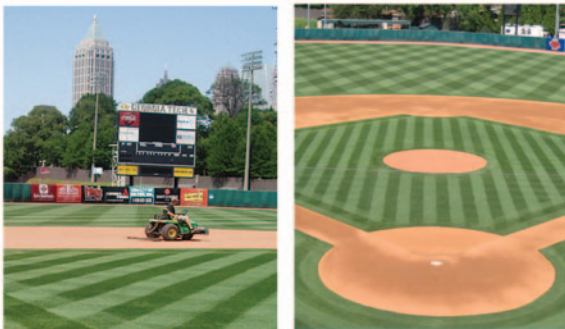
Websites are excellent resources for current weather information. The National Weather Service has an excellent website loaded with information at www.weather.gov. In addition to the standard reports of current conditions, forecast and maps they also provide links to items like their forecast discussions prepared by staff meteorologists (it’s listed under their Additional Forecasts and Information Section). These discussions can provide additional insight as to why they are making a particular forecast.

Also, there are weather consultant services available online that can provide the sports turf manager with forecasts and real-time storm and lightning information. This information can be relayed directly to your cell phone to help you make game-time decisions regarding severe weather, etc. These services are fee-based, but each program is tailored to the particular needs of each facility’s situation.

Weather affects nearly every aspect of a sports turf manager’s job. Having a better understanding of current weather conditions and using forecast information to your advantage can make your life much easier which may save you time, labor, and money now and in the future. ■

Brad Jakubowski is an instructor at Doane College in Lincoln, NE. He would like to thank those who contributed to this article.

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