The Metos weather station references evapotranspiration rate as inches or millimeters of water loss per 24-hour period.

What weather stations can do for your grass

by Dan Dinelli

■ Weather is one of the most difficult factors a turf manager faces. It is beyond human control, yet it can be the greatest influence on turf quality.

Though we cannot rely on consistent, accurate weather predictions, we can collect detailed historical weather data. With this information, degree-day accumulations and computerized models can help predict favorable conditions for pests. And spray data can be entered into the program to track the impact of spray decisions on disease activity.

Scientific support of what we do is becoming increasingly important. People who may question our management activities can relate to a computer print-out over a "judgment" based on experience. If evapotranspiration (ET) rates call for irrigation, the decision is based on scientific calculations and not a person's opinion.

A weather station, with disease model software, is a tool to do just that. Last spring, we purchased a Metos weather station, complete with 10 sensors:

- a thermometer to measure air temperature five inches above the turf;
- another thermometer for measuring soil temperature two inches below the turf in our fourth green;
- a rain gauge to measure rainfall and irrigation water;
- two leaf wetness sensors;
- a solarimeter to record solar radiation and day length;
- a soil moisture probe located two inches deep in the fourth green;
- a relative humidity sensor six inches above the turf; and
- an anemometer to measure wind speed and direction.

A solar-powered micrologger automatically scans all sensors every 12 minutes, and stores this data for up to a week. Information is downloaded from the micrologger to the personal computer in the grounds manager's office any time.

Singularly or collectively, data from these sensors improves and at times justifies many of our management practices.

Soil moisture—The computer, using a Watermark gypsum block soil moisture sensor, graphs soil wetness readings. From the information, we were able to design a rating scale that helped us determine daily watering needs.

The weather station also calculates ET as inches or millimeters of water loss per 24-hour period. Combining ET value and our rating scale gave us an even clearer picture of moisture loss and needs.

Information gathered from soil temperature has helped us to better judge the timing of our first fungicide application to control summer patch (*Magnaporthe poae*) and take-all patch (*Gaeumannomyces graminis*). Soil temperature data will also indicate the proper timing of preemergence herbicide treatments for crabgrass control.

Microbial activity and nutrient release (by some fertilizer carriers) are governed largely by soil temperature and moisture. With this data, we can better understand and predict fertilizer activity.

Insect control—Scientists have come up with a way to better predict insect emergence and activity by tracking accumulated heat, expressed as degree-days.

The degree total for the day is the average minus the base temperature. Each daily calculation is added to the previous days' figures to get the running total of accumulated degree-days.

Researchers have developed degree-day thresholds for many insects. Knowing the degree-day value and referencing it to a particular insect's development, in effect, creates a calendar of insect activity. Following such a calendar helps the turf manager focus on intense scouting for a particular insect and better target insecticide applications if needed.

Dinelli: refining degree-day calculations with computer.

The weather station has refined our degree-day calculations. It averages 120 air temperature measurements each day. This average is much more accurate than simply adding the day's maximum and minimum temperature and dividing by two, the method we used in the past.

Weed control—Other biological activity can be predicted using degree-days:

- Some plants' determination to flower or set fruit can be predicted with degree-days.
- *Poa annua* has a degree-day model for its flowering period.
- Understanding the plant's physiological state can better determine the timing

'Home grown' research based on collected data coupled with field observations is needed.

of plant growth regulator applications.

● Because plants and insects share this heat-related phenomena, field observations of plant activity can also help determine insect and weed activity. For example, pre-emergence crabgrass control can be applied when the bridal wreath spirea (*Spiraea x vanhouttei*) blooms. In this case, the bridal wreath spirea is an indicator plant for the conditions of crabgrass germination.

We have a garden of indicator plants growing on the golf course, and next season we will make comparisons of DD values versus indicator plant responses.

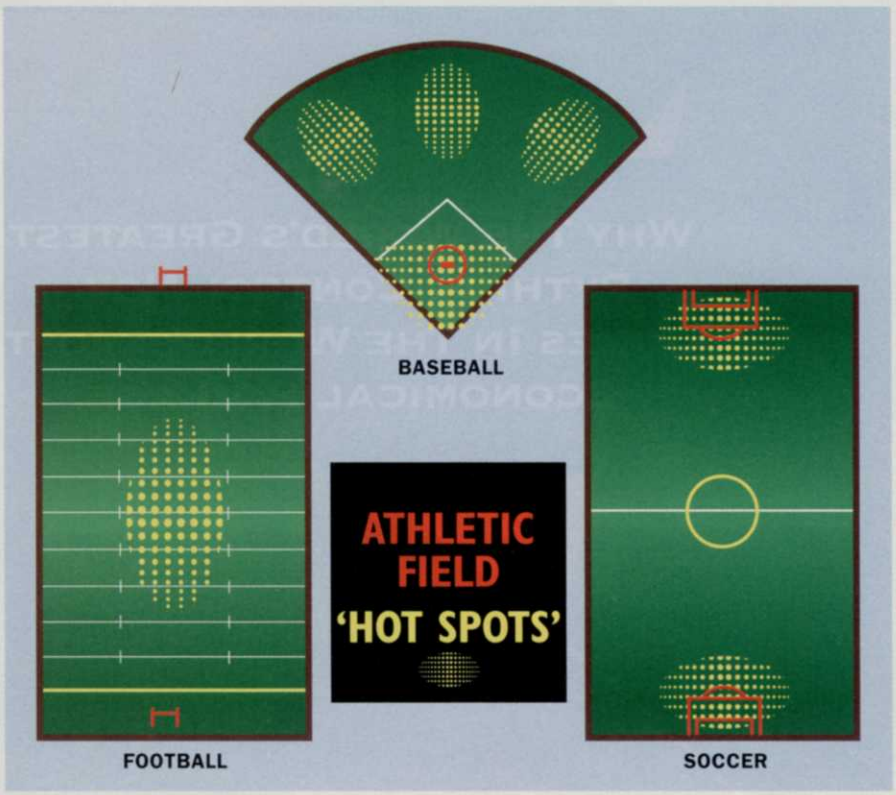
Disease control—This weather station has three prediction models for turf diseases: pythium blight (*Pythium aphanidermatum*), brown patch (*Rhizoctonia solani*) and dollar spot (*Lanzia & Moellerdiscus* spp.). The predictive models, based on complex mathematical calculations, are used as indicators of favorable environmental conditions for disease.

They do not account for inoculum pressure, species or cultivar resistance to disease, fertility or future weather (environmental) conditions. Ultimately, the turf manager makes the decision on disease pressure versus needed controls.

What's to come—Considerable work is still needed to establish historical databases for weather data and to accumulate field observations that relate to it. More disease models must be constructed. Degree-day models need to be calculated for other pests as well as for beneficial insects. "Home grown" research based on collected data coupled with field observations is needed. We are looking at soil temperature readings to help fine tune the timing of green cover applications, day length and how it may affect plant responses, solar thermal units to further refine degree units, and soil temperature versus root growth.

The uses and applications are limited to your imagination. That's what makes the weather station an exciting tool.

—The author is superintendent of grounds at North Shore Country Club in Glenview, Ill.



Managing athletic fields for specific use patterns

Save money by localizing your maintenence areas, this expert tells the STMA.

■ You can maintain an athletic field with less than $1,500 a year in materials, if necessary, says Dr. Henry Wilkinson of the University of Illinois.

Wilkinson, speaking at the Sports Turf Managers Association's annual conference in Florida last month, said, "In general, the greater the shear force, the higher the cost of maintenance." That means that football fields—especially on the professional level—are the highest maintenance, followed by soccer, baseball and softball fields, respectively.

Maintenance factors which influence field safety, playability and appearance are, in order of importance:

1) selection of turfgrass species
2) irrigation
3) mowing
4) fertilization
5) use patterns
6) damage repair
7) aerification
8) pest management

"Sports fields do not need uniform maintenance," Wilkinson told the group. "Certain areas need more maintenance than others." For instance, the areas of highest use (and, thus, maintenance) are:

● **Football fields:** between the hash marks, from 30-yard line to 30-yard line

● **Soccer fields:** in front of the goal mouth

● **Baseball/softball fields:** around home plate, the pitcher's mound and the three areas where outfielders normally stand

Just as use areas vary, you should vary your maintenance patterns for cost-effectiveness. "If you manage a football field for the borders, the center won't last," Wilkinson said. "Likewise, if you manage for the center, you're over-managing the borders. So if you can localize your maintenance, you can afford to do more."

Wilkinson offered these tips for low-cost athletic field maintenance:

1) Look for wear-tolerance in the high-use seasons when you select grasses.

2) Water the entire rootzone, and don't