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TURFGRASS STRESS

Multispectral Radiometry: Opportunities for detecting stress in turfgrass

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The words "stressed turfgrass" quickly bring a picture to the mind of any turfgrass manager. Stressed turf is off-color, wilted, thin, patchy or straggly. It is easy to see the turf is not healthy, even if it is often difficult to tell why it is stressed.

But what if you could identify areas of stressed turfgrass before that stress is visible to the eye? Pinpointing areas that are under stress very early on could allow a turfgrass manager to apply management techniques to correct the stress before the problem becomes visible or widespread. Early detection and correction of stressed areas would maintain the turf's quality and could lead to reduced pesticide, water or fertilizer use, as spot-sprays or treatments could be applied only when and where they are needed.

Using remote sensing methods

A method currently being explored in turfgrass science for early detection of stress is remote sensing via multispectral radiometry. Radiometry measures the amount of energy reflected and emitted from plants. Multispectral radiometry measures reflectance over a range of many wavelengths.

Using a device known as a radiometer, researchers are currently testing whether the light reflected from turfgrass at a variety of wavelengths can predict stress. Currently, researchers mostly are testing handheld radiometers (Figure 2), but the real promise of multispectral radiometry comes when the radiometers are mounted in aircraft, which can then fly over entire golf courses, remotely sensing turfgrass stress from the air. This could allow managers to make a 'stress map' of their turf, enabling them to identify and correct stress before it becomes visible at ground level.

Currently, turfgrass researchers are trying to accomplish two things with remote sensing of turfgrass stress. First, they are trying to see how well the radiometer readings correlate with visual observations of turfgrass stress from a variety of sources (disease, drought, compaction etc.). Second, they are trying to determine which wavelengths of energy are best for detecting stress and whether the wavelength(s) that best detect stress change with the type of stress, the type of grass or time of year.

For a turfgrass manager to use a radiometer to reliably detect stress, he or she must know the wavelength to use and if the measurement is consistent over a range of grasses and environments.

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