

# Putting the pixels together in turfgrass management

**Editor's note:** This article was written by an employee of TurfScout



Photo courtesy of TurfScout®

**Wilbur** Wright pioneered the art of aerial photography shortly after the first airplane flight. What began as a fascination with capturing events, landscapes and architecture paved the way for the science of satellite imaging and remote sensing. Simply put, remote sensing is the act of measuring characteristics of an object without coming into contact with that object. In turfgrass, characteristics measured with remote sensing can be a tremendous asset for: stress detection, monitoring recovery, precision turf management, and irrigation efficiency, to name just a few.

The old adage, "A picture is worth a thousand words," falls short here; remote sensing on turfgrass "Speaks volumes."

How can a camera or sensor measure turf quality and more importantly, how can it "see" what turfgrass managers can't? The amount of light reflected from a surface tells us something about that surface. As different environmental conditions affect a turfgrass (water stress, nutrient deficiency or disease, for example), rapid and predictable changes occur at the cellular level that impact how the plant tissue reflects light. In turf, (and most plants), red and blue light are absorbed for photosynthesis. Healthy turf will absorb more red and blue light than unhealthy turf. In near-infrared wavelengths, healthy turf is highly reflective

and would appear very "bright" to the human eye, if we could see in that region of the light spectrum. In other words, a *decrease* in near-infrared reflectance signals stress while an *increase* signals recovery or improvement in turf quality. This technology has recently garnered the attention of the turfgrass community, but the science behind the sensor dates back to 1950s and has been extensively researched in the agricultural community since the early 1970s.

Over the last decade, the research community has investigated the role of remote sensing in turfgrass. A driving force behind the research has been the ever present demand for a more efficient, conservation-conscious and resource-savvy approach to managing turfgrass. Research shows visible and near-infrared reflectance is sensitive to water stress, nutrient deficiency, disease pressure, and mowing height, for example. As mobile sensors that are easily mounted on mowers or carts are coming to market, the transition from cutting edge technological developments to practical turfgrass solutions has become a reality.

TurfScout is already delivering remote sensing to the turfgrass industry. The company processes raw light reflectance and GPS data to create maps and charts of turf quality designed to help turf managers improve quality, prevent problems and save money. The set-up is nearly

## How refueling propane-powered equipment works

**MORE THAN TWO DOZEN MODELS** of propane-fueled commercial lawn mowers are available from brands well known to sports turf managers. Propane-fueled mowers reduce greenhouse gas emissions by almost 50% and carbon monoxide emissions by more than 80% compared with gasoline mowers.

Refueling is easy thanks to a proven model adopted from another market: the forklift industry. This mature business model applies the exact same methodology to the propane-fueled commercial mower market. Propane providers replace empty cylinders with full counterparts through a just-in-time inventory schedule that meets a sports turf manager's needs, ensuring that a propane mower fleet will never have too much or not enough fuel on hand.

Cylinder exchange programs usually include installation of a storage cage in a centrally located spot that is easily accessible to personnel. When a mower cylinder is empty, appropriately trained personnel can access the cage and refuel their mower in a matter of minutes by removing the empty cylinder and installing a full replacement from the cage, using all relevant safety measures and personal protective equipment.

**In addition to on-site refueling, there are currently thousands of propane refueling stations across the country with locations in every state.**

For fleets that require a large propane volume, a propane provider can install a no-spill dispenser on-site that turf managers can use to refuel empty mower cylinders, as well as tanks for vehicles fueled by propane autogas. Depending on storage necessity, longevity, and available space, this on-site refueling infrastructure includes underground or above ground storage tanks for longer-term use. After installing the dispenser, propane providers facilitate training on how to safely refill both propane cylinders and propane autogas vehicles.

In addition to on-site refueling, there are currently thousands of propane refueling stations across the country with locations in every state. To learn more about propane-fueled commercial lawn mowers, vehicles fueled by propane autogas, and available refueling options, visit [www.poweredbypropane.org](http://www.poweredbypropane.org). -*Brian Feehan, VP, Propane Education & Research Council* ■



**>> PROPANE CYLINDERS** are typically installed horizontally on a mower, and are either located in the mower's rear, or on the sides, as shown here.