

# SPECTRAL EVOLUTION

## Spectral reflectance measurements to estimate nitrogen content

Spectral reflectance measurements in the field and the lab have proven to be a cost-effective and less time consuming option for estimating plant health and the presence or absence of plant nutrients, including nitrogen, than traditional laboratory analysis techniques.

Using a field spectroradiometer such as the Spectral Evolution PSR+ or the RS-3500, a researcher can get an estimate of nitrogen content in a plant or a canopy for a fast overview of plant health. Like phosphorous, potassium, calcium, and magnesium, nitrogen is a nutrient crucial to photosynthesis and affects the production of plant chlorophyll. All nutrient deficiencies in some way affect chlorophyll content with a generally increased reflectance in the visible wavelengths (400-700nm) and the infrared (700-1100nm). In general, nutrient deficiency of any kind will represent a chlorophyll loss and a shift in the position of the “red edge” to a shorter wavelength.

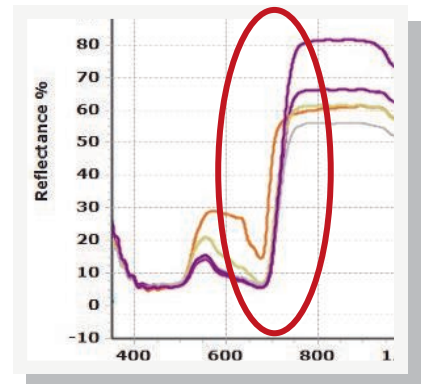
The red edge is usually situated around 720nm. For nitrogen deficient plants, the red edge may be closer to 700nm and the actual slope of the red edge should be slightly steeper (signifying higher reflectance of the sample) than normal for a healthy plant. It is also possible to estimate total plant nitrogen using spectral reflectance measurements at the red at 671nm and the NIR at the 780nm wavelength.

The PSR+ and RS-3500 are both portable full range, UV-VIS-NIR instruments with high resolution and low noise. DARWin SP Data Acquisition software includes 19 vegetation indices in a pull down menu, including the NDVI and Red/Green indices which can be used to determine the health of a plant or a canopy. The PSR+ provides the field researcher with the option of using direct attach lenses for standoff measurements or a fiberoptic cable with FOV lenses, a contact probe, sphere, pistol grip, our unique leaf clip and other accessories. The RS-3500 is equipped with a fiber optic cable and works with all our accessories including FOV lenses. Both instruments offer auto-exposure, auto-dark correction, and auto-shutter for one touch operation.

By assessing nitrogen deficiency quickly in the field, an accurate judgement can be made about adding additional nitrogen to crops or forage pasture. Measurement by a field spectroradiometer is rapid, non-destructive and requires no chemicals.

The PSR+ and RS-3500 are lightweight and rugged—built with photodiode arrays and no moving parts for consistent reliable operation in field conditions. Additional Vegetation remote sensing applications include:

- ◆ Species identification
- ◆ Assessment of phosphorous and potassium nutrients in plants
- ◆ Measurement of moisture and water content
- ◆ Soil characterization and analysis
- ◆ Ground truthing satellite imagery and measurements
- ◆ Total organic carbon (TOC) in soil
- ◆ Biomass research



*Using the position and the steepness of the red edge to estimate nitrogen deficiency. In this multi-scan/multi-plant comparison the purple sample indicates a slightly less healthy sample.*



*Take leaf reflectance measurements in the field with the PSR+ or RS-3500 and our leaf clip attachment.*

26 Parkridge Road ♦ Suite 104  
Haverhill, MA 01835 USA  
Tel: 978 687-1833 ♦ Fax: 978 945-0372  
Email: [sales@spectralevolution.com](mailto:sales@spectralevolution.com)  
[www.spectralevolution.com](http://www.spectralevolution.com)

