

# SPECTRAL EVOLUTION

## Measuring Biomass Using NIR Spectroscopy

Measuring biomass is important for a number of different applications, including the conversion of biomass to fuel or chemicals, using biomass measurements to monitor the health of farmlands and grasslands, assessing the ecological health of a site, analyzing rangeland condition, measuring hydrologic properties (such as runoff and erosion), predicting the risk of wildfires, and forecasting forage availability for cattle.

UV/VIS/NIR spectroradiometers from SPECTRAL EVOLUTION deliver faster, more accurate, and more flexible ways to measure biomass than traditional estimations or wet chemistry. NIR spectroscopy brings the following benefits to your research:

- ◆ Fast collection of data in minutes
- ◆ Minimal or no sample preparation
- ◆ Precision, accuracy, and a wealth of information—especially if the spectra are combined with chemometrics software
- ◆ Non-destructive measurement
- ◆ Affordable measurement technology
- ◆ *In situ* measurement with rugged, portable, field spectroradiometers

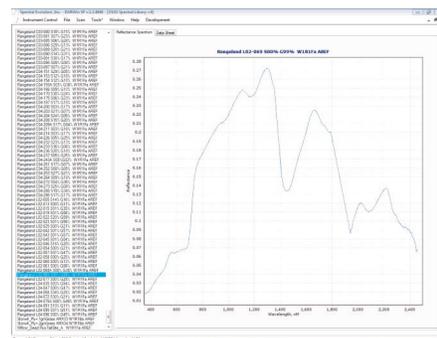
Once collected and analyzed, spectra provide critical information for applications, including:

- ◆ Grassland/rangeland management—farmers need biomass information during early growth stages to regulate the use of fertilizer for the best results
- ◆ Biomass spectra can help farmers to predict yield at harvest using non-destructive field measurements
- ◆ Biomass analysis is key for continued forest health and selective harvesting of old growth and promotion of new growth
- ◆ Floodplains are another area where rapid determination of biomass measurements are crucial, with vegetation providing resistance to floodplain discharge
- ◆ Rapid determination of biomass properties can help characterization of carbohydrates, lignin, moisture, protein, and more
- ◆ Suitability of biomass (such as corn stover slurries, and sorghum) as fuel, including analysis of ethanol production capacity, potential heating value, atmospheric greenhouse gas implications, and total carbon footprint
- ◆ Ecological status assessment, hydrologic properties of an area, or potential support for grazing livestock, can also be determined from biomass analysis

With a full range spectroradiometer, such as SPECTRAL EVOLUTION's PSR+, a scientist can measure organic functional groups either in the lab or *in situ*, in the 350-2500nm range and using chemometric analysis software, such as GRAMS or Camo Analytics Unscrambler, translate the spectra into chemical, compositional data for analysis. This combination of spectroradiometer and analysis software provides rapid analysis, significant savings in time and money, an in-depth level of information, and is applicable to a wide variety of biomass materials.



***SPECTRAL EVOLUTION field spectroradiometers are simple, non-destructive, reliable, fast and accurate***



***In addition to creating and uploading a custom library, SPECTRAL EVOLUTION's DARWin SP Data Acquisition software provides easy access to the USGS spectral library, including rangeland sample spectra.***

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## Biomass Applications:

- ◆ Studies on potential use of biomass for ethanol production
- ◆ Effects of fossil fuel use on forest biomass
- ◆ How much wood is available from forest to support biomass energy development
- ◆ Ecological implications of biomass harvests for fuel use
- ◆ Investigating biomass sorghum as a potential ethanol feedstock
- ◆ Research on cool season perennial grass
- ◆ Simulations of Amazon forest biomass
- ◆ Monitoring vegetation biomass to investigate floodplain monitoring
- ◆ Estimating grassland biomass for better fertilizer use and optimal growth
- ◆ The effects of environmental and human drivers on global vegetation biomass trends
- ◆ Studying biomass and grass seedlings in prairies

The PSR+ field spectroradiometer is ideal for biomass in situ studies, since it delivers a non-destructive measurement method that is easy and fast to use. The PSR+ provides:

- ◆ Fast, full spectrum UV/VIS/NIR measurements with a spectral range from 350-2500nm with just one scan
- ◆ One-touch operation with autosshutter, autoexposure and auto-dark correction before each new scan – no optimization step
- ◆ Small and lightweight with rechargeable Li-ion batteries for field operation—half the weight of competitive instruments
- ◆ Superior signal to noise ratio with faster scan times and better reflectance measurement
- ◆ Reliable field performance with an all photodiode array platform and no moving gratings
- ◆ Detachable, field replaceable fiber optic and field swappable optics for varying target sizes and different measurement modes
- ◆ Single user operation with optional rugged tablet that provides a sunlight readable screen plus the ability to tag spectra with GPS, digital camera images, and audio notes
- ◆ Standalone operation with 1,000 scan storage

The PSR+ comes equipped with DARWin Data Acquisition software that collects data and automatically saves it to a compatible ASCII format for use with 3<sup>rd</sup> party chemometric analysis software without requiring post-collection processing.

SPECTRAL EVOLUTION also offers a full range of portable spectroradiometers, spectrometers, and lab spectrometers. For more information, visit: [www.spectralevolution.com](http://www.spectralevolution.com).

*The PSR+ spectroradiometer allows for rapid scanning of biomass in the lab or in the fields, with significant savings in time, money, and ease-of-use. It provides the precision and accuracy of tradition biomass measurement methods while delivering more useful information, especially when used with chemometric analysis software. Since sample preparation is typically unnecessary, it offers non-destructive measurement capabilities.*



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