

# Ecology & Natural Resources

## Benefits of Our Systems

1. Customize your system by choosing from many datalogger, sensor, and communication options.
2. Long-term operation from rechargeable 12 V batteries and solar panel.
3. Stations operate reliably in harsh environments from the poles to the equator.
4. Time-stamped data is recorded in programmable intervals.
5. Almost any sensor can be measured.
6. Communications options include: satellite, phone, cellphone, and radio.
7. Dataloggers provide on-site statistical and mathematical capabilities.
8. Real-time and historical data can be displayed and analyzed.
9. Dataloggers have control capability—they can activate motors, pumps, purifiers, etc. based on time or measured events.



*Weather stations provide meteorological data from remote sites.*

[www.campbellsci.com/ecology](http://www.campbellsci.com/ecology)



*From monitoring conditions in a forest canopy, to quantifying sediment transport in a stream, or monitoring the heat generated by a forest fire, our systems provide valuable data for a variety of applications.*

**C**ampbell Scientific's data acquisition systems provide accurate, reliable monitoring for ecological and natural resources applications. Designed for versatility, our systems can monitor and record the effects of meteorologic, hydrologic, soil, tectonic, and man-made influences on natural systems. Our systems are used in a variety of ecology and natural resources applications including:

- Habitat characterization
- Micro-, meso-scale climate monitoring
- Global warming/eoindicators
- Reclamation/reforestation
- Carbon budget
- Below ground/duff layer monitoring
- Pollution monitoring
- Animal behavior monitoring
- Pest and disease control
- Canopy research/sap flow
- Soils research
- Surface flux research

For example, our systems can help characterize and monitor aquatic systems by providing data on water level, flow, temperature, and a variety of water quality parameters. In animal behavior applications, our equipment has monitored the requirements, behavior, and habitat of mammals, birds, reptiles, fish, amphibians, and even invertebrates such as insects and marine crustaceans. Parameters such as animal temperature, weight, movement patterns within confined spaces, food consumption, and gas exchange have been monitored. With large species, projects have included GPS and radiotelemetry devices to monitor animal movements.

Battery and solar power allow our systems to provide remote, unattended data collection over long periods of time. Our instrumentation has been proven in some of the harshest environments in the world.

## Dataloggers

At the core of our systems is a programmable datalogger that measures the sensors, then processes, stores, and transmits the data. These dataloggers have programmable execution intervals, wide operating temperature ranges, and on-board instructions for commonly used sensors. If needed, channel capacity can be expanded using multiplexers.

Data are typically displayed and stored in the units of your choice (e.g., wind speed in mph,  $m\ s^{-1}$ , knots). Measurement processing and storage are programmable, but measurements are typically made every minute then processed and stored at hourly and daily intervals (e.g., maxima, minima, averages). Data can be measured and stored more or less frequently (depending on the application and conditional sampling) based on events such as increased wind speeds, torrential rainfall, or diurnal cycle.

PC-based software is customized to simplify datalogger programming, data retrieval, and report generation. The datalogger program can be modified at any time to accommodate different sensor configurations or data processing requirements.

## Sensors

Almost any sensor can be measured by our dataloggers, allowing systems to be customized for each site. Typical sensors used on our stations include, but are not limited to: wind speed and direction, solar radiation of various types, temperature (air, water, soil), relative humidity, precipitation, snow depth, barometric pressure, soil moisture, soil electrical conductivity, and soil heat flux. Our systems interface to a variety of sensors that measure water level and flow, as well as water quality parameters such as pH, conductivity, and dissolved oxygen. Our dataloggers can interface directly to most air flow sensors, opacity meters, particle samplers, and gas analyzers.

## Communications

We offer multiple communications options for data retrieval, allowing systems to meet specific application requirements. On-site options include storage module, laptop computer, PDA (specifically Palm brand), and datalogger keyboard/display. Telecommunication options include short-haul, telephone (including voice-synthesized and cellular), radio frequency, multidrop, and satellite. Options can be mixed within the same network. Robust error-checking and low power-use ensure your data arrives uncorrupted and as scheduled. You can even automate the process of putting your data on the Internet.



*A weather station network on the Bahamas provides data for studying how weather patterns affect the transport of three marine species.*



*This station collects data for ecology research in the McMurdo Dry Valleys of Antarctica.*