Introduction: A twelve chamber, temperature controlled, photosynthesis system using a custom PC based data acquisition system, was adapted for use in the field using custom temperature controllers to track ambient temperature. This system measured photosynthesis and respiration continuously from stems and leaves, using replicate chambers for clones within a treatment ring to provide a daily carbon budget for above ground plant tissue. The open system makes 30-60 integrated measurements per hour, and has been modified to provide elevated CO₂ control to simulate ring conditions in CO₂ treatments.

Summary: An automated, temperature and CO₂ controlled, multiple cuvette photo synthetic system was adapted to measure daily carbon sums for leaves and stems within a treatment ring. The goal is to generate daily totals of carbon assimilation and respirations for leaves and small stems to contribute to the carbon budget of aspen under different treatments. The system has been adapted to track ambient temperature conditions and to provide elevated CO₂ levels to chambers to work in all treatment rings. The ability to do continuous photosynthesis and respirations measurements, with replication, under existing conditions, will contribute to the suite of physiological parameters that are being measured at the Rhinelander FACE site. Respiration under different temperature regimes will contribute to parameterizing models.

Continuous improvements to the system will include: greater portability, scaffolding for canopy access, solving for high CO₂ diffusion gradients with better sealing material, decreasing the flow resistance of long sample lines, and inherent zero drift with multiple cuvettes.

Acknowledgments: This research is supported by the Northern Global Change Program and the Aspen FACE Study.