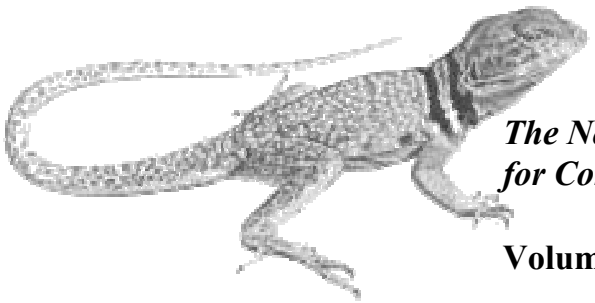

The Glade

The Newsletter of the Missouri Chapter of the Society for Conservation Biology

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Contents

News and Notes

- Poster winner at the Missouri Natural Resources Conference

  Jeffery Ray of Saint Louis University won the MOSCB-sponsored poster contest at the MNRC in January. His poster was entitled "Genetic identification of pallid sturgeon (*Scaphirhynchus albus*), shovelnose sturgeon (*S. platorynchus*) and their hybrids." We thank all those who participated this year and hope to see many new entries next year.

- Hummingbird Photos for Sale

  A beautiful photo of a hummingbird (by Mundy Hackett, vice president) is being sold on the MOSCB website. Proceeds benefit MOSCB's publication of *The Glade*. See our web site for details and a glimpse of the picture. http://www.snr.missouri.edu/moscb/donate.html

- Earth Day is Thurs., April 22

  This year is the 34th anniversary of Earth Day. Get outside and enjoy yourself!

- River Relief

  All along the Missouri River, a wonderful organization called River Relief has organized clean-up events. Check out the map on their web-site (www.riverrelief.org) for an event near you. They run from April 30 in St. Louis to June 19 in Kansas City.

- Questions or Comments?

  Email Sara Storrs at sisk95@mizzou.edu

Monitoring Global Climate Change: The Missouri AmeriFlux Site

Neal H. Sullivan, North Central Research Station, USDA Forest Service,Columbia, MO: sullivann@missouri.edu;

The carbon dioxide concentration in Earth's atmosphere has risen by about 19 percent in the past 45 years and by about 30 percent since the beginning of the Industrial Revolution. As a "greenhouse gas," increasing CO_2 is thought to be contributing to warmer temperatures globally and altered rainfall patterns as a consequence. While global climate change might be viewed as detrimental, CO_2 is the substrate upon which photosynthesis acts to capture solar energy for net primary production. Increasing CO_2 can lead to increased growth rates and yields for natural ecosystems and for agricultural crops. Predicting the outcomes both negative and positive as a result of changes in climate and changes in atmospheric gas concentrations has become a goal for scientists. In 1996, researchers began to form a coordinated network of sites throughout the Americas for monitoring and studying the influence of increasing CO_2 on ecosystems. This North and South American network, *AmeriFlux*, is part of a global network (*FluxNet*) with 257 member sites. (see http://www.daac.ornl.gov/FLUXNET/fluxnet.html).

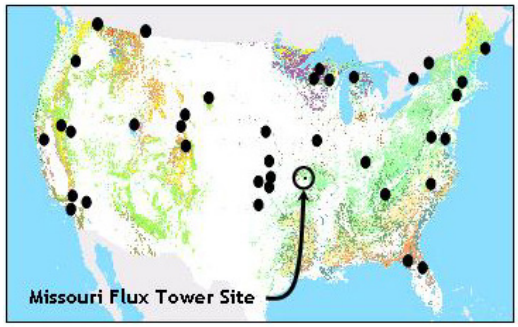

Figure 1. AmeriFlux sites in the lower 48 states with the location of the future Missouri Flux site in Ashland highlighted Shading indicates forested areas.

Study sites have been established in ecosystems ranging from boreal tundra to rainforests to croplands in the American Midwest. The distribution of network sites for the lower 48 states is shown in Figure 1. A team of scientists from the University of Missouri and the Oak Ridge National Laboratory (see below) have been funded by the Department of Energy to establish an AmeriFlux site in Central Missouri at the T.S. Baskett Research and Education Area near Ashland. Although there are sites located elsewhere in the eastern U.S., as shown in Figure 1, this new site is located at the western edge of the eastern deciduous forests. Since this forest edge is thought to be largely determined by moisture limitations, this area may be particularly sensitive to changes in patterns of rainfall and temperature regimes.

All phases of carbon and water cycles are open for study at these sites. The most prominent features of the sites are the flux towers (Figure 2). Instrumentation on the tower system measures and records data used in models for predicting exchange of CO_2 and water vapor from a forest area of about 1 km^2. Some of the instruments are located on a tower that extends above the vegetation. At the Missouri site, the walk-up type tower will extend about 12 meters above the 28 meter canopy. While one instrument measures the concentration of CO_2 and humidity, another instrument simultaneously measures the direction and rate of air movement. The data is continuously monitored, recorded, and integrated using onsite computers. This measurement of air movement direction and air quality is termed "*Eddy Flux Covariance*." For example, during growing season daylight hours, air moving from the canopy would be expected to have lower concentrations of CO_2 and higher concentrations of H_2O than air moving into the forest canopy. This would be due to carbon fixation and transpiration, respectively. Conversely, at night, the concentration of CO_2 would be higher in the air moving

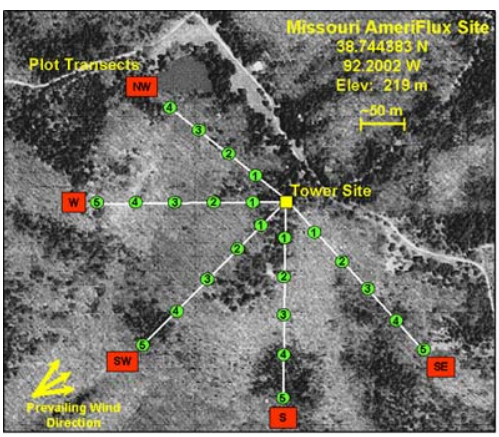

Figure 2. The Missouri AmeriFlux Tower site monitors gas exchange for a 1 km area in an oak-hickory forest. Plots are arrayed upwind of the tower. This leaf-off photo shows the presence of red cedar and plot locations arrayed with consideration for prevailing wind directions.

away from the forest due to the lack of photosynthesis and ongoing respiration of vegetation and soil microbes. The within canopy CO_2 profile will be recorded using separate instruments and a manifold system. Separate eddy covariance instrumentation will be installed near the forest floor to monitor carbon exchange dynamics in the understory.

Other measurements related to carbon exchange incorporated in the initial site establishment include: vegetation growth and phenology, litter production, leaf level photosynthesis and respiration, stem respiration and soil respiration. Climate measurements above the canopy and profiling systems within the canopy include: temperature, short and longwave direct and indirect solar radiation, photosynthetically active radiation, rainfall, and throughfall. Physiological measurements for evaluating plant water relations include: continuously measured sap flow velocity and stand-level sap flow area for estimating stand water use, soil water content and soil water potential, leaf level transpiration and plant segment hydraulic conductivity. In addition to the flux tower, there are plans to move several other canopy access towers to the flux tower site. These towers will be located to increase the number of trees and species that can be sampled.

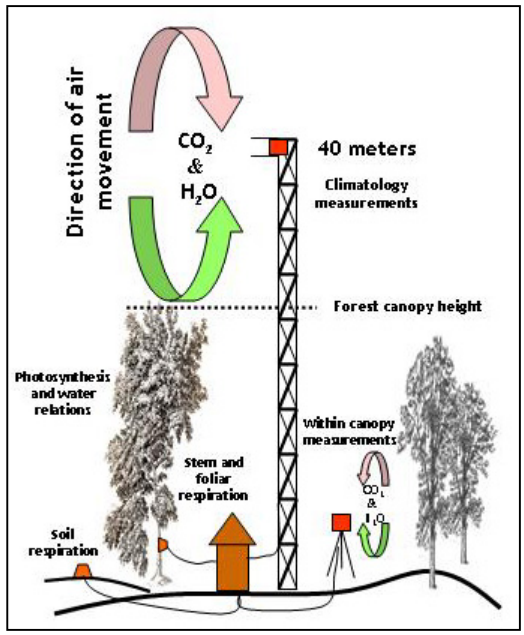

Figure 3. The basic measurements using eddy covariance flux technology at a FluxNet site

As of this writing: the site data management building has been constructed, the foundation of the flux tower has been installed and the flux tower is slated to be assembled soon, vegetation plots have been located and inventoried, litterfall traps have been installed and monthly collections began in the fall of 2003, a team of scientists from Oak Ridge have begun installing soil respiration and sap flow sensors. The flux tower is scheduled to be running and collecting data by the beginning of summer of 2004.

The data from this installation will become part of the coordinated global network of sites established for modeling the role of terrestrial systems in the area of global climate change. The data collected will be used for predicting the carbon balance at local, regional, continental, and global scales. The Missouri site will not only provide information for a forest type and ecosystem not previously represented in the network, but it will provide an opportunity for long-term monitoring of dynamics at the site itself. Located at the western edge of the eastern deciduous forests, this forest may be more sensitive to climate change resulting in observable changes in ecosystem function and dynamics.

Other research efforts at or near the Missouri flux site are encouraged. Although carbon flux and plant-water relations are the research emphasis for the initial site establishment, other ecological research efforts could benefit from the intensive climatological and physiological data that will be collected continuously over the next several years. Anyone who would like to explore the possibility of conducting research at the Missouri Flux site should contact Dr. Stephen Pallardy at the address listed below.

Missouri Flux Site Researchers

Stephen G. Pallardy, Forestry Department, 203 Natural Resources Building, University of Missouri, Columbia MO 65211: PallardyS@missouri.edu

Lianhong Gu, Paul Hanson, Stan Wullschleger, Nelson Edwards, and Tilden Meyers from the Environmental Sciences Division of the Oak Ridge National Laboratory, Oak Ridge, TN.