

Workshop Title: Chlorophyll fluorescence monitoring at selected LTER Network sites

Working Group Organizer: Richard L. Boyce (NWT, HBR) & Herman Sievering (NWT)

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This workshop, which had a brainstorming format, first consisted of a short presentation given by Boyce on chlorophyll fluorescence measurements and how they are interpreted, along with data from a few studies, including ones carried out by Boyce and Sievering, showing how these measurements can be used as stress indicators.

The organizers then proposed that fluorescence monitoring be carried out at selected LTERs. Measurements should be carried out on the dominant vegetation of the major ecosystem(s) at the LTERs. Measurements should be made once or twice a week during the growing season and once/month during the dormant season. Measurements would consist of predawn measurements of F_v/F_m , with mid-day measurements of PSII, F'_v/F'_m , and qP. A variety of measurements would be made because we are currently uncertain as to which parameter or group of parameters responds best to stress. The instrumentation that would be needed consists of a portable pulse amplitude modulation system for each LTER. Two models are suitable, one manufactured by Opti-Sciences, Inc., and the other by Walz GmbH; both cost ~\$13.5-14k. LTERs that had expressed an interest before the workshop were NWT, Andrews and Harvard Forest.

A bibliography of chlorophyll fluorescent studies with ecological and ecosystem applications was compiled before the workshop and handed out to participants.

The brainstorming session that followed was quite productive. To the surprise of the organizers, both of whom work in terrestrial ecosystems, many of the attendees were from coastal/marine LTERs. The major stresses in terrestrial vs. coastal marine ecosystems are likely to be quite different. In terrestrial systems, they appear to be high temperature, low temperature (often with high light) nutrient deficiencies, pollution and drought. In marine systems, some of these stresses are also present, but salt stress may also be important. Thus, it may make a great deal of sense to organize one effort for terrestrial LTERs and another for coastal/marine LTERs. Overall, there is a lot of interest in using the

chlorophyll fluorescence measurements to monitor ecologically important stress levels.

Workshop Outcomes

- 1) As a result of this workshop, the chlorophyll fluorescence workshop presentations and bibliography have been put online at Boyce's web site (<http://www.nku.edu/~boycer/>).
- 2) An email discussion group (Chl F LTER Network) has been organized, based on the initial attendees, as well as others who were at the ASM who wished to be included.
- 3) In response to the solicitation from the LTER Network Office for follow-up initiatives, Boyce submitted a proposal entitled *Planning the cross-site use of chlorophyll fluorescence to measure ecosystem stress within the LTER Network*. The purpose of this workshop would be to bring interested parties together to plan two NSF proposals, one for terrestrial and one for coastal/marine LTERs. This is a connection to the Planning Grants area and is also a way to address the main limitation to implementation (see below).

Limitations to Implementation

The main limitation is finding funding to carry out the research. Since much of the data collection could be carried out by students, the main expense would be for the instrumentation (roughly \$13.5-14.0k) for each site. Our hope is that a planning grant will result in a well-written proposal or group of proposals that may be used for funding this project.