

**Interagency Agreement DOE ID# DE-AI02-05ER64047, and EPA ID#s RW-89-92205501  
and RW-89-92286601**

**Final Report for “Effect of Asymmetric Versus Symmetric Warming on Grassland  
Mesocosms”**

**Summary**

EPA’s Office of Research and Development, National Health and Environmental Effects Research Laboratory, Western Ecology Division in Corvallis, Oregon provided facilities, equipment, and technical advice under this IAG with the DOE; so that they could be used by their grantee (Terrestrial Ecosystems Research Associates) for a study on the effects of air warming on grasslands. These facilities, equipment and advice allowed the DOE grantee to successfully carry out their study during the EPA Project Periods which covered from August 1, 2005 through September 30, 2010. The chambers provided three air temperature treatments, ambient, ambient plus a constant temperature, and ambient plus a maximum warming at approximately sunrise; from April 26, 2007 through July 25, 2010.

**Activities Carried Out by the EPA under this IAG**

***Mesocosm Facilities***

The WED mesocosm facilities provided careful monitoring and control of both atmospheric and soil conditions for study of effects of the environment on vegetation and associated soil ecosystem (Tingey *et al.*, 1996). Atmosphere factors monitored and controlled included temperature, carbon dioxide concentration and relative humidity. Light intensity (photosynthetically active radiation between 400-700 nm) was also measured. Soil moisture was monitoring and controlled, while soil temperature and gases was monitored.

The mesocosm facilities and equipment made available for use by the DOE grantee included twelve mesocosms and supporting structures and equipment, walkways and areas surrounding mesocosms, rooms and areas of the polyhouse (plastic covered greenhouse used to run the mesocosms) designated for shared use by the DOE Grantee with the EPA. Also included were outdoor support facilities to the north of the polyhouse and shared use with the EPA of a weather station to the west of the mesocosm area. The final status of equipment was agreed upon by the EPA and DOE grantee at the close of the IAG.

The DOE grantee made modifications to the chambers including installation of automatic door openers, a rainfall collection system, a system to deliver the rainfall to plants in the chambers, and a new humidification system. These modifications were left in place for future use by the grantee.

***Access to TERF (Terrestrial Ecology Research Facility)***

The EPA provided to the DOE Grantee use of areas of TERF including greenhouses, growth chambers, potting areas, lathe house, drying ovens, balances, leaf area meter, seed separator and

counter. The EPA also provided LI-COR 6400 portable photosynthesis meters and other equipment and facilities on a temporary, as needed basis.

### ***Office Space***

The EPA provided a separate office for the DOE Grantee on site at the US EPA Western Ecology Division. This office included standard office furniture and services available to all other offices on site. Other DOE Grantee staff was located within the area of the polyhouse designated for shared use by the DOE Grantee. All offices included connection to local telephone service, but not long-distance telephone service.

### ***Hazardous and Non-hazardous Chemical and Biological Materials***

The Terrestrial Ecosystems Research Associates were responsible for all hazardous and non-hazardous chemical and biological materials used on the mesocosm site, including purchase, storage and disposal. All hazardous and non-hazardous chemical and biological materials remained on site at the time this IAG was finished, as TERA continued to work on the site under a different agreement. A chemical storage cabinet in the polyhouse was designated for use by the DOE Grantee.

### ***Health and Safety***

The DOE grantee was responsible for all health and safety issues relating to the mesocosm facilities covered in this agreement.

### ***Building Access***

The DOE grantee was provided with access to other WED facilities such as the main building, Annex, or Plant Ecology building on an as needed basis.

### ***Computers***

The EPA supplied two computers which received computer support by the EPA on-site computer support contractor. One computer was used to process data from the chambers, and was used until approximately May 31, 2010. The other computer was used in an office and received computer support through until approximately July 14, 2010.

### ***Utilities***

The DOE provided funds for utilities including gas, electricity and water. The utilities paid for running of the chambers through approximately July 25, 2010, with a minimal cost for utilities for buildings through September 30, 2010. The DOE provided funds for the reverse osmosis water source through May 14, 2010, with the EPA covering the costs after that date.

### ***Stable Isotopes***

The EPA provided access to WED's ISIRF Isotope Ratio Mass Spectrometers (IRMS) to run stable isotope analyses. The DOE provided funds for the expenses involved with running these samples.

### ***EPA Staff Salaries and Fringe Benefits***

The EPA provided a Project Officer carrying out administrative support for the IAG, and a staff scientist for technical assistance during the first part of the IAG.

### ***QA Information***

As requested, the EPA supplied the DOE grantee with materials relating to use of equipment supplied by EPA.

### ***Facility Shutdown and Transfer of Equipment Documentation to EPA***

The mesocosm experiment ran through approximately July 25, 2010, at which time climate control and air flow through the chambers ended. The doors were opened and Teflon® film around the chambers partially removed to prevent overheating of the chambers when cooling was no longer taking place. Prior to July 25, 2010, the DOE grantee met with the EPA to discuss and obtain approval for the procedures used to shut down the facility, including chambers, polyhouse, and building #74 and other facilities used by the DOE Grantee; and how the EPA equipment and supplies supplied to the DOE Grantee were to be treated in a manner acceptable to the EPA. The DOE Grantee provided the EPA with information and documentation on the modifications which they have made to the facility, and a written description of shut down activities. Between July 26, 2010 and September 30, 2010, the DOE grantee completed interim shut down procedures for the chambers and prepared the facility for inactivity. However, the chambers, soil, plants and all DOE grantee equipment and supplies remained in place as the DOE grantee planned to continue their use after Sept. 30, 2010 under a different agreement. The EPA requested that the soil and plants stay in place either for future use by the DOE grantee or for future use by the EPA.

### **Reference**

Tingey, D.T., B. McVeety, R. Waschmann, M. Johnson, D. Phillips, P.T. Rygiewicz and D.Olszyk. 1996. A versatile sun-lit controlled-environment facility for studying plant and soil processes. *J. Environ. Qual.* 25: 614-625.