

## If a peat bog emits CO2 in the forest, and no one's around to measure it... there's still CO2 being emitted

One-of-a-kind, \$30 million climate study called SPRUCE located within the Marcell Experimental Forest will closely examine peat bogs to study CO2 emissions related to climate change

By **Nathan Bergstedt**  
Grand Rapids Herald-Review

North of Grand Rapids up Hwy 38, then down Wabana Road several miles, you've made it most of the way there. Then you turn off the pavement, further into the woods, and slowly the tree line closes in, the road appears to narrow, and pretty soon it's enclosed and shaded enough so that the snow hasn't melted yet, and the dirt road is iced over. After about a mile of this, you've just

about made it to the Marcell Research Center within the Marcell Experimental Forest. This is to be the site for the SPRUCE (Spruce and Peatland Response Under Climatic and Environmental Change) Experiment, a 10 year, \$30 million, state-of-the-art, and one-of-a-kind climate study whose findings will have implications throughout the

world.

This project, sponsored by the U.S. Department of Energy (DOE) and conducted by the Oak Ridge National Laboratory and U.S.D.A. Forest Service Northern Research Station, is the first of its kind. Similar projects have been undertaken in other areas around the country, but nothing to this scale, and nothing that takes as close of a look at peat bogs. The Marcell Experimental Forest was ultimately chosen because of the availability of peatlands for study, as

well as for what is now a 50-year history of scientific research in the forest. A huge amount of information has already been gathered on the specific site picked for the SPRUCE Experiment, adding greatly to the future data that has yet to be collected.

**"It's gonna be one of the neatest experiments on the planet."**

- Randy Kolka, Research Soil Scientist, U.S. Forest Service



**SPRUCE MASTERS** - Dr. Randy Kolka (left) and Stephen Sebestyen are standing at the site of the prototype of the future SPRUCE Experiment chambers. The current plan is to have construction of the 12 or more chambers completed by spring of 2013. (Photo by Nathan Bergstedt, Herald-Review)

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“The DOE was looking for a spot to do a large-scale manipulation of climate to predict the future climate,” said Randy Kolka, Team Leader and Research Soil Scientist with the U.S. Forest Service. “Because peatlands in northern Minnesota have so much carbon in them, and the potential feedback to the atmosphere could be big depending on what climate change we might expect, they became a really important ecosystem to assess.”

So how important are these peatlands on a global scale? According to Kolka, peatlands only comprise about three percent of the total land surface area on the Earth, yet hold as much as 30 percent of the world’s carbon.

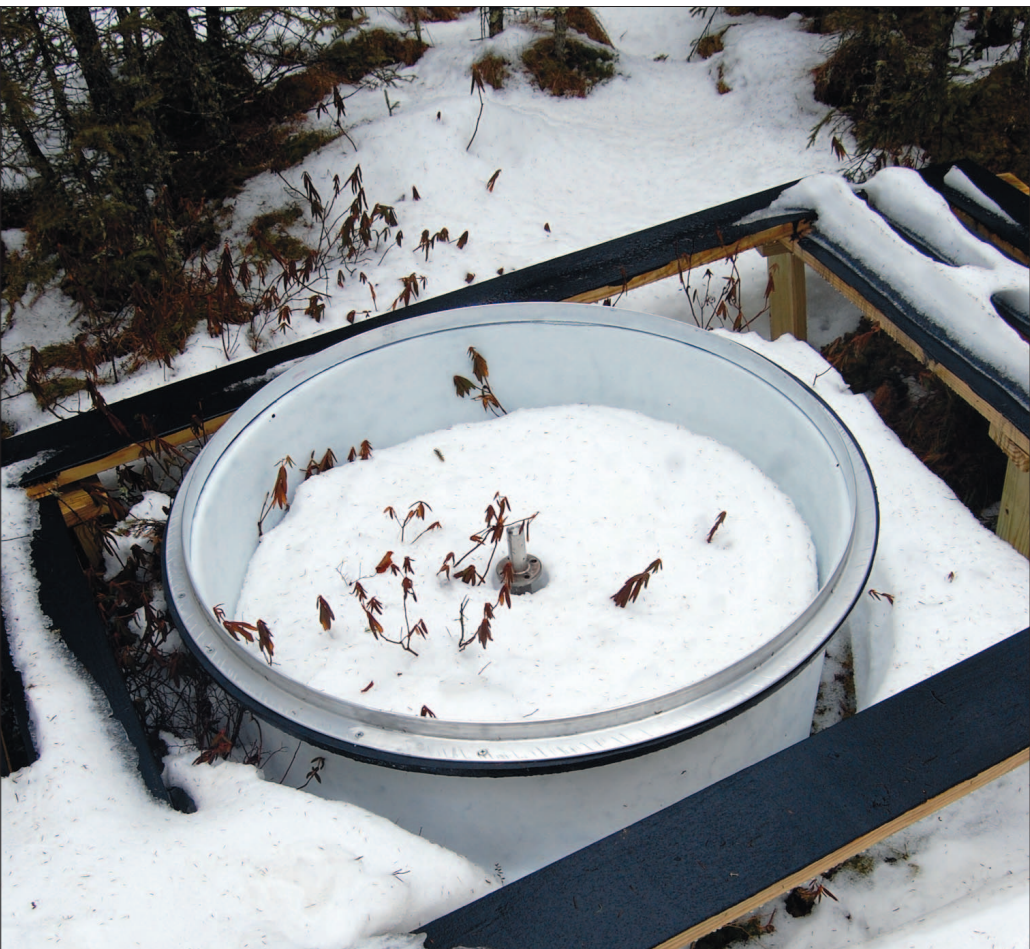
To put this into greater perspective, in the peatlands within the

Marcell Experimental Forest where this study is to take place, there are points where one could stand where they would be above 33 feet of carbon. The upland forest, in the same area as the peatlands, have only 1/30th the amount of carbon on a per mass basis, according to Stephen Sebestyen, Research Hydrologist and Biogeochemist at the center. This difference is because the upland forest is dryer, and therefore the historical production and decomposition of carbon has been more or less equal there, as opposed to the lower, wetter bog, where decomposition of carbon has not matched the production.

“Higher water tables and other conditions in wetlands usually slow decomposition dramatically,”

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## TOOLS OF THE TRADE

- Above, solar panels are "the lifeblood" of much of the research being conducted in the Marcell Experimental Forest, providing electricity to all the instruments. Because of the scale of the SPRUCE Experiment, electric lines will be run out to the site in order to provide power to pieces of equipment such as circular chamber to the right, which measures CO2 and methane levels. Instruments such as this will be within the larger chambers once they're completed. (Photos by Nathan Bergstedt/Herald-Review)

**TALKIN' SCIENCE**

Kolka and Sebestyen discuss the importance of the various instruments in the field as they relate to their research, such as the very large and extremely accurate rain gauge installed before them. (Photo by Nathan Bergstedt/Herald-Review)

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said Sebestyen. “When the water table is near the surface, there’s no real air. So it goes into a different process that the [microbes] aren’t as efficient in.”

The peatlands, therefore, are immense carbon sinks, and have been so for thousands of years as organic material has piled up without fully decomposing. So what happens if conditions change enough so that decomposition increases, turning these bogs from carbon sinks into places of CO<sub>2</sub> emissions?

In order to find out what rising temperatures will do to these ecosystems, the SPRUCE Experiment will consist of 12 or more open-topped chambers, 35 feet in diameter, 30 feet tall, that will also reach as far as 10 feet below ground, that will be used to closely monitor the changing ecology within their confines. Some chambers will be used to artificially increase the temperature as much as 16 degrees Fahrenheit over the outside climate, while others are used as controls. Aside from temperature manipulation, some chambers will also artificially increase the amount of CO<sub>2</sub> in order to monitor the effects.

The scale of what is being monitored within the individual chambers range from microbes

to the individual plants to the trees to the entire chamber as an ecosystem. And over the course of the next 10 years, the hope is to have an immensely greater understanding of both long-term and short-term changes in these environments in regards to how their altered states may affect climate change. The data from this project will be critical for individual scientific models for global warming that take into account peat bogs as carbon sinks and emitters of CO<sub>2</sub>.

Regardless of what the data from this project will mean in terms of global climate, it will be an immediate boon to the local Grand Rapids economy, as well as a source of world-wide scientific notoriety for Itasca County. From an economic point of view, local contractors will be needed for the construction of the chambers, electric lines will need to be run to the sites in order to power the equipment, and visiting scientists to the research center will require room, board, and probably even recreation during their stay. And according to Kolka, there shouldn’t be any real shortage of visiting scientists.

“It’s gonna be one of the neatest experiments on the planet,” said Kolka.