

GLBRC

Great Lakes Bioenergy
Research Center
Michigan State University

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Plant Systems
East Lansing, MI 48824



MICHIGAN STATE
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The Biodiversity Front

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A Look Toward Spring

Happy New Year! As we head into 2009, we wanted to share news of the many exciting developments that have occurred with the Biodiversity Team in the last few months. Our researchers have been busily analyzing field data, working on publications, and getting prepared for field season 2009!! While the new year brings the departure of some members of our team, we look forward to welcoming new researchers, additional projects, and several new landowner collaborations. We'll be in touch in the coming months to discuss continued sampling with those of you with whom we worked in 2008.



News

We are proud to announce the recent publication in the prestigious journal *Proceedings of the National Academy of Sciences USA* by members of the GLBRC Biodiversity and Economics Teams. These researchers joined forces to study the effects of increased corn production on biodiversity and farm profitability. The authors (Doug

Landis, Mary Gardiner, Wopke van der Werf and Scott Swinton) showed that natural predators like lady beetles can control a key pest in soybean reducing the need for pesticide use and boosting farm profits by \$239 million dollars annually. However, as corn acreage increased to record high levels in 2007, the value of this natural pest

control service declined by nearly 25%. They conclude that growing a variety of biofuel crops including switchgrass and mixed prairie can enhance landscape diversity and ecosystem services, saving growers money and improving farm sustainability. Congratulations to the authors on a valuable contribution and great accomplishment!

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Farewells and Welcomes

The Biodiversity Team is bidding farewell to two of our researchers:

Dr. Mary Gardiner, formerly a post-doc with Dr. Doug Landis on the Insect Diversity Team at MSU, will be starting as Assistant Professor at Ohio State University in January 2009.

Dana Gerken (nee Reznik), a graduate student working under Dr. Tom Schmidt on the Microbial Diversity team at MSU, plans to work as a research

technician at Auburn University in Alabama.

We also welcome several new researchers to the Biodiversity Team this year:

Dr. Rufus Isaacs and his post doc, **Dr. Julianna Tuell**, both located in the Department of Entomology at MSU, will start work with the Biodiversity Team conducting studies on bee diversity and pollination in biofuels crop systems.

Ben Werling is currently a Ph.D. student with Dr. Claudio Gratton at the University of Wisconsin-Madison. He will be starting a post-doctoral position with Dr. Doug Landis at MSU on the Insect Diversity project in April 2009.

Dr. Tracy Teal is a post-doc working with Dr. Tom Schmidt at MSU, and has started research with the Microbial Diversity Team.

GLBRC Weather Stations

A collaboration amongst several agencies and donors, the Enviro-weather Program at MSU has established weather stations across the state of Michigan to collect meteorological data for research and public use. Enviro-weather's goal is to provide the public with access to weather-based agricultural and natural resources management information. Recently, the Michigan Automated Weather Network (MAWN) and the Great Lakes Bioenergy Research Center (GLBRC) partnered to secure funding for the purchase of

several new weather stations for the Enviro-weather Program. The weather data provided by these new weather stations will be valuable to farmers, researchers, managers and the general public. Each weather station records data for 14 weather variables every 30 minutes. You can access the weather information for a particular weather station at www.enviro-weather.msu.edu to get hourly or daily updates. In fall 2008, GLBRC study sites were selected for the addition of five new weather stations. These stations have now been

installed and connected by the Enviro-weather team, headed by Jeff Andresen. Weather data for these stations can be accessed at the aforementioned website.



**New stations were erected on GLBRC sites in Barry, Cass, Eaton, Ingham, and Kalamazoo Counties

In Focus: The Bird Diversity Team



The bird diversity team (led by Dr. Doug Schemske) has been actively working on bird and arthropod data in the past few months. Post doc Dr. Bruce Robertson will spend the spring identifying the many insect species that were collected on GLBRC study sites during summer and fall 2008. They hope to learn more about the variety

and availability of insects as food sources for birds among the different biofuel crop types. Additionally, Doug and Bruce are working on a manuscript for peer-review that examines how animal species richness responds to North American biofuel crops. This paper will attempt to determine the potential benefits and drawbacks

of various candidate biofuel crops on animal abundance and diversity, so land managers will know how to best manage these landscapes for the conservation and promotion of habitats and biodiversity. Doug and Bruce plan to submit their findings to *Frontiers in Ecology and the Environment* in the next few months.

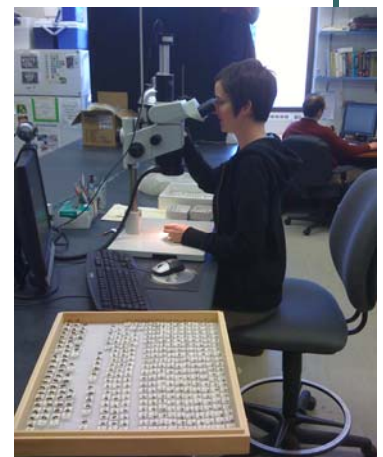
Under the Lens: Studies in Insect Diversity

The Insect Diversity team (headed by Dr. Doug Landis) moved from the field into the laboratory this fall. They have been busily identifying the many species of lady beetles, lacewings, flies and bees that were collected at study sites last summer. Preliminary results suggest that prairie, switchgrass and corn maintain similar amounts of lady beetles; however, prairies provide a higher variety of lady beetle species than the other two crop types. Predation by insects that eat pests was assessed; while predation was highest in prairies

early in the summer, in later months predation rates in prairies declined and were comparable to those in corn and switchgrass.

The team is also in the midst of quantifying large-scale landscape data. These data indicate the types of land cover (urban, agricultural, forest, etc.) that surround each of the study sites. By comparing land cover with insect data, researchers can determine whether some insect species are more likely to occur in the presence of certain land cover types. Finally, the Insect Diversity

Team welcomes Drs. Rufus Isaacs and Julianna Tuell, who have started evaluating the bee specimens collected last summer. Julianna specializes in bee ecology, and has spent the last few months identifying the hundreds of bees that were collected. Early indications suggest that prairies provide the highest abundance and diversity of bees, followed by switchgrass and then corn. The Insect Diversity team plans to further assess the relationship between bee diversity and crop types and to submit these findings in the near future.



Julianna Tuell examines bee specimens under a microscope for identification; a collection of identified bees is displayed in the foreground

Updates on Plant & Microbial Diversity

Dr. Kay Gross' field crew has continued its laboratory work this fall, examining the plant samples taken from the GLBRC study sites for biomass estimates and species richness. Results have shown that species richness is higher in prairie than in switchgrass; however, there are no differences in the amount of live biomass between the two crop types. The team is also in the midst of testing soil samples obtained

from study sites for moisture and nutrient levels. These results will inform researchers about the differences in soil composition amongst the bio-fuel crops.

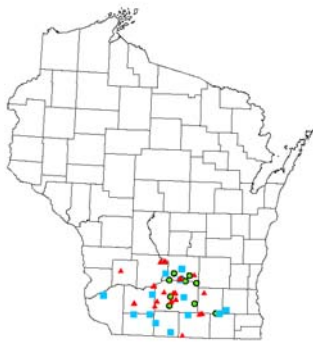
Drs. Tom Schmidt and Tracy Teal are also analyzing soil samples, but they are specifically looking for bacteria species that occur in soil; types that consume methane, and those that oxidize nitrogen.

They are currently taking DNA samples from soil cores to identify all of the species of bacteria that are present. The researchers are attempting to determine whether above-ground plant diversity is related to below-ground microbial diversity. If greater plant diversity allows for higher soil microbial diversity, this might indicate the presence of more types of beneficial bacterial species.



Carol Baker identifies prairie plant species in the Gross Lab

From the Wisconsin Biodiversity Research Team



Potential Extensive Sites in Wisconsin for 2009 season

The Great Lakes Bioenergy Research Center is a collaboration between MSU and UW-Madison. Scientists at both universities are working together to conduct biodiversity experiments at study sites throughout Michigan and Wisconsin. The UW team consists of professors, post-docs and graduate students who are conducting replicate biodiversity studies that complement those carried out by the MSU team.

Dr. Claudio Gratton, associate professor of Entomology, and

his graduate student Hannah Gaines are examining the diversity and abundances of beneficial insects present in corn, switchgrass and mixed prairies. Dr. Teri Balsler, associate professor of Soil Science, and her post-doc Dr. Chao Liang are studying the microbial communities that inhabit the soils of these three cropping systems. Dr. Randy Jackson, assistant professor of Agronomy will be researching the plant diversity and biomass levels in the three systems.

In 2008, the Wisconsin team

identified approximately 100 potential study sites, 30 of which will be sampled in field surveys in summer 2009.



UW-Madison technicians searching for insects in a Wisconsin prairie



Spotlight on Collaborators: Pierce Cedar Creek Institute

Pierce Cedar Creek Institute, located south of Hastings, MI, in Barry County, has functioned as a nature center, biological field station and conference center since 2001. PCCI's mission is to promote environmental education, research, preservation and appreciation. The biological field station partners with a consortium of thirteen colleges and universities to offer a summer research experience to undergraduate students. PCCI also offers an ecology class for pre-service

teachers and opportunities for field trips and other classes. The Institute's 661 acres are a diverse mixture of several high-quality ecosystems, including: prairie fen, rich tamarack swamp, a kettle lake, shrub-carr wetlands, cedar swamp, beech-maple forest, and oak-hickory forest. There are also a number of previously farmed areas, including old fields in various states of succession, fields planted to prairies, and two active hay fields. PCCI is also one of the five host sites

to GLBRC weather stations. When asked why PCCI was interested in the GLBRC's research study, Education Director Matt Dykstra responded, "We are very interested in promoting and accommodating research on the property. The GLBRC research is very exciting and could have profound impacts on Michigan." To find out more about PCCI, visit their web site online at: cedarcreekinstitute.org



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Valuable Resources: Undergraduate Technicians

The Biodiversity Team brought on board several undergraduate research technicians to assist in both laboratory and field work in the past year. A few of our student employees have continued to work into the new semester, and we wanted to recognize their efforts and hard work.

Luke Tomczak is a senior in the Department of Geography at MSU, with specializations in GIS and environmental studies. He has assisted the GLBRC with GIS work, including map making and problem-shooting since spring 2008. Luke plans to graduate in May, and hopes to find employment in the natural resources field using his GIS skills.

Laura Mace is a senior in the Lyman-Briggs College at MSU, with a major in human biology.



Top photo: Luke Tomczak
Middle: Laura Mace
Bottom: Katy Bigsby

Laura started work with the Biodiversity Team in July 2008, assisting with fieldwork and bee specimen preparation. Laura plans to graduate in May, and hopes to attend medical school in the Midwest.

Katy Bigsby is a senior in the Lyman-Briggs College at MSU with a major in zoology. Katy has worked for the Biodiversity Team since September 2008, helping with fieldwork, GIS mapping and bee specimen preparation. Katy plans to graduate in May, and is hoping to enter a program in Physical Therapy in the near future.

Many thanks to all of the technicians who have been so vital to the project over the last year. We would not have been as successful without you!