The OutREACCH

A quarterly report by Regional Approaches to Climate Change

Pacific Northwest Agriculture

August, 2012 - Vol. I, Issue 2

Director's Corner: Reaching out through Internships

Sanford Eigenbrode, Project Director, UI

REACCH is distinctive because of its integration across disciplines institutions and missions (research, education, and extension). An outstanding example of this integration is our exciting annual summer internship for undergraduates, which hosted its first cohort this summer from early June until Aug. 9. Our national search attracted students of uniformly high academic achievement and motivation. Interns were placed within REACCH programs at OSU, WSU, ARS and UI and were mentored by our PIs, graduate students and other personnel. Each had a specific research project and the group was exposed to the breadth of REACCH through weekly presentations and workshops from project PIs. Interns also participated in the summer field tour where they met producers and heard extension presentations on various topics being examined within the project.

Student projects included: the effects of climate and weather on cereal aphid flight patterns and communities, earthworm responses to within-farm variation in slope and soil moisture, effects of conservation tillage on soil carbon, greenhouse gas monitoring from agricultural fields using eddy covariance towers, within-field variability in soil moisture measured using electromagnetic induction, assessing soil texture at Pendleton and Moro research stations, exploring methods for soliciting producer attitudes towards agroclimatic change, modeling effects of climate change on agricultural yield, and PNW climate trends.

Students were enthusiastic about the quality of their experiences and by what they learned while immersed in REACCH for nine weeks. A two samples of student appreciation:

REACCH BRIEFS

* SAVE THE DATE! The REACCH 2nd Annual Meeting will be held at the Courtyard Marriot Portland City Center, February 13th-15th. Watch for details!

* The Pacific Northwest Climate Science 3rd Annual Conference will be held at the Boise Centre in Boise, ID October 1st -2nd. Agriculture-related fields are making a premiere appearance at this conference!

* REACCH graduate students will be kicking off the 2012 school year by building a strong cohort at a Professional Development Retreat at the Center for Organic Studies in Sandpoint, ID, September 14th -16th.

"I learned a new set of skills that opened my eyes to the scientific process…in a forgiving and welcoming environment" and "I learned so much and had access to so many resources."

The internships culminated in a morning-long symposium on the UI campus of high quality, professionally prepared research presentations by the students, full of new information and good science about PNW agriculture and climate. The presentations are posted on our website, www.reacchpna.org.

Special thanks for the success of the internships are due to all of the REACCH PIs and others who mentored these students, and to Jodi Johnson-Maynard, who directed the effort. Marijka Haverhals did a stellar job coordinating all the arrangements, from student travel, scheduling of events, housing, compensation and keeping everyone connected through a Facebook site.

We are excited by the success of the internship and looking forward to making this a part of REACCH for the remaining years of the project.

Please join me in congratulating everyone on a job well done!

Funded through Award #2011-68002-30191 from USDA National Institute for Food and Agriculture

Crop Biota and Climate Change

Ian Burke, Sanford Eigenbrode, Jodi Johnson-Maynard, Tim Paulitz, and Nilsa Bosque-Pérez

Climate change can affect the biology and distribution of crop pests, pathogens, weeds, and beneficial organisms, such as earthworms, in agricultural systems. REACCH scientists are studying the effect of climate and climate change on multiple organisms through a combination of regional sampling and monitoring, field trials, and controlled greenhouse and laboratory experiments. These efforts represent our efforts to understand the impact of biota at multiple scales within the REACCH study area. Ultimately, the data generated will allow us to model how these organisms will respond to projected climate change in the PNW and how that will influence crop protection and production.

The organisms are varied and include insects like aphids (Figure 1A), cereal leaf beetle, and Hessian fly. The pathogens include *Rhizoctonia* root rot and *Fusarium* crown rot (Figure 1B/1C), while weed species include downy brome, mayweed chamomile, and prickly lettuce (Figure 1D). Earthworms (Figure 1E) are considered beneficial organisms, and are highly sensitive to soil moisture levels.

Sampling methods depend on the organism. Root diseases and weeds are collected in soil cores, while sampling methods for insects involve sweep nets, pan traps, and Berlese funnels.

This summer we completed a second year of sampling on REACCH cooperator farms and within REACCH experiments across the region.

How will this research be used?

The Biotic Team is working to integrate the data on biota at multiple scales with information from agronomists, economists, and climate scientists to provide a more complete understanding of climate change on our agroecosystem and the implications for our growers.


Figure 1E

Figure 1D


Seed bank sampling in winter

Figure 1A.


Figure 1B

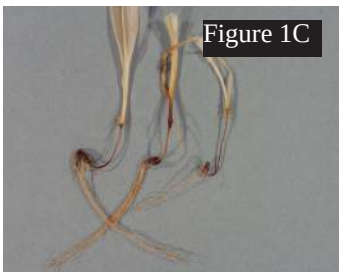


Figure 1C


Growing seed bank samples in the greenhouse

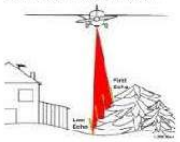
The Hills Have Eyes...
and Lasers, LEDs, Photodiodes, Time-Lapse Cameras, and Satellites

Troy Magney, Lee Vierling, and Jan Eitel

Cross-diciplinary research is an integral part of instrument development. Many of our instruments are located on at REACCH affiliated fields and flux towers for pilot testing and as a means of "ground validation" (making sure instruments are telling us the right information). Working with members from the REACCH team allows us to get meaningful input from soil and plant scientists, hydrologists, ecologists, and most importantly growers, ensuring that we are developing practical tools that answer relevant scientific and application-based questions. Tools for improving precision agriculture could help growers both at the time of fertilizer application, and/or allow them to allocate fertilizer based on how different parts of their fields have responded in the past. The former includes the development of laser systems that could be mounted on tractors for real time assessment of early season crop status at the time of fertilizer application allowing the output of fertilizer to be less in nitrogen rich areas of a field or more in nitrogen poor areas. The latter incorporates the use of satellite or time-lapse camera imagery to create maps of crop drying patterns across a landscape. These drying patterns could tell growers information about crop health and soil moisture across their fields to help determine planting density or fertilizer allocation for next year's crop.

Why is this research important?

By optimizing fertilizer inputs, farmers can save money by reducing over-application, and ensure that excess nitrogen is not added to water as nitrate or the atmosphere as nitrous oxide is one example. The table below discusses the methodology to using the tools as well as the importance of each.

Time-lapse cameras	**Radiometers**	Automated Terrestrial Laser Scanner	Two- Wavelength Laser Tractor	Terrestrial Laser Scanner	**Airborne LiDAR**
					
This camera takes daily photos of the entire farm (360°) from 75 ft. above ground. We hypothesize that the "Drying Patterns" of the crop may indicate soil moisture patterns. **What does this mean to you?** The results from this study may provide visible data which will help in management decisions.	This device is composed of 2 LEDs and 4 photodiodes which measure the radiant flux (power) or electromagnetic radiation. We hypothesize that these results will predict Nitrogen status and photosynthetic activity of crops. **What does this mean to you?** Radiometers can be placed around fields for real-time monitoring of plant health.	Using laser technology to scan wheat from the same location every day to produce a 3D image. We hypothesize that we will be able to quantify dynamic crop growth, and link to carbon fluxuations. **What does this mean to you?** The results of the scans will help to determine how crop yields vary across the landscape.	Using laser technology this tractor can detect plant "greenness" or chlorophyll and Nitrogen on the move. We hypothesize that we will be able to create a map of crop health crop by scanning the field as a whole. **What does this mean to you?** The results of the scans will help to determine the allocation of fertilizer as the tractor travels.	Using laser technology to scan plots at 3 different growth stages in both 3D images and in intensity. We hypothesize that that a green laser can predict leaf N, Chl, and biomass. **What does this mean to you?** This will help to assess the potential for prototype systems like the two-wavelength laser tractor.	Another type of laser that "shoots" out of a plane in pulses as it flies over fields. We hypothesize that with this technology we will be able to provide high resolution topographic maps. **What does this mean to you?** The results/maps will aid the work of other scientists like Landscape Hydrologists.

Notes from a Stakeholder

Patrick Binns, Westbrook Associates LLC

Patrick is a consultant in the field of sustainable agriculture and locally scaled bioenergy practices, technologies and strategies that would enable improved food production and rural economic development.

The REACCH Summer Tour was very useful to me as a Stakeholder Advisory Committee member, as it provided me with new insights into the work involved in establishing and operating the field monitoring installations that support the program's research efforts. I enjoyed the opportunity to visit the long term farming system trials that are participating in REACCH and being able to speak directly with the host farmers and lead scientists about their specific practices and what they have learned to date. The breadth of factors being addressed by the program, from crop rotation impacts on soil quality and crop yields; tracking and combating pest infestations; assessing water runoff and gaseous field emission characteristics; and much more indicate the complex interplay of many scientific disciplines that are needed to understand climate change and agricultural system dynamics. It was also very enjoyable to have the chance to get to know the faculty and students working in this program. My conversations with team members during the bus travels and social events were informative and fun; giving me a greater appreciation of both the personalities and the professionalism of the many individuals who comprise the REACCH research team.

THANK YOU TO OUR TEACHER WORKSHOP AND SUMMER TOUR SPONSORS!!!

IDAHO EPSCoR (Experimental Program to Stimulate Competive Research), Palouse-Rocklake Conservation District, Spectrum Crop Development, Curtis Hennings Farm, Pacific Northwest Direct Seed Association, NASA, ICE Net (Intermountain Climate Education Network), CSANR (Center for Sustaining Agriculture & Natural Resources, REACCH, ARS (Agricultural Research Service), University of Idaho, Oregon State University, Washington State University, USDA National Institute of Food and Agriculture.

Introducing Erin Corwine

Our New Education Coordinator

Erin has experience coordinating research studies at the University of Washington. She'll be working to support undergraduate and graduate students that are part of the REACCH team, developing and delivering K-12 curriculum on agriculture and climate change and she will be designing K-12 professional development opportunities, based on feedback from the teacher workshop. Presently, work on education team objectives is well underway as are the plans for the September REACCH Graduate Student Fall Meeting. This meeting will help graduate students build capacity as a group of interdisciplinary climate and agricultural researchers. In addition she is working to develop partnerships with other Pacific Northwest Climate Science organizations.

*The Out***REACCH**

Editor, Lenea Pierzchanowski
To receive a print copy,
please email leneap@uidaho.edu

You can find The OutREACCH archives and additional information about our project on the REACCH Website:
https://www.reacchpna.org/