Western IPM Center

Project Report Form

How to submit: Please submit this completed form electronically, as an attached Microsoft Word file, to Jane Thomas at jmthomas@tricity.wsu.edu. If you have questions, contact Linda Herbst, (530) 752-7010. **Content:** Complete each section below, and include responses to as many of the questions listed in Attachment A as are relevant to your project. *These are guidelines.* Provide your readers with enough detail that someone who is not familiar with your project can understand what you were trying to achieve, how you went about it, and what you accomplished, but please keep it concise.

A. Report Data

Date: May 4, 2010
Reporting Period: January 1, 2004 - May 4, 2010
Report Type (please check one):
☐ Progress Report ☒ Final Report

B. Grant Data

- Grant Agreement #: UC149A
- Title: UC WIPMC Workgroup on Weather Systems
- Grant Type: Work Group
- Lead investigator:
  - Name: Walter Mahaffee
  - Title: Courtesy Assocaite Professor
  - Institution: Oregon State University
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  - Email: mahaffew@science.oregonstate.edu
- Team members (name, title, institution): Len Coop, Paul Jepsen - Oregon State Univeristy;
- State(s) involved: Oregon, Washington, California, Idaho.

C. Nontechnical Summary. An overview of the project, briefly outlining the problem(s), how your project addresses them, and your results, *written to a lay audience.* (500 words)

Over the course of five years of funding the Western Weather System Workgroup has become a mature collablorative group that encompasses climatologist, entomologists, meterologists, plant pathologists and economists,. This groups has used Western Region IPM funding to develop numberous grant proposals that have leveraged more $2 million in additional funding. Collaborative research that was a direct result of work group meetings has resulted in the implementation of interpolated weather forecasts (e.g. http://pnwpest.org/cgi-bin/risk_model/risk_models), including a "virtual weather station" (VWS) system which uses interpolated data. The VWS system, with resolution of 2km, was developed by Fox Weather, LLC and IPPC and is being ground-truthed. Improvements to Fox Weather weather analysis and forecast models as a result of workgroup activities now allow direct down-scaling of coastal effects to 800m resolution. The improved models are being delivered operationally in California, and were used to develop fire weather forecasts in 2008. A PRISM-based climate informed forecast system with a resolution of 800m has been developed and is being evaluated on an experimental basis. Uncertainty analyses are underway with the various weather analysis and forecasting systems. The use of PRISM climatological aided interpolation was demonstrated to reduce errors compared to temporal interpolation of missing data. Threshold-based pest models appear to be more susceptible to errors in interpolation of weather data than simulation type models. The National Plant Disease Network is utilizing tools developed by the workgroup to help in monitoring pests (arthropods and diseases) outbreaks and the introduction of exotic pests

D. Objectives and Progress. List your objectives and describe your progress for each objective.

1. Continue to identify and assemble experts in climatology, meteorology, information technology, precision agriculture, extension, and insect and plant pathogen epidemiology and modeling to clarify conceptual and technical direction for developing and utilizing weather-based crop, disease and pest management tools.

2. Further develop the conceptual, research, and implementation framework for a weather and climate-based system to enhance management decisions for IPM and other agricultural and societal purposes.

3. Increase awareness of, access to, and use of forecasting and epidemiological models in IPM that exploit high quality weather data.

4. Engage user groups including individual producers, crop consultants, and commodity groups in determining the value and needs of a weather and climate-based decision support system.

5. Coordinate application for regional, federal, and state-based grants that support the collection and use of weather data and modeling tools in IPM.

E. Outputs. List your project's outputs, which might include publications, information, data, meetings held, attendance at meetings held, etc.

Publications:

Coop, L., A. Fox, W. Mahaffee, D. Gent, W. Pfender, C. Thomas, P. Jepson. 2009. Forecast and virtual weather driven plant disease risk modeling system. Phytopathology 99:S24

Fox, A., 2009 Design Document for MtnRT Forecasts: Input to Plant Disease Models, Fox Weather, LLC, April 18, 2009. Published at www.foxweather2.com/MtnRTWhitePaper090418.zip.

Pfender, W., Eynard, J. and Coop, L. 2007. Sensitivity of a rust simulation model to inputs of temperature obtained at standard weather observation height vs canopy height. Phytopathology 97: S92.

Pfender, W., Mahaffee, W., Coop, L., Fox, A., Daly, C., Thomas, C, Gubler, W., Grove, G., Gent, D., Strand,J., Taylor, G., Jepson, P., Graw, R. 2007. Western Weather Systems Workgroup: A collaborative effort to improve weather information for IPM. Phytopathology 97: S92

W. F. Pfender, D. H. Gent, C. Thomas, W. F. Mahaffee, L. B. Coop, A. Fox. 2009. The challenge of assessing uncertainty and risk in weather-based decision support tools. Phytopathology 99:S174

Kim, K. S., S. E. Taylor, M. L. Gleason, L. B. Coop, W. P. Pfender, R. C. Seem, P. C. Sentelhas, T. J. Gillespie, A. D. Marta, S. Orlandini. 2010. Spatial Portability of Leaf wetness models based on Empirical Approaches. Accepted and in Press for publication in: Agric. and Forest Meteor.

To be submitted:

Coop, L., C. Daly, A. Fox, D. Gent, C. Thomas, and P. C. Jepson. 2010. A plant disease risk forecast system for plant biosecurity and IPM in the Western USA - description and virtual weather evaluation. Journal TBD.

Pfender, W. F., and Gent, D. H. 2010. Weather estimation as a source of error in decision aids for multiple-decision disease management. Phytopathology 100: xxxxx.

Presentations:

Coop, L. and the Western Weather Work Group. 2010. The Prospect of virtual weather for pest and disease management in winegrapes. Oregon Wine Industry Symposium. Feb 22, 2010, Eugene, OR. http://explorer.oregonwine.org/symposium/files/Sessions/Viticulture/VineyardTech/Vineyard_Tech.pdf

Coop, L. 2010. Virtual Weather Stations and Their Application to Pest and Disease Modeling. Blue Mountain Horticultural Society. Annual Meeting. Feb. 2, 2010, Milton Freewater, OR.

Coop, L. 2009. Forecasting weather and climate for plant disease models: A western perspective. North Central Division APS Annual Meeting, Ames, IA, June 22, 2009. Symposium: Implications of Climate Change on Plant Pathogens.

Coop, L. 2009. Oregon Report presenting: Oregon IPPC & Western Weather Workgroup Activities – Nov. 2009. WERA-102 Annual Meeting: Climatic Data and Analyses for Applications in Agriculture and Natural Resources, Monterey, CA. Nov 17, 2009.

Coop, L., P. Jepson, G. Grove, A. Fox, C. Daly, W. Mahaffee, C. Thomas. 2008. Delivery of IPM Tools in Real Time for Decision Support – Pull. APS Pacific Division Annual Meeting, Jackson, WY, June 25, 2008. Symposium. http://www.apsnet.org/meetings/div/pc08abs.asp

Coop, L., and M. Hill. 2007. New Tools for Epidemiology – Maps and Reports. Scheduled paper at: Epidemiology Subcommittee Session. NPDN National Meeting Jan-28-30th, 2007, Orlando FL.

Coop, L., and A. Fox. 2008. Novel Delivery IPM Tools in Real Time for Decision Support – Pull. American Phytopathological Society Pacific Division Annual Meeting. June 24-27, 2008, Jackson, Wyoming.

Coop, L. 2010. Virtual Weather Stations and Their Application to Pest and Disease Modeling. Blue Mountain Horticultural Society. Annual Meeting. Feb. 2, 2010, Milton Freewater, OR.

Daly, C., Coop, L., Fox, A., and C. Thomas. 2008. Novel approaches to spatial and temporal estimation of diverse western meteorology. American Phytopathological Society Pacific Division Annual Meeting. June 24-27, 2008, Jackson, Wyoming. http://www.apsnet.org/meetings/div/pc08abs.asp

Fox, A. 2009. Contributing Factors to Frost and Freeze Variability – Planning for Freeze Events with Fox Weather's Forecasts. Frost Risk Task Force, Santa Rosa, CA, July 2009.

Gent, D., L. Coop, C. Daly, A. Fox, G. Grove, D. Gubler, P. Jepson, D. Johnson, W. Mahaffee, W. Pfender, J. Strand, C. Thomas. 2008. Next steps on the horizon for weather and climate-based decision support systems

F. Impacts and Potential Impacts. The "impacts" and "potential impacts" sections of your report will help the Western IPM Center highlight the value of IPM research and education by detailing the real-world impacts of Center-funded projects. We will use the information in news articles, reports, and informational brochures to showcase the impacts of projects that our program supports. *See Attachment A at end of form for questions to assist you in describing the impacts of your project.*

1. Impacts. Describe any impacts of your work. ***Impacts*** are specific changes in condition for those affected by your work. Impacts include adoption of technology, creation of jobs, reduced cost to the consumer, less pesticide exposure to farmers, access to more nutritious food, and a cleaner environment and healthier communities.

Many of the activities of the workgroup have culmenated in the improvement of delievery of weather information at two web portals http://uspest.org/wea/ and http://weather.wsu.edu/. The IPPC site provides data and analyses for NPDN and presents data from >13,000 weather stations acroos the U.S in a publically accessable formation. These portals receive thousands of requests per day for weather and pest model information. Inaddition, group meetings have lead numerous successful grant applications with a total of over $2.2 million in leveraged funds from the $50,000 investment by WRIPM. A midwestern workgroup model on the Western Weaterh Systems Workgroup was formed.

2. Potential impacts. Describe your project's potential impacts. ***Potential impacts*** are the ways that your project's outputs could directly lead to changes in condition that will unfold in the future.

The workgroup has pursued and continues to pursue the improvement of the quality and accessability of fine scale weatehr data. The virtual station concept that the group is currently funded to develop through USDA-NIFA - AFRI Plant Biosecurity program could significantly improve the utilization of pest forecasting by providing easily accessablible site specific weather and forecast data. The expanded use of these models would significantly reduce pesticide use in most years without decreasing pest control thus improving the economic return to producers and reducing the environmental impact o

G. Leveraged Funds. List *additional funding* you have acquired because of the data and results yielded in this WIPMC-funded project.

Additional Funding Award #1:

Date of Award: June 2009	Name of Granting Entity: NPDN Regional center Kansas State , Purdue Univeristy, UC Davis
Dollar Amount: 56,100	Name of Grant Program:
Grant Period Duration: 4 years	

Additional Funding Award #2:

Date of Award: Jauary 2010	Name of Granting Entity: USDA-CSREES
Dollar Amount: 996,112	Name of Grant Program: AFRI - Plant Biosecurity
Grant Period Duration: 3 years	

Additional Funding Award #3:

Date of Award:	Name of Granting Entity:
Dollar Amount:	Name of Grant Program:
Grant Period Duration:	

H. Appendices

1. With your report, please attach ***at least two (2) photographs*** that illustrate your project. Please describe the photo and indicate the name and institution of the person who took the photo. (If you submit more than two photographs, please include those additional descriptions and photo credits under "I. Additional Information," below.)

Photo #1 description:

The IPPC web based interface (http://uspest.org/) for an individual weather station. The blue line indicate actual weather data recorded by the station or pest model outputs derived from the recorded data. The pink link lines indicate forecasted weather data for the next 5 days or model outputs derived from the forecasted data. IPPC weather station.tif

Photo #1 credit (photographer's name and institution):

Len Coop; Web shot from http://uspest.org/ 5/4/2010

Photo #2 description:

A spatialized Tmax forecast based onhybrid of PRISM modeled climatologies and GFS model output. 24 hour forecasts will be routinely created for Minimum(4am) and Maximum(4pm) temperature. The hybrid forecast is unique because of the use of high resolution PRISM climatologies, near real-time observations, and 2 meter near surface GFS temperature forecasts. 09030400 09030500 2 m interp.png

Photo #2 credit (photographer's name and institution):

Chris Daly, PRISM Climate Group Oregon State University

2. Also attach any printed fact sheets or other publications resulting from your work that will enhance our understanding of your project and its impacts. Please provide a description of each attached publication below.

Document #1 description:

Document #2 description:

Document #3 description:

I. Additional Information

Credit: *Some of the language about impacts and potential impacts was adapted from a PowerPoint presentation by H. Michael Harrington, Executive Director, Western Association of Agricultural Experiment Station Directors, Colorado State University.*

Attachment A

Questions to Help in Reporting Impacts and Potential Impacts

Below are some questions that will guide you in assessing and then describing the impacts and potential impacts of your project. The relevance of each question may vary depending on whether yours is a research or extension project. Please answer as many as you can to the best of your ability, and feel free to describe any additional types of impacts not mentioned below. Remember to identify any potential impacts.

1. ***Innovations in IPM:***
   Are there new IPM practices that have been (impacts) or could be (potential impacts) adopted as a direct result of your project? What is the total number of acres (or homes, schools, greenhouses, nurseries) on which these practices could realistically be implemented?
2. ***Safeguarding human health and the environment:***
   a. Has the project reduced risk (or could it potentially do so) by changing the use of pesticides on farms, in homes, in schools, etc.? For example, could it result in fewer sprays per season or a switch to lower-risk pesticides? If possible, quantify the changes in condition. (Since there is no unanimous definition of *high* and *low risk,* investigators selecting this indicator are asked to categorize the pesticides they are reporting on as *high* or *low risk* according to the particular situation [e.g., lower risk to natural enemies]).
   b. Are there any other impacts or potential impacts on human health or the environment as a result of your project?
3. ***Economic benefits:***
   a. What is (or could be) the economic benefit (e.g., dollars saved) for clientele who adopt IPM strategies and systems you studied? Do you envision potential commercialization or mass production of these systems?
   b. How many clients are satisfied with IPM results (such as improved yield, improved quality of yield, reduced pest populations, more effective pest control, greater preservation of nonpest species)?
   c. Are there other financial benefits that might be realized (potential impact) as a result of your project?
4. ***Implementation of IPM:***
   a. How many IPM strategies and systems have been validated through this project (e.g., through on-farm trials, large plot tests, or other methods used to confirm efficacy)?
   b. How many educational materials were delivered? To whom? And what are the impacts or potential impacts?
   c. What is the number of growers/personnel trained? And what are the impacts or potential impacts?
   d. For a Web site, what volume of traffic and type of use has the site experienced? (For example, number of visitors per day or month; number of page views; number of unique user sessions; change in volume during growing season; average viewing time.) And what are the impacts or potential impacts?
   e. How many more people adopted IPM practices as a direct result of your project, or how many people adopted new IPM practices?
   f. Are there other ways in which your work will result in improved use or increased implementation of IPM strategies in your region or across the West?
5. Has your project or study increased collaboration among stakeholders interested in the development and implementation of improved IPM strategies and systems?