



CLIMAS Update

News from the Climate Assessment for the Southwest Project

Integrating science, policy, and community

THE UNIVERSITY OF ARIZONA

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Online Tools and Products

Border Climate Summary: A publication of interpretations of recent conditions and forecasts for the region centered on the political border between the United States and Mexico.

<http://climas.arizona.edu/forecasts.html#border>

AgroClimate: A set of decision support tools for farmers in New Mexico, including county-level information on climate risk, growing degree days, and estimation for pecan irrigation. Adapted from the Southeast Climate Consortium's AgroClimate tools, the New Mexico AgroClimate currently exists in beta form. New features will be added soon, such as chill accumulation, frost forecasting, and an urban drought irrigation decision tool.

<http://nmclimate.nmsu.edu/climatetoolsdoc.html>

Arizona DroughtWatch: This tool is designed to collect qualitative reports of drought impacts across Arizona. This information is used in conjunction with meteorological and hydrological data to characterize drought conditions.

<http://azdroughtwatch.org>

CLIMAS Mission

CLIMAS was established to assess the impacts of climate variability and longer-term climate change on human and natural systems in the Southwest. Our mission is to improve the ability of the region to respond sufficiently and appropriately to climatic events and climate changes.

CLIMAS Team Spotlight: Andrew Comrie and Cory Morin

By Gigi Owen

Southwest summers typically mean scorching temperatures and the onset of the monsoon season—both of which help create the perfect atmosphere for disease-transmitting mosquitoes. Climate influences all aspects of mosquito life; the adult insects feed and mate at certain temperatures and require water to lay their eggs. Yet it is unclear how inter-annual climate variability and projected long-term climate changes in the Southwest will impact mosquito populations.

To help address this question, CLIMAS Investigator Andrew Comrie, a University of Arizona professor of geography and regional development, and

his graduate research assistant Cory Morin have designed a climate-driven model showing how mosquitoes may be affected by future climate projections.

Their Dynamic Mosquito Simulation Model (DyMSiM) has significant implications for public health. The mosquito species *Culex quinquefasciatus* is a vector for the West Nile virus, which was introduced to the eastern U.S. in the early 2000s and spread rapidly across the country within four years. The disease still occurs in the Southwest, with more than 100 cases reported in Arizona and New Mexico in 2008 (see Figure 1). Another species prevalent in the Southwest is *Aedes aegypti*, which can transmit dengue fever. While there

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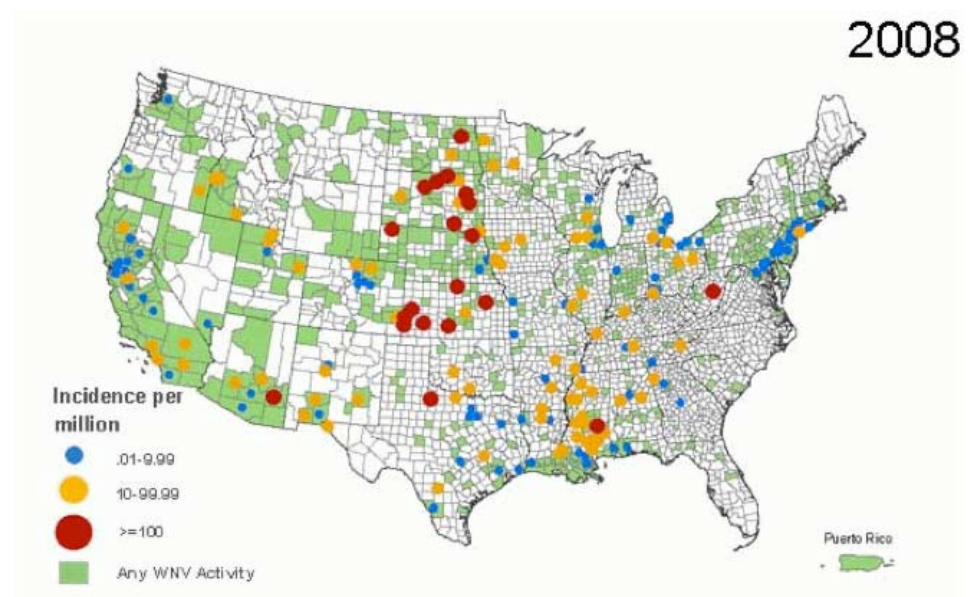


Figure 1: West Nile virus: epidemic to endemic

Credit: Centers for Disease Control and Prevention

<http://www.cdc.gov/ncidod/dvbid/westnile/Mapsincidence/surv&control04IncidMaps.htm>

Core Office Update

Southwest Climate Change Network

Joe Abraham and several members of the CLIMAS team have been working on the Southwest Climate Change Network (southwestclimatechange.org), a new resource for regional climate change information. The Web site includes sections on climate science and regional impacts based on scientific research, along with possible solutions such as adaptation strategies and ways to reduce emissions. The Web site also organizes online news into categories, including climate change research, low-carbon business and technologies, and climate change news in the Southwest. An especially innovative feature called the Knowledge Network will incorporate professional networking themes, allowing scientists, decision makers, and the public to create profiles, share information, ask questions, and collaborate on projects.

Fire Management and Social Networks

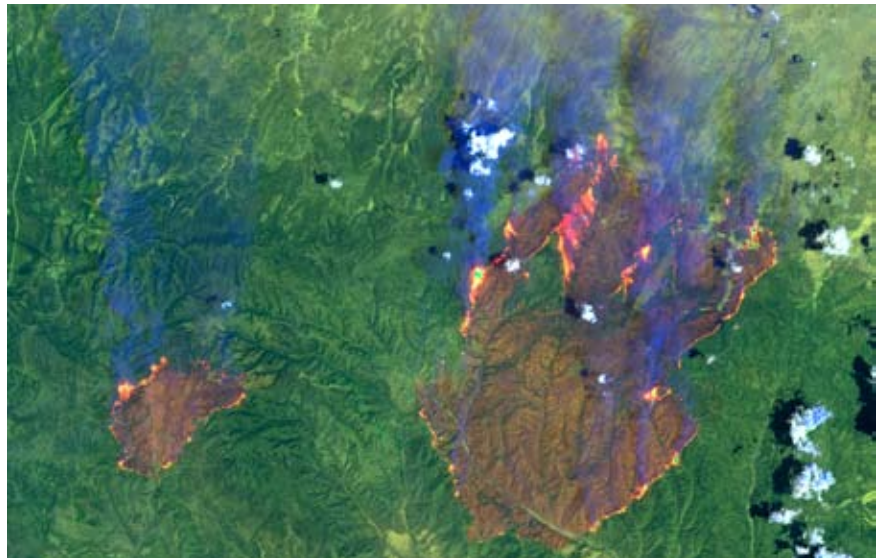
The CLIMAS core office is collaborating with colleagues in Nevada and Alaska on a new project to investigate the social and communication networks of wildland fire management on local, regional, and national scales using social network analysis. Social network analysis can be used to look at the movement of information and resources based on network structures or relationships between groups. The project team includes CLIMAS Program Manager Dan Ferguson and staff social scientist Gigi Owen, Tim Brown from the Desert Research Institute and California Applications Program, and Sarah Trainor and Paul Duffy from Alaska Center for Climate Assessment and Policy.

For the past six years, meteorologists, climatologists, fire behavior analysts, fuels specialists, GIS specialists, and other fire management personnel have come together at the National Seasonal

Assessment Workshop (NSAW) to produce an outlook for the upcoming season's significant fire potential. This new project will evaluate the outlook to determine three things: the usefulness of such products in making decisions regarding fire resource planning at national and regional levels; how these products can better fit the needs of resource managers; and where key uncertainties in decision making reside.

The results of the evaluation will be used to construct a decision framework to identify optimal fire management activities.

Through this project, researchers hope to identify those individuals and agencies that can best help spread the use of climate information in fire management, as well as gather information to help improve climate information products themselves.



Rodeo-Chediski fire on June 21, 2002, before the fires converged. The smaller Chediski fire is on the left. Image by Jesse Allen, based on data courtesy of Landsat 7 Science Team, NASA GSFC.

Recent CLIMAS-Related Publications

- Colby, B. 2009. Water management in urbanizing arid regions: Innovative voluntary transactions as a response to competing water claims. In Dinar, A. and J. Albiac (eds.), *Policy and Strategic Behaviour in Water Resource Management*, 47-66. London: Earthscan Publications Ltd.
- Frisvold, G. 2009. Strategic Behavior in Transboundary Water and Environmental Management. In Dinar, A. and J. Albiac (eds.), *Policy and Strategic Behaviour in Water Resource Management*. London: Earthscan Publications Ltd.
- Hirschboeck, K. 2009. Flood flows of the San Pedro River. In Stromberg, J. and B. Tellman (eds.), *Ecology and Conservation of the San Pedro River*. Tucson: University of Arizona Press.
- Wise, E. 2009. Climate-based sensitivity of air quality to climate change scenarios for the southwestern United States. *International Journal of Climatology* 29: 87-97.

Core Office Update, continued

Evaluating climate science connections to water providers in three western cities

Beginning in fall 2009, the CLIMAS core office (through Dan Ferguson) will collaborate with post doctoral researcher Jennifer Rice and CLIMAS investigator Connie Woodhouse on an 18-month project to evaluate connections between climate scientists and water providers in three western cities. The primary goal of this project is to evaluate interactions between climate science and water management in Denver, CO, Seattle, WA, and Tucson, AZ, to build a body of knowledge that can be used to fine-tune ongoing work and provide a solid basis for new science-to-action programs. Four questions will guide this research: 1) What are the key climate-related vulnerabilities these water providers perceive? 2) How are water providers obtaining and incorporating climate information into operational decision making? 3) What partnerships are successfully bridging the gap between science and policy in the water

sector? and 4) What challenges still exist in making climate information relevant to water planning? Over the next several months the project team will assemble an advisory board made up of representatives from each municipal water company as well as climate scientists in each city. This board will help guide the project and ensure that outcomes from the project are useful to both the user and scientific communities.

Improvements to the Southwest Climate Outlook

In fall 2008, the CLIMAS core office conducted an online survey of readers of our monthly climate summary, the *Southwest Climate Outlook* (SWCO). This survey was part of an ongoing effort within the core office to evaluate CLIMAS products and services so that we can improve them and better understand our stakeholders' needs. One resulting modification to the outlook is the way climate forecast verification information is presented. Led by staff physical scientist Zack Guido, the

CLIMAS team chose to improve this information by integrating the online Forecast Evaluation Tool (FET) into SWCO. FET, developed over the last several years by CLIMAS investigator Holly Hartmann and colleagues, provides a robust, statistical analysis of climate forecasts so users can judge the historical performance of seasonal forecasts and assess their use for upcoming seasons. The core office is actively seeking feedback on these improved sections of the outlook. If you have comments or suggestions, please contact Zack Guido at zguido@email.arizona.edu.

CLIMAS beginning new work with Native stakeholders

Beginning in fall 2008, the CLIMAS core office collaborated with colleagues in Alaska and Hawaii to convene two videoconferences aimed at bringing together Native natural resource managers from across these two states and the Southwest to share information about drought and climate impacts and strategies for dealing with them. This one-year project, funded by the NOAA Climate Program Office, was led by Dan Ferguson and CLIMAS Investigator Gregg Garfin. Building on this project as well as past CLIMAS work with Native stakeholders, the core office has begun a new initiative to work with natural resource managers across Indian Country in the Southwest on climate issues. This effort is in its early stages, but preliminary goals include providing information about current scientific knowledge of climate change science, impacts, and solutions; identifying climate information needs throughout Indian Country in the Southwest, including specific data needs and opportunities for data sharing; and identifying potential opportunities for collaboration between CLIMAS, The University of Arizona, NOAA scientists, and our partners who work for Native Nations or intertribal agencies throughout the region.



Streamflow in Wheatfields Creek upstream of Wheatfields Lake in April 2005 (left) and April 2006 (right), just one of many visible impacts of climate variability and change on Native Nations. Photos courtesy of Jolene Tallsalt-Robertson, Navajo Nation Dept. of Water Resources.



Comrie and Morin, continued

are no reported cases of dengue fever in the southwestern U.S., almost 500 cases were reported in Sonora, Mexico in 2008.

DyMSiM uses information about water, land cover, temperature, and mosquito life cycle stages to replicate mosquito populations for much of the southern U.S. Comrie and Morin used observed climate information to verify the model and were able to simulate mosquito populations that were similar to observed populations.

By inputting temperature and precipitation projections from a global climate model into their mosquito model, Comrie and Morin can hypothesize about future mosquito population sizes. The global climate model suggests that the Southwest will get hotter over the next four decades. Projected trends for precipitation, though less certain than those for temperature, show the Southwest becoming drier during spring and fall months.

Comrie and Morin have found that even though the Southwest may become drier, the region probably won't see fewer mosquitoes. The timing of precipitation drives mosquito population explosions, not the seasonal amount of rainfall. In addition, permanent water sources and temporary standing water in urban areas provide mosquitoes with ample egg-laying opportunities without

precipitation. Without humans and their urban water sources, mosquito populations would be significantly lower (see Figure 2). Furthermore, warming of the spring and fall months extends the survival season for mosquitoes into these seasons. In most cases, populations of mosquitoes will increase across the Southwest.

Comrie and Morin plan to develop DyMSiM for more widespread application by

vector control organizations and public health departments to help plan for future occurrences of diseases spread by mosquitoes.

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Mosquitoes by Month: Urban vs. Non-Urban

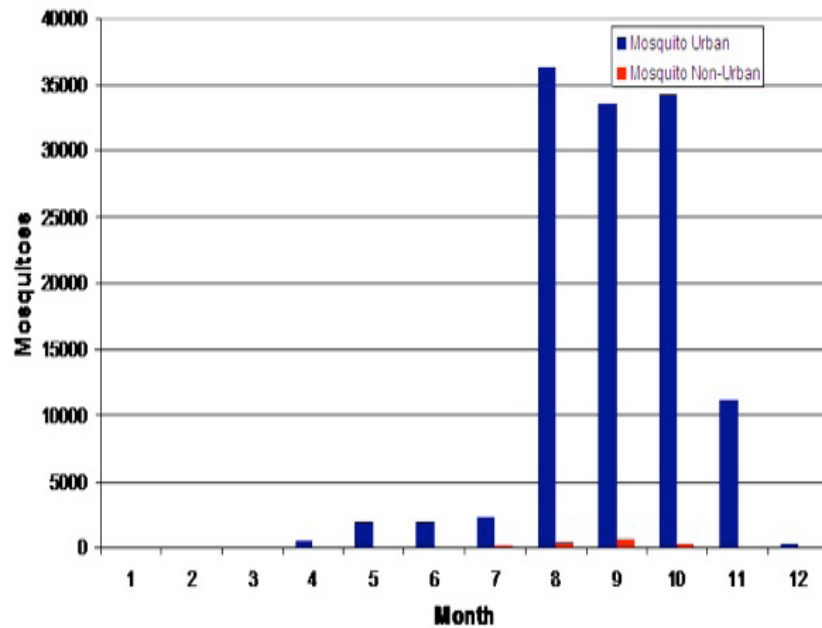


Figure 2: Urban vs. non-urban by month
In semi-arid (water-limited) Tucson, moist urban environments increase the number of mosquitoes and extend the survival season. Credit: Comrie and Morin

Subscription information

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