



Oklahoma Water
Resources Center

Currents

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Oklahoma Governor's Water Conference

Dr. Joan Rose to speak at the 2019 Oklahoma Governor's Water Conference and Research Symposium

Michigan State University professor and Homer Nowlin Chair in Water Research, Joan Rose, will be the luncheon keynote speaker on December 5 at the 2019 Oklahoma Governor's Water Conference in Midwest City. Dr. Rose has received many rewards for her outstanding work as an international expert in water microbiology, water quality, and public health. Most notably, she received the 2016 Stockholm Water Prize for her leadership and accomplishments in the water science field. She and her colleagues are developing new genetic analytics to further investigate waterborne threats. Her work is unique in that it focuses less on the commonly studied pathogen indicator species, and concentrates more on serious human health threats such as viruses.



Joan and her "water detectives," as she calls them, are working on a variety of projects. They have investigated freshwater contamination stemming from septic systems and are working to provide a stronger base for evaluating how septic systems affect watersheds and how this ties into the relationship between water quality and human health. Viral invasions in the Great Lakes is another area of interest for the team. Rose is not only devoted to water quality here in the United States, but has also been working in Singapore for the last 14 years on water infrastructure and water quality assessment. She was named an honorary citizen in Singapore for her extensive work in the country.

After winning the prestigious Stockholm Water Prize, Joan explained why she is so dedicated to her profession. "Water is the core of sustainability, and water quality affects the health of our planet, with humans, animals, and plants equally impacted," Rose said. "It affects our food security, our economic opportunities and our well-being."

Join us December 4-5th in Midwest City for the 2019 Oklahoma Governor's Water Conference and Research Symposium to hear Dr. Joan Rose and many others speak about their endeavors to improve water resources in Oklahoma and beyond.

Managing Drought: OSU's New Drought Index

(by Ali Meek)

Drought is a growing threat to agricultural production and sustainability across the Southern Great Plains. Limited surface water availability and declining groundwater resources in the region impact our ability to effectively mitigate drought impacts. With a recurring tendency of dry spells and low precipitation in western Oklahoma, we must find better approaches to drought monitoring to help us plan for and manage our water resources.

Proper drought management relies on efficient monitoring tools. Oklahoma State University researchers are developing a new agricultural drought index that will estimate the severity of drought episodes using a novel algorithm, eventually improving the drought preparedness of the state.

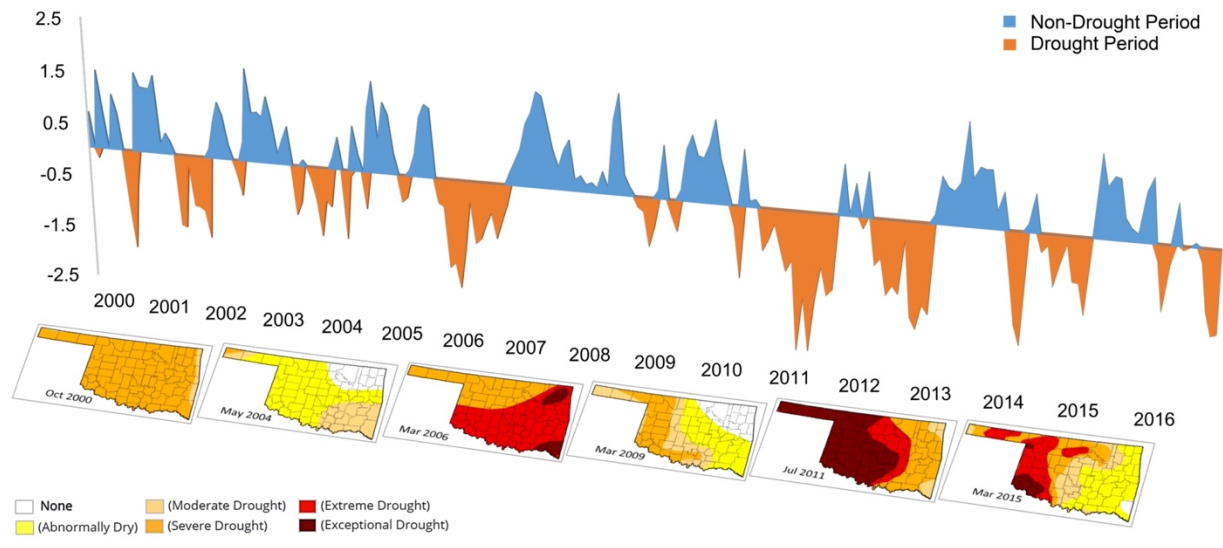
Ali Ajaz, OSU Biosystems and Agricultural Engineering Doctoral student working on this project under the supervision of Dr. Saleh Taghvaeian, is confident that this index will be a great tool for improving the drought management in Oklahoma.

"This index has great potential to improve the drought mitigation strategies," said Ajaz. "It will help farmers as well as extension specialists, irrigation managers, and policy makers."

This new index, called the Soil Moisture Evapotranspiration Index (SMEI), is a contemporary drought assessment tool that provides rigorous evaluation of drought progress. Additionally, in contrast to existing indices, it is simpler, more flexible and easier to use. SMEI uses both soil moisture and evapotranspiration (ET) measurements in its estimations. Soil moisture is commonly used in drought studies because it directly correlates with crop productivity, but it is often based on modeled data. SMEI harnesses measured soil moisture, improving its accuracy, and ET further improves the sensitivity of the drought index. For the development and evaluation of this new index, researchers used high-quality soil moisture and weather data from the Oklahoma Mesonet.

To test how the new index performed in comparison to previously developed indices, data was collected from 2000-2016 at five Mesonet weather stations in Oklahoma including Goodwell (Panhandle), Hollis (Southwest), El Reno (Central), Pawnee (North-central), and Wister (Southeast). Three previously developed soil moisture based drought indices were calculated for each site during the study period including the Soil Water Deficit Index, Water Deficit Index, and Normalized Soil Moisture.

Results showed that the new index is highly correlated with the Normalized Soil Moisture Index and moderately to highly correlated with the Soil Water Deficit Index, indicating the new index was on track for providing accurate analyses. For a more extensive comparison, correlation coefficients of each index were then compared with widely used meteorological indices, for example, Standardized Precipitation index (SPI), Standardized Precipitation Evapotranspiration index (SPEI), Z-Index, and Palmer Drought Severity Index (PSDI) at the same sites. SMEI correlations were, on average, 33% stronger than the existing indices. While the other indices are effective, SMEI is more extensive in its evaluation and was found to produce more reliable results. SMEI is particularly useful for agricultural producers as it demonstrated the strongest correlations with the crop yield, effectively translating the impact of limited water availability on crop growth during water-sensitive development periods.



Top: Drought timeline of Central Oklahoma modeled using Soil Moisture Evapo-transpiration Index (SMEI), Bottom: Drought Maps from U.S. Drought Monitor for drought-stricken months

The SMEI has the potential to increase efficiency in irrigation and aid in improving mitigation strategies. It could provide agricultural producers with more accurate information to base farm-related decisions on, as well as, increase awareness of oncoming drought, so that we can better plan for these situations. As the frequency of climate extremes increases, it is important to take advantage of tools such as these to protect our water resources. Also, the set of drought indices being used in the Drought Management Plan of Oklahoma can possibly be revisited for a probable inclusion of SMEI to improve the data driven decision making.

“Rainfall by 2060 is projected to decrease by 26% in the Southern Great Plains region and the temperature is predicted to increase as much as 11.5%, so there will be a greater need for smart water management” said Ajaz. “This is why we need to be more efficient in terms of drought monitoring.”

“SMEI is a step in the right direction”, said Dr. Kevin Wagner, Director of the Oklahoma Water Resources Center at OSU. “With the importance of irrigation, it is essential that we become as efficient in this practice as possible. This index supports improved agricultural water use, helping ensure our water resources for 2060 and beyond.”

More information available at: <https://doi.org/10.3390/w11071375>

Becoming an Effective Pond Manager



The calm pond surface is only disrupted by the faint splash of a bass hitting the top. As the sun goes down, the colors reflecting off the water blend perfectly with the green of the surrounding cattails. You cast your reel one last time while taking in the beauty around you. Because you have come to understand the responsibility and hard work that owning a pond entails, you enjoy the rewards of your efforts.

Several hundred thousand ponds dot Oklahoma but they are often underappreciated and poorly maintained, preventing them from reaching their full potential. It is a common misconception that ponds are self-sustaining. Because of this many landowners feel blindsided when they begin having issues with their pond. Whether for fishing, agricultural use, or aesthetics, your pond needs your care and attention. For those who are new at it, this can seem intimidating, but it is not as difficult as you may think.

Marley Beem, Oklahoma State University Associate Extension Specialist, has done a lot of research on pond management and aquaculture over the years and has some advice to offer. "Educate yourself on pond management up-front," Beem said. "This will help you be more prepared to catch problems early before they become expensive or impractical to fix."

He recommends inspecting your pond often and provides a checklist of things to look for (<http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-10048/NREM-9212web.pdf>). Steep slopes on the dam can create prime conditions for erosion, which, if not caught soon enough, can lead to a dam blowout from water overtopping. To avoid this, make sure your pond is structured with a wider top and gentle slopes. Also remember to remove young trees and shrubs yearly from the dam. Their roots can create channels through the dam, which can weaken the dam's structure and in a worst-case scenario, can cause the dam to fail.

Another frequent problem in ponds is poor water quality. Many times, muddiness occurs due to inadequate vegetative coverage along the shoreline or eroding areas draining to the pond. To fix this, manage the watershed and shoreline to ensure good vegetative cover to prevent erosion, enhance infiltration, and filter the water. Excess nutrients running off into the pond also cause problems. If a pond receives too much nutrient-rich runoff, fish kills become much more likely. The most common cause of fish kills is oxygen depletion. This usually is caused by over-growth and death of algae followed by massive decomposition and consumption of all the pond's oxygen. You are at high risk of a fish kill if the "greenness" of your pond causes a white object to disappear in 12 or less inches of water. But keep an eye on the density of algae even before this high risk stage – if the white object disappears between 18 and 12 inch you are approaching the high risk zone. Seek advice about the desirability of having emergency aeration equipment on standby at the edge of the pond. Toxic blue-green algae blooms are rare but of concern to many pond owners. These algae can poison the fish and livestock that drink from the pond, or pets swimming in the pond. Algal blooms are more likely in warm, dry seasons. If an algal scum is observed, it is wise to keep livestock, pets and people away. You can learn more on what to do in the event of suspected toxic algae growth at <http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-10365/NREM-9213.pdf>

For more information on fish kills, visit: <http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-1849/NREM-9206pweblinks.pdf>

OSU has these and many other resources available. To find these resources or answers to other pond related questions, contact your local OSU Cooperative Extension office or explore the pond management fact sheets at <http://factsheets.okstate.edu/blog/category/authors/marley-beem/>.

New Faces: Andrea Jilling



For this month's faculty spotlight, we would like to welcome Dr. Andrea Jilling to Oklahoma State University. She joined us this fall as the new Assistant Professor of Environmental Soil Chemistry. Jilling completed her bachelor's in Agricultural and Environmental Science from McGill University in Montreal, Quebec, Canada in 2011 and graduated this September with her doctorate in Earth and Environmental Sciences from the University of New Hampshire. With a great love and curiosity for farming and science, she focuses her research on soil fertility.

"Soil organic matter is a cornerstone of agricultural systems," said Jilling. "With proper soil management, we can support and maintain healthy crops and increase overall plant productivity." However, it is not entirely understood how and when plants absorb the nutrients within soil organic matter. Jilling's research examines how

plants interact with their soil system to absorb the natural supply of nutrients they offer. In studying these plant-soil interactions, she hopes to bring a better understanding of soil health and sustainable agriculture.

Dr. Jilling's research focuses on how soil functions at a fundamental level in an effort to contribute to sustainable agriculture via management for healthier and more resilient agricultural systems. "Because properly managed soils can help clean our water and regulate our climate, her research will help improve water quality as well," said Dr. Kevin Wagner, Director of the Oklahoma Water Resources Center. "We're excited to have Dr. Jilling here at OSU and look forward to working with her to not only improve soil health and agricultural sustainability, but to improve our water resources as well."

Announcements

Events

- Oklahoma Governor's Water Conference (Midwest City, OK; 12/4-5)
- 2020 National Institutes on Water Resources Conference (Washington, DC; 2/9/2020-2/13/2020)
- Oklahoma Clean Lakes & Watersheds Association Annual Conference (Stillwater, OK; 4/8/2020-4/9/2020)

Employment

- Oklahoma Water Resources Center Research Specialist (Stillwater, OK)

Oklahoma Water Resources Center

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