Confluence

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Introduction

Although the Gulf of Mexico Hypoxia issue dominates water quality concerns within the Mississippi River basin, ample water supplies for domestic use and irrigation is also a concern. According to the United States Geological Survey's Mississippi Embayment Aquifer Study (MERAS), decades of pumping from the Mississippi River Valley alluvial aquifer for irrigation and from the Sparta-Memphis aquifer for industry and public-water supply have affected ground-water levels throughout the Mississippi embayment in Arkansas, Louisiana, Mississippi, and Tennessee. Ground-water withdrawals for agriculture have caused water-level declines in the alluvial aquifer in Arkansas of at least 40 feet in 40 years while withdrawals from the Sparta-Memphis aquifer have resulted in declines of more than 390 feet since the 1920's. These declines have prompted concerns over water availability and quality for both agriculture and industry.

In the upper Mississippi River basin, the Cambrian-Ordovician aquifer system extends over a 417,000 km^2 area in parts of Minnesota, Wisconsin, Iowa, Illinois, Indiana, Michigan, and Missouri. Based on

water level data collected since 2000, concerns are growing over declining water levels in this aquifer, especially in Minnesota, Wisconsin and Iowa.

For the Mississippi River Alluvial Aquifer underlying Arkansas, Louisiana, Mississippi, and Tennessee, irrigation is considered the largest use of groundwater from this aquifer. In 2015, the State of Arkansas completed its update of its State Water Plan, a document built on public input and supply and demand projections of water resources through 2050. The plan delivered sobering projections for groundwater decline if current withdrawal rates continue.

In response to the declining aquifer levels, groundwater conservation has become a key consideration in each of these states. For irrigation, conservation practices can be divided into major categories: 1) those that improve irrigation efficiency and 2) those that convert to surface water use. The land-grant Universities, state agencies and NRCS are all promoting more efficient irrigation practices related to irrigation design, scheduling, delivery and termination techniques. Additionally, irrigation districts are developing that sale water to farmers by diverting water from surface sources such as the Arkansas and White River and delivering to nearby farms. Individual farmers are building on-farm reservoirs to capture rainfall and provide storage while capturing runoff at the lower end of fields in long narrow canals known as tail water recovery systems, which recycle water back to storage reservoirs.

In this issue, we introduce you some of the irrigation practices and conservation programs that re helping farmers conserve groundwater.

Sincerely, your Co-Editors:

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Moisture sensors help end soybean irrigation

Bonnie Coblentz, MSU Extension Service

Dry September weather has Mississippi soybean producers on opposite ends of the irrigation spectrum: Some are done, while others want to water one more time.

Jason Krutz, irrigation specialist with the Mississippi State University Extension Service, has a question for them: What do the soil moisture sensors say?

“Soil moisture sensors allow us to know exactly when the crop needs water,” Krutz said. “Some producers cut off the water too soon, and some cut it off too late. The only way to know how to get it just right is to have soil moisture sensors.”

Krutz said a recent Soybean Promotion Board survey found 20 percent of Mississippi soybean producers use soil moisture sensors. That number is far above the national average of 1.5 percent, but Krutz will not be satisfied until all Mississippi farmers are using these tools to irrigate efficiently.

“I’m pushing a lot of guys to tell them, we’re not done with the crop yet. Keep irrigating,” Krutz said. “I’m working with other producers who are eager to irrigate, and they want to send water down the field one more time.”

Growth stage, water availability

Trent Irby, Mississippi Extension soybean specialist, said irrigation termination decisions are based on the soybean growth stage and the availability of water in the soil.

“Using soil moisture sensors, we have a good idea of how much moisture is available in the soil profile. It’s important to base these decisions off of both soil moisture availability and the crop’s stage of development,” Irby said. “We want to make sure the crop has what it needs until it’s finished, and these sensors are great tools to help us do so.”

Mississippi soybeans are typically irrigated four to five times a year. Timely rains early in the season lowered that number on many soybean acres.

Krutz said three tools help producers irrigate at the right time and in the most efficient manner to save money while maintaining high yields.

“In furrow-irrigation situations, if you get the delivery right with a pipe planner to select the right size water hole and use surge irrigation, then the soil moisture sensors will allow you to irrigate at the right time,” he said.

After the crop has reached maturity at the R6.5 stage, producers leave it in the field to dry down. Producers like to harvest when the crop has about a 13 percent moisture content. At this level, grain can be safely harvested and stored.

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Delta Plastics H20 Initiative

Lee Riley, University of Arkansas System Division of Agriculture

Delta Plastics, based in Little Rock, Arkansas, is a manufacturer, supplier, and recycler of plastic products. Delta Plastics' primary products are polytube (colloquially known as poly pipe) and Revolution Bag can liners. Polytube is the thin walled white irrigation tubing so ubiquitous among row crop farms these days.

The tube is delivered flat, rolled on spools. The growers unroll the pipe in the desired location and attach it to their irrigation water sources. Water pressure inflates the polytube and the farmer then punctures holes at the desired intervals for irrigating their crops.

After the growing season is over, and the crops are harvested, the used polytube is gathered up and Delta Plastics collects and recycles it. According to Delta Plastics they are one of the largest recyclers of heavily soiled and contaminated plastics in the U.S. recycling more than 150 million pounds of plastic each year.

In addition to their environmentally conscience recycling program, Delta Plastics has strived to help producers plan and regulate their water use more efficiently. Delta Plastics has launched the "Delta Plastics H20 Initiative" with the lofty goal to reduce irrigation water use in the Mississippi Delta by 20 percent by the year 2020.

One of the key tools Delta Plastics is using to achieve their goal is their irrigation planning software, "Pipe Planner," which is now being offered free to growers. Delta Plastic's Chairman Dhu Thompson said, "This initiative is the most important conservation effort we have ever launched. Preserving our farmland has been our company slogan for nearly 20 years. But conservation and sustainability is so much more than a slogan for us. It is a principle that has driven every major operational decision that we have made."

Pipe Planner is a web based, more user-friendly version of a much older program developed by NRCS, called Phaucet. Over the past 4 years Delta Plastics has worked with the developers of Phaucet, to develop Pipe Planner's simpler interface to allow more wide spread usage of the program. Pipe Planner is designed to help farmers create more efficient pipe irrigation of crops.

The free program allows for computer-precision distribution of water through irrigation pipes more evenly, thus saving the farmer money from an estimated average of up to 50% reduction wasted run-off water and 25% reduction in energy costs. According to Thompson, based on previous experiments with Pipe Planner, he estimates that Delta farmers could "save more than one trillion gallons of water per year."

"Delta Plastics is proud to lead an initiative that will revolutionize the way we address water management on the farm," said Thompson. "We are even prouder to be working alongside the nation's

most respected leaders in agriculture and conservation to accomplish these goals."

The Delta Plastics H20 Initiative is supported by a diverse group of stakeholders from the agriculture, conservation, academia, government and private sectors. Official partner organizations will assist with education efforts to enhance Pipe Planner utilization across the Delta Region.

A large consortium of stakeholders will help educate farmers and other interested parties on the benefits of the Pipe Planner software.

The Delta Plastics H2O Initiative will:

- Create a public/private partnership between Delta Plastics and the University of Arkansas Division of Agriculture, Mississippi State University, and other universities in the region of the Mississippi Delta;
- Host educational forums for farmers, university extension agents, and private consultants focused on Pipe Planner implementation; and
- Allow participants to collaborate on the most efficient water use practices.

"Agriculture has been working tirelessly to contribute efficiencies and new conservation practices to ensure the long-term availability of our natural resources. With the H2O Initiative, we're pushing even farther in those efforts," said Arkansas Farm Bureau Executive Vice-president Rodney Baker.

"Delta Plastics has been a leader in water conservation and solving environmental challenges over the years, and this H20 Initiative is further proof of that commitment," said Bransford, who farms row crops in Lonoke, Arkansas. "Pipe Planner is an example of precision agriculture that is coming of age with the technologies of Internet, wireless communication systems, GPS, and cloud computing."

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Climate's Impact on Water Availability in Minnesota

Minnesota Department of Natural Resources

The impact of climate must be included in all evaluations of water availability in Minnesota. Human activity aside, surface and groundwater quantity is driven by the balance between atmospheric input from precipitation, and losses due to evapotranspiration. Very few of the watersheds in Minnesota extend beyond the borders of the State. Therefore, knowledge of Minnesota's climate patterns provides important insight into water availability issues.

Because it is located near the center of the North American continent, Minnesota is subject to a variety of air masses that make up its climate. Cold, dry continental polar air dominates the winter season, occasionally replaced by somewhat milder maritime polar air. During the summer, hot and dry continental tropical air masses from the desert southwest share predominance with warm and moist maritime tropical air that originates over the Gulf of Mexico. The spring and fall seasons are transition

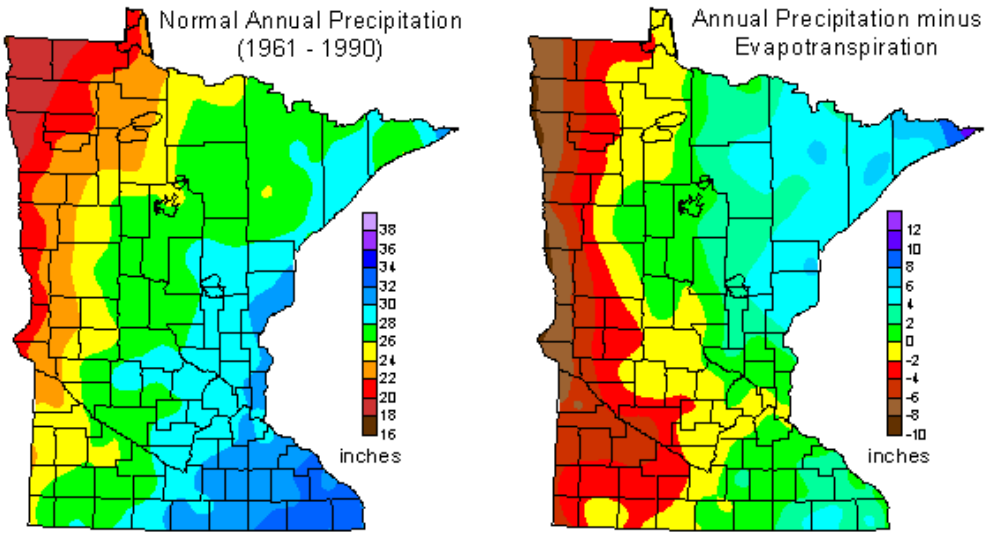
periods composed of alternate intrusions of air from various sources. The diverse nature of the air masses impacting Minnesota's climate leads to a high degree of variability across space (spatial variation) and time (temporal variation).

Climate variability over space

The primary source of moisture for precipitation in Minnesota is the tropical maritime air that moves into the State from the south and southeast. The spatial variation of average (normal) annual precipitation across Minnesota is determined by proximity to these moist air masses coming northward out of the Gulf of Mexico. Therefore, southeastern Minnesota, averaging near 32 inches, receives more precipitation than northwestern Minnesota, less than 19 inches. The normal annual precipitation for Minnesota (1961-1990) is 27.01 inches.

The presence of moist vs. dry air masses also helps to determine the atmosphere's ability to absorb water vapor evaporating from soil and open-water surfaces, or transpiring from leaf surfaces (evaporation plus transpiration is called "evapotranspiration"). Western Minnesota, more frequently under the influence of dry air masses, has higher evapotranspiration rates than the eastern half of the state. Temperature plays an important role in determining the amount of energy available for evapotranspiration. Because spatial temperature patterns are determined mainly by latitude, southern Minnesota experiences more evapotranspiration than in the north.

Due to its position in the continent, Minnesota is located on the boundary between the semi-humid climate regime of the eastern U.S., and the semi-arid regime to the west. Semi-humid climates are areas where average annual precipitation exceeds average annual evapotranspiration, leading to a net surplus of water. In semi-arid areas, evapotranspiration exceeds precipitation on average, creating a water deficit. In Minnesota, the boundary between the climate regimes cuts the State roughly into east-west halves.

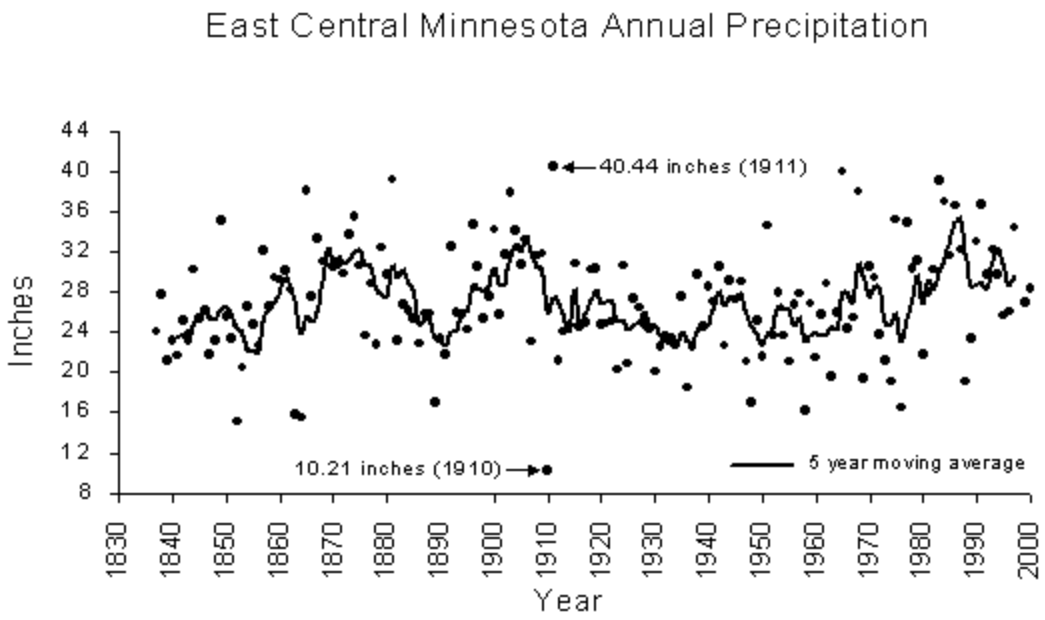


Climate Variability over time

Seasonal variability occurs, as different air masses are dominant. Nearly two thirds of Minnesota's annual precipitation falls during the growing season of May through September, a period during which Gulf of Mexico moisture is often available. Dry spells occur when this moisture source is obstructed or when atmospheric patterns divert storm systems around Minnesota. When hot, dry air prevails, increased evapotranspiration combines with deficient rainfall to create drought conditions. Drought can occur in all areas of Minnesota, however it is more likely in western and northwestern areas more distant from Gulf of Mexico moisture. When Gulf moisture is abundant and numerous storms move through Minnesota, unusually heavy precipitation falls. Repeated rain events can overwhelm surface water systems, raising lake levels and forcing streams out of their banks. Singular, intense rain events can lead to flash floods anywhere in the State.

Only eight percent of average annual precipitation falls in the winter (December through February) when the dry polar air masses prevail. Yet, large scale spring flooding can occur as a result of a combination of a deep late winter snow pack, frozen soil which prohibits infiltration, rapid snow melt due to an intrusion of warm air, and heavy early spring precipitation.

Given the multiple weather scenarios affecting Minnesota, wide ranges of climatic outcomes are the norm. "Normal" is merely a mid-point about which we fluctuate. A look at one Minnesota region illustrates the point. The adjacent figure depicts annual precipitation totals for east central Minnesota from pre-settlement times through the present. A striking feature of this time-series is the range of values. The lowest annual precipitation total recorded over the 161-year period was 10.21 in 1910. Only one year later, precipitation totaled 40.44 inches, the highest on record! Multi-year periods of similar weather also stand out in the climate record. For example, annual precipitation totals show a distinct drying pattern from the turn of the century though and including the "Dust Bowl" years of the 1930's. Note the relative lack of "wet" years over that period. Beginning in roughly 1940, the precipitation trend takes a ladder-step up to an era of tremendous variation including episodes such as the 1976 drought and the extraordinarily wet period in the mid-1980's. It is important to note that climate extremes should not be considered as aberrations, but rather treated as an inherent component of a continental climate. The difficulty comes in learning to live within the extremes knowing that they are not only possible, but likely to occur. Such knowledge does not prevent their occurrence, but does help to shape decisions and make plans that lessen the impact of the extremes upon human activity. When seen in this light, long-term efforts in areas such as water conservation, planning and flood damage reduction take on increased importance.



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Office of Water Prediction and National Water Model

The National Oceanic and Atmospheric Administration (NOAA) created the Office of Water Prediction (OWP) to understanding and predict water dynamics. The OWP bolsters the National Weather Service's (NWS) support of federal, state, and local agencies efforts on water resource management, and drought and flood management.

The OWP collaboratively researches, develops and delivers state- of-the-science national hydrologic analyses, forecast information, data, decision-support services and guidance to support and inform essential emergency services and water management decisions. In partnership with NWS national, regional, and local offices, the OWP coordinates, integrates and supports consistent water prediction activities from global to local levels.

The OWP is a geographically distributed organization which includes elements in Maryland, Minnesota and Alabama. The OWP is designed to support a consistent and unified hydrologic program while maximizing efficient use of resources helping to ensure the NWS excels as a science-based service organization. The OWP conducts development, field support and operational functions through projects and programs that address national, regional, and local needs and are led and supported by staff in multiple offices across the country. Initial activities of the OWP focused on support and development; operational functions will be identified and developed over time. Functional roles have been established in the OWP structure to coordinate and support this framework.

In August 2016, NOAA took a giant leap forward in its ability to forecast the flow of rivers and streams throughout the entire continental United States with the launch of the new high resolution National Water Model (NWM).

The NWM will enhance and expand NOAA's water flow forecasts, which to date have been available for approximately 4,000 river locations with stream gages operated by the U.S. Geological Survey. This new model will expand forecasts to 2.7 million stream locations nationwide. Leveraging the full network of nearly 8,000 U.S. Geological Service stream gauges and NOAA's investment in atmospheric modeling, the NWM will provide high-resolution forecasts of soil moisture, surface runoff, snow water equivalent, and other parameters.

We all recognize that water is an essential component of sustainable and resilient communities. But it's also a stressed natural resource and potential threat to life, property, and livelihoods during extreme weather events.

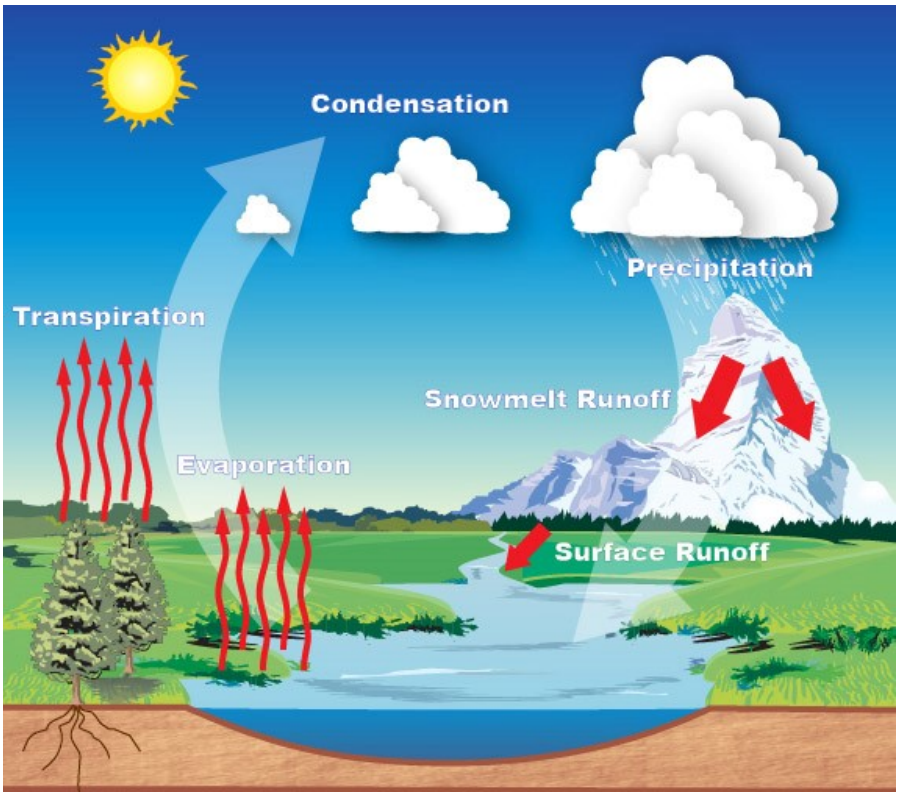
Improved Water Information Services

The new NWM improves the National Weather Service's ability to deliver impact-based decision support services nationwide by providing "street level" water information and guidance, as well as serve as the foundation for additional private sector water services. At a minimum, the NWM will immediately provide predictive water information for many locations where none previously existed.

Initially, this new NWM-based information will be particularly useful in headwater areas in support of NOAA's flash flood mission.

How it Works

The NWM simulates the water cycle with mathematical representations of the different processes and how they fit together. This complex representation of physical processes such as snowmelt and infiltration and water movement through the soil layers varies significantly with changing elevations, soils, vegetation types and a host of other variables.



Additionally, extreme variability in precipitation over short distances and times can cause the response on rivers and streams to change very quickly. Overall, the processes are so complex that to simulate it with a mathematical model means that it needs a “supercomputer” in order to run in the time frame needed to support decision makers when flooding is threatening.

The National Water Model is a cornerstone of the new NOAA Water Initiative, designed to provide more closely integrated water predictive capabilities to promote resilience to water risks. NOAA is seeking to establish an Integrated Water Prediction effort to deliver a suite of more holistic water intelligence products to help communities and industries make better-informed decisions about water management and how to prepare for and respond to extreme water events.

The Integrated Water Prediction initiative will bring together the National Water Model with coastal inundation models developed by the National Ocean Service to transform the nation’s water prediction capabilities at the coast. This will bring a new generation of water-level products and forecasts for coastal communities that do not receive a hydrological forecast.

A Collaborative Effort That Will Pay Great Dividends

The NWM is a collaborative effort among a number of academic and federal research partners. The basis for the NWM is the community-based WRF-Hydro framework developed by the National Center for Atmospheric Research (NCAR).

The development and implementation of the NWM is the result of strong collaboration with NCAR and a partnership with the Consortium of Universities for the Advancement of Hydrologic Sciences, Inc., the National Science Foundation, and Federal Integrated Water Resources Science and Services partners.

To learn more about the National Water Model, visit http://water.noaa.gov/about/nwm, and NWS's Office of Water Prediction, visit http://water.noaa.gov.

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USDA Water Availability and Watershed Management

The mission of the Water Availability and Watershed Management National Program is twofold: (1) to conduct fundamental and applied research on the processes that control water availability and quality for the health and economic growth of the American people; and (2) to develop new and improved technologies for managing the Nation's agricultural water resources. These advances in knowledge and technologies will provide producers, action agencies, local communities, and resource advisors with the practices, tools, models, and decision support systems they need to improve water conservation and water use efficiency in agriculture, enhance water quality, protect rural and urban communities from the ravages of droughts and floods, improve agricultural and urban watersheds, and prevent the degradation of riparian areas, wetlands, and stream corridors. The rationale for this program is that water is fundamental to life and is a basic requirement for virtually all of our agricultural, industrial, urban, and recreational activities, as well as the sustained health of the natural environment.

Goal

The goal of the Water Availability and Watershed Management National Program (211) is to effectively and safely manage water resources while protecting the environment and human and animal health. This goal will be achieved by characterizing potential hazards, developing management practices, strategies and systems to alleviate problems, and providing practices, technologies, and decision support tools for the benefit of customers, stakeholders, partners, and product users. Customers, stakeholders, partners, and users of this research include producers, landowners, consultants, State agencies, Cooperative Extension Service, NRCS, FS, FSA, FAS, ORACBA, EPA, USGS, CDC, NOAA, NASA, BLM, BOR, USACE, NPS, and other action-oriented organizations and centers.

Water Availability and Watershed Management programs in MRBI states:

Arkansas Indiana Iowa Louisiana Minnesota Mississippi Missouri Ohio

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Mississippi Environmental Education Alliance

November 11th & 12th, 2016

Warren-Tully YMCA Camp, Port Gibson, Miss. Registration 11 a.m., Friday; 8 a.m., Saturday. Through Environmental Education (EE) children and adults learn to discover and investigate nature and the environment and to make intelligent, informed decisions about valuing and caring for the land, water, air and their inhabitants. Explore a path to develop a comprehensive environmental education plan for Mississippi, engaging outdoor activities, developing a super nature trail, networking, and more. The conference is funded by a Nonpoint Source grant from EPA to the Mississippi Department of Environmental Quality under the Clean Water Act. Register by Oct. 28. Registration questions? Contact Peggy at (228) 324-3136 or peggyguyton@gmail.com. Other questions? Contact Harold Anderson at (601) 613-5567 or handerson212@gmail.com.

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Arkansas Soil & Water Education Conference & Expo 2017

Wednesday, Jan 25, 2017

The 19th annual Arkansas Soil and Water Education Conference and Expo 2017 will address the latest issues and trends in soil and water conservation. Once again this year's conference will include a vendor trade show – the ASWEC Expo.

The conference cost if registered by January 9th is $20 per person which includes lunch. To register online, visit Arkansas State Universities website here .

Soil & Water continuing education units for certified crop advisors will be awarded.

For more information, contact Chris Jones at (870) 972-2043 or chrisjones@astate.edu

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ACES Conference reminder

December 5-9, 2016

ACES: A Community on Ecosystem Services represents a dynamic and growing assembly of professionals, researchers, and policy-makers involved with ecosystem services. The ACES 2016 Conference brings together this community in partnership with Ecosystem Markets and the Ecosystem Services Partnership (ESP), providing an open forum to share experiences, methods, and tools for assessing and incorporating ecosystem services into public and private decisions.

The focus of the conference is to link science, practice, and sustainable decision-making by bringing together the ecosystem services community from around the United States and the globe. ACES 2016 will bring together leaders in government, NGOs, academia, Native American tribes, and the private sector to advance the use of ecosystem services science and practice in conservation, restoration, resource management, and development decisions.

We hope you will make plans to join more than 500 ecosystem service stakeholders in this collaborative discussion to advance use of an ecosystem services framework for natural resource management and policy.

Register, become a Sponsor, Join the Mailing List, and find out more here:
http://www.conference.ifas.ufl.edu/ACES/

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