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From the Director: The Word on Water… WOW! (by Dave Engle)

Dr. Dave Engle, Director

We knew that water would be an important topic in Oklahoma this year, but did anyone expect it to be like this? Between the legislature, lawsuits, flooding, and the drought, it seems the news is full of water.

Several events converged to precipitate this frenzy of activity. The first was the completion of the update of the state's water plan last fall. Many of the bills being considered by the legislature are responses to the recommendations found in the water plan. The second event is a cluster of lawsuits over Oklahoma water rights. Texas wants water out of the Kiamichi River, Muddy Boggy Creek, and Clear Boggy Creek; the City of Hugo wants to sell water to Texas, and Oklahoma City and the Choctaw and Chickasaw Nations all want water from Lake Sardis. The third, and perhaps most powerful, event is the record-setting drought of 2011.

Like it or not, both science and politics are shaping the future of water resources in Oklahoma. In this issue we highlight news of both. On page 2 you will find summaries of the three water research projects funded through OWRRI this year. On page 3 we provide summaries of some of the water legislation currently being considered by the state legislature.

If you are interested in staying informed daily about new developments in Oklahoma water, we suggest following the OWRRI on Twitter (http://twitter.com/#!/okwaterinst) or Facebook. You can also find important water news on our Web site, water.okstate.edu.

A New Name for a New Era in Oklahoma Water (by Mike Langston)

Dr. Mike Langston, Assistant Director

As you may have noticed, we are donning a new logo in this edition of *The AQUAhoman*. It reflects the umbrella name for the newly combined OWRRI and Water Research and Extension Center (we call it the Water Center, for short).

The addition of the OWRRI has brought a new emphasis on outreach and Extension to the Water Center. Just last month, an Extension fact sheet I co-authored was published. It is titled "Understanding General Stream Adjudications" and available to read here.

We hope the added Extension emphasis will bring about an important advancement for water resources in Oklahoma.

OWRRI-Funded Research Projects for 2012 (by Mike Langston)

In 2012, OWRRI will fund three research projects. We are pleased that for the first time, we will be funding a project conducted by a researcher at Northeastern State University in Tahlequah. Dr. Cindy Cesar has assembled a team that includes Dr. Jonathan Fisher, also of NSU, and Dr. Joy Van Nostrand of OU to assess the impacts of antibiotics in wastewater treatment plant effluent on stream bacteria, which play an important role in removing residual nitrogen from wastewater. Below are summaries of this project and the other two that were selected for funding this year.

Impact of Wastewater Treatment Plant Effluent on Nitrogen Cycling by Stream Bacteria

Cindy R. Cisar, Jonathan Fisher, and Joy Van Nostrand

One of the valuable functions of water bodies that receive wastewater from treatment plants is removing excess nitrogen from the water. This is accomplished through the activity (metabolism) of various bacteria in the water. Much of our municipal wastewater also contains low levels of antibiotics. Recent research indicates that, even at these low concentrations, antibiotics can have an impact on the organisms in the water. For example, antibiotic-resistant bacteria are more commonplace downstream of wastewater treatment plants than upstream. If the antibiotics impede the ability of bacteria to metabolize nitrogen, this nutrient could persist in the water body.

Dr. Cindy Cisar presents her proposal at the 2012 Winter WRAB meeting

As one of the essential plant nutrients, nitrogen left in the water contributes to the growth of algae. This can result in detrimental algae blooms, such as the blue-green algae blooms that occurred in several Oklahoma lakes in 2011.

This project will use the latest DNA-based methods to investigate the impact of antibiotics on bacteria in Tahlequah Creek, which receives treated wastewater from the City of Tahlequah's treatment plant.

Identifying Nutrient Pathways to Streams: Sediment and Phosphorus Loads from Streambank Erosion and Failure in the Illinois River Watershed

Garey Fox, Dan Storm, and Chad Penn

Water quality impairment due to sediment suspended in the water is a major cause of concern for lakes and streams in Oklahoma. Streambank erosion is the primary source of sediment in many streams. Not only does this sediment contribute to the turbidity (cloudiness) of the water, but it also often carries phosphorus, a major plant nutrient and contributor to algae growth. Various state and federal agencies, including the Oklahoma Conservation Commission, have invested heavily in streambank protection, such as vegetated buffer strips, for both sediment and phosphorus pollution prevention.

This project will model streambank stability and erosion in the Illinois River Basin to predict the impact of vegetated buffer strips along streams on both sediment and the associated phosphorus entering the stream. The model will be developed by measuring the physical characteristics of streambanks, streamflows, and the phosphorus content of the adjacent soils.

The completed model can be used to help target future bank stabilization projects and determine the best methods for stabilization efforts. Also, a total maximum daily load (TMDL) is being developed by the EPA for the Illinois River watershed without documented estimates of potential loadings from streambanks. Results from this study will verify whether TMDL model estimates are in line with reality.

Quantitative Assessment of Climate Variability and Land Surface Change on Streamflow Decrease in the Upper Cimarron River

Chris Zou, Jianjun Ge, and William Andrews

During the past several decades, river flows in north-central and northwestern Oklahoma have declined despite an increase in precipitation in the region. A parallel decline has occurred in the fish populations in these rivers, including the endangered Arkansas shiner in the Cimarron River. This disparity between precipitation and river flow suggests an increasing role for other factors such as woody plant encroachment, land use change, and groundwater withdrawals.

This research team will develop a model of the relative impacts of climate, land use change, and human activities on long-term streamflow in the upper Cimarron River. The results of this research will be important to planning for sustainable water supplies and aquatic ecosystems as Oklahoma faces increasing water demands and climatic variation.

Capitol image courtesy of www.expeditionoklahoma.com

The Legislative Update (by Mike Langston)

This year's focus on water in Oklahoma's legislature has seen an abundance of bills rise and fall. What began as a list of 86 water-related bills has been whittled down to just 18.

Here are summaries of selected water bills. (Note that only bills approved by one house before 16 March are still being considered.) Remember that some of these have not been signed into law but are still working their way through the legislature and are subject to change.

HB 2835 – This bill would allow private residents to use up to 250 gallons of their own grey water for "household gardening, composting or landscape irrigation" as long as certain precautions are taken. It would also instruct the Environmental Quality Board to develop "rules for the indirect potable reuse of treated wastewater" which is not permitted now. To develop those rules the Board would form a workgroup to study the issue and make recommendations to the Board.

HB 2836 – This bill would limit efforts by municipalities to take an individual's private property for floodplain management to those purposes directly related to floodplain management except under specific circumstances. It would also require public hearings for any change in floodplain management regulations and 20 days' written notice to affected landowners and 30 days' notice published in local newspapers.

HB 2914 – *The Regional Water Planning Act* would establish nine planning regions (exact boundaries to be determined) within Oklahoma, each with its own Regional Water Planning Council. These councils would be advisory only. They would be charged with developing a regional water plan and providing "recommendations and other input…to the Oklahoma Water Resources Board (OWRB) and other state environmental agencies." Councils will have 15 members appointed by the Governor, President of the Senate, the Speaker of the House, the boards of county commissioners in the region, and the boards of any special-purpose districts (regional or rural water districts, irrigation districts, and conservancy districts) in the region. The chairs of each council will form a Regional Water Planning Council Coordinating Committee to report to and receive input from the OWRB.

The bill specifies three phases of the regional planning effort: (1) "prioritization of projects, studies, and programs pertinent to that region," (2) implementation over eight years, and (3) completion of a regional plan to include evaluation of the implantation phase, updated analysis of the 50-year supply and demand forecasts that were in the 2012 Water Plan Update, and recommendations about needs and priorities for the next 50 years. The regional plans will be submitted to the OWRB for inclusion in the next update of the Water Plan.

HB 2915 – *The Groundwater Severance Restriction Act* restricts the withdrawal of groundwater for commercial uses. It specifies that commercial groundwater withdrawal agreements must be accomplished through leases that have a specified end date. Furthermore, it specifies that underground injection wells must be located at least one half mile from the nearest residential development.

HB 2924 – This bill would limit acquisitions of water rights by municipalities through eminent domain to ten years and limits the condemnation of the land to an easement for access, well sites, pipelines, etc. After the ten-year period a new acquisition could be carried out by the municipality.

HB 2929 – This bill would move the funds that are currently designated for the Oklahoma Comprehensive Water Plan to the Statewide Water Development Revolving Fund (which funds creation, operation, and maintenance of reservoirs and desalination plants and other water projects).

HB 3055 – *The Water for 2060 Act* would set a state policy to work toward consuming no more water in 2060 than today. To this end, it authorizes OWRB to grant funds to communities to develop water conservation pilot projects and creates the Water for 2060 Advisory Council (15 appointed members) to make recommendations for water conservation to the Governor and Legislature in 2015.

HJR 1085 – This bill would send to a vote of the people a constitutional amendment that would create the Water Infrastructure Credit Enhancement Reserve Fund ($300 million) to be used by the OWRB to help pay for water and wastewater infrastructure.

SB 1043 – This bill would permit the switching of a treated wastewater discharge from one water body to another, provided that the permit holder notifies the Oklahoma Department of Environmental Quality and provides a report detailing the suitability of the change at least 120 days before the change, and that redundant disinfection is provided.

SB 1325 – This bill would create the Water Infrastructure Financing Task Force to study and make recommendations regarding the estimated $87 billion in infrastructure need expected in Oklahoma by 2060. The 15 member board will consist of state legislators to be appointed by the Governor, President of the Senate, and the Speaker of the House.

SB 1327 – This bill directs the OWRB to make "full legislative recommendations" concerning implementing and promoting water conservation at a moderate level with the goal of keeping 2060 water use in the state at the same level as in 2020.

SB 1328 – States the intent of the legislature to fund "a holistic statewide surface water and groundwater monitoring program" of water quality and quantity conducted by the OWRB. It does not specify a dollar amount.

In addition, four bills (HB 2502, HB 2503, SB 1500, and SB 1506) deal with the Grand River Dam Authority board members' terms and authority, and are not reviewed here.

The Botanic Garden at OSU Provides Unique Teaching and Research Opportunities

(by Jeri Fleming)

Oklahoma State University has a unique place for visitors to experience the wonders of nature: it's The Botanic Garden at OSU. Located west of campus on Highway 51, the Botanic Garden offers visitors the chance to exercise all five senses as they experience a sensory garden containing over 1,000 species of herbaceous and woody plants. But the Botanic Garden educates the general public on more than just plants; it has a building that is completely off-grid with a rain garden that is watered from the rain collected from the roof of the building and powered through solar panels. The Botanic Garden also provides valuable teaching and research opportunities for OSU professors and students.

Over the past year, one more educational opportunity has been restored, enhanced, and constructed that will provide researchers, students, and the public an opportunity to see first-hand how stream restoration can protect land and improve water quality. OSU, working in cooperation with the Oklahoma Conservation Commission, received an American Recovery and Reinvestment Act loan through the Oklahoma Water Resources Board to perform natural stream restoration and enhancement of a section of Cow Creek, which runs through the Botanic Garden.

"This project will leave the site in its native condition, and this provides a unique opportunity and competitive advantage for use by students and practitioners," said Maronek.

In addition to the stream restoration work, a treatment wetland has been constructed. The wetland will serve to filter runoff from agriculture research land and from OSU's water treatment plant. The wetland has a variety of native species planted to improve insect pollinator habitat.

While this has been a beneficial project for OSU and the state of Oklahoma it has not been without headaches. Maronek said some of the biggest challenges were regulation compliance (before and during construction) and Mother Nature. Fortunately, it was a mild winter, for which the Southern Excavating employees, who did most of the construction work, were glad. Maronek said it was also important to work with people who had experience with natural stream restoration.

The OSU departments involved in this project include Entomology, Biosystems and Agricultural Engineering, and Horticulture and Landscape Architecture. OSU is also working with state and federal agencies such as the Natural Resources Conservation Services, Oklahoma Conservation Commission, and Oklahoma Water Resources Board.

Cow Creek before restoration began.

Cow Creek with restoration practices implemented.

Cow creek had begun to severely erode the streambank, resulting in loss of land and increased sedimentation in the stream. This led to poor water quality and threatened buildings and utilities at the Botanic Garden. Several OSU departments and government agencies came together to develop a plan to restore the stream to a more natural state, while providing education and research opportunities.

"Cow Creek is an opportunity that fit the mission of the Botanic Garden to serve as a place for environmental research and education," said Dale Maronek, Botanic Garden Director and Department Head of Horticulture and Landscape Architecture.

Cow Creek is being restored using bioengineering techniques such as re-sloping the bank and placing rocks in the stream to help direct the flow of water, thus reducing pressure on the bank. Reestablishment of the riparian area is also an important component of restoration, as this helps increase biodiversity in the stream and the riparian area. Native plants were used to help with bank stabilization, as well as improvement of the riparian area. All of these things will work together to improve vegetation, provide habitat for aquatic and terrestrial species, and increase the population of insect pollinators.

The project impact statement says this project "establishes a multidisciplinary environmental team focused on future environmental initiatives. The opportunity to conduct research on such a controlled stream channel system will give OSU researchers a competitive advantage on proposals to the National Science Foundation, USDA, and USGS."

OSU has another stream restoration project funded in the same manner as the Cow Creek project. This second project is in the Illinois River watershed where 11-12 sites will be restored using many of the same bioengineering techniques used at Cow Creek. Designs are currently being developed and the permitting process is in its beginning stage; work should begin around the first of June.

As part of the education component of these projects, several workshops will be held this summer in Tahlequah. The first will be in early June and will help state agencies and non-profits that want to restore streams learn how to read the designs and inspect the work. Additional workshops will be held on design, engineering, and plant selection. For more information on natural stream restoration and to follow the progress of the OSU projects visit http://lid.okstate.edu/natural-stream-restoration.

News & Events

Upcoming Events:

OK Clean Lakes and Watersheds Association Conference near Edmond, OK.; Apr 12-13, 2012. More @ http://www.oclwa.org.

National Water Quality Monitoring Council's 8th Annual Conference in Portland, OR; April 30-May 4, 2012. More @ http://acwi.gov/monitoring/conference/2012/index.html.

National Water Conference in Portland, OR; May 20-24, 2012. More @ http://www.usawaterquality.org/conferences/2012/default.html.

Blue Water, Green Water and the Future of Agriculture in Lincoln, NE; May 30 - June 1, 2012 . More @ http://waterforfood.nebraska.edu/wff2012.

Stream Restoration Workshops in Tahlequah, OK; several this summer. The first will be in early June and targeted to state agencies and non-profits. More @ http://lid.okstate.edu/natural-stream-restoration.

2012 UCOWR/NIWR Conference in Santa Fe, NM; July 17-19, 2012. More @ http://www.ucowr.org.

Congratulations to Dr. Bob Puls, who recently was chosen to head the newly formed Oklahoma Water Survey at OU. Bob brings years of experience and leadership from his work at the EPA's Kerr Lab in Ada to his new position. He also served on our Water Research Advisory Board for a few years. We look forward to collaborating with Bob in his new capacity.

A Growing Family (by Leslie Elmore)

Any new relationship brings with it changes; usually this new relationship is for the good and mutual benefit and furtherance of both parties. This is certainly the case with the adoption of the OWRRI into the Division of Agricultural Sciences and Natural Resource's (DASNR's) Water Research and Extension Center that occurred last August. We've taken a new name, moved into a new place, and are combining our resources.

Recently we've adopted the name Oklahoma Water Resources Center in an effort to simplify naming, while reflecting our goal to be a clearinghouse for water resource information in Oklahoma. With Field Research Service Units and OSU Cooperative Extension (both part of DASNR) having offices throughout Oklahoma, we truly do have a statewide presence and impact.

We moved into our new place last August. If you haven't taken the opportunity to stop by for a visit, you may not know we have moved up in the world, or in Ag Hall, at least. We have set up offices in rooms 245 and 239. Stop by and visit sometime — no housewarming gift necessary.

The latest combining of assets is the joining of our two Web sites. Online materials from the Water Research and Extension Center and information common to both have been placed onto our new site water.okstate.edu. I am currently incorporating the last of the OWRRI materials. When this is complete, visitors wanting to find funding opportunities, get information about our annual research symposium, or learn more about the water research and extension activities going on around the state need visit only one site.

With so many changes taking place, it's impossible for everything to happen overnight, but steadily we are working to strengthen one another and settle into our new responsibilities in this cohesive partnership with similar interests and missions.

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