Summer 2015 Study Abroad!

WHEN: August 15th, 2015 to August 29th, 2015
WHERE: Hacienda Santa Clara, Guanajuato & University of Guanajuato, Guanajuato.

BY CAMILA BIAGGI

If you have comments or questions, or if you would like to submit an article, please email us at TheDrop.WMHS@gmail.com.

Get ready to learn, travel and experience! Our core course WMHS 602: Contemporary Issues in Water Resources: “U.S. Mexico Water, Food, Energy nexus” will be offered as a Study Abroad Program in the state of Guanajuato Mexico from August 16-29, 2015. This summer course will focus on the water, food, and energy nexus in the U.S. and Mexico. It will include an analysis of the biophysical, social and institutional factors in decision-making. Exposure to cultural, institutional, social, political and economic differences among countries is crucial to developing strong critical thinking skills.

More specifically it involves:
- Identification of main contrasting differences in water issues / problem-solving or assessment approaches in the US and Mexico.
- Institutional / legal issues in the water-energy-food production planning process at national / binational / transboundary level.

For further information please contact our WMHS Program Coordinator, Rosario Sanchez: rosario@tamu.edu

WMHS 689: International Water Law, Fall 2015

We are pleased to announce our International Water Law class that will be offered for the first time this Fall 2015. This class will be taught by Professor Gabriel Eckstein from the Texas A&M School of Law in Forth Worth, Texas using TTVN. WMHS students in College Station (KAMU studio) as well as students from Galveston Campus will connect live for a truly broadcasting experience that will be recorded and archived in the WMHS youtube channel (WMHS program).

Keep an eye on the Fall 2015 schedule coming soon…

Congratulations!

To our students that graduated last December 2014: Alisha Multer (MWM), Xin Liu (MS), Alan Lewis (MS), Ray Kamps (PhD), Min-cheng (Peter) Tu (PhD) and Kevin Gamache (PhD), congratulations to all of you and we can only say we shall see you in the water field! Good luck and Gig’em!

Join the Linked In Group ‘Texas Aggie Water Managers & Hydrologic Scientists’

Water Program current and former students are invited to join the new LinkedIn group ‘Texas Aggie Water Managers & Hydrologic Scientists’ is designed to be a more interactive way to facilitate better communication among us, and to explore ways to continue to improve what is already a world class graduate degree program.” If you are not a member yet, please log in (get a linked in account) and join the group.
https://www.linkedin.com/groups/Texas-Aggie-Water-Managers-Hydrologic-8225806

Annual Water Speaker Series Program
Texas A&M University School of Law and the Water Management and Hydrological Sciences Program jointly present:

Dr. Rogelio Montemayor Seguy
“Energy and Water in the Rio Grande Basin: Drought and energy challenges between Mexico and Texas”
April 27 and 28, 2015

This year our Water Speaker Series will host Dr. Rogelio Montemayor Seguy. Dr. Montemayor is a former Governor of Coahuila, Mexico, former President of PEMEX during the Zedillo’s administration, and currently President of the Mining and Energy Cluster of the State of Coahuila. Since Mexico’s recent deregulation of its energy sector, he has been an active voice in the energy reform and fracking/shale gas industry. Dr. Montemayor holds a PhD in Economics from the University of Pennsylvania where he worked with Nobel Prize (Economics) recipient, Dr. Lawrence Klein. Dr. Montemayor will present two lectures – one at the Law school (April 27) and a second in College Station (April 28). Save the date! For additional information please contact:
Rosario Sanchez: rosario@tamu.edu

WATERS IN THE NEWS

Texas News:
Groundwater Wars Brewing in Austin's Suburbs
Texas Tribune

Issues arise when a Houston-based company plans to pump groundwater in an area of Hayes County that is not regulated by a groundwater conservation district.

Israeli Company Eager to Solve Texas' Water Woes with Desalination
Austin Business Journal

Kadima, an Israeli-based company, opens up office in Austin and plans to use expertise in desalination plants to assist Texas water utilities.

Water District Completes ClearWater Project
Midland Reporter-Telegram

Midland County Fresh Water Supply District No. 1 completed its second major project on time and under budget.

Emerging El Nino Could Spell Relief from Lingering Drought.
WacoTrib.com

Meteorologists report signs for a wetter 2015 due to the weather pattern in the Pacific Ocean.

National News:
South Platte Basin Group Looks for Water Alternatives
Reporter-Herald

In Colorado, the South Platte Basin Roundtable, is studying conservation and water supply options for the future.

Study: $18B to Divert Missouri River to Irrigate Farms
SeattlePi

The U.S. Army Corps of Engineers estimates building an aqueduct to transport water to Kansas would have high costs and take 20 years.

The Future of Water Transfers After the 2014 Drought
Maven’s Notebook

Different types of water transfers were heavily discussed in California, including groundwater substitution, crop idling and land fallingow, and reservoir reoperation.

Las Vegas: City of Gambling, Tech Conferences, and Water Crises
Fortune

A three mile pipeline below Lake Mead is finally complete and will help support water supply to Las Vegas.

If you have comments or questions, or if you would like to submit an article, please email us at TheDrop.WMHS@gmail.com.
Antibiotics and antibiotic resistant bacteria, an increasing threat from agricultural production

The increased incidence of antibiotic resistant bacteria (ARB) is posing a significant human health concern in the U.S. and globally. The misuse and overuse of antibiotics has resulted in the release of antibiotics into the environment which has given rise to antibiotic resistant bacteria. Transport via through soil to aquifers and surface water supplies, are the primary mechanisms of distribution resulting in the development of antibiotic resistance of indigenous organisms in these ecosystems.

Bacterial resistance to antibiotics develops through mutation of the bacterial genome or acquisition of gene coding resistance. Evolution of antibiotic resistance is enhanced by the presence of resistant genes on mobile genetic elements and by the use of antibiotics in concentrations that enable them to behave as selective agents [22]. In agriculture, ARB may be transferred to humans from food producing animals through the food chain, occupational exposure, or waste runoff from animal production facilities [22, 8]. The use of antibiotics in animals has been associated or implicated as a source of antibiotic resistant bacteria in humans [15, 10]. However, the risk posed to humans by antibiotic resistant bacteria coming from agriculture has not been clearly established, but is likely an indirect pathway of exposure. Approximately 28.8 million pounds (80%) of the antibiotics produced in 2009 were administered to food producing animals. Tetracyclines are the most commonly administered group of antibiotics in the US. In 2009 and 2010, 10.1 million and 12.3 million pounds were administered to food producing animals, respectively, either for therapeutic, prophylactic or growth promotion purposes [6, 5].

Antibiotic resistance has decreased the effectiveness and increased the cost of antibiotic treatments [21]. However, the major concern is not the direct infection of antibiotic resistant bacteria; rather that resistance can be acquired and transferred between bacteria species. For example, antibiotic-contaminated soils can occur when a manure/slurry is applied to cropland to improve soil quality. Some types of antibiotics such as Tetracyclines may sorb rapidly and strongly to soil, yet are still bioavailable to microorganisms suggesting a potential scenario for toxicity or resistance to develop [11, 4]. Other groups such as Sulphonamides may leach into groundwater sources or reach surface water through runoff.

Antibiotics are routinely administered prophylactically, for growth promotion in animals and to control certain bacterial diseases in crops and animals. Antibiotics enter the environment, they can alter composition and diversity of indigenous soil microbial communities, which can inhibit the decomposition of organic matter, alter nutrient cycling, and change energy flow [11]. Another consequence of antibiotic release to the environment is the potential selection of antibiotic resistant organisms [13, 14]. The use of antibiotics as growth promoters in animal husbandry has been a common practice in the US and other countries since the 1950s [9]. Controversy emerged in the scientific community over the use of antibiotics in animals for non-therapeutic purposes (as growth promoters) due to the potential of developing antibiotic resistant bacteria and exposure of humans [7]. The debate still continues in the United States and other countries [1, 16]. Since the mid-1990s, Europe banned the practice of using many antibiotics (e.g. avoparcin, virginiamycin, bacitracin, spiramycin and tylosin) for non-therapeutic purposes based on the “Precautionary Principle” (when an activity raises threats of harm to the environment or human health, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically) [18]. However, the cost/benefit ratio and the insufficient scientific evidence linking use to the proliferation of resistant bacteria are the main reasons for the lag in action in many countries [19, 20].

Land application of antibiotic-contaminated slurries is a common agricultural practice in the US, Europe, China and other parts of the world due to its value as a nutrient supplier and as an advantageous-waste disposal method [2, 12]. Prior to land application, there is the potential for antibiotic degradation to occur during storage of manure and the slurry phase [3]. However, management practices vary depending on breeding scale, type of livestock and operation, production stage of the animals, and region. Manure and slurry storage times range between 0 to 48 months and 0 to 50 months, respectively [17].

In livestock production, transport of antibiotics through the environment can expose soil, surface water, sediment, and ground water media through different pathways; such as, excretion by grazing animals or intensively outdoor reared animals (in dung and urine), spillage during topical application, direct discharge to the environment and disposal of waste material (manure/slurry and dirty water) (Figure 1). Even though each livestock production type has different housing and manure production characteristics, antibiotic release and distribution pathways are similar.

Many intensive livestock production farms house animals indoors for long periods of time. Consequently, large quantities of manure, slurry or litter are produced which are collected and stored until matured for land application or can be applied directly onto land (for grazing or outdoor reared) and have the potential for transport to aquifers and surface waters.

Antibiotics are administered in feed by intra-muscular and intramammary injections, intraruminal and/or topical. Independent of the method of application, a fraction of the dose is excreted in urine and feces or washed off in the case of topical application. Antibiotic-contaminated manure/slurries are spread onto soil. Depending on the antibiotic properties, the antibiotic remains in the soil, sorb to soil, leach to groundwater, be transported in runoff and reach surface water [3].
**Antibiotics**

cont. from page 3

Final Remarks

Due to the misuse and overuse of antibiotics in agriculture and health care facilities, the potential scenario of reaching the “Post-antibiotic era” seems to be closer. Every year, increased occurrence of ARB cases are reported, and physicians report that some common bacterial infections are now resistant to even the strongest antibiotics. These developments indicate the urgent need to change practices for the rational use of antibiotics in both humans and veterinary medicine. Expanded assessment of environmental exposure to understand the fate and interactions of antibiotics in soil and water environments is essential to evaluate how exposure pathways contribute to the generation of antibiotic resistant bacteria.

References


The Doppler effect and some applications

The Doppler Effect is the apparent shift in frequency at which sound or light waves leave a source and that at which they reach an observer, and can be easily computed by the equation:

\[ f' = \frac{f_v + f_o}{f_v - f_o} \]

Where \( f_v \) is the frequency at which the observer will perceive the sound, \( f_v' \) and \( f_o \) are the speed of sound, the observer and the source, positive in cases at which they are getting closer, and negative otherwise. And \( f_v \) is the frequency at which the source is emitting the sound.

Let’s look at an example of it that all of us have experienced at some point to illustrate the concept, while driving or walking on the street, when you hear an ambulance approaching you (the distance between the source and the observer is reducing) the sound gets pitched higher. Now notice that its pitch drops suddenly as the ambulance passes you (because the source is moving far from the observer). But the ambulance that reduces the pitch of the siren, then notice that its pitch drops suddenly as the ambulance passes you (because the source is moving far from the observer). But the ambulance is emitting sound at a fixed frequency. If neither the ambulance nor you were in movement, you would hear the sound without alterations. That difference in the way we perceive the sound is the Doppler shift.

Now, why is it important? Acoustic Doppler equipment are widely used in water related studies, one of its many application is discharge measurement, where we have multiples choices that goes from the basic 2 dimensional velocity meters (we can observe an example in Figure 1), where we must follow the same procedure than with a current meter. To the Acoustic Current Doppler Profilers ADCP (in Figure 2) that measure depth, velocity (in a high number of cells) and position (GPS-referenced) as we pass through the section.

The basic principle of operation consist in emitting pulses at a fixed frequency and listening to the echoes returning from sound scatterers in the water.

**Fig. 1.** The flowtracker; an Acoustic Doppler Velocimeter designed for wading from the manufacturer SonTek which comes in 2D and 3D versions.

This echoes are shifted because of the movement of this scatterers in the water (which are assumed to be moving at the same velocity of water).

The use of this equipment presents the advantage that we can obtain not only the magnitude of the velocity, but the direction (in the case of the 2D only the angle of the velocity vector with respect to a line parallel to the edge of measurement) which allows to perform some corrections and obtain a more precise rate of the velocity.

Another advantage compared with traditional equipment is the amount of time required to perform the discharge measurement in deep rivers, this time get reduced in a high percentage with this tech. It is important to remember that discharge measurement are of high importance and have a lot of applications in any water related study, for example, in water quality measurement analysis it is usually required to know the discharge of the river at the time the samples are taken, and must be performed in all the gaging station (The U.S. Geological Survey (USGS) makes tens of thousands of streamflow measurements each year across the United States and its territories ) in order to build the rating curve for each station, which is, in ultimate instance what allows us to have discharge data in each of this stations. The relationship between height and discharge must be established for each station, from low to high flows.

**Fig. 2**

Doppler Effect cont. on next page
This task require a lot of work and time, which is saved thanks to the developments of this technology. An important number of measurements must be made before a reliable elevation-discharge curve can be established. Once a rating curve is established it is still required to continue with the discharge measurement, since any change produced in the bottom of the cross-section of the river (by erosion, deposition, or a high flow event, etc.) can change this relation, and the current curve won’t be valid once it occurs.

Doppler equipment is also used to perform bathymetries in shallow and deep waters, monitoring waves and current near shore region (which usually would require separate instrumentation), measuring currents in the oceans, NOAA is using one ADCP to look at the hydrodynamics of coral reef system. There is a range of Doppler equipment available for the different activities required and it is important to select the one the better fits the information you need, and to know the scope and limitation of each one of them.

Legislative Lowdown: Groundwater Legislation in Texas

The Texas 84th Legislative Session is officially in session, having started as of January 13th, 2015. Texas has a legislative session every two years that lasts 140 days, unless a special session is called by the governor. This means any change in policy must make it through all the appropriate committees, houses, and signed by the governor by June 1, 2015. This is an almost impossible feat, and therefore most bills filed do not make it through the process in the limited time.

Many water organizations have been gearing up for the last year and a half to create bills that can be agreed upon by all interested parties. These organizations have a variety of backgrounds, viewpoints, stakeholders, and interests which can lead to disagreement in legislation, therefore the more these organizations can find common ground prior to session, the better chance the bill has to be signed into law. As threat of water scarcity continues to grow, as well as advancement in technology, new ways of storing water have become to surface. One hot item in legislation this session is aquifer storage and recovery projects. This topic has been debated by many water resource organizations as well as had attention in the State Legislature.

The bill that the Texas Water Conservation Association has approved is related to Aquifer Storage and Recovery (ASR) Regulation. Committee is made up of a diverse group of stakeholders of water regulation (Williams, 2015). State Representative Lyle Larson of District 122 is carrying this legislation, now House Bill 655, relating to the storage and recovery of water in aquifers, authorizing fees and surcharges. This bill had over a 90% approval rate from the legislative committee of the Texas Water Conservation Association. ASR projects according to this bill involves injecting water into a geologic formation as part of an aquifer storage and recovery project. There will be an injection site where the water is injected into the underground formation by use of a well, and a recovery site where water will then be recovered when needed from the underground storage. This bill deems that the Texas Commission on Environmental Quality (TCEQ) has jurisdiction over regulation and permitting of ASR projects. The project operator must report to TCEQ on a monthly basis and annually provide a copy of this report to any water district in which the project has wells located. Also, if the ASR project recovers groundwater that exceeds the volume authorized by TCEQ, the project operator must report the amount of excess to the water districts. This bill does not give water districts any authority over ASR projects, but does allow them to continue to have updated information on the aquifers and geological formations by requiring ASR projects to report to the districts. More information regarding this bill can be found here.

Currently, San Antonio and Kerrville are the two successful ASR projects in Texas (TWRI, 2014). The idea of storing water in an aquifer begins as environmental awareness has grown, causing a push against more dams in Texas (Hernandez, Uddameri, & Arreola, 2014). And have now been viewed to have greater potential rather than above ground structures such as reservoirs (Hernandez et al., 2014).

In order to have a successful ASR project, planning, design, and quantifying storage and withdrawals must be developed (Uddameri, 2007). In general, however, the benefits of sub-surface storage have noticeable improvement and value. Above-surface water sources are subject to ecological restriction, which in times of drought can have negative impacts on both estuaries and municipal economies (Hernandez et al., 2014). Underground storage would also reduce water lost to evaporation (TWRI, 2014). However, there are also some gaps that make ASR projects difficult to operate and manage. The main issue with ASR projects include inexperience with technology, and concerns about the policies and control of the water once it is in sub-surface storage (TWRI, 2014). Another issue is that ASR projects can only be created in areas with certain geological formations and chemical characteristics (TWRI, 2014). Being a new technology, there are a lot of unknowns about once the water is injected into the ground and where it might go, because there is not a history of tested areas to improve the model (TWRI, 2014). Lastly, it is a costly project and its uncertainties have some water suppliers choosing not to take the risk (TWRI, 2014). There is a lot of ongoing research to learn more about how ASR can improve water supply in Texas in order to develop expertise and policy decisions (TWRI, 2014).

The second hot topic in Texas Legislation this session is the regulation of brackish water. The term brackish water defines water with the amount of total dissolved solids being between 1,000 milligrams per liter to 10,000 milligrams per liter. For a reference, seawater is considered to contain 35,000 milligrams of total dissolved solids per liter (TWDB, 2014). As of yet, there has not been consensus for brackish legislation between stakeholders, and several bills have been filed relating to brackish groundwater. Representative Larson has filed 3 house bills, HB 30, 835, and 836 relating to brackish water legislation. You can find more information about these bills here. The issue lies within who should have authority of brackish groundwater use. Some believe groundwater districts should serve as the authority while others would like TCEQ to regulate, however there are other minor points of disagreement as well (Williams, 2015). This topic will remain on the radar as session gets further on its way. It is sure that this topic will be debated, but whether a consensus will arise is still unknown.

References

Figure 1: www.twed.org

Figure 2 ADCP from manufacturer Teledyne RD Instruments. And the typical result for the velocity profile of a river obtained with an ADCP.
Legislative

The last important point that needs to be mentioned is the change in the Senate Committee for this 84th Legislative Session. On January 21st, Lieutenant Governor Dan Patrick announced the committees, reducing the number of committees and changing some of their functions. In the past, water legislation was heard in the Natural Resources Committee. However, this session, Lt. Gov. Patrick has combined Natural Resources and Economic Development Committee and created Agriculture, Water, and Rural Affairs Committee which previously was Agriculture, Rural Affairs and Homeland Security. It is assumed that water legislation will now pass through the latter committee. The House of Representatives committee assignments were also announced, with Natural Resources still being a stand-alone committee. For more information about state legislation this session, visit http://www.capitol.state.tx.us/.

Hydraulic fracturing in South Texas: water insight

Hydraulic fracturing has grown to be an arising subject in Texas water issues as parts of South and Northeast Texas experience large volumes of frac wells. Hydraulic fracturing is the process in which rock is fractured by hydraulically pressurized liquid made up of a combination of water, sand, and chemicals. These fractures in the rock allow flow of oil and gas to a well. In Texas, groundwater is considered a private property, and therefore fracking companies must buy or lease the water used for fracking operations, or haul in the water from another location. This is furthering the economic benefit to landowners who are meeting hardships with agricultural activities because of events like the drought of 2011.

Recently, hydraulic fracturing technology has brought economic growth in counties of South and Northeast Texas. As shown in figure 1, the economic growth rate of the top 7 producing counties in South Texas was 22 percent per year during 2009-2012. This large amount of fracturing has quickly increased energy security in not only Texas, but the United States (Benton et al., 2014). It is estimated that current production in South Texas is just a fraction of what could possibly occur, bringing continuous economic benefits to Texas for more years to come (Benton et al., 2014).

Although there are large economic benefits from hydraulic fracturing, there are also some environmental implications, such as land use, water consumption, air emission among others. It is important to note that water use for irrigation still is considered to be half of the water use in Texas. Consumptive use of water for irrigation account for 56%, municipal 26% and fracking 1% in recent years (Nicot et al., 2012). Despite the overall low use of water for fracking, the impact of water use can be higher in specific locations. The rate of groundwater withdrawal may become higher than the rate of recharge in this area. For instance a recent study conducted by Benton et al. (2014), reports that annually 500,000 acre-feet/year (af/yr) of fresh groundwater is consumed, while the recharge rate is 300,000 (af/yr) in Eagle Ford Shale counties. This implies that the groundwater resources in these counties may have negative drawn down affects. The rapid drilling growth in the Eagle Ford Shale makes it difficult to predict groundwater use and increase in consumption, especially in dry conditions (Benton et al., 2014). As noted by Nicot et al., groundwater consumption has drastically increased in the mining category, leading policy makers to question how long irrigation will be the highest use in specific areas.

Despite this facts, currently, there is minimal oversight by Groundwater Conservation Districts (GCD) that can regulate the aquifers to ensure future use of the resource. The main oversight for oil and gas exploration is the Railroad Commission of Texas. However, since the use of hydraulic fracturing has increased so quickly, specific legislation and regulation had to be made quickly. The North east part of Texas is known for having adequate water supply, however the deep Southwest part of Texas (in most of the Eagle ford shale formation) it is a water stressed area characterized by dry climate. Therefore the main issues for Texas, and the focus of this article is mostly on quantitative dimensions of water resource the southern part of Texas.

Figure 1 Economic Activity of the Top 7 Producing Counties' in the Eagle Ford Shale Area

Figure 2 Most Active Counties’ Groundwater Consumption in the Eagle Ford Shale

Hydraulic fracturing in South Texas has economic benefits yet environmental complications as the ones mentioned here. In order to secure energy security and groundwater supply for the future generations of Texas, some changes might be needed in policy and oversight. It is believed that a balance can be found, as researchers and policy makers work to better the current system.

References

By: JIFAR NATA & MEREDITH EARWOOD

If you have comments or questions, or if you would like to submit an article, please email us at TheDrop.WMHS@gmail.com.
The Aggie Green Fund: Providing funds to make Texas A&M a more sustainable campus

Have you ever wondered how you can leave your legacy at Texas A&M? One way that students, staff, and faculty can improve the campus is through the Aggie Green Fund. The Aggie Green Fund is a grant-giving organization that empowers Aggies to take action and bring about novel and creative sustainability initiatives to the Texas A&M campus. We provide funds for projects that create visible and measurable sustainability impacts, as well as those that improve campus infrastructure. The Aggie Green Fund works by funding initiatives to improve recycling, energy efficiency, renewable energy, transportation, and other sustainability programs. We provide grants for projects led by students, faculty, and staff members, as well as any combinations of these groups. Funding from the Aggie Green Fund is given through a two-step process. First someone must submit a grant proposal abstract which gives a general description of the projects as well as an estimate for the projects budget. If approved by the Aggie Green Fund Board, the person submits a longer grant proposal.

Many visible and popular projects relating to sustainability on campus have been funded by the Aggie Green Fund. One of the major projects that have been completed in the past few years includes the installation of Big Belly Recycling Bins throughout popular locations around campus. Another project that has received funding from the Aggie Green Fund are the water bottle filling stations in residence halls, Evans Library, and many other buildings located throughout campus. Recycling throughout the residence halls are another major project that has been funded for several of the past years. One of the largest projects funded through the Aggie Green Fund is the Howdy Farm. Howdy Farm is a student created and maintained farm located on West Campus behind the Horticulture and Forest Science Buildings. The Howdy Farm produces a wide variety of crops in a sustainable manner. Funding from the Aggie Green Fund has provided a portion of the start-up money needed for the farm, building storage locations, buying tools, as well as creating ways to sustainably use water (such as rainwater harvesting).

Water is another central topic to many projects funded by the Aggie Green Fund. As mentioned previously, water bottle filling stations have been installed using money from the Green Fund to decrease dependencies on bottled water. Another project focused on water is updating the sprinkler heads around the George H.W. Bush Library. By installing new sprinkler heads, as well as a new irrigation control system, this project hopes to decrease water consumption by 30 to 40% at the Bush Library. New low flow showerheads were installed at Mosher Residence Hall from funds provided by the Aggie Green Fund.

The Aggie Green Fund receives their money from a fee included in each student's fee and tuition for each semester. This fee is titled “Environmental Service Fee”. This fee comes from House Bill 3353, which allows for each state university or college to charge students for an Environmental Services Fee. One of the requirements of this bill is that each institution have a general student election to see if the students would be in favor of this fee. This was approved by a majority of students when it was put up for vote. The fee charges each student roughly $2.50 (it fluctuates but is usually lower than $5). Every year we receive around $275,000 in order to award to projects. While we are given $275,000 a year, we do not hand out that amount each year depending on the projects we receive for funding.

There are many ways you can get involved with the Aggie Green Fund. The most obvious way to get involved is to submit grant proposals. While this years deadline has past to submit abstracts, you can still prepare an abstract for next year. A date has been set for March 6th at 5pm. Another way you can get involved is to apply to be on the Aggie Green Fund Committee. The Committee is made up of 3 faculty and staff members, and 4 student members. The student members of the Committee has been made up of both graduate and undergraduates in various departments throughout the university. This application will be available later in the spring semester and I would highly recommend to apply for it. Being on the committee gives you knowledge about managing a large grant, analyzing applications for very complex details, and allows you to work and interact with a very diverse group of individuals.

For more information about the Aggie Green Fund, please go to http://greenfund.tamu.edu/Default.aspx. Information about House Bill 3353 can be found here (a direct link to the bill) http://www.legis.state.tx.us/tlodocs/81R/billtext/html/HB03353F.HTM. You can also contact me at brian_jonescu@tamu.edu for more questions or if you would like to get more information about getting involved with the Aggie Green Fund.

BY: BRIAN JONESCU

If you have comments or questions, or if you would like to submit an article, please email us at TheDrop.WMHS@gmail.com.
The Quest for Data: A Westerner in Bangladesh

As I waited in the Dubai airport to board my flight to Dhaka, Bangladesh, I could already tell that I was in for a culture shock. Before the flight attendants started announcing that our plane was ready to board, everybody in the terminal had lined up and started pushing to the front. It was like they were afraid they wouldn’t get a seat if they didn’t force their way on, never mind the fact that everyone has a pre-assigned seat.

After everyone had successfully fought their way through the gate, we all boarded the tram that would drive us to our airplane. There were only about five other women flying with me, and we were directed to board through one set of doors, while the men were sent to another. At first I thought this was overtly sexist, but once I had boarded the small, crowded tram I realized that I felt more comfortable surrounded by the other women.

The five and a half hour plane ride to Dhaka went by quickly compared to the 14 hour flight I had taken from Washington Dulles to Dubai, and when I landed I couldn’t believe it. I was actually in Bangladesh! Who goes to Bangladesh? It’s not a place I had ever thought I would see. I realized that if it didn’t have so much great research potential for everything water-related, then I almost certainly would not have ever visited. Once I arrived in Dhaka, I met my advisor, Professor Peter Knappett, at the hotel and had a day and a half to settle in before we started our field work. The first part of our research would focus on the Meghna River.

We had collected as much data as we could, first on the Meghna River, and then on the Shari River, a small, northern tributary of the Meghna. It was a productive trip, as well as one I would never forget. I did some things I never expected—like take an ambulance to our field site because political unrest was keeping all non-emergency vehicles off the roads. I also saw plenty of things that were entirely new to me. The roads had no lanes and seemed like a total free for all. People walked straight through busy intersections, assuming that all cars would stop for them as long as they put their hand up in front of them. The cities were crowded and smelly with trash strewn about everywhere. The clouds of mosquitoes gave me nightmares of dengue fever and malaria, and I couldn’t drink the tap water without fear of getting sick. My food options were limited by my “weak” western stomach and sensitivity to spices. But in the end, I think it was all worth it.

Bangladesh, lying on the Ganges-Brahmaputra-Meghna Delta, provides a great opportunity to collect abundant data about groundwater-river water interactions, groundwater contamination issues, the effects of tides on delta processes, and numerous other natural phenomena. Labor there is extremely cheap and allows for the collection of far more data than would be possible in most other countries. The world has the potential to learn a huge amount from the data that can be collected here. I am very excited to see what our data tells us, and to see just how much the world will learn from this remarkable setting in the future.

An intersection in Dhaka.

A crowd that formed around my advisor, Professor Peter Knappett, as he used a GPS to find elevation data.

BY: KIM RHODES

If you have comments or questions, or if you would like to submit an article, please email us at TheDrop.WMHS@gmail.com.
Groundwater Districts in Texas: An Overview

Kathy Turner Jones Discusses the Benefits of the WMHS Program has had on her Position of General Manager at the Lonestar. Groundwater Conservation District

CONROE, TX -- Kathy Turner Jones, general manager of the Lone Star Groundwater Conservation District (District), is currently pursuing a master’s degree in Water Management and Hydrological Science Program (WMHS) at Texas A&M University.

“If I have found the knowledge I’m gathering relates directly to my current position at the District,” said Jones. “Learning about how biophysical and social sciences interplay helps me better understand the technical aspects being employed and communicate with the consultants and hydrologists we use on a regular basis to conduct studies on groundwater availability.” Jones further states, “The courses I have taken provided the education necessary to work with representatives of the Texas Legislature regarding legislation that is paramount to the groundwater industry. My course work provides the education in the groundwater water resources to articulate the pros and cons of the proposed legislation.”

“My environmental law class has been helpful, especially when dealing with amendments and changes to our District Rules,” said Jones. “This perspective from the law’s point of view helps me avoid making changes that could lead to negative legal outcomes.”

Montgomery County is fortunate to have not experienced drought to the severity that other areas of Texas has seen, yet the program gives me the tools to further explore and initiate discussions about the county’s future in terms of water supply. I am more aware of alternative sources available, as well as the related negative impacts of overdraining our aquifers.

“As a groundwater district, our goal is to conserve, protect and enhance the groundwater resources of Montgomery County. Even though I’m still in the midst of the program, I’m already reaping benefits from what I’ve learned, and I believe the future of our county also benefits from the pursuing of my advanced degree,” said Jones.

Under Jones’ direction, the District established its offices in Conroe, Texas, built a core staff and office operation, established a well permitting and registration system and approved District Rules. She has also led the District through the process of compiling hydrologic information on the characteristics of the Upper Gulf Coast Aquifer, engineering conversion, information on water usage and water supply in Montgomery County and implementing regulatory procedures associated with the District’s Groundwater Regulatory Plan.

The District’s Groundwater Regulatory Plan impacts all public water supply systems in Montgomery County including investor owned utilities, municipalities and utility districts. All public water supply systems are in the process of managing their groundwater withdrawal through conversion to an alternative water source, Jones notes that the material learned about surface water and water resources management has been extremely helpful during this transition, as she works with area water providers, stakeholders and elected officials.

Jones also serves as a member of the Region II Water Planning Group, Chair of GMA 14 and currently serves on the Trinity and San Jacinto and Galveston Bay Basin and Bay Area Stakeholder Committee created by Senate Bill 3 during the 80th Legislative Session to look at environmental river flow issues in each river basin. She also currently presides as President of the Texas Alliance of Groundwater Districts (TAGD) and as an Executive Board Member of the Texas Water Conservation Association (TWCA).

Q&A with Gary Westbrook, General Manager at the Post Oak Savannah Groundwater Conservation District.

Q: What are GCDs and how many are in Texas?
A: GCDs are political subdivisions of the State, created and empowered with the specific authority and responsibility of management of groundwater resources within the specific boundaries of their GCD, according to Chapter 36, Texas Water Code and their enabling legislation.

Q: What factors go into most GCDs’ Management Plan?
A: A GWMP is the governing document of the GCD. It should contain lists of the goals establishing by the Directors of that GCD which outline how the District will manage the groundwater resources of the District, as well as an outline for accomplishing the purpose of the District as outlined in Chapter 36, TWC and the District’s enabling legislation.

Q: How do GCDs manage water levels & continue to respect property rights
A: The primary and over-riding purpose of all groundwater conservation districts is to regulate the production of groundwater to protect and conserve the aquifers as a continuing, long-term supply of water for the benefit of the residents of the district and the State of Texas. The Day Case made clear to groundwater districts that landowners own the water beneath their land. However as with all property rights, when necessary to accomplish a public purpose, those rights are subject to reasonable regulation.

Q: What did the Day case establish for GCDs?
A: The Day case recognized that regulation of groundwater by the exercise of police powers was authorized by the Constitution and the landowner has absolute title to the groundwater in place under his land subject to the rule of capture and police regulations. This case also recognized the groundwater regulation must consider future needs. As a General Manager, it is imperative to keep up with new legislation and judicial rulings, and one like the Day case requires a review of the districts rules to ensure that no rules need to be amended in response.

Q: What has been the most challenging part of managing a GCD?
A: POSGCD has been “plowing new ground” since its creation by the legislature in 2001. There have been very few instances in which we could rely on another GCD’s management strategies as we developed our own. Like all other GCDs, POSGCD was created to deal with a situation which was somewhat unique to this area. This was due to the availability or groundwater resources and the interest in the marketing of those resources from this area to other areas of the state. Challenges have included continuing to find and define the balance between regulation of groundwater resources and the evolution of defining property rights, as well as participation in improvement of science used for the tasks facing POSGCD. My service has spanned from 2003 to now, and has seen most of the current process of groundwater laws and management which have been developed to date, such as the GMA/DFC process, as well as changes in ownership of groundwater as contained in Chapter 36, TWC, and the prevalent court cases. When I first began as GM of POSGCD in June of 2003 Chapter 36, TWC was approximately 55 pages. Currently it approaches 100 pages in length!
The Nexus in Texas: Food-Water-Energy Resources

A new class has started this semester, studying the Water-Energy-Food Nexus. This course is taught by TEES Endowed Professor at Texas A&M, Dr. Rabi Mohtar. The students in the course are currently discussing the interconnectedness of global resources in water, energy, and food as it pertains to sustainability of extraction, production, and consumption of these resources. This interconnectedness is termed a ‘nexus’. The water-energy-food nexus has come to the attention of many decision-makers, including the global, national, and local scales, as a way of making better decisions for the future security of these precious resources. We can no longer think of these resources as infinite, especially when there are stresses on the system, such as global climate change and increasing population. There are many areas on all scales that are hotspots for nexus activities, and each of them varies in complexities depending on the ecosystem. In order to understand this nexus, I will focus on the water-energy nexus in Texas, looking at the water-for-energy and energy-for-water issues that are still of major concern in this state.

In 2011, there was a comprehensive study done on the Energy-Water nexus in Texas that looked to quantify the relationship between electricity generation and water resources and what policy and society might do to improve this relationship (Stillwell, King, Webber, Duncan, & Hardberger, 2011). It was found that approximately 595,000 megaliters of water are consumed annually for cooling thermoelectric power plants that produce about 400 terawatt-hours of electricity (Stillwell et al., 2011). This is enough water to support about three million people for one year. On the other side of the coin, it was found that Texas uses approximately 2.1 to 2.7 terawatt-hours of electricity to run water systems and 1.8 to 2.0 terawatt-hours to run wastewater treatment plants annually (Stillwell et al., 2011).

Texas is a rapidly growing state, and has been in severe drought conditions for many years, including the exceptional drought in fall of 2011. The finite resources of water and energy are in great need of better management in order to be sustainable for future generations. In the 2012 Texas State Water Plan, it was found that there is a projected 40% gap between water supply and water demand projected for the year 2060 if current practices are not amended (Vaughan et al., 2012).

There are many areas in Texas where there are lots of discussions and some conflicts arising on how best to deal with this projected gap and the energy-water nexus inefficiencies described in the Stillwell (et al.) report. One is in Granbury, TX at Lake Granbury. Lake Granbury is a reservoir maintained by the Brazos River Authority. On this lake, there is a lot of tourism and local recreational activity. The upper Brazos River is also the recharge zone for the Trinity Aquifer, which provides water for major cities such as Austin and San Antonio. The lake and the Brazos River also provide water for energy operations such as the Comanche Peak Nuclear Power Plant and hydrofracturing, or ‘fracking’, operations for shale gas extraction and processing in the surrounding area. Since 2007, the lake level has been dropping significantly, and there are many different opinions as to why. Drought coupled with growing population in the area and demand for energy has greatly impacted this area, and there is no easy solution. The Brazos River Authority continues to sell surface water rights, saying that the drought is the main cause for the dropping lake levels. Many locals say it is the mismanagement of the water by the Brazos River Authority coupled with large quantities of consumption by the nuclear power plant. In response to this, there have been multiple groups that have been formed, such as The Brazos River Alliance and Save Lake Granbury, to fight the Brazos River Authority on the selling of more surface water rights. (McPhate, 2013)

It is evident that there is a lack of balance in the system regarding the management and use of the water in Lake Granbury. The growing population needs the electricity produced by the nuclear power plant, but loss of recreational activities and decreasing property values along the lake have the potential to greatly harm the economy in the surrounding area. This is a great example of how deeply connected energy production and water resources can be in Texas, and just how much a systems-thinking approach is needed to help come up with solutions to aid in the management of these finite resources for future generations.

References


By KAYLA ROHRBACH

If you have comments or questions, or if you would like to submit an article, please email us at TheDrop.WMHS@gmail.com.
The Drop

If you have comments or questions, or if you would like to submit an article, please email us at TheDrop.WMHS@gmail.com.

JIFAR NATA is from Ethiopia, holds Msc degree in agricultural economics from Texas A&M University in 2013. He is currently a PhD student in WHMS. His current research is focusing on economics of groundwater management in changing climate. He plans to pursue career in research organizations or consulting firms working in improving the groundwater management problems.

KATHY TURNER JONES is a native Texan. She earned her Bachelor of Arts and Sciences in Business with a Finance Minor from the University of the Southwest in Hobbs, New Mexico, graduating Summa Cum Laude. She is currently completing course work towards a Master of Science at Texas A&M University in the Water Management and Hydrologic Science Program. In 2002, Kathy was named General Manager of the newly formed Lone Star Groundwater Conservation District serving Montgomery County, bringing 12 years of groundwater experience and knowledge with her.

WATER FOR FUN

BY VICTORIA LOPEZ

Crossword Puzzle
Spring 2015 Edition

ACROSS
8 A famous attraction in Guanajuato.
9 The state in Mexico the city of Guanajuato is located in.
10 Only large natural lake in Texas.
12 Agency with jurisdiction over regulation and permitting of ASR projects.
13 A decrease in water quantity or quality can contribute to this.
14 Another word for collecting rainwater.
15 Create potential environmental hazards for water in Guanajuato.

DOWN
1 Mexico’s capital.
2 One of the three R’s.
3 A drinking water source for the city of Guanajuato.
4 Water that has more salinity than fresh water.
5 Production of this can transport antibiotics through the environment.
6 Groundwater mining can cause the land to do this.
7 Bacteria are showing resistance to this.
11 Another form of water storage.

Join fellow WMHS Students
For Happy Hour starting around 5:30 on Thursdays! Contact James or Taylor for more information:
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If you have comments or questions, or if you would like to submit an article, please email us at TheDrop.WMHS@gmail.com.
In order to be fair, we decided to play wheel of fortune to solve water issues between stakeholders

By CAMILA BIAGGI

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If you have comments or questions, or if you would like to submit an article, please email us at TheDrop.WMHS@gmail.com.