Texas Water Resources Institute
Texas A&M Institute of Renewable Natural Resources

Annual Technical Report
2018

General Information

Products

Noonan, Erin P., 2019, Salinity in the Northern Segment of the Brazos River Alluvium Aquifer: A Hydro-Forensic Approach: Baylor University, unpublished Master thesis, p. 1-232. (2018TX517B)

Noonan, Erin, and Yelderman, Joe C. Jr., 2018, Surface Water/Groundwater Interaction: A Forensic Approach to Salinity in an Alluvial Aquifer, Paper at the 2018 National Groundwater Association Groundwater Summit. (2018TX517B)

Noonan, Erin, and Yelderman, Joe C. Jr., 2018, Sources of Salinity in the Northern Segment of the Brazos River Alluvium Aquifer: A Hydro-Forensic Approach, Paper at the 2018 annual meeting of the Geological Society of America South Central Section. (2018TX517B)

Maulsby, Ferne. Quantifying risk reduction of flood mitigation measures for an urban watershed in Houston, Texas. (April 2019). Defended Master's Thesis. (2018TX518B)

Gregory, Lucas, Terry J. Gentry, Maitreyee Mukherjee, Roverto Rodriguez, Elizabeth A. Casarea, and Joy A. Truesdale, 2018, Texas Bacterial Source Tracking Program Application, Expansion and Marker Evaluation (FY16–FY17) (TR-508), Texas Water Resources Institute, Texas A&M University, College Station, TX, 34 pages. (Information Transfer)

Broad, Tyson, Tom Arsuffi, and Michael Schramm, 2018, Coordinating Implementation of the Upper Llano River Watershed Protection Plan (TR-509), Texas Water Resources Institute, Texas A&M University, College Station, TX, 34 pages. (Information Transfer)

Dictson, Nikki, Clare Entwistle, Nathan Glavy, Destiny Russell, Hughes Simpson, 2018, Final Grant Report for Riparian II (TR-510), Texas Water Resources Institute, Texas A&M University, College Station, TX, 26 pages. (Information Transfer)

Schramm, Michael, Tyson Broad, Tom Arsuffi, 2018, Escherichia coli and Dissolved Oxygen Trends in the Upper Llano River Watershed, Texas (2001-2016) (TR-511), Texas Water Resources Institute, Texas A&M University, College Station, TX, 20 pages. (Information Transfer)

Wurbs, Ralph A., 2019, Water Rights Analysis Package (WRAP) Modeling System Reference Manual (TR-255 12th Edition), Texas Water Resources Institute, Texas A&M University, College Station, TX. 464 pages. (Information Transfer)

Wurbs, Ralph A., 2019, Water Rights Analysis Package (WRAP) Modeling System Users Manual (TR-256 12th Edition), Texas Water Resources Institute, Texas A&M University, College Station, TX, 275 pages. (Information Transfer)

Wurbs, Ralph A., 2019. Fundamentals of Water Availability Modeling with WRAP (TR-283 9th Edition), Texas Water Resources Institute, Texas A&M University, College Station, TX, 116 pages. (Information Transfer)

Wurbs, Ralph A., Richard J. Hoffpauir, 2019, Water Rights Analysis Package (WRAP) Daily Modeling System (TR-430 3rd Edition), Texas Water Resources Institute, Texas A&M University, College Station, TX, 344 pages. (Information Transfer)

Wurbs, Ralph A., 2019, Water Rights Analysis Package (WRAP) River System Hydrology (TR-431 3rd Edition), Texas Water Resources Institute, Texas A&M University, College Station, TX, 241 pages. (Information Transfer)

Wurbs, Ralph A., 2019, Daily Water Availability Model for the Brazos River Basin and Brazos-San Jacinto Coastal Basin (TR-513), Texas Water Resources Institute, Texas A&M University, College Station, TX, 239 pages. (Information Transfer)

Sanchez, Rosario, 2019. Acuíferos transfronterizos México-EUA: Condiciones, retos y propuestas. H20. Gestión del Agua. Enero-Marzo 2019. No 21. pp. 56-62

Sanchez, Rosario, Laura Rodriguez, and Cecilia Tortajada, 2018, Transboundary aquifers between Chihuahua, Coahuila, Nuevo Leon and Tamaulipas, Mexico, and Texas, USA: Identification and categorization. Journal of Hydrology: Regional Studies. (Information Transfer)

Sanchez, Rosario, Laura Rodriguez, and C. Tortajadam, 2018, The transboundariness approach and prioritization of transboundary aquifers between Mexico and Texas. Ambio, 1-11. AMBIO.DOI 10.1007/s13280-018-1015-1 (Information Transfer)

Lozada, Laura Rodriguez, Rosario Sanchez Flores, Hongbin Zhan, and Peter Knappett, 2018, The Allende-Piedras Negras Transboundary Aquifer: An Initial Modelling Assessment. MS thesis. Water Management and Hydrological Sciences Program, Texas A&M University. (Information Transfer)

Gregory, Lucas F., Anna Gitter, Stephen Muela, and Kevin L. Wagner, 2019, Should Contact Recreation Water Quality Standards be Consistent across Hydrological Extremes? Journal of Contemporary Water Research and Education, Volume 166, Issue 1, 12-23. (Information Transfer)

Tracy, John, Jennifer Johnson, Leonard Konikow, Gretchen Miller, Dana Osborne Porter, Zhuping Sheng, and Steve Sibray, 2019, Aquifer Depletion and Potential Impacts on Long-term Irrigated Agricultural Productivity, CAST Issue Paper, Number 63, February 2019. 20 pages. (Information Transfer)

Information Transfer Program

The Texas Water Resources Institute (TWRI) continued its outstanding communication efforts to produce university-based water resources research and education outreach programs in Texas.

• Conservation Matters, a monthly email newsletter that covers the latest research and education news about land, water and wildlife in Texas and beyond state lines; 2,593 subscribers.
• txH2O, a 30-page magazine published twice a year, contains in-depth articles that spotlight major water resources issues in Texas; 4,791 subscribers (total for hard copy and online) with approximately 800 more distributed.
• The Texas Water Journal, an online, peer-reviewed journal published in conjunction a nonprofit organization; published 11 articles; 1,024 enrolled users, although registration is not required to view the journal.
• Texas+Water, a monthly email newsletter published in cooperation with a nonprofit organization and another Texas university water center; provides timely information on the spectrum of Texas water issues including science, policy, and law; 7,465 subscribers.
• Social Media: Twitter: 3,791 followers, 467,200 impressions (number of times our tweets were seen); Facebook: 1,756 page likes; Instagram: 646 followers; Pinterest: 845 monthly viewers and 442 followers; Linkedin: 98 followers.
• News media: 67 news releases with 75 media mentions.
• Website: TWRI recently updated its website to a more modern, responsive site: http://twri.tamu.edu/; in addition to its website and numerous project webpages, TWRI maintains 7 other project websites.

Student Support

Throughout this period, nine students were supported, at least in part, throughout the period of this grant and matching funds.
Undergraduate Students - 2
Graduate Students – 7

Notable Achievements and Awards

2018TX517B: Erin Noonan received the Baylor University Elan Allen Field Safety Scholarship, 2018

2018TX518B: Ferne Maulsby presented Probabilistic flood risk: quantifying uncertainty in flood hazard estimates and flood risk profiles for an urban watershed in Houston, TX at American Geophysical Union Conference, Washington,

D.C., December 2018.

G17AC00440:
* AWRA Conference 2018 on Groundwater Resources, hosted by TWRI in Fort Worth. Approximately 100 participants attended from various transboundary aquifers along the border binationally and internationally.
* Department of State has requested the expertise of the transboundary group to address this topic at federal–binational level.
* Research has been cited by the CRS in 2016 and 2018 and recognized by the National Water Commission in Mexico.
* Development of a Transboundary Water Portal that is being considered to be the official data repository of the IBWC/CILA
* Developed two MOUs with our Mexican counterparts (IMTA and the Rio Bravo Basin Council).
* Developed a White Paper for the Texas Groundwater Protection Committee (TGPC) on transboundary aquifers between Mexico and Texas that has been recently approved by the sub-committee.

Projects

Evaluating the impact of the Katy Prairie and adding HCAD Plan 5 Reservoir on Flooding of Addicks and Barker Reservoirs in Houston, Texas (Amended Title: Quantifying risk reduction of flood mitigation measures for an urban watershed in Houston, Texas)

Project Type: Annual Base Grant **Project ID:** 2018TX518B

Project Impact: Flooding is the costliest natural disaster in the United States. Recently, the increasing occurrence of floods has established the need for new approaches to analyze flood risk and quantify benefits of mitigation practices. The purpose of this research was to produce a novel risk-based framework to quantify the impact of flooding on residential structures and analyze mitigation strategy effectiveness in an urban watershed in Houston, Texas. For the purpose of this research, the baseline annualized expected damage, or risk, was determined for the individual, residential parcels within the watershed due to riverine flooding. Then, change in risk for the total watershed and individual parcels were quantified for various mitigation measures including, elevation of structures, buyouts, channel and bridge modifications and detention. As a result of this study, a parcel-level, annual expected damage map was produced for residential homes based on riverine flooding for the watershed. Additionally, maps calculating the reduction in risk due to each flood mitigation strategy were created. Based on the results of this study, the channel and bridge modification had the highest risk reduction, decreasing the risk by more than 90% over a 30-year period, although it had the highest initial investment. Due to the scalable nature of the parcel-level, risk-based approach, additional flood mitigation measures like buyouts and elevation of structures were able to be evaluated for their risk reduction potential unlike in previous studies. The ability for this method to be performed at various temporal and spatial scales allows this method to be widely applicable.

Identification of Sources of Salinity in the Northern Segment of the Brazos River Alluvium Aquifer

Project Type: Annual Base Grant **Project ID:** 2018TX517B

Project Impact: The Brazos River Alluvium Aquifer is a minor aquifer in central and east Texas under water table conditions. It is an underutilized resource and may be considered a supplemental water source. However, variability in salinity occurs throughout the Brazos River Alluvium Aquifer and the source of this variability is unclear. The objective of this study is to characterize the variability of salinity in the northern segment of the Brazos River Alluvium Aquifer and evaluate potential sources of elevated salinity. Three potential sources of elevated salinity were evaluated: Interactions between the aquifer and the river, concentration from irrigation, and brine contamination from historic oil and gas fields. Based on the ionic and isotopic composition of aquifer and river samples, in- situ water samples, core descriptions, batch leaching of sediment, and hydrographs, the Brazos River and historic oil and gas fields do not appear to be the source of elevated salinity for the aquifer; although, irrigation could impact aquifer salinity.

Identifying and Assessing the Condition of Transboundary Aquifers between Texas and Mexico

Project Type: Coordination Grant **Project ID:** G17AC00440

Project Impact: Primary findings of the TAAP program during the period (6/18/18 – 6/17/19) include: 1) Development of the conceptual hydrochemical framework for the Hueco Bolson Aquifer. 2) Integration of database of lithological and water quality data from all the available wells in the border region between Mexico and Texas. 3) Development of an approach to identify pumping patterns and hotspots within the hydrogeological units between Mexico and Texas (Effective Aquifer/Formation Areas), through the compilation of a transboundary well dataset. 4) Development of the first numerical model of the Allende-Piedras Negras aquifer that includes cross-sections of aquifer formations, physical boundaries, hydraulic connectivity, conceptual model development, surface-groundwater interactions and water budget. 5) Development of a geochemistry analyses of the Allende Piedras Negras Aquifer to confirm the connectivity of the geological units using correlation of similar geochemical processes and evaluate the transboundary connectivity both vertically and across the border. 6) Working on the development of a matrix for

vulnerability of shallow groundwater (DRASTIC or index method), characterization of brackish water, salinization of soil and water and other contaminants of interest in the Hueco Bolson Aquifer. 7) Signature of the MOU between AgriLife Research–TWRI and IMTA (Mexican Institute of Water Technology) and a Specific Agreement. 8) Signature of the MOU between AgriLife Research and the Consejo de Cuenca del Rio Bravo with its corresponding Specific Agreement. 9) Development of the Transboundary Water Portal where users have free access to available data on transboundary waters.