

WARRI REPORT 2018



MISSISSIPPI STATE UNIVERSITY™
WATER RESOURCES RESEARCH INSTITUTE

CONTENTS

3 DIRECTOR'S UPDATE

4 WHO WE ARE

Advisory Board

Staff

Our Mission

EPA Center Of Excellence

8 RESEARCH

USGS/MWRRI 104B Water Research Program

- Plans, facilitates, and conducts research to aid in the resolution of state and regional water problems
- Promotes technology transfer and the dissemination and application of research results
- Provides for the training of scientists and engineers through their participation in research
- Provides for competitive grants to be awarded under the Water Resources Research Act

Current 104B and 104G Funded Research Projects

24 CONFERENCES

2018 Mississippi Water Resources Conference

28 FINANCIALS

DIRECTOR'S UPDATE

We are excited about the accomplishments of the Institute this year. As many of you know, the Mississippi Water Resources Research Institute is supported by a Federal-State partnership authorized by the Water Resources Research Act of 1984. Our aim is to:

- assist in the resolution of State and regional water problems,
- provide for competitive grants to be awarded under the Water Resources Research Act,
- facilitate technology transfer, and
- train the next generation of water scientist and engineers.

To this end, we requested \$21,000,000 in competitive extramural funding and directed \$1,676,047 towards our regions critical research needs. Through the Water Resources Research Act we awarded six 104-B and one 104-G grant to scientists and engineers from Mississippi State University and the University of Mississippi. Projects supported financially or technically by the Institute resulted in 22 peer-reviewed manuscripts and 32 papers presented at state, regional, or national meetings. Researchers affiliated with the institute are currently training 11 Ph.D. and 10 M.S. students, with nine students receiving advanced degrees. Most of our M.S. graduates are pursuing doctoral degrees at Land Grant institutions including Mississippi State University, Oklahoma State University, Purdue University, and the University of Tennessee, while other accepted positions with companies from the private sector, including Helena Chemical Company, Indigo Ag., and John Deere. Some of our Ph.D. graduates filled critical research and



extension positions at the University of Arkansas and Clemson University, while others started their careers with the private sector, i.e, Growers Holdings Inc., Indigo Ag, and Weyerhaeuser. I am hopeful that the training that these young scientists and engineers received through aide from the Water Resources Research Institute will help them resolve the critical water needs our region and nation will face in the future.

Respectfully,

A handwritten signature in black ink that reads 'L. Jason Krutz'.

L. Jason Krutz, Ph.D.



WHO WE ARE

ADVISORY BOARD

Mr. Sam Britton
Mississippi Public Service Commission

Mr. Tom Bryant
Pickering Firm Incorporated

Dr. Don Christy
Yazoo Mississippi Delta Joint Water Management District

Dr. Pat Deliman
Environmental Laboratory, U.S. Army Corps of Engineers

Mr. Mike Freiman
Surface Water Division, Office of Mississippi Pollution Control, Mississippi Department of Environmental Quality

**Mr. W. Scott Gain/
Mr. Richard Rebich**
U.S. Geological Survey

Mr. Mark Gilbert
Mississippi Soil & Water Conservation Commission

Dr. Martin Locke
USDA Agricultural Research Service National Sedimentation Laboratory

Mr. Kirby Mayfield
Mississippi Rural Water Association

Mr. Chip Morgan
Delta Council

Dr. Jami Nettles
Weyerhaeuser Company

Mr. George Ramseur
Mississippi Department of Marine Resources

Mr. Kurt Readus
USDA Natural Resources Conservation Service

Mr. Thomas Richardson
Jackson State University

**Ms. Leslie Royals/
Mr. Lester Herrington**
Mississippi Department of Health

Dr. Alan Shiller
University of Southern Mississippi

Mr. John Sigman
Pearl River Valley Water Supply District

Dr. LaDon Swann
Mississippi-Alabama Sea Grant Consortium

Mr. Andy Whittington
Mississippi Farm Bureau Federation

Ms. Kay Whittington
Mississippi Department of Environmental Quality

Dr. Kristina Gillett
University of Mississippi

Mr. James Palmer,
Independent

STAFF

L. Jason Krutz
Director, MWRRRI
662.588.3897
j.krutz@msstate.edu
601.927.5657

Richard Ingram
Associate Director, MWRRRI
Associate Director, Center of Excellence for Watershed Management
601.927.5657
richardbingram1@gmail.com

Jessie Schmidt
Coordinator, MWRRRI
662.325.3295
jessie.schmidt@msstate.edu

OUR MISSION

THE MISSISSIPPI WATER RESOURCES RESEARCH INSTITUTE (MWRRRI) was authorized by Mississippi's Governor Paul B. Johnson in 1964 and is one of 54 institutes in the United States that form a network of coordinated research programs to solve water problems of state, regional, or national significance. In 1983, the Mississippi legislature formally designated MWRRRI as a state research institute. Federal legislation specifies that each institute consult with leading water officials of the state in developing a coordinated research technology transfer and training program that applies academic expertise to water and related land-use problems. These activities are funded in large part through an annual grant from the U.S. Geological Survey.

The State Water Resources Research Act Program, authorized by section 104 of the Water Resources Research Act of 1984, is a Federal-State partnership which:

- **Plans, facilitates, and conducts research to aid in the resolution of State and regional water problems**
- **Promotes technology transfer and the dissemination and application of research results**
- **Provides for the training of scientists and engineers through their participation in research**
- **Provides for competitive grants to be awarded under the Water Resources Research Act**

CENTER OF EXCELLENCE

THE U.S. ENVIRONMENTAL PROTECTION AGENCY HAS designated Mississippi State University as a Center of Excellence for Watershed Management, becoming the 10th such institution in the Southeast.

Representatives from the EPA's Region 4, the Mississippi Department of Environmental Quality, and the university signed a memorandum of understanding in 2013 to help communities identify watershed-based problems and develop and implement locally sustainable solutions.

The center is housed at Mississippi State, in the Mississippi Water Resources Research Institute, where it serves as a resource for universities throughout the state.

To become a recognized Center of Excellence, an institution must demonstrate technical expertise in identifying and addressing watershed needs; involvement of students, staff and faculty in watershed planning, protection, and restoration; capability to involve the full suite of disciplines needed for all aspects of watershed management; financial ability to become self-sustaining; ability to deliver and account for results; willingness to partner with other institutions; and support from the highest levels of the organization.

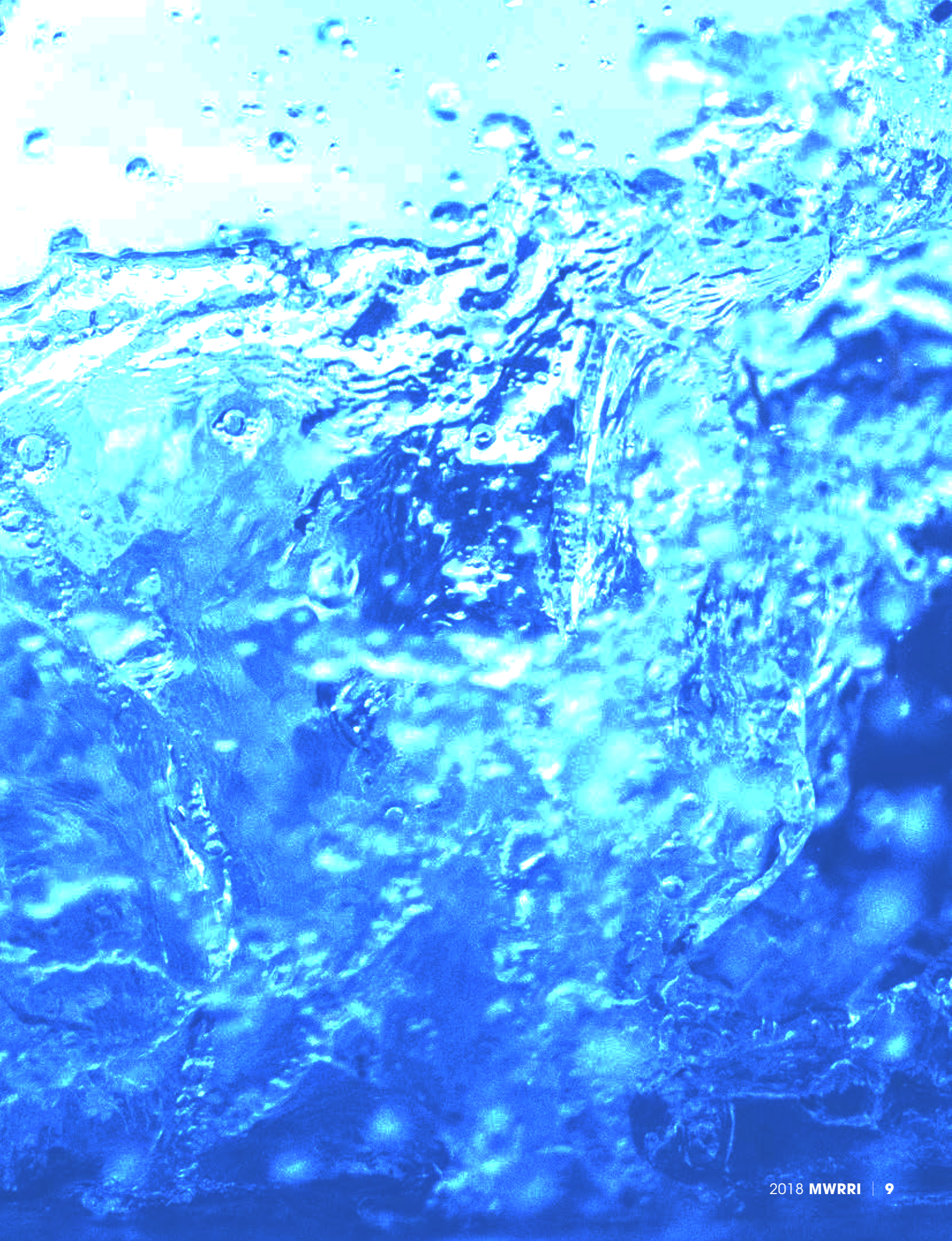
Located on the campus of Mississippi State, MWRRI administers and coordinates research programs dealing with water and related resources. It is one of the state institutes authorized by Section 104 of the Water Resources Research Act of 1984. Its activities are developed in close consultation and collaboration between the institute and leading water resources officials within the state.

Started in 2007, the EPA Region 4 Centers of Excellence for Watershed Management Program works with colleges and universities from across the Southeast to provide hands-on, practical products and services for communities to identify watershed problems and solve them.





RESEARCH



USGS/MWRRI 104B WATER RESEARCH PROGRAM

PLANS, FACILITATES, AND CONDUCTS RESEARCH TO AID IN THE RESOLUTION OF STATE AND REGIONAL WATER PROBLEMS

MISSISSIPPI WATER RESOURCES RESEARCH INSTITUTE AND COOPERATORS SUBMITTED \$21,923,316 FOR COMPETITIVE FUNDING AND WERE AWARDED \$1,673,316:

Barickman, T.C., L.J. Krutz, L. Downy. 2018. Integrating soil moisture sensor technology for sustainable vegetable production. Special Research Initiative, Mississippi State University. \$50,000, Funded.

Biber. 2018-2019. Classifying Shoreline habitat Types, and Validating a Living Shorelines Suitability Tool in the Northern Gulf of Mexico. United States Geological Survey, 104-G, \$250,000, Denied.

Chao, X., R.L. Binger, Y. Zhang and L. Yasarer. 2017-2018. Study of Sediments and Nutrients in Pelahatchie Bay and Upland Mill-Pelahatchie Creek Watershed. United States Geological Survey, 104-B, \$64,742, Funded.

Cizdziel, J. 2018-2019. Microplastics in the Mississippi River and Mississippi Sound: Concentrations, Sources, Sizes, Types, and Loadings to the Northern Gulf of Mexico. United States Geological Survey, 104-G, \$225,173, Funded.

Cizdziel, J. 2018-2019. Microplastics in the Mississippi River and Mississippi Sound: Concentrations, Sources, Sizes, Types, and Loadings to the Northern Gulf of Mexico. United States Geological Survey, 104-B, \$108,518, Funded.

Czarnecki, J. and J.J. Ramirez-Avila. 2017-2018. Applied Use of Unmanned Aerial Vehicles in Surface Water Quality Protection. United States Geological Survey, 104-B, \$45,674, Funded.

Davidson, G.R. and A.M. O'Reilly. 2016-2017. Oxbow Lake-Wetland Systems as a Source of Recharge to the Mississippi River Valley Alluvial Aquifer. United States Geological Survey, 104-B, \$74,183.

Dodds, D., A. Catchot, J. Gore, T. Allen and L.J. Krutz. 2018. Continuation of the Cotton D.E.M.O. (Demonstration and Education of Management Opportunities) Program: A Verification Program for the Mississippi Cotton Producers. MS Cotton Incorporated State Support Program. \$65,000, Funded.

Ervin, G.N. and L.G. Turnage. 2018-2019. Aquatic Vegetation Management to Enhanced Multiple-User Benefits of Southwestern Wetlands. United States Geological Survey, 104-B, \$105,889, Funded.

Ferguson, C., and L.J. Krutz. 2018. Determining optimal rainfall duration by soil type based on irrigation nozzle type. Mississippi Corn Promotion Board. \$38,521, Funded.

- Gude, V.G., J. Martin and D. Truax. 2016-2017. Wastewater Management in Mississippi Coastal Communities. United States Geological Survey, 104-B, \$124,995.
- Ingram, R.B., R. Cossman and K. Genskow. 2016-2018. Using Social Indicators to Guide, Evaluate, and Accelerate Implementation of State-Level Nutrient Reduction Strategies. United States Environmental Protection Agency. \$194,100.
- Ingram, R.B. 2016-2018. Using Social Indicators and Civic Engagement Measures to Advance Nutrient Reduction Initiatives Throughout the Mississippi River/Gulf of Mexico Watershed. \$13,500.
- Johnson, J., L.J. Krutz, L. Falconer, B.R. Golden, H.C. Pringle III, and J.T. Irby. 2019. Cover crop and tillage effects on irrigation application efficiency, irrigation scheduling, soil physical properties, runoff, soybean yield and economic return. Mississippi Soybean Promotion Board. \$70,772, Funded.
- Johnson, J., R.L. Atwill, L.J. Krutz, L. Falconer, H.C. Pringle III, E.J. Larson, J.T. Irby and D. Dodds. 2018. Row Crop Irrigation Science Extension and Research (RISER) Program. Mississippi Soybean Promotion Board. \$143,590, Funded.
- Johnson, J., R.L. Atwill, L.J. Krutz, H.C. Pringle III, W.B. Henry, J.T. Irby, and D. Dodds. 2018. Row Crop Irrigation Science Extension and Research Program. Mississippi Corn Promotion Board. \$85,022, Funded.
- Krutz, et al. 2018. Coordinated Research, Education, and Extension to Promote the Adoption of Sustainable Agricultural Production Systems in the Lower Mississippi River Basin. NIFA. \$10,000,000. Denied.
- Orlowski, J., L. J. Krutz, B.R. Golden, L. Falconer, H.C. Pringle III, E.J. Larson, and W.B. Henry. Irrigation and soil management strategies that improve irrigation application efficiency, soil quality, water quality and corn yield. Mississippi Corn Promotion Board. \$60,786, Funded.
- Pringle, H.C. III, L.J. Krutz, D. Dodds, D. Chastain, and L. Falconer. 2018. Row-crop irrigation science extension and research program. Mississippi Cotton Incorporated. \$30,903, Funded.
- Pringle, H.C. III, L.J. Krutz, L. Falconer, D. Chastain. 2018. Irrigation scheduling of soybean: A dual threshold method to eliminate yield-reducing stresses and maximize water use efficiency. Mississippi Soybean Promotion Board. \$38,597, Funded.
- Pringle, H.C. III, L.J. Krutz, D. Dodds, and D. Chastain. 2018. Row-crop Irrigation Science Extension and Research (RISER) Program. Mississippi Cotton Incorporated State Support Program. \$25,303. Funded.
- Ramirez-Avilla, J.J. and S.L.O. Achury. 2017-2018. Assessing and Predicting In-Stream Processes in the Catalpa Creek Watershed. United States Geological Survey, 104-B, \$65,818, Funded.
- Tracey, J. et al. 2018. Improving Root Zone Soil Water and Nutrient Availability, Farm Economics, and Regional Policy for Sustainable Crop Production in Gulf Coast States. NIFA. \$10,000,000. (In Review).
- Willett, K.L., S. Otts and J. Green. 2017-2018. Assessing the Effectiveness of Community-Based Research Strategies to Analyze Risk of Lead Contamination in Public Water Supplies in the Mississippi Delta. United States Geological Survey, 104-B, \$45,230, Funded.

PROMOTES TECHNOLOGY TRANSFER AND THE DISSEMINATION AND APPLICATION OF RESEARCH RESULTS

MWRRI AND COOPERATORS PUBLISHED 22 PEER REVIEWED MANUSCRIPTS AND PRESENTED 32 PAPERS AT STATE, REGIONAL, AND NATIONAL MEETINGS. THE INSTITUTE ALSO SPONSORED ITS ANNUAL CONFERENCE WITH 160 ATTENDEES, 70 PRESENTATIONS, AND PUBLISHED PROCEEDINGS FROM THE ANNUAL WATER RESOURCES CONFERENCE.

PEER REVIEWED PUBLICATIONS

Abbott, C. C., J. M. Sarver, J. Gore, D. Cook, A. Catchot, R. A. Henn, and L. J. Krutz. 2018. Establishing defoliation thresholds for insect pest of peanut (*Arachis hypogaea*) in Mississippi. (In Press)

Alsajri, F. A., C. Wijewardana, N. Bellaloui, L. J. Krutz, W. Gao, and K. R. Reddy. 2019. Quantifying and validating soybean seed emergence model as a function of temperature. *American Journal of Plant Science* 10:111-124.

Atwill, R. L., L. J. Krutz, J. A. Bond, K. R. Reddy, J. Gore, T. W. Walker, and D. L. Harrell. 2018. Water management strategies and their effects on rice grain yield and nitrogen use efficiency. *Journal of Soil and Water Conservation* 73:257-264.

Bryant, C. J., L. J. Krutz, R. C. Nuti, C. C. Truman, M. A. Locke, L. Falconer, C. W. Wood, R. L. Atwill. 2018. Furrow-diking as a mid-south irrigation strategy: Soybean (*Glycine max*) grain yield, irrigation water use efficiency, and net returns above irrigation costs. *Crop, Forage, and Turfgrass Management*. (Accepted)

Bryant, C. J., L. J. Krutz, L. Falconer, J. T. Irby, C. G. Henry, H. C. Pringle III, M. E. Henry, D. P. Roach, D. M. Pickelmann, R. L. Atwill, and C. W. Wood. 2017. Irrigation water management practices that reduce water requirements for Mid-South furrow-irrigated soybean. *Crop, Forage, and Turfgrass Management* 3:1-6.

Ervin, G. N. and G. Turnage. 2018. Aquatic vegetation management to enhance multiple user benefits of southeastern wetlands. Mississippi Water Resources Conference, Jackson, MS. April 3-4, 2018.

Kovacs, K., J. Lee, C. Henry, L. J. Krutz, R. Nayga, and F. Tsiboe. 2018. Factors influencing the willingness to pay for on-farm water infrastructure. *Journal of Soil and Water Conservation*. (Accepted)

Leininger, S., L. J. Krutz. 2018. Bed formation and alternate row irrigation effects on peanut yield, net returns, and irrigation water use efficiency. *Crop, Forage, and Turfgrass Management*. (Accepted)

Leininger, S. D., L. J. Krutz, J. Sarver, J. Gore, A. Henn, C. J. Bryant, R. L. Atwill, and G. D. Spencer. 2018. Establishing irrigation thresholds for furrow irrigated peanuts. *Crop, Forage, and Turfgrass Management*. (Accepted)

McNeal, J. P., L. J. Krutz, M. A. Locke, M. M. Kenty, R. A. Atwill, D. M. Pickelmann, C. J. Bryant, C. W. Wood, B. R. Golden, and M. S. Cox. 2017. Application of polyacrylamide (PAM) through lay-flat polyethylene tubing: Effects on infiltration, erosion, N and P transport, and corn yield. *Journal of Environmental Quality* 46:855-861.

Mueller, T. C., E. T. Parker, L. Steckel, S. A. Clay, M. D. K. Owen, W. S. Curran, R. Currie, R. Scott, C. Sprague, D. O. Stephenson, D. K. Miller, E. P. Prostko, W. James Grichar, J. Martin, L. J. Krutz, K. Bradley, M. L. Bernards, P. Dotray, S. Knezevic, V. Davis, and R. Klein. 2017. Enhanced atrazine degradation is widespread across the United States. *Pest Management Science* 73:1953-1961.

Omer, A. R., M. T. Moore, L. J. Krutz, R. Kröger, J. M. Prince Czarnecki, B. H. Baker, P. J. Allen. 2017. Potential for recycling of suspended solids and nutrients by irrigation of tail-water from tail-water recovery systems. *Water Supply* 18(4):1396-1405.

Omer, A. R., L. E. Miranda, M. T. Moore, L. J. Krutz, J. M. Prince Czarnecki, R. Kröger, B. H. Baker, J. Hogue, P. J. Allen. 2018. Reduction of solids and nutrient loss from agricultural land by tail-water recovery systems. *Journal of Soil and Water Conservation* 73:284-297.

Omer, A. R., M. T. Moore, L. J. Krutz, R. Kröger, J. M. Prince Czarnecki, B. Baker, and P. J. Allen. 2017. Representation of solid and nutrient concentrations in irrigation water from tailwater-recovery systems by surface water grab samples. *Journal of Irrigation Drainage Engineering* 143(11):1-6.

Plumblee, M. T., L. J. Krutz, D. M. Dodds, A. L. Catchot, J. T. Irby, and J. J. Jenkins. 2019. Determining optimum irrigation scheduling using soil moisture sensors in furrow-irrigated cotton. *Crop, Forage, and Turfgrass Management*. (Accepted)

Pringle III, H. C., L. Falconer, D. K. Fisher, L. J. Krutz. 2019. Soybean irrigation initiation in Mississippi: yield, soil moisture, and economic response. *Applied Engineering in Agriculture*. (Accepted)

- Pringle III, H. C., L. Falconer, D. K. Fisher, and L. J. Krutz. 2017. Initiation of furrow irrigation in corn on a Dundee/Forestdale Silty Clay Loam soil with and without deep tillage. *Applied Engineering in Agriculture* 33: 205-216.
- Spencer, G. D., L. J. Krutz, C. J. Bryant, L. Falconer, J. T. Irby, C. G. Henry, H. C. Pringle III, M. E. Henry, D. P. Roach, and R. L. Atwill. 2018. Irrigation practices that reduce water requirements for furrow-irrigated corn. *Crop, Forage, and Turfgrass Management*. (Accepted)
- Wijewardana, C., K. R. Reddy, F. A. Alsajri, J. T. Irby, L. J. Krutz, and B. Golden. 2018. Quantifying soil moisture deficit effects on soybean yield and yield component distribution patterns. *Irrigation Science* 36:241-245.
- Williams, J. J., W. B. Henry, J. J. Varco, N. W. Buehring, L. J. Krutz, L. Falconer, and D. L. Boykin. 2018. Corn grain yield, water use efficiency, and net returns in response to irrigation threshold, planting date, and hybrid selection. *Crop, Forage, and Turfgrass Management* 4(1):180052.
- Wood, C. W., L. J. Krutz, J. T. Irby, B. Henry, J. Orlowski, and L. Falconer. 2018. Soybean planting date and maturity group selection as a method to optimize net returns above irrigation costs and irrigation water use efficiency. *Crop, Forage, and Turfgrass Management*. (Accepted)
- Wood, W., J. Gore, A. Catchot, D. Cook, D. Dodds, and L. J. Krutz. 2017. Effect of leaf pubescence on tarnished plant bug ability to cause damage and yield loss in mid-south cotton. *Journal of Cotton Science* 21:122-127.
- Wood, C. W., L. J. Krutz, L. Falconer, H. C. Pringle III, J. T. Irby, C. J. Bryant, R. L. Atwill, and D. M. Pickelmann. 2017. Surge irrigation reduces irrigation requirements for soybean on smectitic clay-textured soils. *Crop, Forage, and Turfgrass Management*. 3:1-6.
- PUBLISHED ABSTRACTS**
- Abbott, C., J. Sarver, J. Gore, A. Henn, and L. J. Krutz. 2017. Evaluating the impact of canopy defoliation levels at two critical timings in peanut. *Agronomy Society of America Southeastern Branch Meeting*.
- Atwill, R. L., L. J. Krutz, J. Satterfield, D. P. Roach. 2018. Evaluation of furrow irrigation practices for mid-south rice production. 37th Rice Technical Working Group.
- Atwill, R. L., L. J. Krutz, D. P. Roach, and J. Satterfield. 2018. Furrow irrigation for mid-south rice production. Southern Branch of American Society of Agronomy Annual Meeting, Jacksonville, FL.
- Atwill III, R. L., L. J. Krutz, B. R. Golden, J. Bond, and J. Satterfield. 2017. Evaluation of furrow-irrigated rice in Mid-South production systems. *Agronomy Society Annual Meeting*.
- Bryant, C. J., L. J. Krutz, M. A. Locke, B. R. Golden, T. Irby, D. B. Reynolds, and R. W. Steinriede Jr. 2018. Furrow-diking as a mid-south soybean irrigation strategy. *American Society of Agronomy Annual Meeting*, Baltimore, MD. November 4-7, 2018.
- Bryant, C. J., L. J. Krutz, M. A. Locke, W. Steinriede, and T. Irby. 2017. Cover crops and irrigation application efficiency in soybean. *Cotton and Rice Conference*.
- Kelly, R., J. Gore, A. Catchot, D. Cook, L. J. Krutz, and B. Golden. 2018. Management of rice water weevil in water conservation rice production systems. *Beltwide Cotton Conference*.
- Kelly, R., J. Gore, A. Catchot, D. Cook, L. J. Krutz, and B. Golden. 2017. Management of rice water weevil in water conservation rice production systems. *Entomological Society of America Annual Meeting*.
- Krutz, L. J., D. Pickelmann, R. Atwill, S. Leininger, C. Bryant, J. McNeal, W. Wood, M. Henry, and D. Roach. 2017. Irrigation water management strategies that improve crop yield and/or on farm profitability. *Mississippi Water Resources Conference*.
- Krutz, L. J., D. Pickelmann, R. Atwill, S. Leininger, C. Bryant, J. McNeal, W. Wood, M. Henry, and D. Roach. 2017. Irrigation water management strategies that improve crop yield and/or on-farm profitability. *Cotton and Rice Conference*.
- Leininger, S. D., L. J. Krutz, J. Gore, J. M. Sarver, A. Henn, and C. C. Abbott. 2017. Land preparation method and irrigation strategy impacts on peanut pod yield, canopy closure, quality, water use efficiency and net return above irrigation costs. *American Peanut Research and Education Society*.
- Leininger, S. D., L. J. Krutz, J. Gore, J. M. Sarver, and C. C. Abbott. 2017. Land preparation and irrigation method impacts on peanut pod yield and quality. *Cotton and Rice Conference*.
- Plumlee, M. T., D. M. Dodds, L. J. Krutz, C. A. Samples, and S. Davis. 2018. A soil moisture sensor approach to scheduling cotton irrigation. *Beltwide Cotton Conference*.
- Plumlee, M. T., D. M. Dodds, L. J. Krutz, C. A. Samples, and S. Davis. 2017. A soil moisture sensor approach to

- scheduling cotton irrigation. Beltwide Cotton Conference. Baltimore, MD.
- Singh, B., D. Chastain, J. L. Snider, L. J. Krutz, S. R. Stetina, and K. R. Reddy. 2018. Growth, development and yield characteristics of rotylechulus reniformis resistant cotton lines grown in nematode-infested fields. American Society of Agronomy Southern Branch annual meeting, Jacksonville, FL, USA. February 4-6, 2018.
- Singh, B., D. Chastain, J. L. Snider, L. J. Krutz, S. R. Stetina, and K. R. Reddy. 2018. Rotylechulus reniformis resistant cotton lines exhibit higher early-season vigor and fiber yield, when compared to susceptible varieties. Beltwide Cotton Conference, San Antonio, Texas. January 3-5.
- Singh, B., D. Chastain, J. L. Snider, L. J. Krutz, S. R. Stetina, and K. R. Reddy. 2018. Characterization of Rotylechulus reniformis resistant cotton lines based on growth, development and yield responses in the nematode-infested fields. Mississippi Academy of Sciences (MAS) annual meeting, Hattiesburg, MS, USA. February 22-24, 2018.
- Singh, B., D. Chastain, J. L. Snider, K. R. Reddy, L. J. Krutz, and S. Stetina. 2018. Rotylechulus reniformis resistant cotton lines exhibit higher early-season vigor and fiver yield, when compared to susceptible varieties. Beltwide Cotton Conference.
- Singh, B., D. Chastain, J. L. Snider, L. J. Krutz, S. R. Stetina, and K. R. Reddy. 2017. An evaluation of Rotylechulus reniformis resistant cotton lines in the nematode-infested fields using classical growth analysis. American Society of Agronomy Annual Meeting, Tampa, FL, USA. October 21-25, 2017.
- Spencer, G., L. J. Krutz, J. M. Orlowski, M. A. Locke, B. R. Golden, and B. Henry. 2018. The effects of cover crops on runoff, erosion, and off-site N and P transport. Southern Branch of the American Society of Agronomy annual meeting, Jacksonville, FL. February 4-6, 2018.
- Spencer, G., L. J. Krutz, M. A. Locke, B. Henry, B. Golden. 2018. The effects of cover crops on runoff, erosion, and off-site N and P transport. Mississippi Water Resources Annual Conference, Jackson, MS.
- Spencer, G., L. J. Krutz, M. A. Locke, B. Henry, and B. Golden. 2018. The effect of cover crops on corn grain yield, irrigation application efficiency, and economic returns in a mid-southern corn production system. Soil Science Society of America International Meeting,
- Thrash, B., A. Catchot, J. Gore, D. Cook, F. Musser, T. Irby, and L. J. Krutz. 2017. Impact of planting date and plant population on soybean defoliation thresholds. Entomological Society of America Annual Meeting.
- Thrash, B. C., A. Catchot, J. Gore, D. Cook, F. Musser, T. Irby, and L. J. Krutz. 2017. Impact of defoliation on mid-south soybeans. Beltwide Cotton Conference.
- Williams, J. J., W. B. Henry, L. J. Krutz, J. J. Varco, N. W. Buehring, D. B. Reynolds, and L. L. Falconer. 2018. Drought tolerant and short season hybrids to mitigate risk, optimize yield and net returns, while increasing water use efficiency. Southern Agronomy Society of America Annual Meeting, Jacksonville, FL.
- Williams, J. J., W. B. Henry, L. J. Krutz, J. J. Varco, N. W. Buehring, and D. B. Reynolds. 2017. Irrigation Threshold, planting dates, and hybrid selection on yield, water use, and profitability. Mid-South Association of Wheat and Feed Grain Scientists, Madison, AL. August 16, 2017.
- Williams, J. J., W. B. Henry, L. J. Krutz, J. J. Varco, N. W. Buehring, and D. B. Reynolds. 2017. Drought tolerant hybrids and short season hybrids to mitigate risk, optimize yield and net returns, while reducing supplemental irrigation. Southern Regional Branch Agronomy Society of America, Mobile, AL. February 7, 2017.
- Wood, C. W., L. J. Krutz, J. T. Irby, and W. B. Henry. 2017. Impact of planting date and maturity group on irrigation water use efficiency in mid-south soybean production. Cotton and Rice Conference.

PROVIDES FOR THE TRAINING OF SCIENTISTS AND ENGINEERS THROUGH THEIR PARTICIPATION IN RESEARCH

RESEARCHERS AFFILIATED with the institute are currently training 11 Ph.D. and 10 M.S. students with nine students receiving advanced degrees. The quality of their education is evidenced by the number of awards won at state, regional, and national meetings. Most of our masters graduates are pursuing doctoral degrees at land grant institutions including Mississippi State University, Oklahoma State University, Purdue University, and the University of Tennessee, while other accepted positions with companies from the private sector, that is, Helena Chemical Company, Indigo Ag., and John Deere. Some of our Ph.D. graduates filled critical research and extension positions at the University of Arkansas and Clemson University, while others started their careers with the private sector, (i.e. Growers Holdings Inc., Indigo Ag, and Weyerhaeuser Company).

Ph.D. STUDENTS

- Richard Lee Atwill, Department of Plant and Soil Sciences, Mississippi State University
- Jenny Bibb, Department of Plant and Soil Sciences, Mississippi State University
- Corey Jay Bryant, Department of Plant and Soil Sciences, Mississippi State University
- Austin Omer, Department of Wildlife Fisheries and Aquaculture, Mississippi State University
- Michael Plumblee, Department of Plant and Soil Sciences, Mississippi State University
- Austin Scircle, Ph.D. Student, Department of Chemistry, 2018-Present, University of Mississippi
- Bhupinder Singh, Department of Plant and Soil Sciences, Mississippi State University
- Gene David Spencer, Department of Plant and Soil Sciences, Mississippi State University
- Benjamin Thrash, Department of Plant and Soil Sciences, Mississippi State University
- Chaturika Wijewardana, Department of Plant and Soil Sciences, Mississippi State University
- Clinton Wilks Wood, Department of Plant and Soil Sciences, Mississippi State University

M.S. STUDENTS

- Chad Abbott, Department of Plant and Soil Sciences, Mississippi State University
- Beau Badon, Department of Plant and Soil Sciences, Mississippi State University
- Meredith Brock, Department of Plant and Soil Sciences, Mississippi State University
- Kennedy Calhoun, Department of Biology, Mississippi State University
- Savana Davis, Department of Plant and Soil Sciences, Mississippi State University
- Read Kelly, Department of Plant and Soil Sciences, Mississippi State University
- Stephen Leininger, Department of Plant and Soil Sciences, Mississippi State University
- Richard Smith, Department of Plant and Soil Sciences, Mississippi State University
- John Williams, Department of Plant and Soil Sciences, Mississippi State University
- Bradley Wilson, Department of Plant and Soil Sciences, Mississippi State University

DISSERTATIONS AND THESES

Abbott, C. M. 2018. Establishing defoliation thresholds in peanut [*Arachis hypogaea* (L.)] in Mississippi. M.S. Thesis. Department of Plant and Soil Sciences, Mississippi State University.

Davis, S. S. 2018. Evaluation of cotton agronomic practices: Irrigation, fertility, and cover crops. M.S. Thesis. Department of Plant and Soil Sciences, Mississippi State University.

Leininger, S. D. 2018. Furrow irrigation strategies for peanut production in the mid-southern USA. M.S. Thesis. Department of Plant and Soil Sciences, Mississippi State University.

Omer, A. R. 2017. Efficacy of tailwater recovery systems as an approach to water resource conservation. Ph.D. Dissertation. Department of Wildlife, Fisheries and Aquaculture, Mississippi State University.

Plumlee, M. T. 2018. Effects of irrigation scheduling and simulated damage on development and yield of cotton (*Gossypium hirsutum* L.) in the Mid-South. Ph.D. Dissertation. Department of Plant and Soil Sciences, Mississippi State University.

Smith, R. M. 2018. Evaluation of narrow row production and twin row planter errors for furrow irrigated soybean in Mississippi. M.S. Thesis. Department of Plant and Soil Sciences, Mississippi State University.

Thrash, B. C. 2018. Evaluation of soybean production practices that impact yield losses from simulated insect defoliation. Ph.D. Dissertation. Department of Biochemistry, Molecular Biology, Entomology and Plant Pathology, Mississippi State University.

Wijewardana, G. C. 2018. Soil moisture stress effects on soybean vegetative, physiological, and reproductive growth and post-harvest seed physiology, quality, and chemical composition. Ph.D. Dissertation. Department of Plant and Soil Sciences, Mississippi State University.

Williams, J. J. 2018. Drought-tolerant and short-season corn hybrids to mitigate risk, optimize yield and profit, while increasing water use efficiency. M.S. Thesis. Department of Plant and Soil Sciences, Mississippi State University.

Wood, C. W. 2018. Agronomic practices and irrigation water management tools that improve water use efficiency in Mid-South soybean production systems. Ph.D. Dissertation. Department of Plant and Soil Sciences, Mississippi State University.

2018 Mrs. Savana Davis; 2nd Place M.S. Poster Presentation; Beltwide Cotton Conference; Agronomy, Physiology, and Soil Conference

2018 Mrs. Savana Davis; 2nd Place M.S. Oral Presentation; Beltwide Cotton Conference; Agronomy, Physiology, and Soil Conference

2018 Ms. Savana Davis, 1st Place M.S. Oral Presentation, Mississippi State University, Future of Agriculture Graduate Student Presentation Contest

2017 Mrs. Savana Davis; 1st Place M.S. Poster Presentation; Beltwide Cotton Conference; Agronomy, Physiology, and Soil Conference

2017 Mrs. Savana Davis; 1st Place M.S. Oral Presentation; Beltwide Cotton Conference; Agronomy, Physiology, and Soil Conference

2017 Mr. Stephen Leininger, 2nd Place M.S. Oral Presentation, American Peanut Research and Education Society Annual Meeting

2017 Mr. Stephen Leininger, 1st Place M.S. Poster Presentation, Mississippi Academy of Science Summer Student Symposium

2017 Mr. Austin Omer, College of Forest Resources Graduate Student Research Award, Mississippi State University

2018 Mr. Michael Plumlee; 1st Place Ph.D. Poster Presentation; Beltwide Cotton Conference; Agronomy, Physiology, and Soil Conference

2018 Mr. Michael Plumlee; 1st Place Ph.D. Oral Presentation; Beltwide Cotton Conference; Agronomy, Physiology, and Soil Conference

2018 Mr. Michael Plumlee, 2nd Place Ph.D. Oral Presentation, Weed Science Society of America Annual Meeting

2017 Mr. Michael Plumlee; 1st Place Ph.D. Poster Presentation; Beltwide Cotton Conference; Agronomy, Physiology, and Soil Conference

2017 Mr. Michael Plumlee; 1st Place Ph.D. Oral Presentation; Beltwide Cotton Conference; Agronomy, Physiology, and Soil Conference

STUDENT AWARDS AND HONORS

2018 Mr. Lee Atwill, 1st Place Ph.D. Oral Presentation, Southern Branch of American Society of Agronomy Annual Meeting

2018 Mr. Corey Bryant, 2nd Place Ph.D. Oral Presentation, Applied Soybean Research Community, American Society of Agronomy Annual Meeting

2018 Mr. Corey Bryant, 2nd Place Ph.D. Poster Presentation, Soil and Water Management Community, American Society of Agronomy Annual Meeting

- 2017 Mr. Michael Plumblee, 1st Place Ph.D. Poster Presentation, Weed Science Society of America Annual Meeting
- 2018 Mr. Austin Scircle, 1st Place Ph.D. Oral Presentation, Society for Environmental Toxicology and Chemistry Regional Meeting, Memphis, TN
- 2018 Mr. Bhupinder Singh, Gerald O. Mott Meritorious Graduate Student Award in Crop Science, Crop Science Society of America
- 2018 Mr. Bhupinder Singh, 2nd Place Poster Presentation, Crop Science Society of America Annual Meeting
- 2018 Mr. Bhupinder Singh, 2nd Place Ph.D. Oral Presentation, Division of Agricultural and Plant Sciences, Mississippi Academy of Sciences Annual Meeting
- 2018 Mr. Dave Spencer, Future Leaders in Science Award, American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America
- 2018 Mrs. Chathurika Wijewardana, 1st Place Oral Presentation, Climatology and Modeling Community, Crop Science Society of America
- 2018 Mrs. Chathurika Wijewardana, Nelson Yield Limiting Factor Award, American Society of Agronomy
- 2018 Mrs. Chathurika Wijewardana, 3rd Place Poster Presentation, Crop Science Society of America
- 2018 Mrs. Chathurika Wijewardana, Excellence in Research Graduate Student Award, Office of Research and Economic Development, Mississippi State University
- 2018 Mrs. Chathurika Wijewardana, First Place Poster Presentation, Department of Plant and Soil Sciences, Mississippi State University
- 2018 Mrs. Chathurika Wijewardana, Outstanding Graduate Student Research Award, College of Agriculture and Life Sciences, Mississippi Agricultural Forestry Experiment Station
- 2018 Mrs. Chathurika Wijewardana, U.S. Borlaug Fellow for the Summer Institute on Global Food Security, University of Purdue
- 2018 Mrs. Chathurika Wijewardana, First Place Graduate Student Poster Presentation, Mississippi Academy of Sciences
- 2017 Mrs. Chathurika Wijewardana, Gerald O. Mott Meritorious Graduate Student Award in Crop Sciences, Crop Science Society of America
- 2017 Mrs. Chathurika Wijewardana, 2nd Place Ph.D. Poster Presentation, Life and Biomedical Sciences and Engineering, Graduate Research Symposium, Mississippi State University
- 2017 Mrs. Chathurika Wijewardana, Ph.D. Graduate Student Award of Merit Scholarship, Gamma Sigma Delta, Mississippi State University Chapter
- 2017 Mrs. Chathurika Wijewardana, 1st Place Oral Presentation, Mississippi Academy of Sciences Annual Meeting
- 2017 Mrs. Chathurika Wijewardana, 1st Place Poster Presentation, Mississippi Academy of Science Annual Meeting
- 2017 Mrs. Chathurika Wijewardana, 3rd place Poster Presentation, Southern Branch of American Society of Agronomy Annual Meeting
- 2017 Mr. Wilks Wood, 1st Place Ph.D. Oral Presentation, American Society of Agronomy Annual Meeting

PROVIDES FOR COMPETITIVE GRANTS TO BE AWARDED UNDER THE WATER RESOURCES RESEARCH ACT

THROUGH THE WATER RESOURCES RESEARCH ACT, we awarded six 104-B and one 104-G grant to scientists and engineers from Mississippi State University and the University of Mississippi. These research projects address critical water quality and quantity needs in the mid-south including microplastics in the Mississippi River and Sound, invasive species in marshes, surface water quality in Pelahatchie Bay, UAVs to assist with erosion issues, and safe drinking water.

These research projects funded three Ph.D. students and five M.S. students at Mississippi State University and the University of Mississippi.

104B WATER RESEARCH PROGRAM

The 104B Water Research Program was established under the provisions of Section 104 of the Water Resources Act of 1984 (Public Law 98-242), as amended by Public Laws 101-397, 104-147, 106-374, and 109-471. Section 104 of the Water Resources Research Act directs the Secretary of the Interior to administer program grants to Institutes and Centers established under the provisions of section 104(a) of the Act. Water Resources Institutes or Centers have been established in each of the 50 states, the District of Columbia, Guam, the U.S. Virgin Islands, and Puerto Rico. Responsibility for administration of the State Water Resources Research Institute program has been delegated to the U.S. Geological Survey (USGS).

MWRRI's Advisory Board met on November 15, 2017 to discuss proposals submitted in accordance with the 2018 Request for Proposals. From that discussion and in order to better serve researchers submitting proposals for consideration, Dr. Krutz suggested that funding be provided for a two-year period in order to better train graduate students. Researchers are required to submit again in 2018 for Year 2 funding.

THE TWO PROJECTS BEGINNING IN JUNE 2018 AND CONTINUING TO 2019 ARE:

1 MICROPLASTICS IN THE MISSISSIPPI RIVER AND MISSISSIPPI SOUND: CONCENTRATIONS, SOURCES, SIZES, TYPES, AND LOADINGS TO THE NORTHERN GULF OF MEXICO

Dr. James Cizdziel, Associate Professor, Department of Chemistry and Biochemistry, University of Mississippi (Principal Investigator)

There is growing evidence that microplastics are harming marine organisms and finding their way into the human diet. The majority of seafood consumed by humans comes from coastal areas where microplastic particles are ubiquitous. The Mississippi River drains about 41 percent of the contiguous U.S. into the northern Gulf of Mexico, making the Gulf Coast particularly vulnerable to microplastic pollution. Indeed, microplastic concentrations on the inner shelf of the northern Gulf of Mexico are among the highest levels reported globally. These particles are causing deleterious effects on filter feeders such as oysters, a vital industry for the Gulf Coast. Thus, Mississippi is the *ideal* place to study microplastic pollution and its impacts on aquatic ecosystems.

An overlooked problem with microplastics is sorption of methylmercury (MeHg), a toxin that accumulates in organisms and concentrates in the food chain. Exposure to high levels of MeHg cause deleterious effects in both humans and wildlife. This is of particular concern along the Gulf Coast because, on average, residents there consume more seafood than other U.S. residents, and because Gulf of Mexico seafood tends to have higher levels of MeHg compared to other U.S. coastlines. Whereas there are significant health benefits from eating seafood, it is also the greatest source of MeHg exposure. As much as 30 percent of Gulf Coast residents may exceed the recommended safe dose of MeHg. The Gulf of Mexico accounts for 41 percent of the U.S. marine recreational fish catch and about 16 percent of commercial fish landings. Given the importance of commercial and recreational fishing to the Gulf of Mexico economy and the potential threat to the aquatic ecosystem, understanding the link between microplastics, MeHg, and impacts on the ecosystem is important to the long-term health and sustainability of the region. Examining microplastic-pollutant load is the *next step* in advancing microplastics water research. This Ph.D. project is wanted by state universities (involved in training the next generation of water scientists); state agencies (responsible for protecting the state's water resources); and residents of the Gulf Coast, many of whose livelihoods depend on a healthy Gulf of Mexico ecosystem. This project will also generate data, which will make collaborative grant proposals to NOAA and NSF very competitive.

Microplastics concentrations on the inner shelf of the northern Gulf of Mexico are among the highest levels reported globally. Because their size range overlaps that of zooplankton, they are confused with prey and are accumulating in the food chain. The plastic particles are causing deleterious effects on aquatic organisms, particularly filter-feeders such as oysters. Moreover, plastics attract (absorb) certain contaminants, such as

persistent organic pollutants and mercury, and thus their accumulation in biota may be an overlooked source of contaminants to ecosystems. The majority of microplastics in the northern Gulf of Mexico originate from the Mississippi River, whose basin encompasses thirty one states. Yet, surprisingly little is known about the concentrations, types, sizes, and loadings of microplastics in the Mississippi River and its major tributaries and along oyster reefs in the Mississippi Sound. This lack of data is hindering our understanding of the magnitude and sources of the problem. Our research will fill key knowledge gaps and improve people's education around microplastic pollution and its impacts.

2 AQUATIC VEGETATION MANAGEMENT TO ENHANCE MULTIPLE-USER BENEFITS OF SOUTHEASTERN WETLANDS

Dr. Gary Ervin, Professor, Department of Biological Sciences, Mississippi State University (Principal Investigator); Gray Turnage, Research Associate, Geosystems Research Institute, Mississippi State University (Co-Investigator)

Across the US, it has been estimated that more than \$100 million per year is spent on control of aquatic weeds, and a recent estimate for the state of Florida alone places control costs for aquatic weeds on natural areas in the range of \$32 million per year. In Mississippi, two of the nine state noxious weed species listed by the Bureau of Plant Industry are aquatic weeds, and state-wide surveys are often conducted to monitor the status of these and other aquatic weeds on Mississippi water bodies. Some of the reasons for concern over such plants include the plants' abilities to: restrict access to water bodies for recreational or other direct human uses, replace desirable plant species, reduce overall biological diversity, reduce utility of aquatic or wetland habitat for wildlife, increase mosquito breeding habitat and thus insect borne disease, and changes to ecosystem services, such as water quality improvement.

Biologists at the Sam D. Hamilton Noxubee National Wildlife Refuge have identified certain problematic aquatic plants, specifically American lotus (*Nelumbo lutea*), white/fragrant waterlily (*Nymphaea odorata*), and water shield (*Brasenia schreberi*), as key obstacles to achieving the multiple use needs of refuge lakes and associated wetlands. The biologists at the refuge further indicated that these issues are experienced by many other refuges, wildlife management areas, and private waterbodies in Mississippi and adjacent states. Few methods currently are known that allow the control of these regionally specific aquatic weeds,

while simultaneously enhancing the diversity of desirable species and maintaining areas of open water that are needed for many species of wildlife and for human use of these facilities. This project aims to determine effective means of controlling these aquatic plant species, and then cooperate with refuge personnel in disseminating our findings among other refuges and similar land management areas. Accomplishing this work will address such water resource priorities as enhancing recreational water use, maintaining fish and wildlife habitat quality, and maintaining surface water quality.

The work we propose would explore a variety of chemical control measures (herbicides) to reduce the abundance of key nuisance plant species, while maintaining diversity of desirable species and also minimizing any negative impacts on key water quality parameters (e.g., dissolved oxygen, nitrogen, and phosphorus). Thus, this work would address numerous focus areas of the Mississippi Water Resources Research Institute, including natural resources conservation, wetland ecology, water quality, and management of problematic aquatic plant species.

The ultimate objective of this work is to discover methods to control nuisance aquatic vegetation in wetland and aquatic habitats of areas like the refuge, while minimizing impacts on non-target vegetation and water quality. We will cooperate with refuge staff in distributing our findings to land managers throughout the region who encounter similar habitat management challenges, in addition to distributing this information through more typical science outlets of peer-reviewed journals and conference proceedings.

FOUR PREVIOUSLY FUNDED RESEARCH PROJECTS CONTINUED AND WERE COMPLETED PRIOR TO JANUARY, 2019. THESE INCLUDE:

3 STUDY OF SEDIMENT AND NUTRIENTS IN PELAHATCHIE BAY AND UPLAND MILL-PELAHATCHIE CREEK WATERSHED

Dr. Xiaobo Chao, Senior Research Scientist, National Center for Computational Hydroscience and Engineering (NCCHE), University of Mississippi (UM); Dr. Ronald L. Bingner, Agricultural Engineer, Water Quality & Ecology Research Unit/ Watershed Physical Processes Research Unit USDA-ARS National Sedimentation Laboratory; Dr. Yaoxin Zhang, Senior Research Scientist, National Center for Computational Hydroscience and Engineering, University of Mississippi; and Dr. Lindsey Yasarer, Research Hydrologist, Water Quality & Ecology Research Unit, USDA-ARS National Sedimentation Laboratory

Ross Barnett Reservoir is the largest drinking water source in the state of Mississippi. The water quality in the Reservoir is generally affected by the physical, chemical, and bio-chemical processes in the reservoir, and it is also significantly influenced by the Upper Pearl River watershed and Ross Barnett Reservoir Watershed. Six priority issues in the reservoir and its watershed have been identified and recommended for reducing and controlling: 1) watershed erosion/sedimentation; 2) nutrient enrichment and algal growth; 3) pathogens; 4) invasive aquatic plant species; 5) pesticides; and 6) litter/trash in the reservoir and around the shoreline.

To better understand the water quality conditions in Pelahatchie Bay, the loads of runoff, sediment, and nutrients from the upland watershed are simulated using the AnnAGNPS watershed model. The simulated results are used as boundary conditions for CCHE model to simulate the flow, sediment, and water quality in the bay.

The research results will help to understand the water quality processes affected by anthropogenic and natural factors in the Pelahatchie Bay. The technical approach of the research can also be used to evaluate the best management practices (BMPs) implemented in other watersheds.

Findings from the research project were: integrated

AnnAGNPS watershed model and CCHE model which provides useful tools to study the response of water quality in surface water to the loads of upland watershed. Numerical models are effective tools to predict the loads of suspended solids and nutrients from the upland watershed and simulate the long term and short term distributions of suspended solids and nutrients in the receiving waterbodies. CCHE_MESH is a very effective tool to generate computational mesh for natural water bodies with complex geometry. In the Mill-Pelahatchie Watershed, the urban growth increased runoff and nitrogen loads, but implementing water retention ponds limited these loads by up to 1 percent and 25 percent, respectively. In high urban growth areas, concentrations of suspended solids and nutrients in Pelahatchie Bay are generally affected by the loads from the upland watershed. The outlet of Pelahatchie Bay is very narrow which could limit the exchange of suspended solids and nutrients in/out of Pelahatchie Bay, and implementation of BMPs, such as the establishment and stabilization measures of disturbed soil on urban construction sites that included water and sediment retention ponds, is very effective to reduce the loads of suspended solids and nutrients in the upland watershed.

4 APPLIED USE OF UNMANNED AERIAL VEHICLES IN SURFACE WATER QUALITY PROTECTION

Dr. Joby Czarnecki, Assistant Research Professor, Geosystems Research Institute, Mississippi State University; Dr. John Ramirez-Avila, Assistant Professor, Civil and Environmental Engineering, Mississippi State University

Erosion represents a significant detriment to Mississippi's surface waters, as a source of both chemical (i.e., phosphorus) and physical (i.e., sediments) pollutants. Significant financial investment has been made by federal and state agencies, as well as private entities, to install best management practices (BMPs) on the landscape. The typical BMPs in Mississippi either limit erosion or trap resultant sediment (e.g., filter strips, pads and pipes, slotted inlet pipes, grade stabilization, and tailwater recovery systems), recognizing that Mississippi has both "highly erodible soils and a highly erosive climate." Accordingly, erosion control will be necessary for maintaining the quality of Mississippi's

surface water resources, and identifying and monitoring erosion in critical areas will enable stakeholders to better manage the state's water resources by addressing a key source of degradation.

The objective of this research is to evaluate the accuracy of erosion calculations derived from Structure from Motion (SfM) captured with unmanned aerial vehicles (UAV) and determine the best practices for use of this technology for this purpose. The research project combines results from SfM digital surface models (DSM) with ground-truth measurements of erosion to determine the accuracy of this approach. Derived values were incorporated into existing models (e.g., BSTEM) to determine if SfM data served as a valid model input. The result of this research is a scientific validation of the erosion calculations derived from DSM. The research serves as a proof-of-concept project to develop a method by which UAVs could be employed to identify, quantify, and monitor erosion in drainage channels and other eroded areas. This would enable federal, state, and local agencies to utilize this technology to more efficiently monitor, remediate, and regulate degradation of surface waters. Outputs from this research project include transfer of information on the appropriate data collection strategies for UAV-based erosion assessment, as well as best practices, along with methods, estimates of accuracy, and any necessary cautions. This data will be communicated to stakeholders through scientific exchange and interaction, in addition to the established university extension network.

The UAV is a low-cost, rapid turnaround solution for characterizing landscapes. When paired with the cloud-based processing environment, users could generate interactive 3D models of their landscapes in less than one day, with little to no skill and no pre- or post-flight effort. The tool could easily find its place with stakeholders, such as NRCS personnel, as a means to characterize and visualize eroded landscapes and to discuss options for conservation implementation with their landowners. However, this action does assume a need for high accuracy of the output DSM data, only realistic looking images and models. Obtaining the accuracy necessary for any type of measurement or modeling requires a more stringent attention to ground control and ground truth.

One drawback for using geometry extracted from DSM is the flow depth at the moment of UAV survey. These experimental reaches were running almost all the time under baseflow conditions, and that water depth appears not to be a factor affecting the bathymetric

assessment of the channel. If using other systems, this could represent a major limitation that should be noted.

5 ASSESSING AND PREDICTING IN-STREAM PROCESSES IN THE CATALPA CREEK WATERSHED

Dr. John Ramirez-Avila, Assistant Professor, Civil and Environmental Engineering, Mississippi State University; Dr. Sandra Ortega-Achury, Research Associate II, Civil and Environmental Engineering, Mississippi State University

Excessive erosion and the transport and deposition of sediment in surface waters are major water-quality problems. Physical, chemical, and biological damage associated with excess sediment costs about \$16 billion annually in North America. Preliminary studies completed by researchers from the National Sedimentation Laboratory and Mississippi State University have determined that up to 89 percent of the eroded sediment leaving watersheds within the Southeastern Plains ecoregion comes from streambeds and streambanks with the balance coming from upland sources. The researchers also found that up to 78 percent of all eroded materials, in the studied watersheds, come from unstable streambanks. These results have important implications for managing streams in the ecoregion, such as the Catalpa Creek, which main channel was listed by the Mississippi Department of Environmental Quality (MDEQ) in the Mississippi 2004 Section 303(d) List of Impaired Streams due to sediments from headwaters to confluence with Tibbee Creek. The proposed Total Maximum Daily Load (TMDL) for impaired streams within the Tibbee Creek Watershed, including Catalpa Creek, recommended to prioritize the restoration of streambank and riparian buffer zones and the implementation of sediment reduction Best Management Practices (BMPs) to reduce water impairment due to sediments in the entire area.

This research will focus on the identification, assessment, evaluation, and prediction of in-stream processes within the study watershed. Three studies were undertaken using a combination of methods including field reconnaissance and detailed data collection, laboratory analysis, and channel modeling. Modeling results can help to determine critical areas to be potentially considered

for future management and restoration activities, as well as to optimize a design for a desired outcome and to understand what results might be expected.

6 ASSESSING THE EFFECTIVENESS OF COMMUNITY-BASED RESEARCH STRATEGIES TO ANALYZE RISK OF LEAD CONTAMINATION IN PUBLIC WATER SUPPLIES IN THE MISSISSIPPI DELTA

Dr. Kristine Willett, Chair and Professor of Pharmacology & Environmental Toxicology in Biomolecular Sciences and Research Professor in the Research Institute of Pharmaceutical Sciences, University of Mississippi; Dr. John Green, Professor of Sociology and Director of the Center for Population Studies and Director of the Interdisciplinary Minor in Society and Health, University of Mississippi; Ms. Stephanie Otts, Senior Research Counsel and Director of Sea Grant Law Program, University of Mississippi

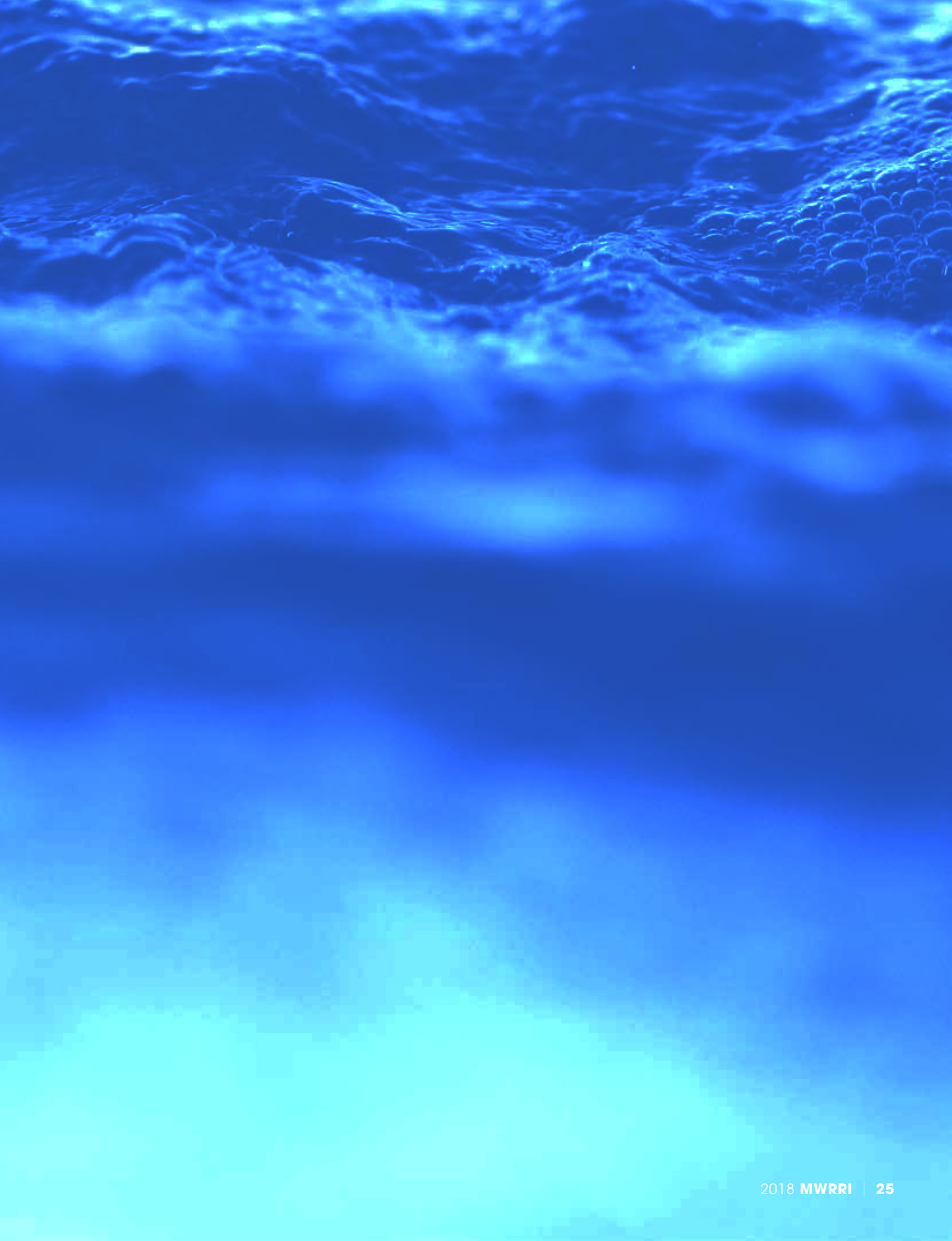
Childhood lead poisoning is a challenging social issue that requires the coordination of health, housing, and environmental law and policy. There is no safe blood level for lead, and all sources of lead exposure for children should be controlled or eliminated. A recent Health Grove analysis of state reporting data from 2014 ranked Mississippi as one of the top 20 (#18) worst states for lead poisoning. African-American children and children of low-income families are at greater risk of lead exposure due to economic, health, and housing disparities (living in older or poorly maintained housing). Environmental and health policy focuses on minimizing exposure to lead-based paint, but much less attention is paid to the exposure to lead through drinking water. Little is known about the contribution of lead pipes and water treatment to lead poisoning in the state. Recent events in Jackson, Mississippi, have raised awareness within the state of this potential source of lead contamination. A search of the 2016 lead sampling results of

public water systems in Mississippi available through Drinking Water Watch indicates that several public water systems in the greater Delta region face lead contamination challenges including Hide-away-Hills in Panola County (17 ppb) and Delta Mobile Home Park in Leflore County (19 ppb). The proposed interdisciplinary project will advance the state of knowledge regarding lead contamination of drinking water in seven Delta counties and assist in the identification of future research and community intervention priorities.

The project aimed to create an atmosphere of community and inclusion in order to inform and influence a major public health issue, namely lead in drinking water. By using a mixture of community-based public outreach methods to do outreach and sampling, we were able to join forces with community partners to organize educational events that facilitated this research. Though each event employed different methods of participant recruitment and engagement, the project used commonalities of community-based public outreach to engage and ultimately empower more than 200 Mississippi Delta residents and their families with the knowledge to impact their behaviors to minimize risk of lead exposure from their own drinking water. Furthermore, our research on public water systems has allowed us to focus our ongoing efforts in higher exposure risk communities. This WRRRI-supported research provided the preliminary data included in a recently submitted NIH-National Institute of Environmental Health Sciences Research to Action R01 proposal that will be reviewed later this spring. Future work would allow expansion of partnerships to include, for example, lead testing in school drinking water.



CONFERENCES



2018 MISSISSIPPI WATER RESOURCES CONFERENCE

APRIL 3-4, 2018

THE ANNUAL MISSISSIPPI WATER RESOURCES CONFERENCE, hosted by MWRRI, was held at the Jackson Hilton on April 3-4, 2018. There were more than 160 participants at the conference. Researchers and students from college and universities as well as water resource planners, managers, and policy-makers from state and federal agencies, industry, and other backgrounds presented 42 professional oral presentations and 14 student oral presentations along with eight student posters and six professional posters on the following topics:

- BMP Effectiveness
- Challenges to Establishing Targets and Practices for Managing Nutrients in Delta Waterbodies I and II (2 sessions)
- Coastal Issues
- Groundwater Availability in the Mississippi River Alluvial Plan I and II (2 sessions)
- Irrigation Efficiency and Conservation
- Management of Water Resources in Mississippi
- Measurements and Mechanisms for Earthen Levee and Gully Erosion
- Reservoirs and Streams
- Streamflow Alteration Assessments to Support Bay and Estuary Restoration in Gulf States
- Streamflow and Sedimentation
- Surface Water – Groundwater Interaction
- Water Treatment

The opening plenary session featured Dr. Jason Krutz, newly-appointed director of MWRRI. Dr. Krutz gave an overview of the mission and objectives of the institute.

- Deals with water policy issues
- Supports state water agencies' mission with research on problems encountered and expected
- Provides water planning and management organizations with tools to increase efficiency and effectiveness of water planning and management
- Trains students

Tuesday's luncheon speakers were Bennett Beardon, special assistant to the state geologist at the Geological Survey of Alabama, and James I. Palmer, Jr., an attorney and environmental consultant in Oxford, Mississippi. Mr. Beardon is responsible for assisting with development and implementation of the state geologist's policy initiatives and programs. He is the founding director of the Water Policy and Law Institute at the University of Alabama. He also served as special counsel to the governor on water law and policy and as is a former assistant attorney general for the State of Alabama. Mr. Palmer focuses his practice on environmental law, natural resources law, energy law, and administrative law. He is a member of the Mississippi Bar Association, the American Bar Association, the Environmental Council of the States, and a Fellow in the American College of Environmental Lawyers. He is also a Registered Professional Engineer in Mississippi. The topic for their presentation was, "The Status of Water Policy in Mississippi and Alabama." Both gentlemen brought years of experience working with the environment and water issues featuring past policies, present conditions, and future implications.

Wednesday's luncheon speakers were Abby Braman and Dr. Ronald E. Cossman. After moving to Mississippi, Abby began a Take2Miss social media campaign designed to highlight plastic pollution problems in our watershed. She organized the first annual Pearl River Clean Sweep event that deployed river cleanup teams along the entire length of the Pearl River. During the Clean Sweep, over 1,000 volunteers cleaned up 34,000 pounds of trash from the Pearl River watershed. She is the only licensed Waterkeeper Alliance member in the state of Mississippi. Dr. Cossman is a research professor in the Social Science Research Center at Mississippi State University. He has been associated with more than \$2.3 million in grants and contracts. His philanthropic work focuses on a built environment that supports health living. The topic of their presentation was, "How Important are Stakeholders and Can Their Impacts Be Measured?" Dr. Cossman worked on an EPA-funded grant to use social indicators as a supplement to environmental measures of water quality.

Both presenters understand the capacity of solving environmental issues when volunteerism is fully-engaged.

Again this year, students had opportunities to be involved in both oral and/or poster presentation competitions. Through a Weyerhaeuser sponsorship and an anonymous gift, cash prizes of \$150 for first place, \$100 for second place, and \$75 for third place were awarded to the winners in both categories.

The Institute extends thanks to our sponsors and

exhibitors: Mississippi Soil and Water Conservation Commission, Mississippi Water Resources Association, Neel-Schaffer Inc., Pickering Firm Inc., Weyerhaeuser Company, and Yazoo MS Delta Levee Board.

Special thanks go to the Mississippi Department of Environmental Quality and U.S. Geological Survey for their assistance with conference planning and to all technical session facilitators/coordinators who identified and solicited speakers for sessions.

STUDENT POSTER COMPETITION WINNERS:

1ST PLACE

ALEXANDRA FIRTH, Wildlife, Fisheries, and Aquaculture, Mississippi State University—“Ecological Agriculture Application with Winter Flooding”

2ND PLACE

TADESSE SINSHAW, University of Mississippi—“A Spatial Decision Support System for Choice and Placement of Nitrogen Source Reducing Best Management Practices in the Beasley Lake Watershed, Delta Region of Mississippi”

3RD PLACE

NATASHA DROTAR, Department of Forestry, Mississippi State University—“Effects of Prescribed Burning on Canopy Structure and Water Partitioning in an Upland Oak Forest”

STUDENT ORAL PRESENTATION COMPETITION WINNERS:

1ST PLACE

CATIE DILLON, Agriculture and Biological Engineering, Mississippi State University—“Examining the Effects of Directional Wave Spectra on a Nearshore Wave Model”

2ND PLACE

GRAY TURNAGE, Plant and Soil Sciences, Mississippi State University—“Chemical Control of the Floating Aquatic Plant Common Duckweed (*Lemna minor L.*) and Watermeal (*Wolffia spp.*)”

3RD PLACE

JAMES GRAFFE, Civil and Environmental Engineering, Mississippi State University—“Understanding Relations between Streamflow, Turbidity, and Suspended-Sediment Concentration in an Impaired Mississippi Stream”

FINANCIALS

PROVIDED BELOW ARE THE SOURCES AND USES OF FUNDS STATEMENT FOR THE OPERATION OF MWRRRI IN 2018.

SOURCES OF FUNDS

STATE OF MISSISSIPPI	469,980
COMPETITIVE FUNDING RECEIVED	1,580,981
U.S. GEOLOGICAL SURVEY/DOI	92,335
TOTAL REVENUE	\$2,143,296





MISSISSIPPI STATE
UNIVERSITY™

MS WATER RESOURCES RESEARCH INSTITUTE
P.O. Box 9547
Mississippi State, MS 39762

Mississippi State University is an equal opportunity institution. Discrimination in university employment, programs or activities based on race, color, ethnicity, sex, pregnancy, religion, national origin, disability, age, sexual orientation, genetic information, status as a U.S. veteran, or any other status protected by applicable law is prohibited. Questions about equal opportunity programs or compliance should be directed to the Office of Compliance and Integrity, 56 Morgan Avenue, P.O. 6044, Mississippi State, MS 39762, (662) 325-5839.