

**Mississippi Water Resources Research Institute
Annual Technical Report
FY 2011**

Introduction

The Mississippi Water Resources Research Institute (MWRRI) provides a statewide center of expertise in water and associated land use and serves as a repository of knowledge for use in education, research, planning, and community service.

The MWRRI goals are to serve public and private interests in the conservation, development, and use of water resources; to provide training opportunities in higher education whereby skilled professionals become available to serve government and private sectors alike; to assist planning and regulatory bodies at the local, state, regional, and federal levels; to communicate research findings to potential users in a form that encourages quick comprehension and direct application to water related problems; to assist state agencies in the development and maintenance of a state water management plan; and to facilitate and stimulate planning and management that:

* Deals with water policy issues, * Supports state water agencies' missions with research on problems encountered and expected, * Provides water planning and management organizations with tools to increase efficiency and effectiveness.

Research Program Introduction

The Mississippi Water Resources Research Institute (MWRRI) conducts an annual, statewide competitive grants program to solicit research proposals. Proposals are prioritized as they relate to the research priorities established by the MWRRI Advisory Board and by their ability to obtain Letters of Support or External Cost Share from non-federal sources in Mississippi. The MWRRI's External Advisory Board then evaluates all proposals. Based on the most current list of research priorities, these would include: 1) Physical Processes (ex. Climate, Hydrology, Hydraulics and Sediment, Water Quality); this could include a section of a major Mississippi river - construction and validation of a model of the interactions/communications between groundwater and surface water under base flow conditions whereby the model could incorporate water quality and/or quantity; 2) Biotic Processes (ex. Terrestrial, Aquatic); this could include the development of vegetation management plans for drainage canal systems; and 3) Human Systems (ex. Built Environment, Social Sciences, Economics); this could be the evaluation of the economic impacts of consumptive water users in Mississippi as well as assessment of the impacts of various types of Green Infrastructure on water quality. Other issues that could be addressed include: surface and groundwater management, water quality management and water resources development, contaminant transport mechanisms, wetlands and ecosystems, groundwater contamination, as well as other issues addressing coastal and marine issues linking water associates through the state, and institutional needs that include capacity building and graduate student training.

Water quality and other ecosystem services in wetlands managed for waterfowl in Mississippi

Basic Information

Title:	Water quality and other ecosystem services in wetlands managed for waterfowl in Mississippi
Project Number:	2011MS135B
Start Date:	3/1/2011
End Date:	7/31/2012
Funding Source:	104B
Congressional District:	3rd
Research Category:	Water Quality
Focus Category:	Water Quality, Wetlands, Economics
Descriptors:	
Principal Investigators:	Richard Kaminski, Amy B. Spencer

Publications

1. Quarterly reports 2011-2012 to Mississippi Water Resources Research Institute, Mississippi State University, Mississippi State, MS.
2. Alford, A.B., R.M. Kaminski, L.R. D'Abramo, and J. Avery. 2011. Characteristics of harvestable crayfish populations in managed wetlands of the Lower Mississippi Alluvial Valley. Poster presentation. American Fisheries Society, Seattle, WA. September 4-9, 2011.
3. Alford, A.B. 2011. Crawfish harvest as a wildlife enterprise. Natural Resources Enterprise and LSUAgCenter Paddling and Canoeing and Lease Opportunities for Landowners Workshop. Monroe, LA. September 28, 2011.
4. Alford, A.B., R.M. Kaminski, R. Kroger, L.R. D'Abramo, and J. Avery. 2011. Ecosystem services derived from moist-soil management. Poster presentation. Mississippi Chapter of the Wildlife Society. Louisville, MS, October 4-5, 2011.

Mississippi Water Resources Research Institute (MWRRI)

Quarterly Report – (From) 7/1/11 – (To) 2/29/12

Reports due: 1st (March 31); 2nd (June 30); 3rd (Sept. 30); 4th (Dec. 31)

Note: Please complete form in 11 point font and do not exceed two pages. You may reference and append additional material to the report.

SECTION I: Contact Information

Project Title: Water quality and other ecosystem services in wetlands managed for waterfowl in Mississippi

Principal Investigator: Amy B. Alford and Richard M. Kaminski, Ph.D.

Institution: Department of Wildlife, Fisheries, and Aquaculture, Mississippi State University

Address: 775 Stone Blvd., Mississippi State, MS 39762

Phone/Fax: 662-325-2623

E-Mail: rkaminski@cfr.msstate.edu, aspencer@cfr.msstate.edu

SECTION II: Programmatic Information

Approximate expenditures during reporting period:

Federal: 5,702.27, Non-Federal (MWRRI): _____, Non-Federal (Dept.): 800.00,
In-Kind: _____, Total Cost Share: _____

Equipment (and cost) purchased during reporting period:

Progress Report (Where are you at in your work plan):

We have completed all field work related to crayfish harvests from moist-soil wetlands. We sampled 18 wetlands in Arkansas, Louisiana, Mississippi, and Missouri during April-July 2011. Daily harvest for the 2011 sampling season was 3.64 kg/ha (CV = 35%). Summer drought precluded water sampling. We will resume sampling water from moist-soil wetlands in the fall of 2011.

We completed a sensory analysis of crayfish in cooperation with the Department of Food Science, Health and Promotion. Analyses have been completed. We have also submitted samples of crayfish for proximate analysis and amino acid profiles.

We resumed sampling water from moist-soil wetlands in October 2011. Significant rainfall in October and December produced sustained runoff events in both wetlands and agriculture fields in the north Mississippi Delta. Concentrations of N and P species and suspended solids were 18%-85% lower in runoff samples from wetlands than from agriculture fields. Sampling is currently expected to continue through March 2012.

We also submitted samples of crayfish for proximate analysis and fatty acid profiles. Proximate analyses of crayfish harvested from natural moist-soil wetlands and rice-production fields were similar. Gross energy was estimated to be approximately 1000 calories/gram, protein was 17%, and fat was 0.05%. Analyses of fatty acids indicated that tail meat is high in unsaturated fats with the exception of the saturated fatty acid palmitic acid.

Amy successfully completed her doctoral comprehensive exams in December 2011 and has been accepted as a candidate for the degree of Doctor of Philosophy in Forest Resources.

We estimated nutrient and sediment concentrations in runoff samples from wetlands and agriculture fields during October 2011-2012. Concentrations of total orthophosphate, soluble

reactive phosphorus, NO₃-N, NH₃-N, and total suspended solids were all less in wetland run-off samples than in samples from agriculture run-off. The average orthophosphate concentration in wetland runoff was 0.28mg/l. Although significantly less than the average concentration in agriculture fields, the average concentration of total orthophosphate in wetland runoff was greater than recommended for Region X by the Environmental Protection Agency (0.128 mg/l). Concentrations of NO₃-N were 50% lower in wetland runoff compared to agriculture runoff and were less than that recommended for Region X. Total suspended solid concentrations in wetland runoff were 95% less than in agriculture runoff.

We have begun calculating loads of nutrients and sediments in runoff samples from moist-soil wetlands. In 2010, we installed water level loggers at the flashboard risers of our study wetlands. Data from these loggers are used to estimate water volume released from each wetland and combined to estimate the average total load (kg/ha) of nutrients and sediments. During the impounded period of December 2010-April 2011, the average total loads from wetlands were:

	Water Quality Parameter				
	TP	SRP	NO ₃	NH ₃	TSS
kg/ha(S.E.)	2.95(1.86)	1.32(0.94)	0.97(0.35)	3.75(2.83)	287(134)

Current assumed loads of total inorganic phosphorous and nitrogen delivered to the Gulf of Mexico from wetlands in the Mississippi Alluvial Valley are 1 kg/ha; we estimate wetlands are delivering more orthophosphate to the Gulf of Mexico than previously assumed.

Problems Encountered:

No problems to report

Publications/Presentations (Please provide a citation and if possible a .PDF of the publication or PowerPoint):

Alford, A.B., R.M. Kaminski, L.R. D'Abramo, and J. Avery. 2011. Characteristics of harvestable crayfish populations in managed wetlands of the Lower Mississippi Alluvial Valley. Poster presentation. American Fisheries Society, Seattle, WA. September 4-9, 2011.

Alford, A.B. 2011. Crawfish harvest as a wildlife enterprise. Natural Resources Enterprise and LSUAgCenter Paddling and Canoeing and Lease Opportunities for Landowners Workshop. Monroe, LA. September 28, 2011.

Alford, A.B., R.M. Kaminski, R. Kroger, L.R. D'Abramo, and J. Avery. 2011. Ecosystem services derived from moist-soil management. Poster presentation. Mississippi Chapter of the Wildlife Society. Louisville, MS, October 4-5, 2011.

Student Training (list all students working on or funded by this project)

Name	Level	Major
Kelsey Brock	B.A.	Speech
Jonathon Horton	B.S.	Construction Engineering
Ryan Doler	B.S.	Construction Engineering

Next Quarter Plans:

We will continue to sample water from moist-soil wetlands and agriculture fields in fall/winter 2011-2012. Sampling will conclude in March 2012. We have two student workers processing crayfish and invertebrate samples. Samples are expected to be completed by May 2012. Amy

Alford, the graduate student for this research, will be completing her Ph.D. candidacy exams in late fall.

We will continue to sample water from moist-soil wetlands and agriculture fields in winter/spring 2012. Sampling will conclude in March 2012. We have two student workers processing crayfish and invertebrate samples and will be hiring additional workers in January. Samples are expected to be completed by May 2012. Final analyses of crayfish harvest and population characteristics will be completed by April 2012. We will be presenting the results of our 2-year water sampling efforts at the Mississippi Water Resources Conference in April 2012.

All study wetlands will be drained by May 2012. We will remove all runoff sampling stations from wetlands and adjacent agriculture fields in May 2012. Amy Alford, the doctoral candidate on the project will be completing data analysis and will begin writing the dissertation.

Section III. Signatures

Project Manager

Date

Comparisons of Indigenous and Selected Bacterial Degrading Pentachlorophenol (PCP) Consortiums for Remediation of PCP Contaminated Groundwater

Basic Information

Title:	Comparisons of Indigenous and Selected Bacterial Degrading Pentachlorophenol (PCP) Consortiums for Remediation of PCP Contaminated Groundwater
Project Number:	2011MS136B
Start Date:	3/1/2011
End Date:	12/15/2012
Funding Source:	104B
Congressional District:	3rd
Research Category:	Water Quality
Focus Category:	Water Quality, Toxic Substances, Groundwater
Descriptors:	
Principal Investigators:	M Lynn Prewitt, Hamid Borazjani, Ken O Willeford

Publication

1. Quarterly reports 2011-2012 to Mississippi Water Resources Research Institute, Mississippi State University, Mississippi State, MS.

Mississippi Water Resources Research Institute (MWRRI)

Quarterly Report – (From) 7/1/11 – (To) 2/29/12

Reports due: 1st (March 31); 2nd (June 30); 3rd (Sept. 30); 4th (Dec. 31)

Note: Please complete form in 11 point font and do not exceed two pages. You may reference and append additional material to the report.

SECTION I: Contact Information

Project Title: Comparisons of Indigenous and Selected Bacterial Degrading Pentachlorophenol (PCP) Consortiums for Remediation of PCP contaminated groundwater

Principal Investigator: M. Lynn Prewitt, Hamid Borazjani, and Ken Willeford

Institution: Mississippi State University, Department of Forest Products

Address: 100 Blackjack Road, Starkville, MS 39759

Phone/Fax: 662-325-4083/662-325-8126

E-Mail: lprewitt@cfr.msstate.edu; hborazjani@cfr.msstate.edu; kwilleford@bch.msstate.edu

SECTION II: Programmatic Information

Approximate expenditures during reporting period:

Federal: 7,037.56, Non-Federal (MWRRI): _____, Non-Federal (Dept.-FP): 6,396.18,
Non-Federal (Dept.-BCH): 2,133.78, In-Kind: _____, Total Cost Share: 8,529.96

Equipment (and cost) purchased during reporting period:

None

Progress Report (Where are you at in your work plan):

Water samples were collected on September 29, 2011 from eight monitoring wells installed for sampling PCP contaminated groundwater at a wood treating site in central Mississippi. Immediately one milliliter of groundwater sample was inoculated into nutrient broth containing 2 ppb PCP and incubated on a shaker at 30°C overnight. The DNA was extracted using a modified NucleoSpin Tissue nucleic acid purification kit (Macherey-Nagel, Bethlehem, PA). The DNA was checked for quality using a Nanodrop 1000 UV-Vis spectrophotometer (Thermo Scientific, Wilmington, DE) and revealed that two of the water samples did not contain sufficient quality or quantity of DNA for further processing. Bacterial enumerations were performed on water samples and revealed that the number of bacteria was low in all wells. Wells 51 and 52 had the highest number of general and PCP tolerant bacteria with 99% and 70% of the bacteria in these two wells being PCP tolerant bacteria. We will proceed with bacteria from wells 51 and 52 for the gene expression component of this study.

Five gallons of PCP contaminated groundwater were collected from at a former wood treatment site during this reporting period and three of the five treatments using this groundwater were started. The treatments were: a) Treatment 1 (Control) - groundwater without augmentation, b) Treatment 2 (Indigenous) – groundwater augmented with Miracle Grow fertilizer and c) Treatment 3 (Bacteria 1)- sterilized groundwater augmented with Miracle Grow and the PCP degrading bacterial *Sphingobium chlorophenolicum*. PCP concentration is being determined on Day 0, Day 21 and Day 42.

In order to start the remaining 2 treatments for this study, the bacterium *Burkholderia cepacia* is required. In order to purchase *B. cepacia* an upgrade of our laboratory to a Biosafety Level II (BS2) and an APHIS (Animal and Plant Health Inspection Service) permit is required. This should be completed by the end of January. Upon the acquisition of *B. cepacia* the remaining treatments will be started. Treatment 4 (Bacteria 2) will be sterilized groundwater augmented

with Miracle Grow and *B. cepacia* and Treatment 5 will sterilized groundwater augmented with Miracle Grow.

Three treatments to address remediation of PCP in contaminated groundwater were started in January and consisted of 1) groundwater only, 2) groundwater + fertilizer and 3) sterilized groundwater + fertilizer+ *Sphingobium chlorophenolicum*. Sampling occurred on day 0 and day 21. Results indicated that the PCP concentration was 0.4 ppm in all treatments at day 0 and remained unchanged at day 21. The microbial community consisted predominately of *Burkholderia sp.* (34%), *Ralstonia eutropha sp.* (22%), *Bacillus cereus* (19%), *Cupriavidus sp.* (19%), and *Sphingobium chlorophenolicum* (3%) all of which are known PCP degraders. Gene specific primers for pentachlorophenol-4-monoxygenase produced by *Burkholderia sp* were designed and confirmed the presence of this gene in treatments 1 and 2 only. Our conclusions were that PCP degrading bacteria are present and producing genes (at low quantity) that lead to the production of enzymes that will degrade PCP. However the decrease in PCP was not observed at these sampling times.

Problems Encountered:

The water samples were sampled by Mike Lybrand LLC and delivered to us on September 29, 2011 and this has delayed progress on the project. Also we were not able to recover sufficient DNA from two wells that we think are needed to make comparisons with the other wells. However samples will be collected again in December and we will check again for sufficient microbial growth for DNA extraction.

We have incurred a problem with sequence alignment which has delayed identification of bacteria present in the groundwater. We have not previously had this problem. We will work with Dan Peterson and the Institute for Genomics, Biotechnology and Bioinformatics to address this issue.

The concentration of the PCP degrading genes was too low for quantitation. We extended the incubation time to 90 days in order to increase the PCP- degrading gene concentration.

Publications/Presentations (Please provide a citation and if possible a .PDF of the publication or PowerPoint):

Student Training (list all students working on or funded by this project)

Name	Level	Major
Vaibhav Joshi	Master's student	Forest Products

Next Quarter Plans:

We plan to start extracting RNA from the water samples and performing gene expression analysis in order to determine if PCP is being degraded by these indigenous microbial communities. Also we plan to start evaluating an assay method for the determination of PCP-4-monoxygenase enzyme.

The plans for the next quarter will be to complete determination of PCP in the five treatments, extract RNA from the microbial community from each treatment and perform gene expression on the RNA.

We are working on a poster presentation to be made at the 2012 Mississippi Water Resources Conference, April 3-4 in Jackson, MS. We plan to include *Burkholderia sp* in the next round of treatments and determine the gene expression and PCP concentration at day 0, day 21 and day

90.

Section III. Signatures

Project Manager

Date

Water-Conserving Irrigation Systems for Furrow & Flood Irrigated Crops in the Mississippi Delta

Basic Information

Title:	Water-Conserving Irrigation Systems for Furrow & Flood Irrigated Crops in the Mississippi Delta
Project Number:	2011MS137B
Start Date:	3/1/2011
End Date:	6/30/2012
Funding Source:	104B
Congressional District:	3rd
Research Category:	Engineering
Focus Category:	Irrigation, Water Quantity, Non Point Pollution
Descriptors:	
Principal Investigators:	Joseph H. Massey

Publications

1. Quarterly reports 2011-2012 to Mississippi Water Resources Research Institute, Mississippi State University, Mississippi State, MS.
2. Massey, Joseph H. 2011. Water Conservation Practices for Rice Production in the Mid-South, USA. Irrigated Rice Congress of Brazil, Balneario Caboriu, Santa Catalina, Brazil. 10 August 2011. (Invited)
3. Massey, J. 2011. Yazoo Water Management District water meeting. September 14, 2011.
4. Massey, J. 2011. Water and Energy Conserving Irrigation Practices. Rice Short Course 15 November 2011. Stoneville, MS.
5. Massey, J. 2011. Water and Agriculture in the Mississippi Delta. Café Scientifique Starkville, MS 15 November 2011.
6. Massey, J. 2011. Intermittent irrigation of rice. Carbon Trading Kickoff meeting. Hosted by WinRock International and the White River Irrigation District. Stuttgart, AR. December 6, 2011.
7. Massey, J. Invited Panel Member on Water Issues in the Delta. AG EXPO Cleveland, MS 17 January 2012.
8. Massey, J. Invited speaker. Rice Consultants Meeting, Cleveland, MS. 19 January 2012.
9. Massey, J. Invited speaker. Arkansas Soil and Water Education Conference. Jonesboro, AR 26 January 2012.
10. Massey, J. and E. Kline. 2012. Cotton and Rice Conservation Systems Conference. Invited speakers. 31 Jan and 01 Feb. Tunica, MS.
11. Massey, J. 2012. Invited speaker. YMD Water Resources Conference. 08 February. Stoneville, MS.

Mississippi Water Resources Research Institute (MWRRI)

Quarterly Report – (From) 7/1/11 – (To) 2/29/12

Reports due: 1st (March 31); 2nd (June 30); 3rd (Sept. 30); 4th (Dec. 31)

Note: Please complete form in 11 point font and do not exceed two pages. You may reference and append additional material to the report.

SECTION I: Contact Information

Project Title: Water-Conserving Irrigation Systems for Furrow & Flood Irrigated Crops in the Mississippi Delta

Principal Investigator: Joseph H. Massey

Institution: MSU

Address: 117 Dorman Hall

Phone/Fax: 662-325-4725

E-Mail: jmassey@pss.msstate.edu

SECTION II: Programmatic Information

Approximate expenditures during reporting period:

Federal: 10,442.25, Non-Federal (MWRRI): _____, Non-Federal (Dept.): _____,
In-Kind: 24,000.00, Total Cost Share: 24,000

Equipment (and cost) purchased during reporting period:

Progress Report (Where are you at in your work plan):

Irrigation of the six rice fields has been terminated and the fields await harvest (on-going). The four soybean fields are still being irrigated. Once the grain yields from all rice and soybean fields have been determined, harvest indices (bushels of grain per A-in water applied) will be determined along with other irrigation efficiency parameters. These will be compared with state average water use and yield results for the 2011 season.

In June, manual timers were installed on two additional wells for use with the Phaucet furrow irrigation optimization program (soybean fields).

Rice: Data analysis has been completed for the 2011 season and the following results were determined. The rough rice yields and milling qualities of eight Clearfield rice varieties were largely unaffected by intermittent flooding as compared to continuous flooding. Of the eight varieties, CL131 and CL152 showed differences in rice yield ($p < 0.05$), but both were higher in the upper plots that underwent eight wetting-drying cycles as compared to the plots located at the bottom of the paddy that remained continuously flooded with water. These results agree with those from 2010 where 15 rice varieties were compared. Here, no differences in yield and milling quality were measured, but when the yields for all varieties located at the top of the paddies that underwent 5 wetting-drying cycles were compared to the yields for the bottom of the paddies (continuous flooding), yields were significantly higher ($p < 0.05$) for the plots located at the top of the paddy. These results confirm published research that indicates that rice survives, even thrives, under conditions of intermittent flooding. Water use for the past nine years has averaged approximately 22 A-in/A which is on par with zero-grade rice systems, the current gold standard in terms of rice irrigation efficiency.

Soybean: Side-by-side field comparisons for conventional furrow irrigation versus furrow irrigation optimized by the NRCS Phaucet program combined with pump timers were made at two field locations in Leflore County. At one field, Phaucet + timer reduced water use by

approximately 22.6% (16.8 vs. 13.7 A-in/A) and energy use by approximately 20% (~12 vs. 10 gallons diesel per A per 33.8 A field). At the second field location, water use was increased by ~11%. This latter result is not typical of Phaucet savings observed over the past two growing seasons where water and energy savings averaged about 20%. This particular grower already does an excellent job with his irrigation, so it might be that water savings will be difficult to show. There is no reason to expect that Phaucet optimization would result in greater water use. Soybean yields at both field locations were not significantly different between irrigation treatments.

Additional statistical analyses: Additional analyses combining research from 2010 and 2011 were performed since the last report. The represent combined results from this WRRRI-funded research and joint soybean irrigation research conducted with Tom Eubank and Lyle Pringle (MSU DREC) and Jason Krutz (USDA ARS-Stoneville). The results, summarized below, are from four fields studied during the 2010 and 2011 growing seasons that compared Phaucet optimization and convention furrow irrigation designs.

Parameter	Phaucet Design	Convention Furrow Design	p-value
Irrigation events	4	4	1
Avg. Water use (A-in/A)	15	18	0.02
Avg. pumping time (hr)	85	110	0.11
Energy Use (%)	80	100	0.01
Soybean Yield (bu/A)	50	48	0.24

Problems Encountered:
None to date

Publications/Presentations (Please provide a citation and if possible a .PDF of the publication or PowerPoint):

Massey, Joseph H. 2011. Water Conservation Practices for Rice Production in the Mid-South, USA. Irrigated Rice Congress of Brazil, Balneario Caboriu, Santa Catalina, Brazil. 10 August 2011. (Invited)

Massey, J. 2011. Yazoo Water Management District water meeting. September 14, 2011.

Massey, J. 2011. Water and Energy Conserving Irrigation Practices. Rice Short Course 15 November 2011. Stoneville, MS.

Massey, J. 2011. Water and Agriculture in the Mississippi Delta. Café Scientifique Starkville, MS 15 November 2011.

Massey, J. 2011. Intermittent irrigation of rice. Carbon Trading Kickoff meeting. Hosted by WinRock International and the White River Irrigation District. Stuttgart, AR. December 6, 2011.

Massey, J. Invited Panel Member on Water Issues in the Delta. AG EXPO Cleveland, MS 17 January 2012.

Massey, J. Invited speaker. Rice Consultants Meeting, Cleveland, MS. 19 January 2012.

Massey, J. Invited speaker. Arkansas Soil and Water Education Conference. Jonesboro, AR 26 January 2012.

Massey, J. and E. Kline. 2012. Cotton and Rice Conservation Systems Conference. Invited

speakers. 31 Jan and 01 Feb. Tunica, MS.

Massey, J. 2012. Invited speaker. YMD Water Resources Conference. 08 February. Stoneville, MS.

Student Training (list all students working on or funded by this project)

Name	Level	Major
Cedric Reid	Undergrad	Biochemistry

Next Quarter Plans:

We have had to wait until the producers were finished with harvest before we can finalize data collection and analysis for this season.

Prepare presentation for the 2012 Mississippi Water Resources Conference, April 3-4, in Jackson, MS.

Perform additional statistical analyses and write final technical report for project.

Section III. Signatures

Project Manager

Date

Developing rapid methods for dating of sediments in Mississippi using ICP-MS

Basic Information

Title:	Developing rapid methods for dating of sediments in Mississippi using ICP-MS
Project Number:	2011MS141B
Start Date:	3/1/2011
End Date:	8/31/2012
Funding Source:	104B
Congressional District:	1st
Research Category:	Water Quality
Focus Category:	Sediments, Water Quality, Wetlands
Descriptors:	
Principal Investigators:	, James Cizdziel

Publication

1. Quarterly reports 2011-2012 to Mississippi Water Resources Research Institute, Mississippi State University, Mississippi State, MS.

Mississippi Water Resources Research Institute (MWRRI)

Quarterly Report – (From) 7/1/11 – (To) 2/29/11

Reports due: 1st (March 31); 2nd (June 30); 3rd (Sept. 30); 4th (Dec. 31)

Note: Please complete form in 11 point font and do not exceed two pages. You may reference and append additional material to the report.

SECTION I: Contact Information

Project Title: Developing Rapid Methods for Dating Sediments in Mississippi using ICP-MS

Principal Investigator: James Cizdziel

Institution: University of Mississippi

Address: Department of Chemistry, 222 Coulter Hall, University, MS 38677

Phone/Fax: 662-915-1814

E-Mail: cizdziel@olemiss.edu

SECTION II: Programmatic Information

Approximate expenditures during reporting period:

Federal: 4,514.24, Non-Federal (MWRRI): _____, Non-Federal (Dept.): _____,
In-Kind (Weyerhaeuser): 9,160.00, Total Cost Share: 9,160.00

Equipment (and cost) purchased during reporting period:

Eichrom resins (columns and power) for extraction/pre-concentration of Pb and Pu (\$6,160.00).

Progress Report (Where are you at in your work plan):

A sediment core was obtained and analyzed for Pu by leaching, isolation using column chromatography, and ICP-MS detection. However, there was relatively poor recovery for the tracer possibly a result of an unexpected precipitate formed during sample preparation (see below). A second analytical run is underway.

A sediment core was obtained and analyzed for Pb isotopes by ICP-MS after leaching and isolation using column chromatography. Data is being evaluated. We estimate about $\frac{3}{4}$ of the work plan is complete.

A sediment core was obtained and analyzed for Pb isotopes by ICP-MS after leaching and isolation using column chromatography. Whereas the Pu data showed similar age-dating results compared to convention radiocesium analysis, the Pb-210 ICPMS-derived data was less promising and subject to interferences. Another approach is being investigated. We estimate a little more than $\frac{3}{4}$ of the work plan is complete. An oral presentation and poster titled, "Measuring Fallout Plutonium and Lead Isotopes in Sediment Using ICPMS for Age-Dating Purposes" was prepared for the Water Resources Conference in Jackson April 3-4, 2012.

Problems Encountered:

The sample preparation scheme resulted in an unexpected precipitate upon final elution. The precipitate does not readily dissolve in acids. We are working with the resin manufacturer to find the source of the problem.

The variability in the ICP-MS data is greater than expected. We are exploring ways to improve precision.

The Pb-210 counts by ICPMS were correlated with stable Pb suggesting a Pb-208 polyatomic hydride and/or Pb-208 tail interference.

Publications/Presentations (Please provide a citation and if possible a .PDF of the publication or PowerPoint):

Student Training (list all students working on or funded by this project)

Name	Level	Major
Pragya Chackravarty	Graduate Student	Chemistry

Next Quarter Plans:

Re-run sediment cores for Pu using modified procedure. Begin Pb work.

Complete analytical analyses and prepare report.

Note: Although the project start period states 3/1/11, funding was only received in July 2011, effectively setting us back four months.

Section III. Signatures

Project Manager

Date

Information Transfer Program Introduction

The Mississippi Water Resources Research institute addresses research and outreach efforts targeted at maintaining plentiful, quality water supplies throughout the state. The Institute is a hub for information and expertise on water resources issues within the state and region. We do this in full partnership with our public and private cooperators.

The Mississippi Water Resources Research Institute is committed to providing public outreach, education opportunities, and assisting with economic development activities. Researchers and students have the opportunity to present their research by giving oral and poster presentations. Also included are plenary sessions and workshops. Those persons subscribed to the MWRRI listserv receive newsletters, award opportunity notices, job opportunities, conference information, and timely water related information.

Information Transfer Program-Publications

Basic Information

Title:	Information Transfer Program-Publications
Project Number:	2011MS180B
Start Date:	3/1/2011
End Date:	2/29/2012
Funding Source:	104B
Congressional District:	3rd
Research Category:	Not Applicable
Focus Category:	None, None, None
Descriptors:	
Principal Investigators:	, Wayne Wilkerson

Publications

1. Mississippi Water Resources Research Institute. 2011. 2011 Annual Report. Mississippi State University, Mississippi State, MS, 20 pages.
2. Mississippi Water Resources Research Institute. 2012. Newsletter, Volume 2012, Spring Issue, 5 pages. http://wrri.msstate.edu/newsletter_0112.asp

2011 Mississippi Water Resources Research Institute

Annual Report





Director's Update

Greetings from the Mississippi Water Resources Research Institute. As most of you know by now, the Institute has recently had a change in leadership. My name is Wayne Wilkerson, and I am the Institute's new Director. I am also an Associate Professor in the Department of Landscape Architecture here at MSU. Since taking on the role of Director back in the spring, I have traveled all over the state of Mississippi meeting with as many citizens and stakeholders as possible to get their impressions of how the Institute could best be addressing current and future water related issues. These include the traditional concerns of water quality and quantity, both urban and agricultural, as well as economic development.

I am sure everyone is aware of the impact that the Flood of 2011 had on the Mississippi Delta. The Flood set new record stages at Vicksburg and Natchez and approached record levels at Greenville and Memphis. Farm Bureau estimated that over 600,000 acres of Mississippi farmland were impacted. At the same time that the Mississippi River was experiencing record flood levels, on the other side of the levee farmers in the Delta were seeing decreasing levels in the alluvial aquifer available for irrigation.

Although the nation's economic growth has been somewhat unsure, Mississippi recently welcomed the opening of the new Toyota Plant at Blue Springs. When production is fully operational in 2012, over 2,000 new well paying jobs will be created on-site, with additional support industries providing many more.

What is the common denominator for these issues? Water. Our agricultural commodities require water to grow and flourish, and mega-sites such as Toyota and Nissan can use over a million gallons per day as part of the industrial process. I see the role of the Institute as a clearinghouse of resources to assist the citizens of Mississippi respond to water related issues in a positive manner.



The Institute's mission, as defined in its charter, is to provide a statewide center of expertise in water and associated land-use planning and to serve as a repository of knowledge for use in education, research, and community service. We will work hard to accomplish our stated mission, and improve the quality of life for all the citizens of Mississippi.

Wayne Wilkerson

Institute Mission Statement

Established by the U.S. Congress in 1964, the Mississippi Water Resources Research Institute (MWRRI) is one of 54 institutes (one in each state, the District of Columbia, Guam, Puerto Rico, and the Virgin Islands) that form a network of research efforts coordinated to solve water problems of state, regional, or national significance. In 1983, the Mississippi Legislature formally designated the MWRRI as a state research institute. Federal legislation specifies that the institute consult with leading water officials in the state to develop 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, Department of the Interior. The Institute's state authorization charges it with assisting state agencies in the development of a state water management plan, maintaining a technology transfer program, and serving as a liaison between Mississippi and funding agencies.



The MWRRI goals are to:

- (1) Serve public and private interests in the conservation, development, and use of water resources.
- (2) Provide training opportunities in higher education whereby skilled professionals become available to serve government and private sector alike.
- (3) Assist planning and regulatory bodies at the local, state, regional, and federal levels.
- (4) Communicate research findings to potential users in a form that encourages quick comprehension and direct application to water related problems.

Two Year Strategic Plan 2011-2013

Research

- Continued support for food/fiber/fuel mission.
- Develop a better understanding of the interactions between water systems, land use, the built environment, and climate change.

Education

- Develop a Certificate of Watershed Protection.
- Utilize demonstration projects as service learning.
- Expand the number of funded graduate students.

Engagement/Outreach

- Enhance working relationships with Mississippi universities and state agencies.
- Offer workshops for technology transfer.
- Return the annual conference to Jackson, MS.

MWRRI Research Impacts

- **Watershed Management** – The WRRRI has been assisting interested stakeholders organize comprehensive watershed management organizations since the mid-’90s. Regardless of the geographic size of the watershed or the scope of interest, watershed management organizations are increasingly important nationally and in Mississippi because they can integrate and coordinate various federal and state environmental, agricultural, natural resource, emergency management, and economic development programs to develop and implement plans for environmentally sustainable economic development.
- **Water Quality** – Increasingly, good water quality is critical in attracting new industries to an area. As county and local governments begin to take a more active role in addressing nonpoint sources of water pollution, it is important to accurately and fully quantify the potential water quality benefits of various non-regulatory management alternatives. The WRRRI is collaborating with local governments, the Environmental Protection Agency, the Mississippi Department of Environmental Quality and other state and regional agencies to design projects to meet these needs.
- **Water Quantity** – Industry experts say that the three things that we currently take for granted about the current state of water – quantity, quality, cost – will not be present in the decades ahead.

Mississippi is currently blessed with adequate quantities of water. Availability of adequate water supplies was a major factor in the location of both the Nissan and the Toyota automobile manufacturing plants to Mississippi. But this may change in the future. Communities in Northeast Mississippi are experiencing drinking water shortages. The Mississippi Delta is also concerned with potential irrigation problems. The WRRRI is working with these diverse economic and political groups to ensure that future generations of Mississippians will continue to have access to adequate supplies of water.

- **Small Public Water Systems** – The need to assist small (10,000 or fewer customers) and even the smallest (3,400 or fewer customers) public water systems in Mississippi and the Southeastern United State to develop financial, managerial, and technical capacity remains a WRRRI priority. The Southeastern Regional Small Public Water Systems Technical Assistance Center (SETAC) was funded in 2000 to provide this assistance. SE-TAC projects have benefited hundreds of small systems in the region, providing technical assistance to more than 97 systems; training more than 2,000 water system personnel; and saving water associations more than \$3 million in water loss and energy costs.



MWRRRI Project Summaries

Watershed Assessment and Education

Maifan Silitonga, Mississippi River Research Center, Alcorn State University

The Coles Creek Watershed, located in the southwestern quadrant of the state of Mississippi, is listed under the US EPA impaired water section 303(d). Degradation of the ponds/lakes and streams/creeks in this watershed is caused mostly by biological impairment, followed by nutrients, organic enrichment or Low Dissolved Oxygen, sediment/siltation, pesticides, and pathogens (US EPA, 2007).

Research objectives were to:

1. Analyze the quality of water in the ponds
2. Analyze soil samples in the surrounding areas
3. Identify the cause of degradation
4. Find and select the best management practice(s) to restore the pond's conditions, and
5. Develop educational materials for the community

Water quality samples from Coles Creek Watershed were collected in 23 locations and monitored monthly for 13 months. Areas of concentrated research and analysis included such topics as: temperature, pH, turbidity, total dissolved solids, dissolved oxygen, nitrate, chlorophyll, total coliform, and *Escherichia coli*.

Watershed education and stewardship efforts were conducted to help promote water quality preservation quality in the Coles Creek Watershed. Activities included workshops, Non-Point Source Education Tour of the Mississippi River in collaboration with MDEQ, and Earth Day Recycling Competition whereby numerous student organizations and clubs collected approximately 1700 lbs of paper, 200 lbs of aluminum cans, and 200 lbs of plastic bottle during 2009.

In March 2010, the Small Farmers Conference was held for conducting educational presentations addressing non-point pollution and how it can directly and indirectly affect drinking water and human health. Summer Apprenticeship Programs sponsored by the Department of Agriculture, School of Agriculture, Research, Extension, and other sciences were conducted and administered by Alcorn State University Experiment Station personnel to introduce agriculture and relations sciences to students. At the end of the curriculum, students gave PowerPoint presentations to be shared with other students, staff, and parents. In 2010, two high school students are assigned to the environmental science program. They were trained to use Global Positioning Systems (GPS) to locate potential sources of contaminants and analyze data.

Assessing the Effectiveness of Measures to Reduce Sediment Loads in Surface Waters Using Pb Activity in Lacustrine Sediments

Gregg Davidson, Geology and Geological Engineering, University of Mississippi

Erosion control methods are difficult to measure on surface erosion which can vary widely over a specific area and hamper the development of management practices. Preventing accurate assessment of the value of erosion control structures over time is also hampered due to measurement practices. As a watershed drains into a lake, the accumulated sediments have the potential to provide information about historic rates of sedimentation that possibly will yield information about historic rates of sedimentation which can then be used to evaluate the effectiveness of previous erosion control measures.

During this study, sediments from five natural oxbow cutoff lakes in the Mississippi River alluvial floodplain were dated using Pb decay rates and bomb-pulse derived Cs with the possibility of relating trends in sedimentation rate to reductions in erosion due to management practices.

Results from the research conducted found that Pb and Cs dating methods were better quantifiers when working with known dates for implementation of management practices. Sedimentation rate changes over time frames as short as 12

years were detectable and larger lakes indicated smaller changes in sedimentation rate relative to smaller lakes.



Successful application requires that lake sediments that have not been significantly reworked since deposition and erosion control measures which were implemented at least 10 years prior result in measures that will remain in effect after the implementation.

Influences of Land Surface / Land Use Characteristics on Precipitation Patterns over the Lower Mississippi Alluvial Plain

Jamie Dyer, Department of Geosciences, Mississippi State University

The lower Mississippi River alluvial valley in southeast Arkansas, northeast Louisiana, and northwest Mississippi is often characterized as few urban areas but widespread agriculture. Land use is cultivated cropland with little variation in topographic variation; however, the eastern edge of the alluvial valley is described as having small rapid changes in elevation which then moves to heavily forested landscape. This change in land use / land cover has known to enhance precipitation through generation of a weak mesoscale convective boundary. This research project seeks to define the causes and influences of the land surface on corresponding precipitation processes by simulating a convective rainfall event which is influenced by regional surface features. Using a high-resolution simulated dataset generated by the Weather Research and Forecasting (WRF) model, results show that the strongest uplift coincides with an abrupt low-level thermal boundary which primarily is developed by a rapid change from sensible to latent flux relative to the agricultural and forested areas, respectively. This information can then be used to define and predict surface-influenced convective precipitation along agricultural boundaries in other regions where the synoptic environment is weak.

One important finding from the research identified and described the influences of land cover properties, including soil and vegetation conditions, on atmospheric processes of the

Mississippi Delta. Analysis confirmed that variations in the energy and moisture fluxes during the warm season along with the eastern boundary of the Mississippi Delta were responsible for the generation of a mesoscale convective boundary through processes similar to that found in an urban heat island. This is a direct indication of regional climate change resulting from agricultural practices. Another finding was the development of a convective circulation in the area was responsible for the generation of localized precipitation to the east of the Mississippi Delta. While convection was initiated along the boundary of the land cover, prevailing westerly flow cause the cloud cover to move around to the east where it eventually rained. The result of this finding concludes that the atmosphere is acting as a source of interbasin water transport but the exact volume of moisture removed from the study region has yet to be quantified.

These findings indicate that more research ideas should include quantification of the volume of moisture that could be transported through the atmospheric due to surface-influenced convective circulation. Findings would then assist not only in the development and understanding of the sources and releases of moisture over the Mississippi Delta but water resource management as well.

Water Quality and Other Ecosystem Services Performed in Wetlands Managed for Waterfowl in Mississippi

Richard M. Kaminski and Amy S. Spencer, Department of Wildlife, Fisheries and Aquaculture, Mississippi State University



Wetlands are ecologically, environmentally, and economically valuable worldwide. Natural moist-soil emergent vegetated wetlands, abundant in the Lower Mississippi Alluvial Valley (MAV), are generally flooded

during fall-winter and then dewatered naturally by evaporation or by managers during spring-summer to promote growth of annual grasses and sedges.

The life-history strategies of these plants are adapted for production of abundant seeds or tubers that are used by a wide diversity of waterfowl and other wetland wildlife. Within agricultural landscapes, such as in the MAV, strategic location of moist-soil wetlands amid farmed lands can reduce dispersal of sediments and other nutrients into surrounding watersheds and thus enhance water and environmental qualities. Additionally,

seasonal decay of native vegetation in wetlands sustains nutrient cycling and is the foundation of detrital based food webs in these systems. Crayfish (*Procambarus* spp.) and other aquatic invertebrates inhabiting moist-soil wetlands are bio-indicators of quality freshwater wetlands. Crayfish can also provide additional economic gain and food for landowners.

Research in the MAV will: (1) generate baseline water quality data for describing potential watershed quality improvements provided by moist-soil management, (2) model factors contributing to the formation of a detrital-based food web of crayfish and other invertebrates within these managed wetlands, and (3) estimate population size, survival, and recruitment of crayfish populations to assess economic potential for sustainable harvest of this resource from natural wetlands for human consumption.

It is hoped that by increasing awareness of multiple ecological, environmental, and economic benefits of moist-soil management the potential to enhance water quality, wetland conservation, biodiversity, and economic values of public and private lands in Mississippi and the MAV will provide numerous advantages.



Water-Conserving Irrigation Systems for Furrow and Flood Irrigated Crops in the Mississippi Delta

Joseph Massey, Plant & Soil Sciences, Mississippi State University

Significant declines in the Mississippi River Valley Alluvial Aquifer have occurred over the past 20 years. As a result of this decline, improved crop irrigation practices are even more of an important issue. This project's goal is to improve water use efficiency for one of the most economically important cropping rotations which is practiced in the Mississippi Delta – soybean-rice rotation. Past planting history has typically been two years of soybean are followed by one year of rice. Rice and soybean together are grown on approximately 100 million acres and represented about \$500 million (soybean) and \$100 million (rice) in economic activity for the Mississippi Delta in 2007.

This project research will include: **economic** – using a systems approach to calculate water-saving irrigation techniques for the soybean-rice rotation; **regulatory** – assist MDEQ and YMD by providing practical, field-tested irrigation practices; **environmental** – reduction of non-point source runoff of agrichemicals into nearby surface waters while reducing carbon emissions related to energy use; and **educational** – results will be used for reports, seminars, and videos for educating producers on more water-efficient cropping systems.



A Climate-driven model to serve as a predictive tool for management of groundwater use from the Mississippi Delta Shallow Alluvial Aquifer

Charles L. Wax, Geosciences and Jonathan W. Pote, Agricultural and Bioengineering, Mississippi State University

Research to develop a model that could be used as a management tool to find ways to meet the need for water use while conserving groundwater was needed to assist water management personnel as well as stakeholders in the Mississippi Delta. In phase one, growing season precipitation was used to develop a relationship estimating irrigation use which became the driving mechanism of the model that simulated water use through the year 2056. Phase two added the use of surface water when growing season precipitation was 30% or more above normal. During the third phase, new climatological input was added to the model – irrigation demand. This was calculated using daily precipitation, evaporation, and crop coefficient to estimate daily water needs by crop type. Daily values were then summed to one week segments which were added to derive the total growing season irrigation demand. Weekly summations increased temporal resolution thereby improving the model's efficiency in accounting for excess daily rainfall.

Findings from the research were:

- The amount of water withdrawn from the aquifer each year for irrigation is directly related to climate inputs: specifically precipitation, evaporation, and resulting plant water demand.

- The aquifer volume responds positively and quickly to changes in management strategies and land use changes.
- Use of surface water in lieu of groundwater for irrigation in years when growing season precipitation is 30% or more above average can significantly reduce aquifer drawdown in the particular year resulting in a faster recovery of volume in the aquifer during the recharge period.

Data analysis concludes that climate could provide the entire water need of the plants in 70% of the years for corn, 65% of the years for soybeans and cotton, and even 5% of the years for rice. Analysis also demonstrates that extra water delivered by the climate could be a possible source of water that could be used often in place of pumped groundwater. Positive economic benefits include a savings in energy, save producers money, and enhance the sustainability of the aquifer.

Sources, sinks, and yield of organic constituents in managed headwaters of the Upper Gulf Coastal Plain of Mississippi

Jeff A. Hatten, Janet C. Dewey, and Andrew W. Ezell, Forestry, Mississippi State University

Forest management activities can potentially affect as much as 20 million acres in Mississippi, much of which is in headwater catchments. Headwater streams are important in-terms of their contribution of water and nutrients to downstream fluvial environments, however headwater-derived sediment, organic matter, and nutrients (particularly nitrogen) are constituents that most often lead to the impaired designation for rivers in Mississippi. Many studies of non-mountainous systems have focused on the quantity of particulate or dissolved forms of material (e.g. suspended solids, organic matter, and nitrogen); few have examined the source of this material. This proposal addresses the transport and source/sink behavior of sediment and dissolved and particulate forms of organic matter in the form of nitrogen (N) and organic carbon (OC), over a range of hydrographic conditions and scales. Our objective is to quantify the yield, source, and transport processes of OC and nutrients within managed, forested watersheds in Webster County, Mississippi.

Results from this research will be of value to forested-watershed managers as they weight the environmental cost vs. nutrient cycling benefit of organic inputs resulting from silvicultural activities.



**Southeastern Regional Small Public Water
Systems Technical Assistance Center (SE-TAC)**

*Mary Love Tagert, Mississippi Water Resources Research
Institute; Jonathan Pote, Department of Agricultural and
Biological Engineering,
Mississippi State University*

The Southeastern Regional Small Public Water Systems Technical Assistance Center (SE-TAC), funded by the Environmental Protection Agency, was established in 2000 as part of EPA's Technical Assistance Center Network authorized by the Safe Drinking Water Act (SDWA) amendments of 1996 and has been administered by Mississippi State University since its inception. SETAC's mission is to build partnerships among water utility organizations, state primacy agencies, technical assistance providers, and universities throughout the Southeastern Region of the United States to protect public health by enhancing small water systems' capacity to protect and provide safe drinking water. SE-TAC works closely with state and regional organizations and agencies to assist small public water systems in acquiring and maintaining the technical, financial, and managerial capacity to provide safe drinking water and meet the SDWA's public health protection goals. SE-TAC's efforts are focused on eleven states in the Southeastern United States: Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee and Texas. A multi-state, fifteen member, external Advisory Board helps SE-TAC avoid duplication of effort and focus the program's resources on issues

inadequately addressed by existing programs. SE-TAC provides a forum to create partnerships that can identify gaps in existing capacity development programs. Since its establishment, SE-TAC has provided a competitive grants program to develop novel pilot projects to fill those gaps and directly assist small drinking water systems in protecting human health and complying with the SDWA's increased technical, monitoring, and reporting requirements. Competitively-funded projects currently underway include:

- Asset Management, Board Training, and Capacity Development for Small Drinking Water Systems, Florida Rural Water Association
- Developing Workforce Strategies to Meet Utility Employment Needs, Alabama Rural Water Association.

More recently, SE-TAC has also incorporated an applied approach to directly and meaningfully provide asset management and mapping assistance for small public water systems in the region, with efforts in the current funding cycle focused on Northeast Mississippi. Hundreds of small public water systems have received training and assistance with technical, financial and managerial issues through SE-TAC projects, as all projects and outputs have the goal of transferability to other small systems.

2010 Water Resources Conference

The 40th Annual Mississippi Water Resources Research Conference was held November 3-5, 2010 at Hollywood Casino in Bay St. Louis. More than 200 individuals attended the two and one half day conference, which included 20 student presenters. The conference included 12 keynote speakers and offered 11 technical tracts including Sedimentation, Weather/Climate, Coastal Resources, Surface Water Management, Wetlands, Education, Management/Planning, Delta Groundwater, Nutrients, Delta Water Resources, and Ports.

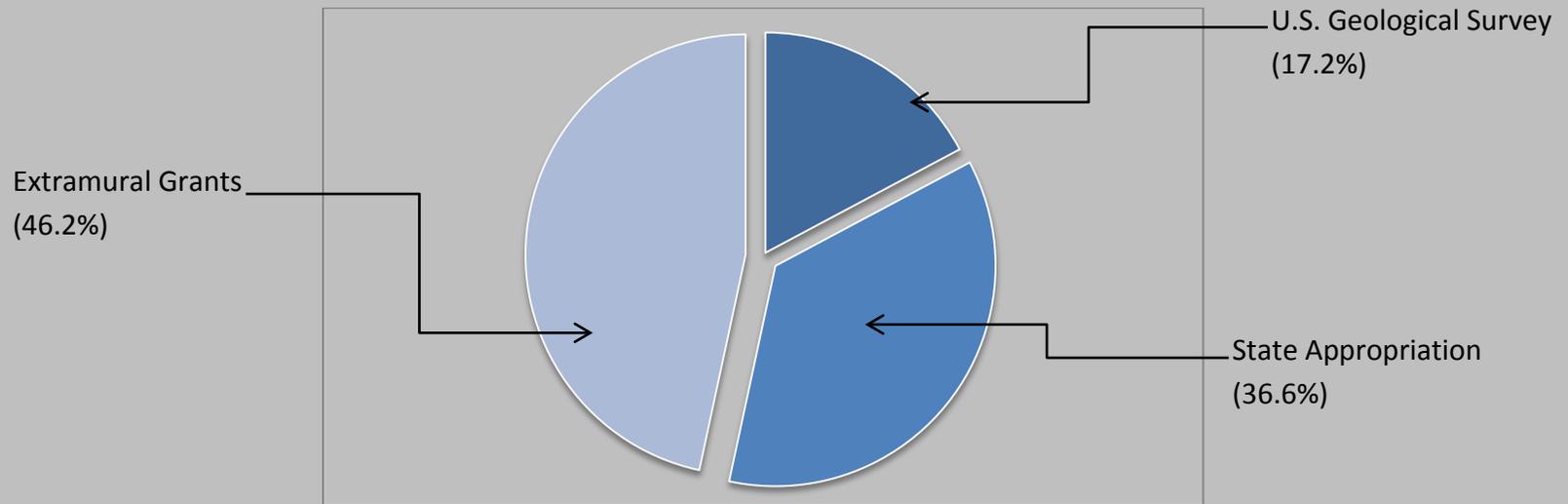
A student competition was offered for both oral and poster presentations. Eight student posters were presented with **Garry Brown, Jr.**, a graduate student at University of Mississippi, garnering the top prize. The presentation was on *Concentration of Methylmercury in Natural Waters from Mississippi Using a New Automated Analysis System*. Thirteen students made oral presentations during the conference. **Mary Catherine Mills**, a graduate student at Mississippi State University received third place for her presentation on *Evaluating Physiological and Growth Responses of Arundinaria spp. To Inundation*. **C. Elizabeth Stokes**, a PhD candidate from Mississippi State University garnered second place for her presentation on *Identification of Pentachlorophenol (PCP) Tolerant Bacterial Communities in Contaminated Groundwater after Air-Sparging Remediation*.

The first place winner was **Amy Spencer**, a Mississippi State University PhD candidate, whose presentation was on *Ecosystem Services from Moist-Soil Wetland Management*. All of the students did an exemplary job and it was difficult to choose three winners from the group of presentations. Special thanks go to Mississippi Water Resources Research Institute, Mississippi Water Resources Association, and Weyerhaeuser Company for sponsoring the student competition awards.

The conference was planned by Mississippi Department of Environmental Quality, Mississippi Water Resources Association, Mississippi Water Resources Research Institute, and U.S. Geological Survey. Sponsors included Florence and Hutcheson, Neel Schaeffer, Rosedale-Bolivar Port, Waggoner Engineering and Yazoo-Mississippi Delta Levee Board. Exhibitors present at the conference included Mississippi Department of Environmental Quality, Natchez Convention Center, Northern Gulf Institute, Pickering Firm, Inc., Pierce Pacific, Taylor Machine Works, U.S. Army Corps of Engineers, and U.S. Geological Survey.

Financial Summary

Program Component	Federal	Non-Federal	Total
U.S. Geological Survey Grant	\$92,335		\$92,335
State Appropriations		\$193,868	\$193,868
Extramural grants and contracts		\$250,000	\$250,000
TOTAL	\$92,335	\$443,868	\$536,203



MWRRI Advisory Board

University (3)

Dr. Raymond C. Highsmith, Director
UM Field Station, Center for Water and Wetland Resources

Dr. Jacob F. Schaefer, Associate Professor
Biological Sciences
University of Southern Mississippi

Mr. Thomas W. Richardson, Deputy Director
Center for Excellence, Analysis and Response
For Coastal Hazards, Jackson State University

State (8)

Mr. Jan Boyd
Mississippi Department of Marine Resources

Mr. Jamie Crawford
Mississippi Department of Environmental Quality/Office of Land and Water

Dr. Deirdre McGowan, Executive Director
MWRA

Mr. Chip Morgan, Executive Director
Delta Council

The Honorable Brandon Presley, Commissioner
Mississippi Public Service Commission

Dr. LaDon Swann, Director
Mississippi-Alabama Sea Grant Consortium

Mr. Don Underwood, Executive Director
Mississippi Soil & Water Conservation Commission

Mr. Andy Whittington, Environmental Specialist
Mississippi Farm Bureau Federation

Federal (3)

Dr. Pat Deliman
Environmental Laboratory Technical Director, CEERD-EP-E

Dr. Karrie Pennington
State Water Quality Specialist
Natural Resources Conservation Service

Mr. Mickey Plunkett, District Chief
U.S. Geological Survey

At large (5)

Mr. Tom Bryant, Managing Principal
Pickering Firm Inc.

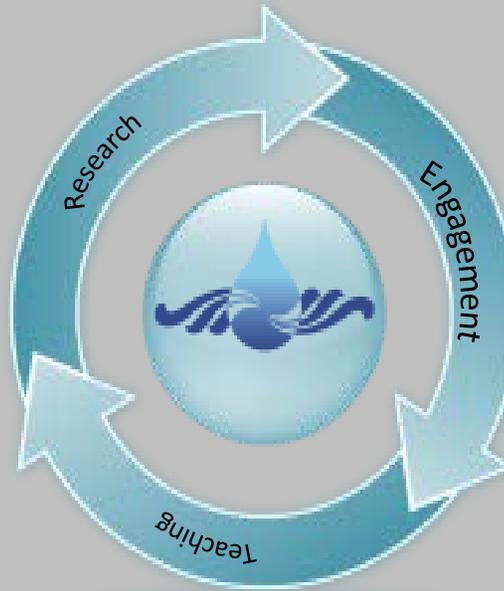
Dr. Jami Nettles
Weyerhaeuser Company

Mr. Michael Hatcher
Michael Hatcher and Associates

Dr. Dean A. Pennington, Executive Director
Yazoo Mississippi Delta Joint Water Management District

Ms. Kay Whittington
Mississippi Department of Environmental Quality/Office of Pollution
Control

Collaborators/Partners





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From the Director's Desk

Greetings from the Mississippi Water Resources Research Institute. As most of you know by now, the Institute had a change in leadership in 2011. My name is Wayne Wilkerson, and I am the Institute's new Director. I am also an Associate Professor in the Department of Landscape Architecture here at MSU.

Since taking on the role of Director back in the spring of 2011, I have traveled all over the state of Mississippi meeting with as many citizens and public officials as possible to get their impressions of how the Institute could best be addressing current and future water related issues.

I am sure everyone is aware of the impact that the Flood of 2011 had on the Mississippi Delta. The Flood set new record stages at Vicksburg

and Natchez and approached record levels at Greenville and Memphis. Farm Bureau estimated that over 600,000 acres of Mississippi farmland were impacted. At the same time Texas and Oklahoma, as well as parts of Louisiana, are experiencing severe droughts.

What is the common denominator for these issues? Water. I see the role of the Institute as a clearinghouse of resources to assist the citizens of Mississippi respond to these types problems in a positive manner.

If you look at page four of this newsletter you will see the Institute's four goals clearly defined. I plan to make an effort to have at least one success story for each of those goals each year. Following issues will highlight these successes.



This is the Spring publication for 2012. We hope to have four issues per year—Spring, Summer, Fall, Winter. Each issue will have a different theme. This publication introduces you to our four new Advisory Board members, as well as a brief description of our Annual Conference. Page 5 is a profile of one of success stories. Enjoy.

WRRI 2012 U.S.G.S. Annual Competitive Grants Awards

Title: *Acoustic Measurements for Monitoring Fine Suspended Sediment in Streams.*

Principal Investigators:

James P. Chambers, Interim Executive Director, National Center for Physical Acoustics, University of Mississippi.

Cristiane Q. Surbeck, Assistant Professor, Department of Civil Engineering, University of Mississippi.

Wayne Carpenter, R & D Engineer, National Center for Physical Acoustics, University of Mississippi.

Title: *Soil Media Compositions for Water Quality Improvements And Stormwater Management in Urban Flow-Through Facilities.*

Principal Investigators:

Robert Kröger, Assistant Professor, Dept. of Wildlife, Fisheries & Aquaculture, Mississippi State University.

Warren C. Gallo, Assistant Professor, Dept. of Landscape Architecture, Mississippi State University.

Title: *Analysis of Precipitation Variability and Related Groundwater Patterns over the Lower Mississippi River Alluvial Valley.*

Principal Investigators:

Jamie Dyer, Associate Professor, Department of Geosciences, Mississippi State University.

Andrew Mercer, Assistant Professor, Department of Geosciences, Mississippi State University.

New Advisory Board Members



Karrie Pennington, PhD

Karrie has been working with the US Department of Agriculture's Natural Resources Conservation Service since 1992, studying the impacts of land use on water ecosystems. She completed a B.A in biology at the University of North Texas, and completed a M.S. in soils

from the University of Idaho in Moscow. She taught as a visiting professor at the same university until moving to Tucson, Arizona, where she taught for three more years. She received her Ph.D. in soil and water science, and moved east to the Mississippi Delta, completing her post-

doctoral studies with the USDA's Agricultural Research Service.

She recently co-authored a book entitled "Introduction to Water Resources and Environmental Issues", published by Cambridge University Press.

MS Water Facts

Total water use in Mississippi averages around 3.0 billion gallons per day (BGD).

• *Approximately 73% of all Mississippi water use comes from groundwater*

• *Remaining 27% comes from surface water or recycled water*

Mississippi uses water as follows:

- *irrigation – 60%*
- *aquaculture – 15%*
- *public water supply – 14%*
- *Others, including industrial and thermal energy - 11%*



Mr. Thomas W. Richardson

Tom is the Deputy Director of the Coastal Hazards Center of Excellence at Jackson State University. He is the former director of the Coastal and Hydraulics Laboratory at the Engineer Research and Development Center in Vicksburg, Mississippi, and has spent his pro-

fessional career managing and conducting research in the field of coastal and hydraulic engineering. He holds a BS in civil engineering from The Citadel, an MS in civil/ocean engineering from the University of Miami, and a diploma in hydraulic/coastal engineering from the Inter-

national Institute for Hydraulic and Environmental Engineering in Delft, the Netherlands.

Mr. Michael Hatcher

Michael is President of Michael Hatcher and Associates, located in Olive Branch, MS.

He launched his own business career as Michael Hatcher Landscape Contractor in 1986.

He lives in Olive Branch, MS, with his wife Mary and their youngest son Shawn.

Upon receiving his degree in Landscape Contracting from Mississippi State University in 1982 he moved to Memphis, TN, where he worked for several well know firms be-

In 1996 the company was incorporated as Michael Hatcher & Associates and in 2009 become an Employee Owned Company where he serves as President.

Ms. Kay Whittington

Kay is the chief of the Basin Management Branch in the Surface Water Division at MDEQ. Kay has been with MDEQ for 14 years and previously worked on TMDLs as a water quality modeler.

She is a native of Tuscaloosa, Alabama, and earned

B.S. and M.S. degrees from the University of Alabama in Civil and Environmental Engineering.

When Kay is not able to be enjoying nature with her husband and two young children, her primary responsibility is to implement Missis-

sippi's Basin Management Approach, which is a collaboration of public agencies, non-governmental organizations (NGOs), and other stakeholder groups that collaborate to restore and protect the quality of Mississippi's water resources.

2012 Mississippi Water Resources Conference



Water, Sustainability, and Climate

April 3-4, 2012

Mississippi is fortunate to currently have plentiful supplies of clean water. However, potential problems loom on the horizon. Drought conditions continue to plague parts of the Southeast, stretching from Texas to Georgia. Parts of the Mississippi Delta were inundated by the Flood of 2011, while at the same time groundwater supplies experience declines. The Mississippi Water Resources Conference provides a forum for the water resources community to discuss these complex water issues facing our state, region, and nation. This year's conference is organized around four tracks – Water Quality, Water Quantity, Climate, and Sustainability. Research findings and applications from state and federal agencies, as well as colleges and universities, will be shared with conference attendees.

Scheduled for April 3-4 in Jackson, MS, this year's conference promises to be an exciting event. This will be the water conference you will not want to miss, with exciting presentations and keynote speakers, as well as a panel forum comprised of representatives from several federal and state agencies. Poster sessions will showcase student work, and exhibitors from the private and public sectors will be in attendance.

Location - Jackson Hilton, Jackson, MS

The conference will be held at the Jackson Hilton, in Jackson MS. Reservations may be made by phoning 1-601-957-2800. Please make your reservations by March 1, 2012 to receive the group rate of \$ 109.00 per night. Mention group code "WATER" to receive the special group rate.

Invited Keynote Speakers and Panel Participants

Dr. Gregory Bohach Vice President for Ag, Forestry & Vet-Med, Mississippi State University
Ms. Trudy Fisher, Executive Director, Mississippi Department of Environmental Quality
Mr. Eric J. Evenson, Coordinator National Water Census, U.S. Geological Service
Mr. Stephen Kirkpatrick, Wildlife and Nature Photographer

Panel member – Mr. Coen Perrott, MDEQ Basin Management Branch
Panel member – Dr. William McAnally, Northern Gulf Institute (NGI)
Panel member – Mr. Trey Cooke, Delta F.A.R.M.
Panel member – Mr. Larry Jarrett, Desoto County Greenways
Panel member – Dr. Cristiane Surbeck, Department of Civil Engineering, University of Mississippi

Visit our Web site at www.wrri.msstate.edu or contact Jessie Schmidt at 662.325.3295 for more conference details.

Mississippi Water Resources Research Institute

The mission of the Mississippi Water Resources Research Institute (WRRI) is to provide a statewide center of expertise in water and associated land-use and to serve as a repository of knowledge for use in education, research, planning, and community service.

The WRRI goals are to:

- (1) Serve public and private interests in the conservation, development, and use of water resources.
- (2) Provide training opportunities in higher education whereby skilled professionals become available to serve government and private sector alike.
- (3) Assist planning and regulatory bodies at the local, state, regional, and federal levels.
- (4) Communicate research findings to potential users in a form that encourages quick comprehension and direct application to water related problems.

Two Year Strategic Plan 2011-2013

Research

- Continued support for food/fiber/fuel mission.
- Added focus on urban storm water issues, especially water quality.
- Assess Green Infrastructure solutions for waste water treatment.
- Investigate innovative monitoring solutions for BMP effectiveness.
- Enhance working relationships with other Universities.
- Quantify outcomes from WRRI research and support funding.

Education

- Develop a Certificate of Watershed Protection. This could be offered to traditional on-campus graduate students as well as to off-campus professionals utilizing distance learning.
- Utilize demonstration projects as service learning.
- Expand the number of funded graduate students.

Engagement/Outreach

- Offer workshops for technology transfer and revenue generation.
- Return the annual conference to Jackson, MS.
- Revise the conference agenda to reflect desire for more applications.
- Expand working relationship with MSU Extension.

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WRR Spring 2012 Profile

Researchers: Richard M. Kaminski and Amy S. Alford, Department of Wildlife, Fisheries and Aquaculture, Mississippi State University

Project: Water Quality and Other Ecosystem Services Performed in Wetlands Managed for Waterfowl in Mississippi

Crawfish are a staple of spring time fellowship across the South. Thousands of pounds of crawfish tails are pinched and consumed at boils each year. While most crawfish are grown and harvested in neighboring Louisiana, Mississippi State University (MSU) scientists have found that crawfish are available to harvest in wetlands throughout Mississippi and beyond. Commercial crawfish production in rice fields of Louisiana has been studied extensively. However, the quantity of naturally occurring crawfish is not known. Scientists in the university's Forest and Wildlife Research Center, under the leadership of Dr. Richard Kaminski, embarked on a study to determine how much crawfish are available for harvest in Mississippi's wetlands. To determine the quantity of naturally occurring crawfish in these habitats, MSU Ph.D. candidate Amy Alford deployed baited traps similar to those used in commercial crawfish production. From April through June, Alford harvested crawfish throughout the Mississippi Alluvial Valley.



Alford found crawfish harvested from moist-soil wetlands averaged two pounds per acre. Commercial crawfish production usually requires a harvest of 10 pounds per acre for a farmer to break even or make a profit. While the differences in yield may seem large, the team is investigating the economic benefits landowners may gain by harvesting their own crawfish from duck holes. "The traps cost around \$8 and commercial bait cost \$12 per pound. However, "landowners that rely only on natural vegetation rather than rice may see decreases in operational costs associated with planting and harvesting," Alford added.

Moist-soil wetlands and swamps in Mississippi and other states in the Lower Mississippi Valley not only produce crawfish, they also provide a myriad of environmental services. Over 50,000 acres of wetland area are enrolled in federally funded easement programs such as the Wetlands Reserve Program in the Mississippi Flyway. "These wetlands provide habitat for ducks and other wildlife," Kaminski said. "They also serve as filters for nutrients washed off of farmlands and populated areas. " So grab a few traps and some bait, find a good duck hole, and contribute to the conservation of wetland habitat by catching and consuming your own crawfish.



USGS Summer Intern Program

None.

Student Support					
Category	Section 104 Base Grant	Section 104 NCGP Award	NIWR-USGS Internship	Supplemental Awards	Total
Undergraduate	4	0	0	0	4
Masters	2	0	0	0	2
Ph.D.	1	0	0	0	1
Post-Doc.	0	0	0	0	0
Total	7	0	0	0	7

Notable Awards and Achievements

Publications from Prior Years