

Water Quality Extension Newsletter

WHAT'S NEW

EXTENSION – PAGE 3

A full quarter of workshops, webinars,
and association meetings

RESEARCH – PAGE 4

From floating solar to black soldier
flies, research is rolling

TEACHING – PAGE 5

Guest lectures to promote water quality
and graduate school

UPCOMING EVENTS

OCTOBER

Fourth Wastewater Installers Workshop
to be hosted in Crowley

New instrument installation!!!

NOVEMBER

Experimental results from solar
efficiency and water quality project

Scaling feed trial for black soldier fly
project

DECEMBER

Final Preparations for new Water
Quality Extension Series debuting in
January 2025!



Photo by M.P. Hayes

Let the water flow, and floating solar glow!

After a long summer of designing and building, the lab deployed our first set of floating solar panels in the Hammond Extension Station! Louisiana's diverse water landscape provides an opportunity for a novel approach to pond health and energy through floating photovoltaics (FPV). FPV is a field with limited exploration and is narrowly focused on offshore and large lake potential, with only recent studies addressing the potential of drinking water reservoirs and large remediation ponds. This research project has targeted industrial oxidation, agricultural irrigation, and municipal wastewater treatment ponds to utilize non-recreation valued space. Over the course of the next year, we will be collecting data for water quality parameters (temperature, nitrate, dissolved oxygen, and algae) and energy production for the pond space. We hope to expand the findings of this project to a large-scale audience through workshops and extension platforms.



LSU Gulf Scholars Poster

Congrats to Karrie Cheng who presented her research at the LSU Gulf Scholars Summer Poster Session. Karrie worked with the Water Quality Extension Lab over the summer to see the impact of water and waste on Louisiana seafood processors. Her poster title *Analyzing and Surveying the Solid Waste Profile of the Louisiana Aquaculture Industry* looked at regional zones of processors and estimating the nutrient content of the wastewater effluent and solid waste material. This is an ongoing project in collaboration with Jerrod Penn in Agricultural Economics to survey the state's immediate sustainability needs in the aquaculture industry. As a mass communications major, Karrie has an interest in environmental policy and through the lab's experiential learning programs was able to visit and speak with industry personnel to see a unique perspective of the effect policy has on day-to-day operation. This summer's experience at fish farms and processors is sure to have a lasting impact as she progresses into her future career.

LSU Discovery Funding Secured!

Congratulations to Nick Wagner for receiving funding from the LSU Discovery Program to conduct research with the Water Quality Extension Lab this year. His project titled *Developing the Framework for Agricultural Energy Optimization at Crawfish Farms* using Water Quality Sensing seeks to combine water quality metrics and energy usage in agriculture. The project will use an uncrewed surface vessel (USV) and deployable water quality sensor to map dissolved oxygen and trace nutrients throughout crawfish ponds to identify more efficient dispersion techniques. Ponds will be mapped with GPS handheld on the boat to isolate major areas of dissolved oxygen from input water and promote best practices in energy and aeration. This project will pave the way for additional USV missions across various waterways to locate persistent water quality issues. With a background in engineering, Nick is interested in graduate school for renewable energy in agriculture. This funding from LSU will help him also build a foundation for future graduate fellowship opportunities and long-term goals of attending graduate school to help advance energy in agriculture.



Photo by Ella Magerl

The Future is Fluorescent!

The lab in conjunction with LSU AgCenter faculty (Evelyn Watts, Jeff Plumlee and Damon Abdi) and Southern University faculty (Espinosa Teodoro and Miriam Ortega) was recently funded through the USDA Equipment Grant Program (EGP) for a new fluorescence instrument. The proposal *Characterizing Louisiana Agriculture by Innovative Fluorescent Fingerprinting of Dissolved Organic Matter (DOM) and Parallel Factor Analysis (PARAFACs)* will provide funding to support the purchase of a Horiba Aqualog to open research pathways into fluorescence DOM for agricultural stakeholders! This fingerprinting tool will provide innovative data sets to couple with ongoing research from the faculty team!

Best Practices in Water Quality for... Meat Processors!

Water quality impacts a range of stakeholders in the state of Louisiana. In August, Dr. Hayes presented a lecture tailored to best practices for meat processors' water quality enhancement in Natchez, MS, for the Louisiana Meat Processors Association (LAMPA) general association meeting. Two major topic areas at the lecture were the use of benchtop biological oxygen demand (BOD) sensors to estimate effluent onsite and safe choice compound conversion of cleaning products for long-term chemical sustainability. The growing concern at facilities is meeting compliance with state agencies while not sacrificing productivity. The integration of checkpoint sensors is an easy, affordable tool to provide manufacturers peace of mind and the ability to be proactive instead of reactive to issues that may arise. The LSU Water Quality Extension Lab provides hands-on opportunities to see new technology for facility adoption and showcase user-friendly resources through companies like Hanna, YSI and In-Situ. Additionally, the chemical footprint from these industries can be an easy steppingstone with the one-to-one conversion of cleaning products and other compounds through EPA's Safer Choice online tool. It was a great opportunity to promote sustainable water practices for our region's processing communities. Stemming from the visit, three different facilities have

Accessible Science for Louisiana Communities

In August, the LSU Institute for Energy Innovation selected our floating solar research to be presented at a meeting for Veolia's North American. During the series of presentations, physicists and engineers showcased incredible research on advancements in solar technology and efficiency. When the time came to discuss our project, the presentation shifted from benchtop sciences to boots-on-the-ground community engagement. Though the projects revolve around data-driven research for energy efficiency and water quality enhancement, the overall goal is Louisiana community resilience. The Water Quality Extension Lab is built to make the research and technology feasible for stakeholders from all backgrounds through field days and workshops. Bringing in this alternative perspective was well-received by the industrial audience and cemented the need for accessible science to translate great research into adoptable practices.

Hammond Research Station Horticulture Field Day

Just two days after the team deployed our floating solar unit (see next page), we were able to present at the Hammond Research Station Field Day on optimizing pond space for renewable energy. Technology in Ag is on the rise and providing real-world examples is critical for stakeholders to understand the feasibility of projects at their sites. Hosted with the Louisiana Nursery and Landscape Association (LNLA), the growers were able to see firsthand a system that can generate enough power to add extra aerators to a pond system for increased dissolved oxygen. The scalability of this renewable opportunity also provides an opportunity to

offset energy for irrigation at farming operations. Undergraduate research with the lab performed a preliminary analysis using the National Renewable Energy Lab's (NREL) online PVWatt Calculator to estimate the energy production per acre of pond space. The initial results show a generous estimated energy production of 861,434 kWh per year (or 71,786 kWh per month) for one acre of pond space. The LSU team will be comparing values generated from the floating solar units to the NREL PVWatt Calculator estimation in hopes of providing a template for future stakeholder outreach and technical assistance.



Photo by Eric DeBoer

Determining Floating Solar Efficiency and Effect on Pond Health



Photo by Mason Marcantel

From the pond's perspective, floating solar panels can add benefits to a healthy ecosystem and water quality. With the collaborators on our team looking at energy efficiency and economic benefit, the Water Quality Extension Lab is outfitting the floating units with water sensors to promote the added benefits of shading and evaporation reduction. The YSI EXO2 Sonde can analyze temperature, pH, nitrates, dissolved oxygen, conductivity and algae for complete datasets. The team has a sonde positioned under the shaded unit and in the adjacent pond under normal conditions. The sondes will float the same depth from the surface as the pond fluctuates with water inputs. The major indicators the lab is looking for are changes in temperature and dissolved oxygen which are drivers for nutrient cycling (i.e. nitrates) and algae growth. The data from each sensor will be compared to show correlated variables and how the pond shading affects the grouped parameters. For instance, the algae sensors (chlorophyll & phycocyanin) will provide total counts that can be correlated to the concentrations of nitrate and dissolved oxygen

that fuel summer blooms. For an agricultural irrigation pond, preventative maintenance for excess nutrients and algae growth can increase the cost of chemicals, pumping and labor. The scalability of these floating panels can offer versatility in energy generation for aerators, irrigation, and equipment along with pond coverage for added water quality benefits.

Waste Valorization for Louisiana Seafood Processors

A first trial run for a waste valorization network for Louisiana agriculture was completed this quarter! This project revolves around the utilization of seafood processors' wastewater effluent and solid waste shells as a food source for insect rearing. There are many anticipated benefits from this concept including volume reduction of waste, potential feedstock generation and organic frass production. The first round of trials was to assess the feasibility of three waste sources: crab shell, shrimp shell, and protein cake (from wastewater effluent). These three waste streams were tested at LSU AgChemistry Lab and were seen to contain desired levels of protein, fat and fibers. Additional composition of metals raised the question of whether insects would feed on the materials. A small cup trial was performed using blended ratios of waste materials and the current insect diet. The results were ultimately positive with the insects growing in the blended formulas of crab and shrimp shells, but additional trials are scheduled to optimize the moisture of the diet. After the next cup trial, the team plans to scale the diet trials to micro-bins and incorporate an array of analyses for the frass, larvae and waste shells including nutrients, metals, amino acids and microbial studies. The data sets that are being generated will be leveraged for external funding to scale projects into greenhouse spaces where plant growth assessments can be conducted on organic frass versus synthetic market fertilizers.



Photo by M.P. Hayes

WATER CONSERVATION: REUSING WATER IN MANUFACTURING FACILITIES

WEBINAR

The progressive culture of environmental sustainability demands manufacturers to minimize their negative social and environmental impact but provides an inadequate framework for innovative solutions to water issues. This seminar topic will cover water conservation practices for diverse manufacturing industries including concurrent rinsing and water reuse opportunities. Manufacturers will have the opportunity to see how water conservation practices can be applied to diverse effluent types and how reuse can lower water demand.

Dr. Michael Hayes
Assistant Professor of Agricultural & Industrial Water Quality
Louisiana State University

ECU CSE3 National Webinar

An exciting opportunity to present for East Carolina University's Center for Sustainable Energy and Environmental Engineering (CSE3) Program provided a national audience for my water conservation webinar! ECU recognized the LSU Water Quality Extension Lab for best practices in water conservation and used their webinar series to highlight Louisiana manufacturers' sustainable water practices. The presentation offered the national audience insight into projects being conducted in our state's facilities including concurrent rinsing, water reuse for irrigation and real-time water quality sensing for treatment techniques. The experiences presented in this webinar were gathered from the lab's experiential learning program funding from various agencies. An emphasis on EPA Pollution Prevention (P2) was promoted to show the audience of manufacturers and state agencies the benefits of working with student and faculty teams to expand resources/networks, promote innovative (yet practical) recommendations to persistent issues and enhance workforce development for students future careers.

Louisiana Lectures

We are taking the Water Quality Extension Lab to various universities to showcase the diverse areas of research and extension in water quality for students to explore graduate school opportunities and future career paths. The lecture topic is *Identifying and Mitigating the Sources of Water Quality for Louisiana Communities* and revolves around practical solutions to persistent water quality issues around the state. This topic uses hands-on field tools and case studies from experiential learning programs to teach students how an individual stakeholder problem can have an amplifiable impact on both a community and regional scale. The lab thrives on providing extension and research resources to promote immediate solutions through stakeholder grant and incentive programs as well as innovative long-term projects to propel future sustainability initiatives. Experiential learning starts with students and the Water Quality Extension Lab is growing our network starting with **Nicholls State University!**

Content Created

Hayes, M., 2024. Water and Energy: Utilizing Pond Space for Renewable Energy. Louisiana Nursery and Landscape. Fall 2024

Hayes, M. Water Conservation: Reusing Water in Manufacturing Facilities. ECU's Center for Sustainable Energy and Environmental Engineering (CSE3) Program. Webinar. August 14, 2024 (30 attendees)

Hayes, M. Experimental Analysis of Floating Photovoltaics (FPV) Systems for Louisiana Community resiliency. LSU IEI & Veolia North America Meeting. Baton Rouge, LA. August 20, 2024 (12 attendees)

Hayes, M. Best Practices for Meat Processors Water Quality Enhancement. Louisiana Meat Processors Association General Meeting. Natchez, MS. August 24, 2024 (22 attendees)