Spatial Evaluation of Water Quality Parameters to Optimize Nutrients and Dissolved Oxygen for Crawfish Ponds

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Crawfish production in Louisiana is present in 29 parishes and contributes more than 214 million dollars to its economy. It is estimated that roughly 110,000 acres of land is used to farm crawfish with approximately 1,300 commercial farmers. These aquaculture farmers use surface and well water inputs to stimulate crawfish growth, nutrient dispersion, and dissolved oxygen generation. The objective of this study is to optimize water input and aeration areas to balance nutrient loads and dissolved oxygen for the ecosystem. A novel approach using uncrewed surface vessels and precision water quality analytical sensors was used to map the pond for nitrate, ammonium, temperature, conductivity, turbidity, pH, and dissolved oxygen. The autonomous systems are deployed in closed systems to run missions during different parts of the day and collect continuous data sets for spatial analysis of water quality parameters. The data sets will be linked to GPS coordinates around the pond to show nutrient and dissolved oxygen profiles correlated to surface water temperature and distance from the input water (or aeration) source. Methodologies and spatial contour mapping will be highlighted for future research missions and provide innovative analysis for a variety of aqueous systems. This project will ultimately provide data on the nutrient dynamics in crawfish ponds and account for the dispersion of dissolved oxygen across pond acreage.