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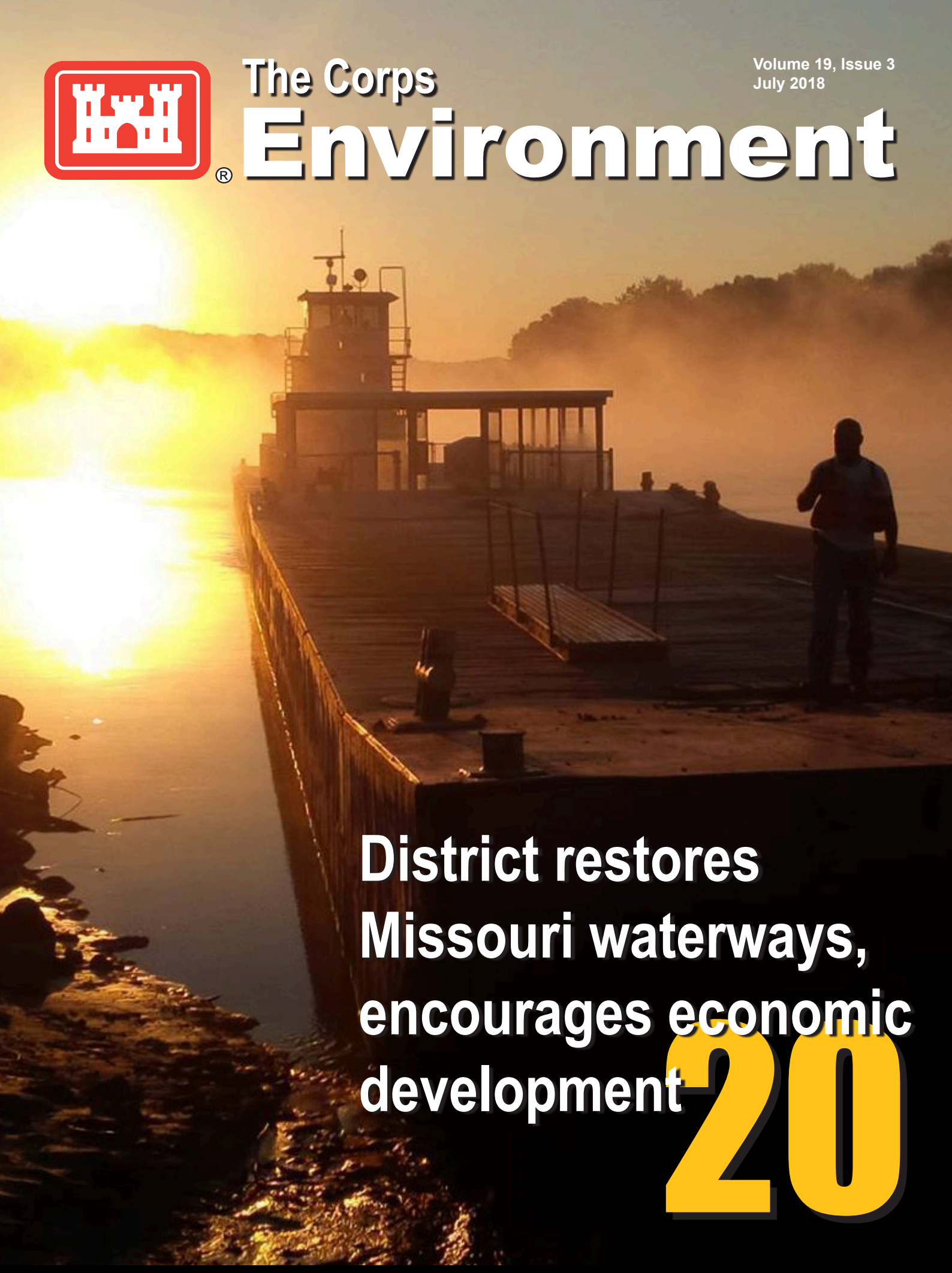

District restores Missouri waterways, encourages economic development

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Research group studies restoration sites to determine shape of future projects

By Holly Kuzmitski
U.S. Army Engineer Research and Development Center

VICKSBURG, Mississippi — When Elizabeth Murray, U.S. Army Engineer Research and Development Center, heard the question, she knew it represented an opportunity to engage in an Engineering With Nature® research project. She also knew that the outcome of that research would determine the shape of future marsh restoration projects in the San Francisco Bay Area, possibly for many years to come.

"Restoring coastal marshes is important because they deliver so many benefits to people," Murray said. "Marshes provide economic benefits by acting as a shoreline buffer, protecting homes and infrastructure from flooding and wave energy."

"And, of course, marshes provide environmental benefits by providing habitat to endangered species, such as the ridgway's rail. However, restoration of these sites requires sediment because they've subsided — or sunk — so much, and bringing in that much sediment is expensive."

Murray, who is embedded in the San Francisco District as a research biologist with ERDC's Environmental Laboratory, said that it was her new colleagues, Eric Jolliffe and Tom Kendall, who asked whether the optimal barrier shape for decreasing wave energy at bayland restoration sites is long, linear berms or round mounds.

"The question was important, because it addressed a crucial step in marsh restoration, in which we use natural processes to optimize benefits and reduce costs," Murray said.

That crucial step is the natural build-up of the last foot or two of sediment in the marsh, a process known as sediment accretion.

"We bring in dredged material to address most of the subsidence, but it's best to let nature to do the work for the last foot or two," she said. "If the waves and water flow are slowed enough by barrier features, the sediment will fall out of the water and naturally build up marsh.

"Accreting the last foot of sediment naturally is desirable, because the grain size, chemistry and elevation develop exactly as the marsh requires, making conditions optimal for marsh vegetation to take root and propagate to form a fully functional marsh."

She said that the project was an ideal subject for EWN research, since using natural processes and identifying multiple project benefits are the goals of its initiative.

The research investigated two bay area marsh restoration projects that each used different designs for these barriers: Hamilton Wetlands and Sears Point. Located along the edge of San Pablo Bay, both sites had been diked and drained for over 100 years and had recently undergone restoration.

Hamilton Wetlands, a joint venture between San Francisco District and the California State Coastal Conservancy, primarily utilized long, linear berms to slow the flow of water; and Sears Point, restored by the Sonoma Land Trust, Ducks Unlimited and numerous other partners, used round marsh mounds.

Murray assembled a research team, first calling Dr. Jane Smith, ERDC Coastal and Hydraulic Laboratory. Smith specializes in wave modeling, allowing the research not only to ask how the restoration projects were implemented, but to investigate alternate designs utilizing the same volume of dredged material to form features, swapping mounds and berms. Smith and a team of CHL scientists, including Thad Pratt, Jarrell Smith and Catie Dillon developed and validated wave models at Hamilton Wetlands and Sears Point and then tested new designs at each site.

The ERDC research team concluded that the Hamilton Wetlands' interior berms reduce wave energy most efficiently, promoting more rapid accretion; therefore, the linear berms are optimal for marsh restoration, if the space is available to use them. However, at Sears Point, space constraints precluded berm siting in some areas; consequently, a combination of berms and mounds were optimal.

Murray said recent visits to Hamilton Wetlands show the site is thriving.

"Good, healthy marsh has developed on the site's fringe and on the berms, and sediment accretion is progressing nicely around the berms," she said.

Murray and the team are working to publish the results now.

"Documentation of the best way to design these projects is so important; there is so much restoration that has to happen in the bay, by the Corps and others," she said. "Wherever there are estuaries that have been diked off and subsided, there is the opportunity to apply these designs."