

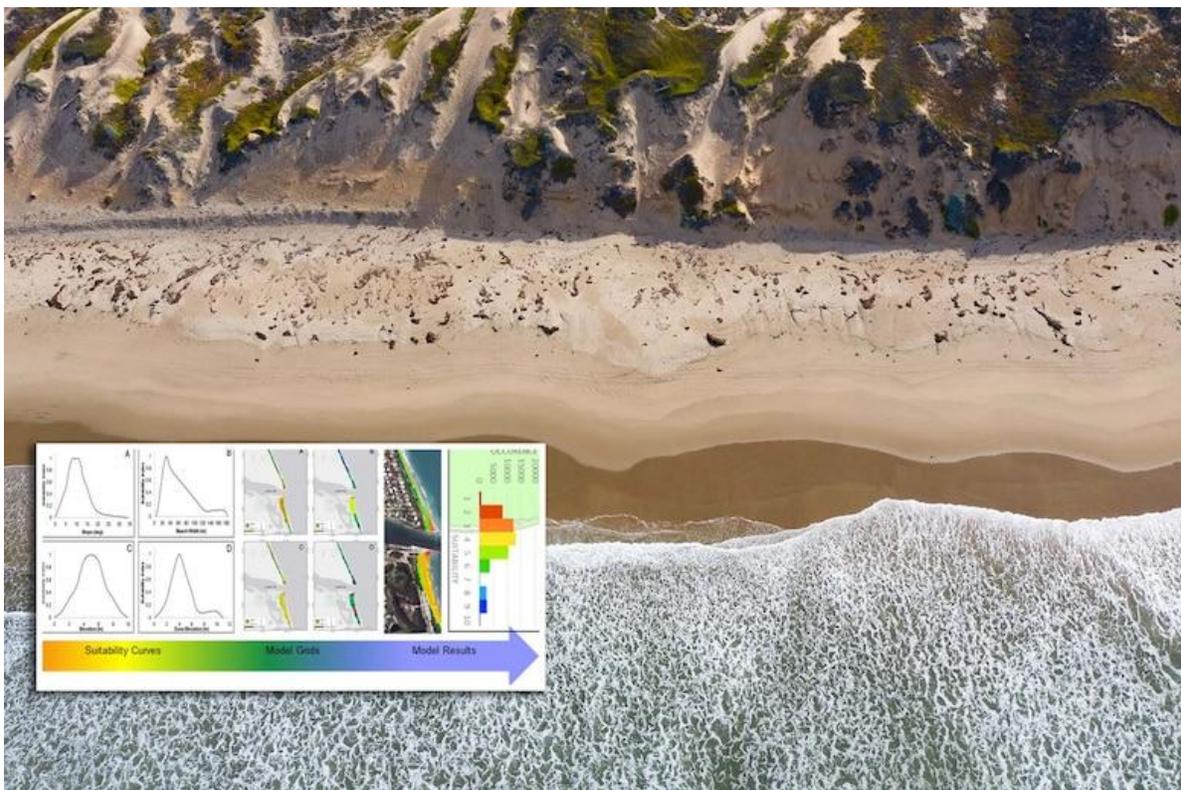


# USACE developing multifaceted approach to environmental forecasting

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A team at the U.S. Army Engineer Research and Development Center’s Environmental Laboratory is taking a new approach to predicting environmental response by focusing on ecological modeling. Researchers have now taken that a step further by integrated ecological models with engineering models. Integrated Ecological Modeling provides user-friendly rapid modeling capabilities that can result in time savings of 6-8 months if not more. (U.S. Army Corps of Engineers Graphic)

Climate change and environmental issues are at the forefront of national conversation. Researchers across the public and private sectors are looking to tackle some of the world’s most pressing environmental challenges.

The U.S. Army Corps of Engineers (USACE) recently adopted a set of “Top 10 Research and Development (R&D) Priorities.” One of these priorities, “Ensure Environmental Sustainability and Resilience,” directs USACE researchers to innovate holistic approaches to aligning civil works projects with ecosystem benefits.

Leaning into this priority, a team at the U.S. Army Engineer Research and Development Center (ERDC) is taking a new approach to predicting environmental response.

“Dr. Candice Piercy and I started the Integrated Ecological Modeling team about 12 years ago,” said Dr. Todd Swannack, a research biologist at ERDC’s Environmental Laboratory. “Our team focuses on quantifying how the environment will respond to different disturbances ranging from natural occurrences like storms to large-scale USACE projects like ecosystem restoration, navigation and operations; we approach these questions from the point of view of the nexus of ecology and engineering.”

Ecological modeling constructs and analyzes mathematical models of ecological processes, including both purely biological and combined biophysical models. Swannack and his team have taken ecological models a step further by integrating them with engineering models.

“Traditionally, ecological models don’t have the predictive capabilities that engineering models have,” Swannack said. “We are taking advantage of ERDC’s engineering and ecological knowledge and developing state-of-the-art tools to be able to forecast environmental response more accurately.”

Looking at ecological modeling in an innovative way is important because as the climate and environment continue to change and as the world becomes more complex and connected, ecological models can show a more accurate representation of the system being studied.

“We are trying to take the foundations of quantitative ecology and apply them with engineering rigor to create the most accurate picture of the system that we possibly can,” said Swannack.

Operational R&D is important because it is where research is put into practice in the field. The Integrated Ecological Modeling team has developed partnerships with numerous USACE districts.

“Over the past five or six years, we’ve been conducting model development workshops with different districts across the country,” Swannack said. “These workshops are intended to demystify the modeling process and allow the districts to develop functional models that can be used for their specific projects.”

However, armed with the tools to develop their own models, the districts typically come back to ERDC to develop or refine those models.

“The districts will come back to ERDC to help develop the models because we can do a rapid turnaround,” said Swannack. “Because this is our expertise, we can develop these tools efficiently

and provide the districts with state-of-the-art toolkits for predicting ecological and environmental response.”

Swannack says that the biggest advantage to the workshops has been the integrated partnerships that have developed between ERDC and the districts.

“The ERDC modeling team is involved throughout a district project, providing technical expertise and lessons learned from other projects,” he said. “Conversely, by being part of the team, ERDC is kept up to date with what is going on in the district.”

By taking advantage of all the disciplines within USACE and integrating them into a predictive modeling toolkit, they can be applied across scales and systems. This allows the organization to stay at the cutting edge of research and development.

“Having refined forecasting tools not only reduces the cost associated with long-term data collection and model development, it also provides a more accurate approach for predicting the dynamics of environmental systems,” said Swannack. “We need to consider the different disciplines and integrate that knowledge into these more advanced tools enterprise-wide.”

R&D research and development