

## Adaptive Modeling to Inform Environmental Management

Katie Irving<sup>1</sup>, Rupert Mathwin<sup>2</sup>, Christopher J. Kotalik<sup>3</sup>, J. Angus Webb<sup>4</sup>, David M. Walters<sup>3</sup>, Siwan Lovett<sup>5</sup>, S. Kyle McKay<sup>6</sup>, Christa L. Torrens<sup>7</sup>, John R. Olson<sup>8</sup>, Ziad A. El Jack<sup>9</sup>

<sup>1</sup>*Southern California Coastal Water Research Project, Costa Mesa, CA*

<sup>2</sup>*College of Science and Engineering, Flinders University, Tarndanya (Adelaide), South Australia*

<sup>3</sup>*U.S. Geological Survey, Columbia Environmental Research Center, Columbia, MO*

<sup>4</sup>*Department of Infrastructure Engineering, The University of Melbourne, Parkville, Australia*

<sup>5</sup>*Australian River Restoration Centre, Canberra, Australia*

<sup>6</sup>*U.S. Army Corps of Engineers, Environmental Laboratory, New York, NY*

<sup>7</sup>*Flathead Lake Biological Station, University of Montana, Polson, MT*

<sup>8</sup>*California State University Monterey Bay, Seaside, CA*

<sup>9</sup>*Facilities Planning Department, Los Angeles County Sanitation Districts, Whittier, CA*

### ABSTRACT

Ecological modeling captures natural phenomena and processes, aiding in our understanding of ecology, conservation biogeography, and hydrology. The integration of ecological modeling into adaptive management frameworks is, however, underutilized. Adaptive modeling can enhance adaptive management by integrating new information and responding to changing environmental conditions, which facilitates dynamic and effective decision-making. This paper addresses challenges in implementing adaptive modeling, such as the need for collaborative model development, clear communication of model outcomes and limitations, and data and code accessibility. We propose a suite of potential actions to enhance communication, collaboration, and model utility. Focusing on water resource management, we demonstrate how adaptive modeling can inform management decisions and improve conservation outcomes. We highlight the importance of integrating adaptive modeling into future adaptive management plans to ensure models are relevant, reliable, and effectively utilized in resource management and conservation.

**Due to distribution restrictions, the full-text version of this article is available by request only.**

Please contact [pubrequest@sccwrp.org](mailto:pubrequest@sccwrp.org) to request a copy