Improving Ecological Modeling Practices for the USACE Planning Community of Practice

Research Need
USACE decisions affect the environment across all business lines. Ecological models provide a means of quantifying decision outcomes. SMART Planning timelines require teams to rapidly develop and apply models in short horizons (often 18-24 months!). There is an urgent need to improve ecological modeling practice within the USACE Planning, Regulatory, and Operational Communities.

Project Objectives & Plan
This research project seeks to improve ecological modeling practice and decision-making within these USACE communities. To accomplish this objective, we will provide a set of analytical tools for practitioners to apply, with guidance on best practices for ecological modeling. We will develop an ecological modeling platform that standardizes the application of index-based models (e.g., habitat models) for the USACE planning community of practice, that meets the guidelines set in EC 1105-2-412 (or subsequent policies). This model platform will be explicitly designed to meet the needs of the SMART planning paradigm by facilitating the development and application of models in a faster, more efficient manner, while maintaining scientific integrity and transparency throughout model development process. Additionally, this project will develop guidelines and training for ecological modeling for practitioners of ecosystem restoration, regulatory, and operations communities of practice.

Two sets of deliverables are the emphasis of this work unit. First, an ecological modeling toolkit will be provided to facilitate the development and application of index-based models, which will contain several quantitative tools to:

- Generate equations for index-based models,
- Integrate equations into overall suitability indices in an error-checked, consistent platform,
- Perform basic analyses for model evaluation, and
- Produce integrated documentation of model equations and relevant, user-defined comments and assumptions.
The second set of deliverables will provide a thorough set of ecological modeling best practices covering each step of the model development process (i.e., conceptualization, quantification, evaluation, and application) in a complement of technical notes, journal papers, webinars, training courses, and web resources, as requested by field practitioners.

Payoff
This effort will result in a standardized methodology for developing and applying index-based models USACE-wide for applications in the ecosystem restoration, operations and, potentially, regulatory communities of practice. Standardizing the approach for index-based ecological modeling will be an advancement over current, ad-hoc approaches and will enable Corps managers and planners to more effectively and efficiently support USACE decision-making. The emphasis on modeling best practices will enhance agency capacity by providing repeatable processes and associated training in the development of ecological tools for a variety of purposes and applications.

Products

**White Papers**

**Conference Presentations/Webinars/Workshops**
(Workshop) 25/26 JUL 2017 Mod Squad Workshop, ERDC Vicksburg. Organized by Dr. Pat Deliman, TD and Dr. Trudy Estes, PM for EMRRP. ERDC/IWR/HEC researchers met, along with Division, District and EcoPCX representatives, to discuss modeling related issues, including pros and cons of proprietary platforms, how best to categorize and organize available models and their capabilities in a user friendly fashion, and identifying capability gaps and redundancies.


May 2018: Ecological modeling workshop with Fort Worth District - Cypress Valley watershed, development and certification of Toolkit for Interactive Modeling (TAM) prototype Excel model calculator, completed Blue Book model database.

**Project Activities**
Model – Index-based model construction tool prototype development

McKay (in review) Visualization as a tool for ecological analysis (manuscript submitted to MRW-ECL2@elsevier.com March 17, 2017 as part of the Encyclopedia of Ecology, Second Edition)

National Certification – Toolkit for Interactive Modeling (TAM). The ECO-PCX review team found the tool to have sufficient technical and system quality and to be compliant with USACE policies. The ECO-PCX Director has certified the toolkit for use by study teams nationwide. Any models developed in the future using the toolkit are subject to review and certification under
EC 1105-2-412. The ECO-PCX and ERDC will announce the availability of the model development tool in an upcoming planning community newsletter and other publications across the Corps community.

¹Project Alias – Work Unit Documentation Title: Improving Ecological Modeling Practices for the USACE Planning Community of Practice