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### INVESTIGATING CASE-BASED REASONING FOR ECOSYSTEM DESIGN

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**ABSTRACT** Ecological engineering is applicable in many different situations, each with its own set of goals, obstacles, and conditions for which an ecosystem must be designed. While there are a number of basic principles and common practices that can be used during the development and implementation of an ecological engineering project, a comprehensive set of guidelines or theories has not yet been established for the design of the ecosystems used in these projects. For such guidelines to be developed, the ability to qualitatively and quantitatively evaluate large datasets of information regarding ecological interactions and tools to aid in the design of ecosystems based off that information are both required. Thus, a project was undertaken to investigate the use of case-based reasoning (CBR) as a method of gathering and analyzing large sets of ecological data not only for prediction of the performance of design scenarios but for the purpose of design itself, a previously untested application. Simulation outputs from a number of randomly created virtual ecosystems and values for applied measures were compiled into a case base to test the capacity of a case-based reasoner to predict the results of several additional randomly created virtual ecosystems. The accuracy of the predictions made by the case-based reasoner varied, but they were more than 75% accurate 83.3% of the time. An initial attempt was made to apply this approach to “engineering” ecosystems for specified performance levels within the virtual ecosystem framework. While the targeted values of persistence were not obtained, the “engineered” virtual ecosystems were more persistent overall than the randomly created systems, with an average ratio of 0.40527 surviving species to initial species versus an average persistence of 0.20750 for the random systems. This is indicative of the potential of CBR for data analysis and ecosystem design for ecological engineering.

**Keywords:** Ecological engineering, ecosystem design, case-based reasoning, decision support systems