FUZZY CASIMIR

Model Uses   The Fuzzy Fish Model applies fuzzy-logic methodology to flow regimes, bed flow statistics and hydraulic and morphologic criteria in order to more efficiently model fish habitat.

Major Categories   Habitat Classification

Subject Knowledge Level
Intermediate

Minor Categories   Fish and Fish Habitat; Habitat Fragmentation

Technical Difficulty Level
Intermediate

Model Type   Conceptual Model

Geographic in Nature?
No

Abstract
The Fuzzy Fish Model was developed to improve the performance of the habitat simulation model CASIMIR. To do so, 'fuzzy-logic' rules were applied to describe habitat preferences of fish species during their different life stages. Fuzzy rules turned out to be more effective to develop because they can be derived from experts' knowledge that is often readily available and more applicable than inferred values or information. The model works by utilizing common species preferences either alone or with various combinations of other physical parameters. The fuzzy characteristics of the model allow users to incorporate as many parameters as they feel appropriate. The results gained with fuzzy rules clearly differ from those gained with traditional preference functions.

CASIMIR (Computer Aided Simulation Model for In-stream Flow Requirements) is a Toolbox for habitat simulation in rivers. It was developed at the Stuttgart Institute of Hydraulic Engineering in the early 1990's. The simulation model comprises modules with individual computing programs which can be combined to suit a particular case in question. Three main areas of simulation are implied in the current version: (1) The flow regime module includes programs to simulate hydropower plants, including energy generation, reservoir operation and in-stream flow regulations.(2) The river bed module calculates statistical distributions of near bed flow forces derived from field measurements. (3) The aquatic zone module simulates and analyses hydraulic and morphologic patterns. The latter two modules are complemented with biological components that contain data about habitat preferences and simulation tools for habitat quality and availability. This modular structure has the advantage that further parameters can be adopted at any time, should they prove to be ecologically relevant.

Future Developments
Unknown

Model Limitations
Unknown

Model Features

- Applies fuzzy-logic modeling techniques to the existing CASIMIR mode

- Utilizes a flow regime model to simulate hydropower plants, reservoir operations and in-stream flow regulation

- Incorporates a river bed module to calculate near-bed-flow forces

- An aquatic zone module is included to summate and analyze hydraulic and morphologic patters

Required Data Types
Ideal data sets used in these models are obtained by various forms of field work, such as snorkeling and/or electro-fishing. Newer approaches for preference functions are based on multivariate statistics and results reveal a higher correlation between fish findings and predicted habitat quality in some cases.

Model Outputs
Model outputs fuzzy findings based on the relative truth of input data and associates likelihood of fish habitat in various conditions or conditioned locations.

Source
Klaus Jorde, Matthias Schneider, Armin Peter & Frank Zoellner

Source (URL)
http://www.sjeweb.de/pdf/jorde2001.pdf

Hardware Requirements
None noted.

Software Requirements
None noted.

Supported Platforms

DOS	☒	**UNIX**	☒
Windows	☐	**Macintosh**	☐

Cost, Licensing and Availability
Free, available from the link above.