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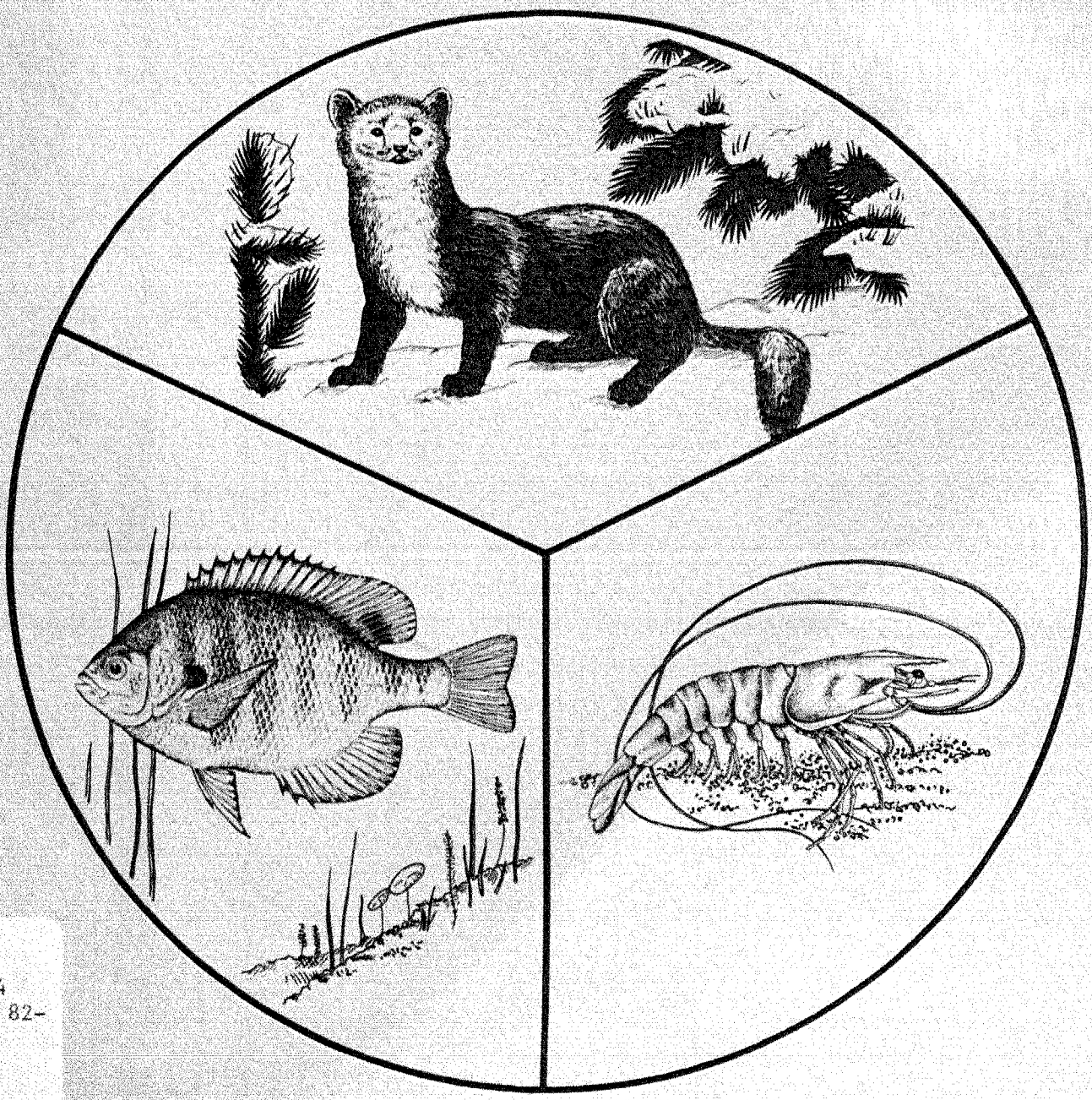
HABITAT SUITABILITY INDEX MODELS



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HABITAT SUITABILITY INDEX MODELS: INTRODUCTION

by

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INTRODUCTION TO THE HABITAT SUITABILITY INDEX MODEL SERIES

This series provides habitat information for evaluating impacts on fish and wildlife habitat resulting from water or land use changes. The impetus for this series was the Habitat Evaluation Procedures (U.S. Fish and Wildlife Service 1980a), a planning and evaluation technique that focuses on the habitat requirements of fish and wildlife species. The habitat information in this series has been formatted according to Standards for the Development of Habitat Suitability Index Models (U.S. Fish and Wildlife Service 1981).

This series may appear similar to other sources of information that address, in general terms, the habitat requirements of fish and wildlife species. Several other efforts to compile species data bases have been initiated in recent years (e.g., Mason et al. 1979; U.S. Fish and Wildlife Service 1980b). Whereas these other data bases are descriptive in content and contain an array of habitat and population information, this series is unique in that it is constrained to habitat information only, with an emphasis on quantitative relationships between key environmental variables and habitat suitability. In addition, this series synthesizes habitat information into explicit habitat models useful in quantitative assessments.

The models in this series reference numerous literature sources in an effort to consolidate scientific information on species-habitat relationships. Models are included that provide a numerical index of habitat suitability on a 0.0 to 1.0 scale, based on the assumption that there is a positive relationship between the index and habitat carrying capacity (U.S. Fish and Wildlife Service 1981). The models vary in generality and precision, due in part to the amount of available quantitative habitat information and the frequent qualitative nature of existing information. When possible, models are included that are derived from site-specific population and habitat data.

The HSI models are usually presented in three basic formats: (1) graphic; (2) word; and (3) mathematical. The graphic format is a representation of the structure of the model and displays the sequential aggregation of variables into an HSI. Following this, the model relationships are discussed and the assumed relationships between variables, components, and HSI's documented. This discussion of model relationships provides a working version of the model and is, in effect, a word model. Finally, the model relationships are described in mathematical language, mimicking as closely and as simply as possible, the preceding word descriptions.

The models are documented for several reasons. First, the documentation explains the model's structure and inherent assumptions. Second, the model building process involves considerable judgement, and documentation provides the insights necessary to modify the model when these judgements are inconsistent with local or new knowledge. Finally, documentation should facilitate reformulation of the model to meet individual study constraints. Graphic or word model formats may be used to support reconnaissance level assessments, although repeatability may be reduced when using these model forms.

The models should be viewed as hypotheses of species-habitat relationships rather than statements of proven cause and effect relationships. Their value

is to serve as a basis for improved decisionmaking and increased understanding of habitat relationships because they specify hypotheses of habitat relationships that can be tested and improved. Results of model performance tests, when available, are presented or referenced with each model. However, models that have been reliable in specific studies may be less reliable in other situations. For this reason, feedback is encouraged from model users concerning improvements to models, the availability of other habitat models, results of model tests, and suggestions that may increase the effective use of habitat information for fish and wildlife planning. Comments should be sent to one of the addresses below.

The appendices to this series contain supplementary information for model applications. This information is general in nature although certain appendices may apply to only part of the model series. For example, Appendix A provides specific guidance and model application information for inland aquatic fish species and contains sample field data sheets for collecting aquatic field data and converting those data into habitat variable values. Measurement techniques for terrestrial variables are summarized in Hays et al. (1981).

Requests for models and appendices published in this series or feedback concerning model use should be sent to one of the following addresses:

Terrestrial and Inland Aquatic Species

Office of Biological Services
Western Energy and Land Use Team
U.S. Fish and Wildlife Service
2625 Redwing Road
Fort Collins, Colorado 80526

Estuarine and Marine Species

Office of Biological Services
National Coastal Ecosystem Team
U.S. Fish and Wildlife Service
NASA/Slidell Computer Complex
1010 Gause Boulevard
Slidell, Louisiana 70458

REFERENCES

Hays, R.L., C. Summers, and W. Seitz. 1981. Estimating wildlife habitat variables. U.S.D.I. Fish and Wildlife Service. FWS/OBS-81/47. 111 pp.

Mason, W.T., Jr., C.T. Cushwa, C.J. Slaski, and D.M. Gladwin. 1979. A procedure for describing fish and wildlife: Coding instructions for Pennsylvania. U.S.D.I. Fish and Wildlife Service. FWS/OBS-79/19. 21 pp.

U.S. Fish and Wildlife Service. 1980a. Habitat Evaluation Procedures (HEP). U.S.D.I. Fish and Wildlife Service. Division of Ecological Services. ESM 102.

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U.S. Fish and Wildlife Service. 1981. Standards for the development of habitat suitability index models for use in the Habitat Evaluation Procedures, U.S.D.I. Fish and Wildlife Service. Division of Ecological Services. ESM 103.

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This is one in a series of publications describing habitat requirements of selected fish and wildlife species. Numerous literature sources have been consulted in an effort to consolidate scientific data on species-habitat relationships. These data have subsequently been synthesized into subjective Habitat Suitability Index (HSI) models. The models are based on suitability indices formulated for variables found to affect the life cycle and survival of each species. The models are designed to be modified to evaluate specific habitat alterations using the HSI model building techniques presented in the U.S. Fish and Wildlife Service's Habitat Evaluation Procedures.

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