

Catalog of Community Habitat Models

by Antisa C. Webb and L. Jean O'Neil

Introduction

Corps Districts are concentrating on tasks such as designing restoration projects (Planning), assessing impacts to the environment (Planning/Operations and Maintenance), and evaluating permitting requests (Regulatory) using standard modeling tools such as the Habitat Suitability Index (HSI) models associated with Habitat Evaluation Procedures (HEP). Although developed for assessing impacts of large water resource projects, the utility and flexibility of HSI and HEP in other areas has been well established. In addition to models published by the U.S. Fish and Wildlife Service (USFWS), several additional HSI models and suitability curves (components of a model) have been constructed and published in other formats. The familiar USFWS species HSI “blue books” can now be found on the Internet; one location is the EMRRP’s Ecosystem Management and Restoration Information System (EMRIS) at <http://www.wes.army.mil/el/emrrp/emris>.

Although existing index models focus for the most part on one species, ecosystem restoration and management initiatives often require attention to habitat needs of multiple animal and plant species. Emphasis may therefore be placed on a larger scale, such as a community (Figure 1). Although a few community models have been available for some time,



Figure 1. A Cypress-Tupelo “community” in southern Illinois

finding and retrieving them is somewhat of a challenge. Few community habitat models were developed by the USFWS for the “blue book” series. Most were developed by other resource agencies and universities. The lack of a centralized library of models has resulted in Corps Districts spending time and money searching for applicable models or reinventing existing ones.

As part of the Community Templates Work Unit funded by the Ecosystem Management and Restoration Research Program, community index habitat models have been located and compiled into a Community Model Catalog. This catalog will be accessed from EMRIS.

Background

Original habitat evaluation models produced scores that quantified habitat quality for individual fish or wildlife species, or rarely, groups of species. In recent years, interest has broadened to evaluating biotic communities with their component fish, wildlife, and plant species (e.g., Schroeder 1996). Plants provide food, cover, and other needs of fish and wildlife, as well as performing other functions (e.g., soil stabilization). A plant community may also be a unique or specialized assemblage of species and processes in need of restoration and management attention itself (Noss et al. 1985).

A community is defined as an assemblage of plants and animals living together and linked by their interactions with one another and their environment. This concept is important to ecosystem restoration and protection, because one way to look at an ecosystem is to view it as a system of communities, defined as in Figure 2, and characterized by a complex of ecological processes. The two constructs, communities and ecosystems, can be considered as part of a hierarchy as shown in the diagram in Figure 2.

The nomenclature of communities does not have the rigor that nomenclature of species has achieved. Instead, designation of a community is largely in the eyes of the beholder.

Other terms often used to describe communities include cover class, cover type, ecological type, ecosystem, habitat type, substrate class, assemblage, timber stand, vegetation class, and vegetation type. Statistical techniques exist to define similar groups and therefore derive communities based on data, e.g., ordination. However, existing community models reflect a lack of standard naming conventions, so the reader must be aware of how the model identified or defined the community, prior to selecting a model for use.

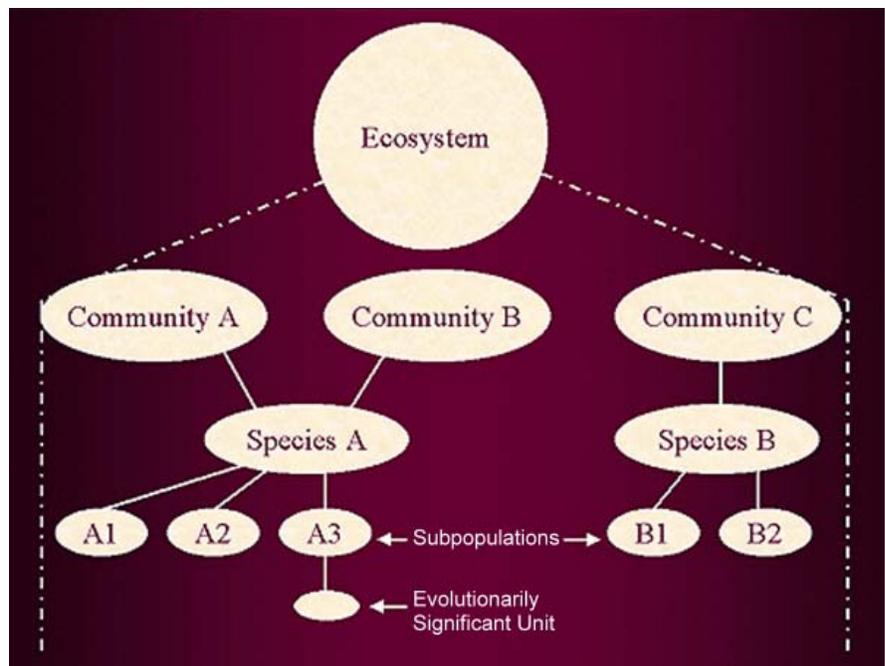


Figure 2. Ecosystem as a Significant Evolutionary Unit system of communities

Product Overview

The Community Models Catalog contains more than 30 community models in its database. A sample is found in Table 1. As community models are developed through the Community Template Work Unit, they will be added to the catalog database. Six community models are currently under development at ERDC: Riparian Cottonwood Community Model for Missouri National Recreation River; Freshwater Macroinvertebrate

Community Model for Missouri River; Oyster Reef Community for the South Atlantic Coast; and three communities (Riparian, Salt Marsh, and Prairie) within the Clear Creek Watershed of southeast Texas.

The models listed in Table 1 should be taken in an “as is” condition. The only criterion that the models must meet is to offer approaches to quantifying a community. The authors of this article will put others

Table 1**Selected Community Models Currently in the Catalog**

Aggus, L. R., and Bivin, W. M. (1982). "Habitat suitability index models: Regression models based on harvest of coolwater and coldwater fishes in reservoirs," Biological Report FWS/OBS 82/10.25, U.S. Fish and Wildlife Service, Washington, DC, 38 pp.
Fris, M. B., and DeHaven, R. (1993). "A community-based habitat suitability index model for shaded riverine aquatic cover, selected reaches of the Sacramento River System," Draft, U.S. Fish and Wildlife Service, Sacramento, CA, 31 pp.
McConnell, W. J., Williamson, K. L., and Bergeson, E. P. (1984). "Habitat suitability index models: A low effort system for planned coolwater and coldwater reservoirs (Revised)," Biological Report FWS/OBS 82/10.3A, U.S. Fish and Wildlife Service, Washington, DC, 62 pp.
Miller, A. C. and Killgore, K. J.. (1987). "Community Habitat Suitability Models for Warmwater Fishes," Miscellaneous Paper EL-87-14, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, 31 pp.
Miller, A. C., Naimo, T. J., Payne, B. S., and Russell-Hunter, W. (1987). "Gravel Bar Mussel Communities: A Community Model," Technical Report EL-87-13, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, 71 pp.
Nestler, J. M., Schneider, L. T., and Latka, D. (1993). "Physical habitat analysis of Missouri River main stem reservoir tailwaters using the riverine community habitat assessment and restoration concept (RCHARC)," Technical Report EL-93-22, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.
O'Connell, T. J., Brooks, R. P., and Jackson, L. E. (1998). "The bird community index: A tool for assessing biotic integrity in the mid-Atlantic highlands," 98-4, Pennsylvania State University, University Park, PA, 70 pp.
O'Neil, L. J., and Webb, A. C. "Model design and evaluation of wetland enhancement in Buckeye Basin, Toledo, Ohio," in preparation, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, 16 pp.
O'Neil, L. J., Middleton, B., and Webb, A. C. "Habitat Suitability Index Model: Cypress/Tupelo Community in Southern Illinois," unpublished report, U.S. Army Corps of Engineers, Vicksburg, MS, 23 pp.
Rankin, E. T. (1989). "The Qualitative Habitat Evaluation Index (QHEI): Rationale, Methods, and Application," Ohio Environmental Protection Agency, Columbus, OH, 54 pp.
Schroeder, R. (1986). "Habitat suitability index models: Wildlife species richness in shelterbelts," Biological Report 82(10.128), US Fish and Wildlife Service, Washington, DC, 17 pp.
Schroeder, R. (1996). "Wildlife community habitat evaluation: A model for deciduous palustrine forested wetlands in Maryland," Technical Report WRP-DE-14, U.S. Army Corps of Engineers, Vicksburg, MS, 30 pp.
Schroeder, R., and Allen, A. W. (1992). "Assessment of Habitat of Wildlife Communities on the Snake River, Jackson, Wyoming," USFWS Resource Publication 190, U.S. Fish and Wildlife Service, Washington, DC, 21 pp.
Schroeder, R., Pullen, T. Jr., and O'Neil, L. J. (1994). "Wildlife community habitat evaluation: A model for Bottomland Hardwood Forests in the Southeastern United States," Biological Report 92(X), U.S. Fish and Wildlife Service, Washington, DC, 114pp.
Short, H. L. (1984). "Habitat suitability index models: The Arizona guild and layers of habitat models," Biological Report FWS/OBS 82/10.70, U.S. Fish and Wildlife Service, Washington, DC, 37 pp.

in touch with authors of unpublished models upon request. The catalog will be available through EMRIS in late FY04. User access screens in the catalog are described in the following paragraphs.

The main screen (“Main Switchboard,” Figure 3) provides four buttons for data entry:

- Enter/View Publications
- Enter/View Model Information
- Enter/View Classification
- Enter/View Regions

The user must select “Enter/View Publications” to enter the catalog. All other information is tied to the model publication “Title” field.

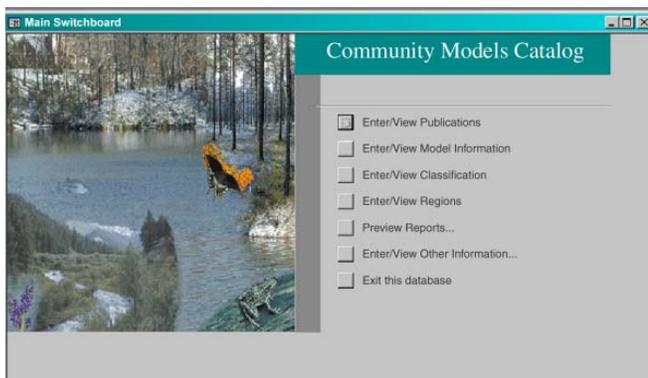


Figure 3. Main Screen

The Model Information form (Figure 4) contains fields pertaining to model criteria and assumptions.

- *Basis* – refers to what is being modeled. For example:
 - 1) HSI models infer carrying capacity; 2) Functional capacity index (FCI) models quantify wetland functional capacity; and 3) the Index of Biotic Integrity (IBI) assesses integrity.
- *Status* – refers to the level of model completion (Draft, Final, Revised, Modified, and Tested).
- *Purpose* – refers to the originally intended application of the model (i.e., restoration, impact assessment, mitigation, management, etc.).
- *Target* – identifies the animal or plant group assessed.
 - ⇒ HSI models infer carrying capacity
 - ⇒ Functional capacity index
 - ⇒ Amphibians
 - ⇒ Reptiles
 - ⇒ Birds
 - ⇒ Mammals

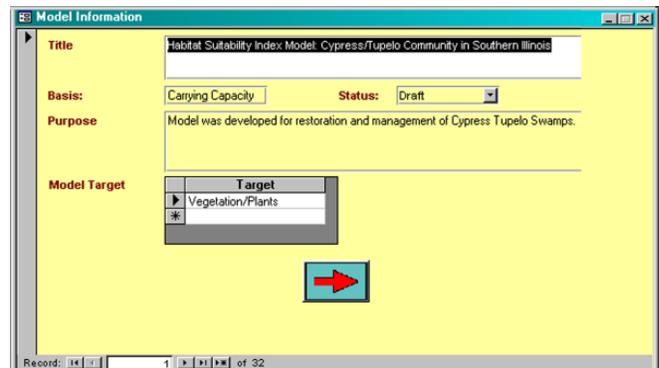


Figure 4. Model information form

- ⇒ Vegetation/Plants
- ⇒ Wildlife (Figure 5) (general category)

The classification form contains fields pertaining to three classification schemes.

- *Author Description* – allows for the community classification as described by the author.
- *Cowardin et al. (1979) Wetland Classification System* – two levels of the classification scheme are listed in a pull-down menu. The first describes the "System" and the second describes the "Class."
- *Community Type* – two levels are named, separated by a hyphen. The first describes the Structure "Level" and the second describes the Structure "Sublevel."

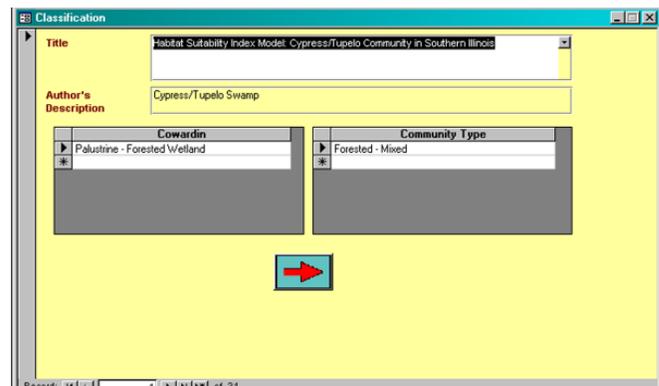


Figure 5. Classification form

The Region form (Figure 6) contains fields pertaining to four geographical boundaries where the model is applicable.

- *Geographic Region* – general geographic region of the United States.
- *USFWS Region* – organized by the seven agency regions (numbered 1-7).
- *USACE Region* – organized by Corps Division.

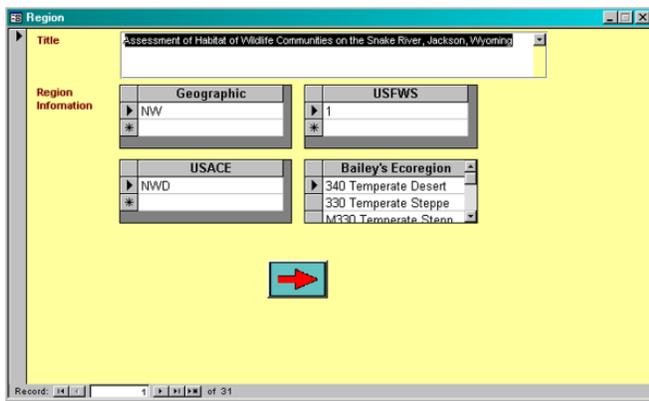


Figure 6. Region form

➤ *Bailey's Ecoregions* – organized by divisions based on climate, vegetation, and topography (Bailey 1983).

The buttons on the Main Switchboard are designed for other purposes, such as viewing reports and other information, and exiting the database. Reports can be generated based on sorting options: author, title, target, classification, and/or region information.

We anticipate ready availability of community habitat index models will further their use and development. We welcome contributions by readers and communication on experiences in application of the models.

Appreciation

Ms. Renee' Caruthers, DynTel, Vicksburg, MS, programmed the Access database and developed the report formats. Review comments on this document were provided by Mses. Julie Marcy, Amy Lee, and Kelly Burks-Copes, ERDC-EL.

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References

- Bailey, R. G. (1983). "Delineation of ecosystem regions," *Environmental Management* 7, 365-373, or (www.fs.fed.us/land/ecosysgmt/ecoreg1_home.html).
- Cowardin, L. M., Carter, V., and LaRoe, E. T. (1979). "Classification of wetlands and deepwater habitats of the United States," FWS/OBS 79-31, U.S. Fish and Wildlife Service, Washington, DC. http://www.nwi.fws.gov/Pubs_Reports/Class_Manual/class_titlepg.htm
- Noss, R. F., LaRoe, E. T., and Scott, J. M. (1985). "Endangered ecosystems of the United States: A preliminary assessment of loss and degradation," Biol. Report 28, U.S. Department of Interior, National Biological Service, Washington, DC. <http://biology.usgs.gov/pubs/ecosys.htm>
- Schroeder, R. L. (1996). "Wildlife community habitat evaluation: A model for deciduous palustrine forested wetlands in Maryland," Technical Report WRP-DE-14, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. <http://www.wes.army.mil/el/wetlands/pdfs/wrpde14.pdf>

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Upcoming PROSPECT classes include:

- 7-11 Jun 2004** – Coastal Ecology, No. 263, Monterey, CA. **POC for class content:** William Brostoff (601-634-3435, William.Brostoff@erdc.usace.army.mil).
- 7-11 Jun 2004** – Fund Wetlands Ecology, No. 272, Annapolis, MD. **POC for class content:** Morris Mauney (601-634-4258, Morris.Mauney@erdc.usace.army.mil).
- 21-25 Jun 2004** – Ecosystem Res/Plan/Eval, No. 348, Albuquerque, NM. **POC for class content:** Darrell Nolton (403-428-9084, Darrell.G.Norton@wrc01.usace.army.mil).
- 28 Jun-2 Jul Mar 2004** – Wet Mit Bank Dev/Mgt, No. 239, Orlando, FL. **POC for class content:** Ellis Clairain (601-634-3774, Ellis.J.Clairain@erdc.usace.army.mil).
- 19-23 Jul 2004** – Ecol Pln/Mgt Issues, No. 264, Lafayette, LA. **POC for class content:** Jean O’Neil (601-634-3641, L.Jean.O'Neil@erdc.usace.army.mil).
- 19-23 Jul 2004** – Riparian Ecol/Mgt, No. 281, Anchorage, AK. **POC for class content:** Richard Fischer (502-315-6707).
- 2-6 Aug 2004** – Fund Wetlands Ecology, No. 272, Olympia, WA. **POC for class content:** Morris Mauney (601-634-4258, Morris.Mauney@erdc.usace.army.mil).

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EMRRP-ER-01 Economic Values Associated with Construction of Oyster Reefs by the Corps of Engineers, September 2003

Related Research Published by ERDC — 2003

Uranowski, C., et al. (2003). “A Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing Wetland Functions of Low-Gradient, Blackwater Riverine Wetlands in Peninsular Florida,” *ERDC/EL TR-03-3*, U.S. Army Engineer Research and Development Center, Vicksburg, MS.



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